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Radio & Electronics World

The communications and electronics magazine

IC-2 MOD:
AUTO-TONEBURST
FOR THIS HANDHELD

PACKET RADIO:
SOME THOUGHTS ON
DATA TRANSMISSION

TV PROJECT:
A CONVERTER
FOR TV BUFFS

UK SPECTRUM:
BRIEF DETAILS OF
VHF/UHF ALLOCATIONS

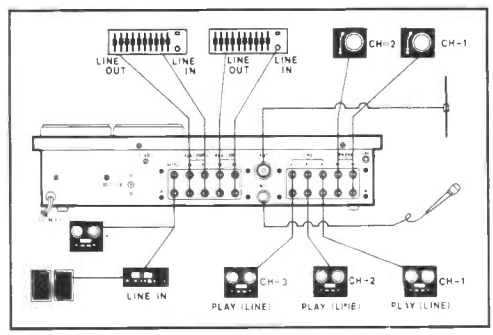
DATA FILE:
APPLICATIONS OF
JUNCTION FETS

LOOKING BACK:
A VOICE FROM THE PAST

NOW AVAILABLE FOR THE VERY FIRST TIME IN THE U K

STEREO FM PRIVATE BROADCASTING STATION!

A portable 6 channelmixer/studio at your fingertips!



Raycom Ltd – the communication specialists announce an exciting new concept in broadcasting with the CT4-FM Private Studio. Complete with a low-power FM broadcast-band stereo transmitter, this ultra compact twin deck console is suitable for both portable or fixed applications. Furthemore, its facilities enable individuals or companies to start their own local community radio service with the minimum of expense (Government license is required for installation and operation). The basic unit costs £520.80 + VAT and accessories to be introduced shortly include graphic equalizers and other related products. Demand for these unique quality units are bound to be extremely high so contact us **NOW** for full details.

★ Ideal for DJ's
★ 6 Stereo Channels
★ Facilities include 'On-Air' switch, Test Tone, Pre-Fade Controls, Full Cuing Facilities, Mike Overide, VU Meter monitoring of all channels, Over Level LED's.
★ Twin Deck
★ Pan Facility for Microphone
★ Frequency coverage 88-106MHz
★ Unit operates from 12V DC
★ Low Power Output @ 20mw
★ Specify Frequency Required

RAYCOM LTD the communication specialists

Unit 2, 584 Hagley Road West, Oldbury B68 OBS Tel: 021 421 8203. Telex 334303 TXAWM-G

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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 – The all-singing, all-dancing ALM 203E, now available from ICS Electronics (p9)

Bottom – Two new mixer pre-amps from Magnum Microwave (p8)

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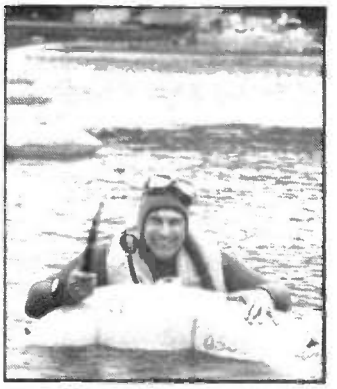
NEXT MONTH

☐ **Next Issue**
Cover date January 1986 on sale Thursday, 12 December

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



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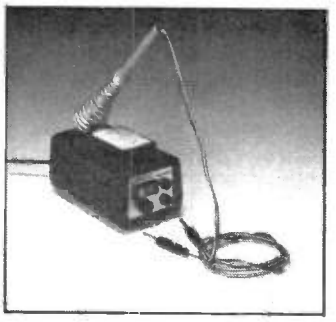

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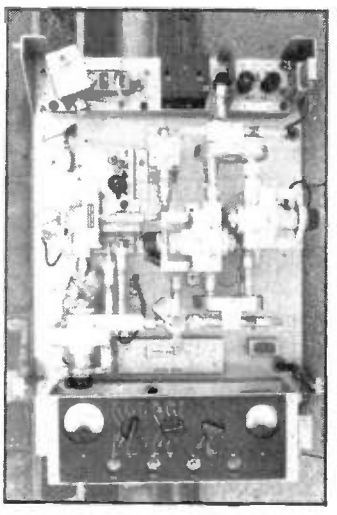

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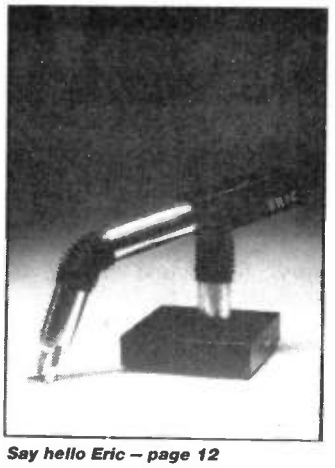


Say hello Eric – page 12

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

I/O BOX

A new company, MG Systems Ltd, have released a real time data acquisition and control box for use with any type of computer system. It is a medium resolution, medium speed unit for handling analogue and digital inputs and outputs, together with relay and power switching and real time clock facilities. Communications to or from a computer are via an RS232 serial line, baud selectable, and the use of simple English commands such as SET or READ will initiate the desired operation.

The MGS1 product is well packaged and documented and is priced at £650 excluding VAT. Delivery is within 28 days of order.

MG Systems Ltd,
The Genesis Centre,
Birchwood Science
Park South, Warrington,
Cheshire WA3 7BH.
Tel: (0925) 828 247.

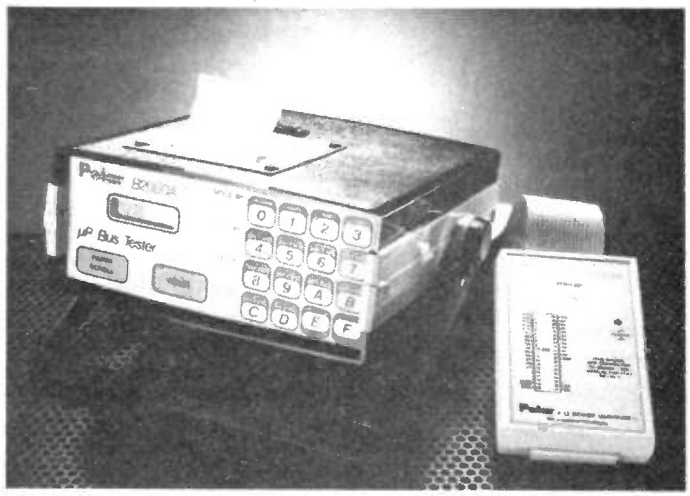
MICRO SYSTEM TESTER

Antron Electronics has launched a low cost trouble-shooting instrument for microprocessor-based systems.

The B2000A, made by Polar Electronics, offers greater ease of use than logic analysers. Unlike signature analysers it can be used on a completely unserviceable unit and requires no additional designed-in facilities. Compared with the third alternative, microprocessor emulators, the B2000A has a very low cost.

In operation, the B2000A is connected to the system under test in place of the microprocessor, and takes command of the address, data and control lines. It then generates the signals required to test and activate RAM, ROM, and I/O. Results are reported on an integral ticket printer.

Thirteen pre-programmed tests are available, including ROM checksum, RAM and I/O write/read, disassemble, and search. Of particular value is the shorts test, which finds short-circuits between any data or address line and the V_{CC}, GND, or other lines.



Connection from the B2000A to the system under test is made via a personality pod which configures the instrument to the particular microprocessor. Pods are available for Z80, 1802, 6502, 6800, 6802, 6809, 8080, 8085, and the BBC microcomputer.

Antron Electronics Ltd,
Hamilton House,
39 Kings Road,
Haslemere,
Surrey GU27 2QA.
Tel: (0428) 54541.

DIGITAL MULTIMETER

The Monacor DMT-700, from Croydon Discount Electronics, is a pocket-sized (67 × 112 × 25mm) 3½-digit LCD digital multimeter.

It has thirteen ranges, as follows: 0-1kV dc (four ranges); 0-500V ac (two ranges); 0-200mA dc (three ranges); 0-2kΩ (four ranges).

There is effective overload and transient protection on all ranges, over-range indication on each range, and full auto-polarity operation.

The company believes that the multimeter's handy size, and the fact that it is devoid of superfluous ranges, makes it a practical investment for both the electronics enthusiast and the service engineer.

It comes boxed with battery, fuse, test leads and manual, and costs £29.95.

Croydon Discount Electronics,
38 Lower Addiscombe Road,
Croydon, Surrey CR0 6AA.
Tel: (01) 688 2950.

LOGIC TESTER

A new versatile pocket-sized logic testing device offering clear and simple 'hands free' operation has been introduced at a budget price of £49.95 ex-works by Johnson Scanatron, who are leading exponents in electronic design and data management systems.

Known as Logic Klip, the unit is designed to appeal to both the professional and to schools, colleges and hobbyists, and has the built-in capability to monitor the interaction of up to 16 points or nodes, readout being clearly given on 16 numbered LEDs.

Simply connected using a 4-point IC clip supplied as standard, or a combination of clips, interfaces, grabbers and probes supplied as extras, the logic state at the test point is indicated by logic 1 (high) LED on, or logic 0 (low) LED off. Power supply taken from the test circuit is either TTL (operating voltage +5V) or CMOS (4.5 to 18V).

A feature of the Logic Klip is that the display face can be temporarily marked, using a chinagraph pen, to describe circuit layout or IC pin-outs. A separate overlay is also supplied with the unit to facilitate alternative layouts, whilst additional overlays are readily available to enable the build-up of a library.

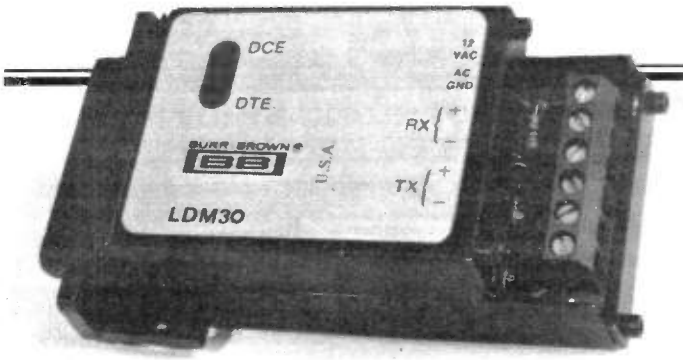
Johnsons (Leigh) Ltd,
100/102 Glendale Gardens,
Leigh-on-Sea,
Essex SS9 2AY.
Tel: (0702) 713734/710990.

LOGIC ANALYSER

The new Advance Model 1950 from House of Instruments, the company's first product to bear the Advance brand name since its acquisition by the Advance Group of Companies, is a British-made instrument designed to interface with a personal computer to provide a range of powerful logic-analysis features.

The instrument, which can be used with the IBM-PC, BBC Model B, or Apple II micros, uses the computer's built-in cost-effective intelligence to provide analysis on up to 32 channels of data, with a 1024-sample memory on each channel.

The Advance 1950 is fully controlled by the computer's keyboard, and the computer's display provides data acquisition details, data in the chosen format and an on-screen menu. The computer's disc and printer facilities provide storage and hard copy output for all data and set-up parameters.



MODEMS

Burr-Brown recently announced two limited-distance modems, designed to allow video display terminals and other RS232 devices to be connected through optically-coupled circuits.

Known as the LDM30 and LDM70, these low-cost modems have data rates up to 9600 baud at a distance of three miles, 19200 baud at one mile and 57600 baud at half a mile. The use of an optically-coupled receiver eliminates online ground potential difference problems and minimises the effects of the electrical noise often found in many industrial environments.

An on-board 500 watt, one millisecond transient voltage suppressor protects the modem, and the host device, from electrical transients caused from the effects of induced lightning or the operation of heavy industrial equipment.

Each model is available as a host-powered unit which takes its ± dc power from pins 9 and 10 of the RS232 connector, or as a self-powered unit which uses 12V ac from a wall-mounted transformer.

Burr-Brown International,
Cassiobury House,
11-19 Station Road,
Watford, Herts WD1 1EA.
Tel: (0923) 33837.

As a logic analyser, the Advance 1950 offers both timing and state displays, with glitch detection capabilities down to 20ns. Disassemblers are available for a range of standard processors including the Z80, 8085, 6800, 6809 and 6502, while the processing and storage capabilities of the micro allow automatic comparison of measured data with stored reference information.

The 1950 is supplied as an add-on module which interfaces to the personal computer via an RS232 or IEEE link. The unit measures 342 × 260 × 70mm and weighs 4kg, and is supplied complete with four data input pods each carrying eight inputs and ground.

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

SYSTEM DMM

The new PM2534 system multimeter from Philips Test and Measurement offers guarded 3½ to 6½ digit sensitivity and up to 100 measurements per second via the standard IEEE 488/IEC 625 interface. It costs £795 (plus VAT) complete – there are no expensive extras.

The instrument, which has 100nV and 100nA resolutions and 0.005% long term accuracy, offers outstanding dc performance. Other standard measurements include true RMS ac current and voltage, ohms (2 and 4 wire) 0.001 to 300MΩ, and temperature (Pt 100).

Full guarding of the analogue input circuitry ensures measurement integrity at high resolution. It eliminates the risk of parasitic voltages or noise being picked up by the measurement leads or input circuits.

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

ELECTROSTATIC METER

IMCS Corporation has introduced the Electroscan-30, a self-contained measurement system capable of instantly verifying electrostatic potentials stored in conductive as well as non-conductive materials. The Electroscan-30 features a non-contacting combination voltmeter and coulombmeter enabling the user to measure either field intensity (field strength) or charge accumulation.

When used as a coulombmeter, the instrument displays its data directly and accurately in nC (nanocoulombs). Low noise amplification allows a resolution of ±1nC. As a voltmeter, surveying typical materials, the unit will provide reasonable values of the surface potentials present on those materials.

An LCD readout displays up to 100kV or 1000nC with automatic scaling for accurate readings. High intensity focused beams are utilised for accurate ranging of 12 inch measuring distance. All system components are contained within a dedicated case and include rechargeable Nicads with charger, low battery indicator, high voltage electrostatic calibrator, and a user manual with a tutorial on electrostatic fields.

Of special interest is the inclusion of a high voltage calibrator which produces verifiable electrostatic voltages on the surface of a sphere of known capacity.

IMCS Corporation,
1300 Spacepark,
Mountain View,
California 94043, USA.

TRANSIENT CAPTURE

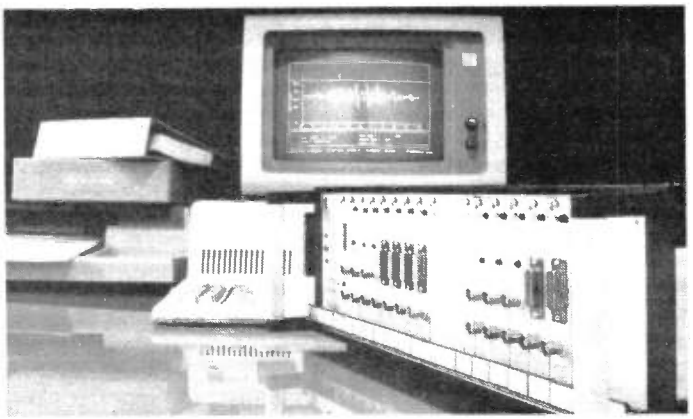
The Microlink transient capture system is a hardware and software solution to the problems of waveform capture, storage and processing. It is designed for the measurement of fast events such as vibrations, oscillations and compressions.

The system uses standard microcomputers like the IBM PC or Apricot, while offering the facilities associated with most sophisticated instrumentation.

The modular Microlink hardware allows the capture of a practically unlimited number of waveforms, either simultaneously or independently. Capable also of split timebase transient capture and a variety of triggering options, the instrumentation offers 12-bit analogue to digital conversion at rates of up to 50,000 samples per second per channel. Memory sizes of 4, 8 and 16K samples per channel are available.

The modularity of the hardware enable the user to add a variety of measurement, control and timing functions from Microlink's range of more than 40 modules.

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



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27128 £5.50 **6800** £2.50 **6821** £1.00 **68A09** £8.00
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8748 £15.00.
Thousands of IC's EX STOCK send SAE for list.

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A300 07191315 12v 3ah as RS 591-770 **NEW £13.95**
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DISTEL©

The **ORIGINAL FREE OF CHARGE** dial up data base. Buy, browse or place **YOUR OWN AD** for goods or services to sell. 1000's of stock items, spares and one off bargains. Updated daily. **ON LINE NOW.** CCITT, 8 bit word, no parity.
For **300** baud modems call 01-679 1888
For **1200-75** baud modems call 01-679 6183

PRINTER / TERMINAL SCOOP

A **MASSIVE** purchase of these attractive stand alone terminal units enables a **SUPER BARGAIN** offer. Made by the **US GENERAL ELECTRIC CORPORATION** the **GE MODEL 30** features a standard **QWERTY** 80 key electronic keyboard coupled to a quality built matrix printer with variable 3" to 9.5" forms tractor. The printer is capable of continuous duty printing, with up to 120 characters per line. Standard **RS232** interface accepts **ASCII** data at 110, 150 or 300 baud. Ideal for Terminals, Data loggers, local label printing, or just as a printer!! Sold **TESTED** with data **ONLY £95.00**. Also available with **TWIN MAGTAPE CASSETTE** unit for data capture, data preparation etc **£150.00** Carriage £10.00.

DISK DRIVES

Japanese Half height, 80 track double sided disk drives by **TEAC, TOSHIBA** etc. Sold as **NEW** with 90 day guarantee **ONLY £125.00.**
SUGART SA400 SS FH 35 TRK **£55.00**
SIEMANS FDD100 SS FH 40 TRK **£75.00**
carriage on 5¼" drives £5.50
Brand **NEW** metal cases with internal PSU etc for above drives, below cost!!!
DSKC 1 for 2 HH or 1 FH 5¼" drive **£39.95** + pp £4.50 **DSKC 2** for 1 HH or 1 FH 5¼" drive **£29.95** + pp £4.50
8" Refurbished standard units.
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SUGART 851 DS £250.00 + pp £8.50
DRE 7100 SS as seen £125.00
TWIN SUGART 851's in smart case, complete with PSU etc, £595.00
8" DRIVE PSU for 2 drive units £45.00

Hard Disk Drives
DRE/DIABLO Series 30 2.5 Mb front load, **£525.00**, Exchangeable version £295.00
ME3029 PSU for above £95.00
DIABLO 44/DRE4000A, B 5+5 Mb from £750.00
CDC HAWK 5+5 Mb £795.00
CDC 9762 80 Mb RM03 etc £2500.00
PERTEC D3422 5+5 Mb £495.00
RODIME 10MB ST506 Winchester NEW £299.00
BASF 6172 23Mb Winchesters, as seen £199.00
Carriage on other drives £10.00.
Unless stated all drives are refurbished with 90 day guarantee. Many other drives and spares in stock – call sales office for details.

MODEMS

Join the communications revolution with our super range of **DATA MODEMS**, prices and specifications to suit all applications and budgets . . .
BRAND NEW State of the art products.
DACOM DSL2123 Multi standard 300-300, 1200-75 Auto answer etc. **£288.00**
DACOM DSL2123AD Auto dial, smart modem with multi standard **AUTO SPEED** detect, and data buffer with flow control etc. **£365.00**
DACOM DSL2123GT The **CREAM** of the intelligent modems, auto dial, auto call, index, buffer etc etc. **£498.00**
STEEBECK SB1212 V22 1200 baud **FULL DUPLEX**, sync or async, optional auto dial. **£485.00**
TRANSDATA 307A Acoustic coupler **300** baud full duplex, originate only, **RS232** **£49.00**

Ex BRITISH TELECOM full spec, CCITT, ruggedised, bargain offers. Sold **TESTED** with data. Will work on any **MICRO** or system with **RS232** interface.
DATEL 2B 300 Baud Modem see **SPECIAL OFFER.**
MODEM 13A 300 baud unit, only 2" high fits under phone. **CALL** mode only £45.00
MODEM 20-1. 75-1200 baud. Compact unit for use as subscriber end to PRESTEL TELECOM GOLD, **MICRONET** etc. **£39.95** + pp £6.50
MODEM 20-2 1200-75 baud. Same as 20-1 but for computer end. **£85.00** + pp £6.50
DATEL 2412 Made by SE labs for BT this two part unit is for synchronious data links at 1200 or 2400 baud using **2780/3780** protocol etc. Many features include 2 or 4 wire working, self test, auto answer etc.
COST OVER £800 Our price **ONLY £199** + pp £8.00
DATEL 4800, RACAL MPS4800 baud modem, EX BT good working order, **ONLY £295.00** + pp £8.00

SUMMER OFFER
MODEM TG2393. Ex BT, Up to 1200 baud, full duplex over 4 wire or half duplex over 2 wire line. **ONLY £85.00 PER PAIR** + pp £10.00

For more information
CONTACT OUR SALES OFFICE

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Keep your hot parts **COOL** and **RELIABLE** with our range of **COOLING FANS**
ETRI 126LF21 240v 5 blade equipment fan Dim. 80 x 80 x 38mm **£9.95**
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8UHLER 89.11.22 8-16v DC micro miniature reversible fan. Uses a brushless servo motor for extremely high air flow, also silent running and guaranteed 10,000 hr life. Measures only 62 x 62 x 22mm. Current cost £32.00. OUR PRICE **ONLY £12.95** complete with data.
MUFFIN-CENTAUR standard 4" x 4" x 1.25" fans 110v OR 240v **NEW** at **£10.50** or tested EX EQUIPMENT 240v £6.25 or 110v £4.95.
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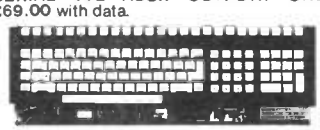
Call for Details. Post & Packing on all fans £2.00.

QWERTY KEYBOARDS

Manufacturer's **BRAND NEW** surplus.
ALPHAMERIC 7204/60 Full travel **ASCII**, 60 key with parallel output and strobe. £39.95
DEC LA34 Uncoded keyboard with 67 quality gold plated switches on X-Y matrix – ideal micro conversions etc. **£24.95**
AMKEY MPNK-114 Superb word processor chassis keyboard on single **PCB** with 116 keys. Many features such as On board Micro, Single 5v rail, full **ASCII** coded character set with 31 function keys, Numeric keypad, cursor pad and 9600 baud **SERIAL TTL ASCII OUTPUT!! ONLY £69.00** with data.



Carriage on all Keyboards £3.50

PLESSEY VUTEL

Manufactured by **PLESSEY** Ltd this compact unit, only slightly larger than a telephone, features an all in one **TELEPHONE**, 24 x 40 character CRT screen, **VIEWDATA – PRESTEL** modem. Keypad and electronics to run as a fully fledged **PRESTEL** terminal or telephone. Ready to plug direct into a BT 600 type jack socket and instantly connect you to **PRESTEL** etc. Many other features include Memory dialling, Recall button, Off line screen data storage, Picture expand, Standard Mullard LUCY chip set, Integral 5" JVC crt monitor, etc etc. Designed to sell to the **EXECUTIVE** at over £600!! But from **DISPLAY, BRAND NEW AND BOXED** at only £99.00 for **DTMF** tone dial or **£140.00** for standard **DIAL PULSE** version. Carr. £8.00.

COLOUR AND MONOCHROME MONITOR SPECIALS

'SYSTEM ALPHA' 14" COLOUR 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 video inputs: **RGB** and **PAL** Composite Video, allow direct connection to the **BBC** and most other makes of micro computers and **VCR's**. An internal speaker and audio amplifier may be connected to your systems output or direct to a VCR machine, giving superior sound quality. Many other features included 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

DECCA 80 16" COLOUR monitor. RGB input.

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, coupled with the tried and tested **DECCA 80** series TV chassis gives 80 column definition and picture quality found only on monitors costing **3 TIMES OUR PRICE**. In fact, **WE GUARANTEE** you will be delighted with this product, the quality for the price, has to be seen to be believed. Supplied complete and ready to plug direct to a **BBC MICRO** computer or any other system with a **TTL RGB** output. Other features are: internal speaker, Modular construction, auto degaussing circuit, Attractive **TEAK CASE**, compact dimensions only 52cm W x 34 H x 24 D, 90 day guarantee. Although used, units are supplied in **EXCELLENT** condition, **ONLY £99.00** + Carr.
DECCA 80, 16" COLOUR monitor. Compositve video input. Same as above model but fitted with Composite Video input and audio amp for **COMPUTER**, VCR or **AUDIO VISUAL** use. **ONLY £99.00** + Carr.
REDIFFUSION MARK 3, 20" Colour monitor. Fitted with standard 75 ohm composite video input and sound amp. This large screen colour display is ideal for shops, schools, clubs and other **AUDIO VISUAL** applications. Supplied in AS NEW or little used condition **ONLY £145.00** + Carr.

BUDGET RANGE EX EQUIPMENT MONOCHROME video monitors.

All units are fully cased and set for 240v standard working with composite video inputs. Units are pre tested and set up for 80 column use on **BBC** micro etc. Even when MINOR screen burns exist – normal data displays are unaffected.
12" KGM 320-1 B/W high bandwidth input, will display up to 132 x 25 lines. **£32.95**
12" GREEN SCREEN version of **KGM 320-1** Only **£39.95**
9" KGM 324 GREEN SCREEN fully cased very compact unit Only **£55.00**
9" HITACHI VM-906E/K Black and White screen **£49.95**
Carriage and insurance on all monitors **£10.00**

D.C. POWER SUPPLY SPECIALS

GOULD OF443 enclosed, compact switch mode supply with DC regulated outputs of +5v @ 5.5a, +12v @ 0.5a, -12v @ 0.1a and -23v @ 0.02a. Dim 18 x 11 x 6 cm. 110 or 240v input. **BRAND NEW** only **£14.95**
GOULD G6-40A 5v 40 amp switch mode supply NEW £130.00
GREENDALE 19A-BOE Switch mode 60 watt open PCB with a fully regulated DC output of 5v @ 6 amps, and three semi regulated outputs of +12V, -12V +15V @ upto 1 amp. Dim only 11 cm x 20 cm x 5.5 cm. Similar to RS 591-994. 110 or 240v AC input. **TESTED** ex equipment. **Only £24.95**
AC-DC Linear PSU for **DISK** drive and **SYSTEM** applications. Constructed on a rugged ALLOY chassis to continuously supply fully regulated DC outputs of +5V @ 3 amps, -5V @ 0.6 amps and +24v @ 5 amps. Short circuit and overvoltage protected. 110 or 240 V AC input. Dim 28 x 12.5 x 7 cm **NEW £49.95.**
Carriage on PSU's £3.00

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
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- Supplied with full data
- Modular construction
- Direct isolated connection
- 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

NOW ONLY £29.95

BT 600 Jack plug and cable £2.25 Carriage and Ins. £10.00

VDU TERMINALS

Standard VDU data entry terminals at give away prices!!
QUME QVT108. Current product, state of the art terminal with detachable keyboard, 12" green screen, 2 page RAM, **TVI 925** emulation, 25 x 80, Clock, Swivel and tilt base, Printer port, Function keys etc. **BRAND NEW** and BOXED AT ALMOST **HALF PRICE** Only **£425.00**
AJ510 – EX RENTAL. Z80 controlled, 15" green screen 24 x 80 display, graphics, cursor addressing, printer port etc. Very good condition **TESTED** complete with manual only £225.00.
ADDS 520 – Dumb terminal, used, 12" b/w screen RS232 interface and printer port. **TESTED. ONLY £125.00**
Carriage on terminals £10.00
100's of other terminals in stock, **CALL** for more details.

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

ERS — PRINTERS — PRINTERS — PRINTERS

SUPER DEAL? NO - SUPER STEAL
THE FABULOUS 25 CPS "TEC STARWRITER"

Made to the very highest spec the **TEC STARWRITER FP1500-25** features a very heavy duty die cast chassis and **DIABLO** type print mechanism giving superb registration and print quality. Micro-processor 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 381mm paper handling with up to 163 characters per line, friction feed rollers for single sheet or continuous paper, internal buffer, standard **RS232** serial interface with handshake. Supplied absolutely **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 **£3.50**. Carriage & Ins. (UK Mainland) £10.00.

SUMMER OFFER ONLY £399.99!!

DIY PRINTER MECH

Brand New surplus of this professional printer chassis gives an outstanding opportunity for the **Student, Hobbyist** or **Robotics** constructor to build a **printer - plotter - digitiser** etc, entirely to their own specification. The printer mechanism is supplied ready built, aligned and pre tested but **WITHOUT** electronics. Many features include all metal chassis, phosphor bronze bearings, **132** character optical shaft position encoder, **NINE** needle head, 2 x two phase 12V stepper motors for carriage and paper control, 9.5" Paper platten etc. etc. Even a manufacturer's print sample to show the unit's capabilities!! Overall dimensions 40 cm x 12 cm x 21 cm.

Sold **BRAND NEW** at a **FRACTION** of cost **ONLY £49.50** + pp £4.50.

TELETYPE ASR33
DATA I/O TERMINALS

Industry standard, combined ASCII 110 baud printer, keyboard and 8 hole paper tape punch and reader. Standard **RS232** serial interface. Ideal as cheap hard copy unit or tape prep. for CNC and NC machines. **TESTED** and in good condition. Only **£235.00** floor stand **£10.00**. Carr & Ins. £15.00.

EX NEWS SERVICE PRINTERS

Compact ultra reliable quality built unit made by the **USA EXTEL Corporation**. Often seen in major Hotels printing up to the minute News and Financial information, the unit operates on 5 **UNIT BAUDOT CODE** from a Current loop, **RS232** or **TTL** serial interface. May be connected to your micro as a low cost printer or via a simple interface and filter to any communications receiver to enable printing of worldwide **NEWS, TELEX** and **RTTY** services.

Supplied **TESTED** in second hand condition complete with **DATA, 50 and 75 baud xtals and large paper roll.**

TYPE AE11 50 Column	**ONLY £49.95**
Spare paper roll for AE11	**£4.50**
TYPE AF11R 72 Col. + Ribbon	**£65.00**
TYPE AH11R 80 Col. ASCII/BAUDOT	**£185.00**

Carriage and Insurance £7.50

GE TERMIPRINTER

A massive purchase of these desk top printer terminals enables us to offer you these quality **30** or **120** cps printers at a **SUPER LOW PRICE** against their original cost of over £1000. Unit comprises of full **QWERTY**, electronic keyboard and printer 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 **GE30 £130.00. GE1200 120 cps £175.00**

Untested **GE30 £65.00** Optional floor stand **£12.50** Carr & Ins. £10.00.

SEMICONDUCTOR 'GRAB BAGS'

Mixed Semis amazing value contents include transistors digital, linear, IC's, triacs, diodes, bridge recs, etc. etc. All devices guaranteed brand new full spec with manufacturer's markings, fully guaranteed

50+ £2.95 100+ £5.15

TTL 74 Series. A gigantic purchase of an "across the board" range of **74 TTL** series IC's enables us to offer **100+** mixed "**mostly TTL**" grab bags at a price which two or three chips in the bag would normally cost to buy. Fully guaranteed all IC's full spec. **100+ £6.90, 200+ £12.30, 300+ £19.50**

20,000 FEET OF ELECTRONIC AND COMPUTER GOODIES
ENGLAND'S LARGEST SURPLUS STORE - SEEING IS BELIEVING!!

DEC CORNER

PDP 1140 System comprising of CPU, **124k** memory & MMU 15 line RS232 interface. RP02 40 MB hard disk drive.	
TU10 9 track 800 BPI Mag tape drive, dual track system. VT52 VDU, etc. etc. Tested and running.	**£3,750.00**
BA11-MB 3.5" Box, PSU, LTC	**£395.00**
DH11-AD 16" x RS232 DMA interface	**£1,900.00**
DLV11-J4 x EIA interface	**£350.00**
DLV11-E Serial. Modem support	**£190.00**
DUP11 Synch. 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 PLUS	**£1,100.00**
LA30 Printer and Keyboard	**£80.00**
LA36 Decwriter EIA or 20 mA loop	**£270.00**
MS11-JP Unibus 32kb Ram	**£80.00**
MS11-LB Unibus 128kb Ram	**£450.00**
MS11-LD Unibus 256kb Ram	**£850.00**
PDP11/05 Cpu Ram, i/o etc	**£450.00**
PDP11/40 Cpu, 124k MMU	**£1,850.00**
RT11 ver 3B documentation kit	**£70.00**
RK05-J 2.5 Mb disk drives	**£650.00**
KL8 JA PDP 8 async i/o	**£175.00**
M18E PDP 8 Bootstrap option	**£75.00**
VT50 VDU and Keyboard - 20 mA	**£175.00**
VT52 VDU and RS232 interface	**£250.00**

Give your **VT100** a Birthday!!!
Brand New **VT100** Keyboards only **£85.00**

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**.

MAG TAPE DRIVES

Many **EX STOCK** computer tape drives and spares by **PERTEC, CIPHER, WANGO, DIGIDATA, KENNEDY** etc. Special offer this month on **DEI** Cartridge tape drives **ONLY £450.00 each.**

CALL FOR DETAILS

COMPUTER/SYSTEM CABINET & PSU

All in one quality computer cabinet with integral switched mode PSU, mains filtering, and twin fan cooling. Originally made for the famous **DEC PDP8** computer system costing thousands of pounds. Made to run 24 hours per day the psu is fully screened and will deliver a massive **+5v DC at 17** amps, **+15v DC at 1 amp** and **-15v DC at 5 amps**. The complete unit is fully enclosed with removable top lid, filtering, trip switch, **power** and **run** leds mounted on ali front panel, rear cable entries, etc. etc. Units are in good but used condition - supplied for 240v operation complete with full circuit and tech. man. Give your system that professional finish for only **£49.95** + carr. 19" wide 16" deep 10.5" high. Useable area 16" w 10.5"h 11.5"d.

Also available less psu, with fans etc. Internal dim. 19"w, 16"d, 10.5"h. **£19.95. Carriage £8.75**

66% DISCOUNT ON ELECTRONIC COMPONENTS EQUIPMENT

Due to our massive bulk purchasing programme, which enables us to bring you the best possible bargains, we have thousands of ICs, Transistors, Relays, Caps, PCBs, 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 OF A LIFETIME**. Thousands of components at giveaway prices. Guaranteed to be worth at least 3 times what you pay. Unbeatable value and perhaps one of the most consistently useful items you will every buy!!! Sold by weight.

2.5kls £5.25 + pp £1.25 — **5 kls £6.90 + £1.80**
10kls £11.25 + pp £2.25 — **20kls £19.50 + pp £4.75**

MAINS FILTERS

CURE those unnerving hang ups and data glitches caused by mains interference with professional quality filters. **SD5A** matchbox size up to **1000 watt 240 V** Load **ONLY £5.95. L12127** compact completely cased unit with 3 pin fitted socket up to **750 watts ONLY £9.99**.

EPROM COPIERS

The amazing **SOFTY 2** The "Complete Toolkit" for copying, writing, modifying and listing **EPROMS** of the **2516, 2716, 2532, 2732** range. Many other functions include integral keyboard, cassette interface, serial and parallel i/o UHF modulator ZIF socket etc.

ONLY £195.00 + pp £2.50.

"GANG OF EIGHT" intelligent Z80 controlled 8 gang programmer for ALL single 5v rail EPROMS up to 27128. Will copy 8 27128 in ONLY 3 MINUTES. Internal **LCD** display and checking routines for **IDIOT PROOF** operation. Only **£395.00** + pp £3.00.

"GANG OF EIGHT PLUS" Same spec. as above but with additional **RS232** serial interface for down line loading data from computer etc **ONLY £445.00** + pp **£3.00**

Data sheets on request

1000's of other EX STOCK items including POWER SUPPLIES, RACKS, RELAYS, TRANSFORMERS, TEST EQUIPMENT, CABLE, CONNECTORS, HARDWARE, MODEMS, TELEPHONES, VARIACS, VDU'S, PRINTERS. POWER SUPPLIES, OPTICS, KEYBOARDS etc. etc. Give us a call for your spare part requirements. Stock changes almost daily.

Don't forget, ALL TYPES and QUANTITIES of electronic surplus purchased for CASH

MIXER PRE-AMPS

Magnum Microwave has added two new mixer preamplifiers, the MMA943M/P-1 and MMA943M/P-3, to its family of products. The new mixer preamplifiers, which cover the frequency range of 6-18GHz, feature typical noise figure performance of 9.0dB and 9.5dB respectively and a 1dB compression point of +15dBm, minimum. These wide dynamic range units have an IF frequency centered on 160MHz and operate with +10dBm, typical of LO drive.

These pre-amps feature conversion gains of typically 22dB and 12dB respectively. Both units are designed for use in either a drop-in configuration or with SMA connectors. The outline for both products is 1.00 × 1.00 × .38 inches.

Magnum Microwave Corp,
365 Ravendale Drive,
Mountain View,
California 94043, USA.
Tel: (415) 968 9281.

FLOPPY DISK DRIVE

Epson's new SMD-280 floppy disk drive is a very low profile (28mm), 3.5 inch device designed for high reliability, with one option only 25mm high, making it what is believed to be the world's slimmest.

This makes it especially suitable for use in portable computers, where standard profile 3.5 inch drives have not been compact enough for hand-held models. It will also see service in desk-top computers and word processors.

Although slimness is the most obvious benefit of the SMD-280 to computer and systems designers, there are other attractive features.

The low power requirement of 1.6W typically and the need for only a single 5V supply allow the systems designer to opt for smaller, cheaper and simpler power supplies than are needed for standard drives.

A low weight of 460g combines with the small size to make it highly valuable for integration in products designed for portability.

SMD-280 offers an unformatted storage capacity of 1MB, with a track to track access time of 3ms.

Epson (UK) Ltd,
Dorland House,
388 High Road, Wembley,
Middlesex HA9 6UH.
Tel: (01) 902 8892.

THERMAL PRINTING

A low cost alternative to dot matrix printer mechanisms is now available from DED. The TP40 has a simple rugged construction with a 7 needle thermal head giving high reliability and low cost.

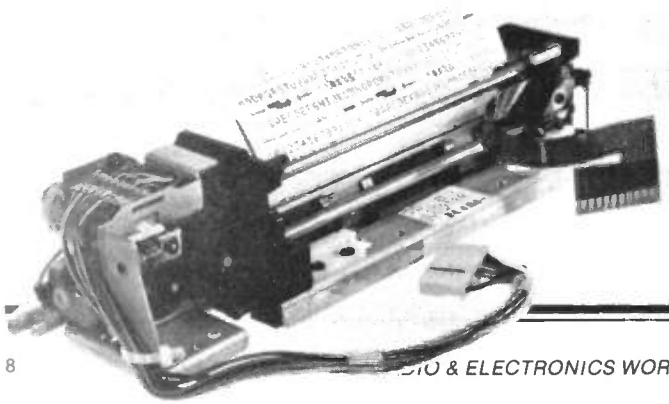
Forty characters per line are printed at 1 line per second. Graphic printing is also possible with 320 dots per line being addressed.

A masked controller chip is available to simplify interfacing the mechanism.

Power requirements are +5V for motors, +15V for the thermal head. The physical size of the TP40 is 208.5mm (W) × 56.0mm (H) × 45.0mm (D).

The price of this mechanism is £29.40.

DED,
Mill Road, Lydd,
Kent TN29 9EJ.
Tel: (0679) 20636.



ELECTROLYTICS

A new range of computer-grade aluminium electrolytic capacitors with screw-fix terminals has been developed by Iskra for power supply equipment where reliability and stability are essential requirements. Designed to operate with voltages up to 350V, the range offers capacitance values from 220 to 220,000μF with a tolerance of −10 to +50%.

The reliability of these capacitors is claimed to be outstanding. The lifespan is at least 1000 hours at dc rated voltages of 100V and below and a temperature of 85°C, or dc rated voltages above 100V and a temperature of 70°C.

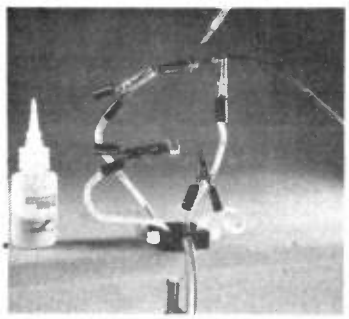
Iskra Limited,
Redlands, Coulsdon,
Surrey CR3 2HT.
Tel: (01) 668 7141.

GETTING TO GRIPS

Few of the jobs of the electronics hobbyist are more frustrating than the one that needs 'three hands' – two to hold the work and a third to apply solder, glue or some other operation. The smaller the component, the more difficult if usually proves to position and hold it accurately and firmly.

'Gripmate', produced by Kemplant, is a small clamped device that provides up to four extra hands, able to grip small components, wires and other items in an infinite number of working positions.

Any of the flexi-arms can be replaced with one attached to a 48mm diameter 2.5× safety magnifiying glass for close-up work, or a small magnet where this is more appropriate than the clip.



Supplied in a neat 3-fold storage wallet with assembly instructions, the Gripmate is sold as a basic 4-handed kit for £5.99 or, with the addition of the magnifier and magnet flexi-arms, for £9.35, inclusive of post, packing and VAT.

Kemplant Ltd, Durfold Wood,
Plaistow, Billingshurst,
West Sussex. RH14 0PN.
Tel: (048 649) 344.

MICRO PSU OFFER

To launch its new product, the Oryx Micro power supply unit, Greenwoods are offering a one-off deal on the price, which gives a 40% discount off list price to anyone sending a cheque direct to the company. The offer is effective until the end of November 1985. The unit costs £25.00 inclusive of VAT, with free post and packing.

This fixed voltage unit has been designed to feed the Oryx Micro range of soldering irons. Available in output voltages of 6, 12 and 24V and rated at 25 watts, the unit can be used for general purpose power supply needs. The solder stand is removable.

Inputs can be set at 115, 220 or 240 volts and the unit is presented in an attractive case measuring approximately 130mm long by 75mm wide by 60mm high. Output is designated at the point of ordering and cannot be varied by the user.

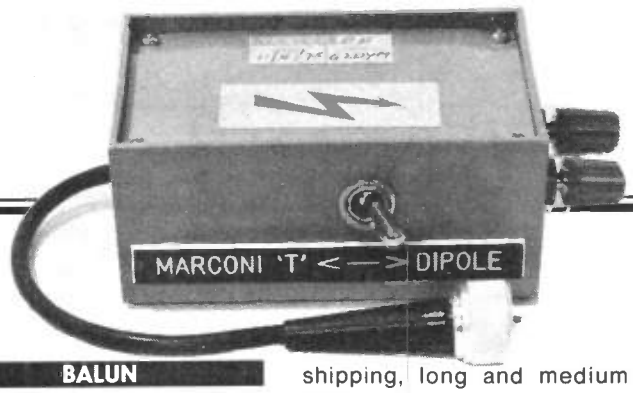
Greenwood Electronics,
Portman Road,
Reading RG3 1NE.
Tel: (0734) 595843.

DESOLDER PUMP OFFER

East Cornwall Components are currently offering a desoldering pump for £2.99 (normal price £4.50) with each order worth £10.00 or more received by 31 December.

The company's latest catalogue, with over 130 pages, covers its range of aerials, batteries, cables and connectors, ICs, PCBs, test equipment, etc and includes a credit note for 50p on any order over £10.

East Cornwall Components,
119 High Street,
Wern,
Shropshire SY4 5TT.
Tel: (0939) 32689.



BALUN

New from the G2DYM stable, manufacturers of a range of anti-TVI trap dipoles, is a balun to match the unbalanced output of a transmitter or input of a receiver to a balanced anti-TVI 75 ohm twin feeder.

It incorporates a change-over switch for the mode of aerial changing from that of a dipole or trap dipole to that of a Marconi 'T' for 160 metres, shipping, long and medium waves.

It has a rating of 1.5 to 30MHz/500W PEP, SSB or CW.

The switched balun matching unit with Marconi 'T' facility is £19.50 and £17.00 with the 'T' facility (plus £1.50 postage and packing).

G2DYM,
Uplowman, Tiverton,
Devon EX16 7PH.
Tel: (03986) 215.

PACKET + RTTY

ICS Electronics Ltd is now marketing AEA's Pakratt PK-64, a fully assembled Packet Radio controller which can be used with a Commodore 64 or 128 computer. Included with the controller is a new version of the company's advanced MBA-TOR software, which makes it the first packet controller with AMTOR, Baudot, ASCII and Morse.

The Pakratt controller shows messages and connect status simultaneously on the Commodore with a split-screen display. Letter perfect text from the text editor software can be sent whilst incoming messages are being monitored.

The 20Kbyte QSO buffer stores over 20 video screens of text. Disc commands enable the user to save specific operating parameters for quick set-up for emergency services, clubs and multiple frequency use.

Pakratt is available for £259 including VAT, plus £2.50 p&p.

BBC SOFTWARE

A new piece of software for the BBC computer which is aimed at the amateur radio enthusiast has been devised by J Melvin G3LIV.

Many manufacturers of amateur radio gear are now supplying a data input socket on their equipment. The interfaces can be purchased from these companies but these are quite expensive, and G3LIV and his son, G8UEE, noticed that there seemed to be no readily available software.

This was the inspiration behind the production of a range of software to allow the BBC computer to drive receivers and transceivers with fitted data input sockets. Existing interfaces or the Melvins' own interface may be used.

The first program is for the Yaesu 757GX transceiver. This allows complete control of the equipment with many extra facilities supplied by the program.

Up and down cursors can select frequency steps of 10Hz, 100Hz, 1kHz and 10kHz. Left and right cursors give 1MHz steps. There is control of fitted A/B VFOs, direct keyboard frequency entry, and 300 memory storage, with over-write or recall facility.

In fact, this program will allow the owner of the equipment to check 300 station frequencies in a matter of seconds. Programs currently being considered are for the FT9600, FRG8800, FT980, and others in the Trio range. Readers should indicate their interest and the Melvins will work on the most popular request.

The Yaesu program is available on disc (£9.50) and will shortly be produced on ROM (£12.00). The price of the interface is still to be finalised, but should be in the region of £25.00.

J Melvin G3LIV,
2 Salters Court,
Gosforth,
Newcastle,
Tyne and Wear NE3 5BH.
Tel: (091) 284 3028.

THE COVER PIC

ICS Electronics have also been appointed the exclusive UK distributor for a new range of hand-held and mobile transceivers from Alinco International Ltd of Osaka, Japan.

The initial product to be introduced is a price competitive hand-held transceiver, the new ALM203E for 2 metres. This push-button, keypad operated transceiver, housed in a robust high impact plastic/cast aluminium case, provides all the features needed for pleasurable 2 metre operation.

Included in the price is a 400mAH Nicad battery pack to give 3W output, an ac battery charger, a belt clip and antenna and hand strap as well as various attractive features, one of which is a built-in S-meter.

The transceiver costs £209 including VAT, plus £2.50 postage and packing.

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

ATU UPDATE

ATUs UK, of Cap Co Electronics Ltd, formerly TAU Systems Ltd, have announced modifications to the SPC-300 and SPC-3000 aerial tuning units.

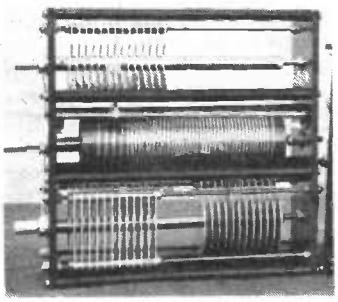
The eight tie bars in the original design of both units were made of metal. These have now been replaced with acetole. The metal tie bars were discovered to introduce extra inductance, which did not help on 10 metres.

The long connection lead from the split stator through the tie bar to earth has been removed, and the company has shortened the spindle and increased its diameter on the front of the roller coaster.

On the original models there was some difficulty in tuning 10MHz and 28MHz. Both frequencies are now tunable and the SPC-300, being smaller, will suit some amateurs whilst still handling up to 1kW, which is ample for the UK market.

By altering the links on the front and rear of the units, the user can transform the SPC format into a transmatch, P1 match, L and C match, T match, C match, L match, etc.

The SPC-300 retails at £164.000 including VAT and the SPC-3000 at £214.00 including VAT.



ATUs UK of Cap Co Electronics,
63 Hallcroft, Birch Green,
Skelmersdale,
Lancs WN8 6QB.
Tel: (0695) 27948.

NEW KENPRO RANGE

Hi-Tech Worldwide Ltd have announced a new range of Kenpro hand-held transceivers for both 2m and 70cm bands. The two models currently available feature all the usual facilities, including full 10MHz coverage on each band and the usual 1750Hz toneburst, etc.

As appointed distributors for the entire range of this brand, a full range of accessories are currently in stock with full factory spares back-up and more extras on the way.

The KT200EE 2m model is priced at £169.00 and the KT400EE 70cm is priced at £189.00. Both models feature a rechargeable Nicad pack and free mains charger, which is included as an introductory offer.

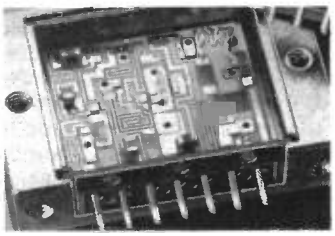
Hi-Tech Worldwide Ltd,
584 Hagley Road West,
Oldbury,
Warley,
Birmingham B68 0BS.
Tel: (021) 421 6001.

PRODUCT NEWS

PA MODULES

Power amplifier modules intended for applications in 900MHz portable cellular radios are now available from Motorola. The MHW802-1 and MHW802-2, rated at 2.2 watts output power, are ideal for 1.0 watt portables. They provide over 3dB reserve power to compensate for normal duplex/filter losses. The amplifier operates at a supply voltage of 9.5V dc, which enhances battery life.

Thin film hybrid construction provides consistent performance and outstanding reliability in addition to guaranteed stability and ruggedness over a wide



range of input power and source/load VSWRs. One model covers the American band (825-845MHz), and the other is for the European band (890-915MHz).

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

COMMUNICATION CASE

MRZ Communications are currently marketing a flexible communication system in the shape of a cellular radio telephone installed in a briefcase.

It contains its own integral power supply which can be powered from a suitable mains electricity supply. A portable power pack with charger is also available for occasions when there is no other power supply available.

The company have now made the case available to the trade as a power supply/enclosure for any current model of cellular phone.

Specifications are as follows: input – 215-250V ac, 50Hz; output – regulated 12.5V, internal adjustment ±1V; line ripple is better than 10mV; line regulation is 0-6A better than 60mV and 0-3A better than 35mV; output series regulation has 20A capability (2N 3772); bridge rectifier is rated at 25A.

The case features total over-current protection, total over-voltage protection and an isolated dc output.

MRZ Communications Ltd,
Newton House,
248 Uttoxeter Road,
Longton,
Stoke-on-Trent ST3 5QL.
Tel: (0782) 336221.

TRANSFORMERS

A range of miniature transformers is now available from Avel-Lindberg which incorporate an internal ptc (positive temperature coefficient) device which automatically breaks the primary circuit if the transformer becomes overloaded. The advantage of this system, as opposed to normal fuses, is that the transformer will revert to normal operation as soon as the transformer has cooled sufficiently to allow the ptc device to return to its conducting state.

A single primary winding for operation at 240V, 50/60Hz is provided and single secondary windings of 6, 8, 9, 12, 15, 18 and 24V: dual windings of 6, 8, 9, 12, 15 and 18V are available. The transformers with single secondary windings are all rated at 1.0VA and those with dual secondaries are rated at 2.0VA.

Mounting is by direct soldering to the printed circuit board, and extra rigidity can be achieved by inserting self-tapping screws through holes in the case.

Avel-Lindberg Ltd,
South Ockendon,
Essex RM15 5TD.
Tel: (0708) 853444.

ENGINEERING SOFTWARE

Seasim Engineering Software, sole distributors of Harcourt's ac circuit analysing Circuit Modeller, has announced the availability of new related engineering software packages, two by Harcourt and the third by Tatum Labs, with whom Seasim have made a UK sole distribution agreement.

To complement Circuit Modeller Harcourt have released the enhanced Circuit Modeller Plus, which expands the number of nodes to 41, raises the arithmetic precision, calculates group delay and incorporates more flexible graph plotting routines. This low cost CAE is available for £245.

Interfacing directly to Circuit Modeller Plus is Circuit Plotter, a hardware and software package whose four-colour graph plotter produces Bode plots of ac circuit response. The hardware may also be used with other software. Circuit Plotter is priced at £199 including hardware.

Tatum Labs' ECA-2, a development of ECA-1, enables electronic engineers to probe anywhere in the circuit to assess ac response, dc operating points with dissipations, input arbitrary waveforms, view the results and undertake Monte Carlo worst case tolerancing, as well as calculate temperature effects.

This software runs on all MS.DOS micros with 192K minimum memory and takes advantage of an 8087 co-processor if this is fitted. Graphics extensions to ECA-2 are planned soon.

Seasim Engineering Software Ltd,
The Paddocks, Frith Lane,
Mill Hill, London NW7 1PS.
Tel: (01) 346 9271.

HIGH POWER RESISTORS

The new HVR series of high voltage, high power resistors has been introduced by the CGS Resistance Company.

The thick film resistor element has minimum inductance and negligible capacitance, allowing the resistors to operate at high frequency and withstand significant voltage surges.

The resistors can operate up to 125kV. Good humidity protection is afforded by their conformal resin coating. Connection may be made via steel tabs, silver rings or brass bushes.

Power ratings are from 5 to 50W in air (10 to 100W in oil). Values available are from 500 ohms (ideal for high frequency dummy loading applications) up to 1 gigohm.

The CGS Resistance Company Ltd,
Downley Road,
Havant,
Hants PO9 2NL.
Tel: (04254) 70117.

FORCE TRANSDUCERS

Interlink Electronics has introduced a new, low cost commodity electronic component called a force sensing resistor (FSR) device. Available in standard or custom configurations, FSRs consist of a sheet resistor held in contact with a flat conductor. The resistor is formulated to conduct only when a force is applied to the surface.

The stand-off resistance when in contact but under no mechanical load is in the megohm range, and can remain in the 'ready state' indefinitely with essentially no power drain. Resistance drops as a progressive force is applied to the surface until a predetermined saturation value is achieved. Resistance at force saturation is determined by the chemistry of the device, and can be tailored to occur from 100 ohms to 100,000 ohms. Repetition rates at 2-5ms are practical.

A data sheet with a free FSR sample is available, and an FSR sample kit containing a variety of FSR device formats in five resistance ranges may be ordered from the company for $34 ppd. The FSR kit is designed as an introduction to this new technology and permits easy evaluation for use in a variety of potential applications.

Interlink Electronics,
331 Palm Avenue,
Santa Barbara,
California CA93101, USA.
Tel: (805) 965 5155.

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7905/12/15/24 plastic **50p**
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Plastic 3055 or 2955 equiv 50p ..... 100/**£30.00**
2N3773 NPN 25A 160V £1.80 ..... 10/**£16.00**

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Futaba 4 digit clock, fluorescent display 5-LT 16 ..... **£1.50**
Futaba 8 digit calculator, fluorescent display 9CT-01-3L **£1.50**
LCD Clock display 0.7" digits **£3.00**
Large LCD Clock display 1" digits **£3.00**
7 seg 0.3" display comm cathode ..... 2/**£1.00**

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A1/216 24v 150w **£2.25**
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4×4 MEMBRANE KEYBOARD **£1.50**
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MAINS ROCKER SWITCHES 6A SPST ..... **5/£1**
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12v 1.2w small wire ended lamps fit AUDI/VW TR7 VOLVO SAAB ..... 10/**£1.00**
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250 mixed res diodes, zeners **£1.00**
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1K 1K15 1K2 1K3 1K5 1K8 2K4 2K7 3K3 10K
W22 or sim 6 watt 7 OF ONE VALUE for **£1.00**
R47 1R5 9R1 10R 12R 20R 33R 51R 56R 62R 120R 180 270R 390R R47 560R 620R 1K 1K2 2K2 3K3 3K9 10K
W23 or sim 9 watt 6 OF ONE VALUE for **£1.00**
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Zero voltage switching
Control voltage 8-28v DC **£2.50**
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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**
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GLASS BEAD NTC Res @ 20°c **80p**
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2u2 20V 8/£1 ..... 100/**£8.00**

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NEWS DESK

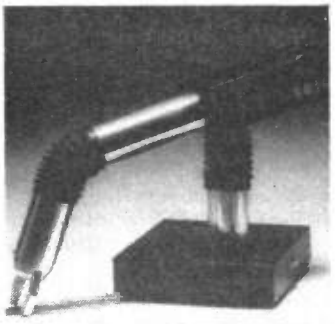
ERIC the robot

ERIC, Educational Robot Incorporating Cybernetics, is a robot arm being introduced by Flight Electronics of Southampton. Designed and manufactured in Britain, it provides a low-cost method of teaching robotics in schools, colleges and universities.

Unlike other robotic arms, it is controlled without strings and pulleys – adopting instead the same principles as professional industrial robots. All of its mechanics and electronics are fully encased – both in the interests of safety and operational efficiency, though the joints are easily exposed to examine the moving parts. ERIC has features such as epicyclic gearboxes and steel worm gears acting on brass gear wheels.

Many more expensive robot systems do not incorporate safety cut-outs which would prevent damage in the event of the arm over-riding. ERIC has sensors in each joint, so that the motors cut out if the robot tries to move beyond its safe working limits. As a result, a user with little experience of this type of system cannot damage it by incorrect programming.

An important feature in the design of ERIC is the optical sensor in each joint, which enables the system to 'see'



where it is. The company feel that this facility is crucial if the practice of industrial robotics is to be taught correctly.

New headquarters

The new headquarters of Electronic Brokers Ltd, the specialist supplier of electronic test and measurement instrumentation and second-user computers and test equipment, was officially opened by Professor Heinz Wolff on 27 September.

The new 25,000 square-feet headquarters, conveniently located in London's Camden Town, contains greatly expanded facilities.

Features of the new headquarters include a sophisticated DEC computer system with customised database software, designed to allow the company to make regular follow-up calls to all DEC installations and test equipment users throughout the world.

In addition, the new plant includes an assembly area where used DEC computers, peripherals and test equipment are completely stripped down, refurbished, re-assembled, tested and prepared for shipping, backed up by all the necessary documentation and guarantees that in most cases are the equivalent of the original manufacturer's.

The move to the new headquarters follows a big expansion in Electronic Brokers' activities as an authorised distributor of test and measurement equipment from leading manufacturers such as Philips and Fluke.

VHF/FM changes

As a result of the decisions of the International VHF Band II Conference, held in Geneva at the end of last year, many local radio stations, including those of Independent Radio, will be changing their VHF/FM frequencies over the next two years.

Although the initial need for re-tuning sets may cause some inconvenience to listeners, implementation of the new plan will bring some firm advantages. Listeners will generally find all ILR stations within two specific VHF sub-bands – 96.0 to 97.6MHz and 102.0 to 103.5MHz – and space has also been earmarked for a new Independent National Radio service to be opened within the next few years.

The first change affecting Independent Local Radio (ILP) occurred on 3 September when the IBA's VHF transmitter covering the Huddersfield and Halifax area – served by Pennine Radio – moved from 103.4 to 102.5MHz. The second took place on 22 October when Reigate and Crawley's ILR contractor Radio Mercury moved its VHF frequency from 103.6 to 102.7MHz.

Further frequency changes will be introduced in phases from now until planned completion in July 1987.

The changes do not affect medium wave frequencies, where at present most people listen (although the majority of the population have at least one radio set capable of receiving VHF).

MAC TV

At the beginning of 1987 Philips will have a television adapter ready for individual reception from broadcast satellites transmitting in the new MAC standard. The adapter, which is connected to the television set, together with the parabolic antenna located outside the house, constitutes the complete receiving installation.

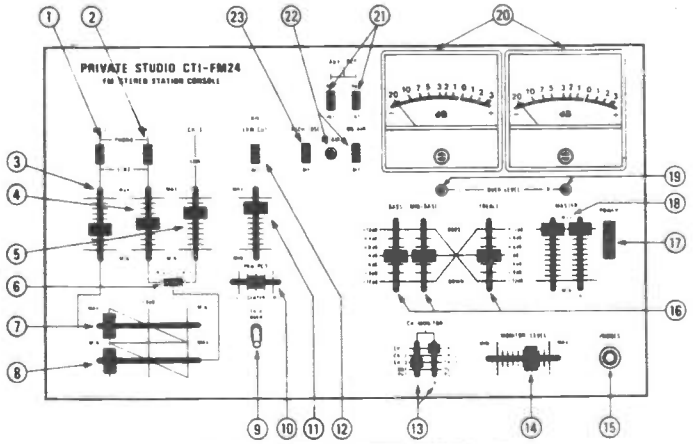
Work is now being carried out on design and production preparation for the integrated circuits in the adapter which make the satellite signals suitable for reproduction on a television receiver.

The MAC signal prevents interference effects in picture reproduction and also permits improved sound transmission. A further advantage is that more sound channels can be used, providing the opportunity, for example, of studying several different languages (or subtitles) on one television programme.

With the introduction of the advanced adapter Philips is contemplating a gradual conversion to the future high-definition TV. The design, which conforms to the full

Community radio

Raycom Ltd have announced a new product called CTI-FM24 Private Studio, a stereo 6 channel mixer/studio complete with a low power FM broadcast band stereo transmitter in a compact size, suitable for both portable and fixed applications.



Following the Government's announcement about its plans for a local community radio service the company expect this unit to become very popular.

The unit, which is subject to type approval when the relevant specification is announced, is suitable for local use due to its present low level of power output.

The CT-FM24 is priced at £520.80 plus VAT in its basic form and accessories will be introduced shortly, which include graphic equalisers and other related products.

For further details and information please contact: *Raycom Ltd, Unit 2, 584 Hagley Road West, Oldbury, Birmingham B68 0BS. Tel: (021) 421 8203/8216.*

specification for the MAC standard, as agreed between the EBU and the European Electronics Industry in February 1985, already offers a wide range of new possibilities in this context.

The adapter will continue to be suitable for picture reproduction should a different height-to-width ratio of the picture tube be introduced in the future. This is important for the broadcasting of feature films. There is also the possibility of using a key for pay-TV or for broadcasts for closed viewing circles.

Eutelsat delay

Following the launch failure of the ECS-3 satellite which was destined for Eutelsat, the organisation has had to accept a delay in the commencement of operation of its three-satellite system.

In order to minimise as far as possible the implications of this delay, the organisation has already made the necessary contacts with the European Space Agency for preparation and launch of the ECS-4 satellite at the first opportunity. ECS-4 is currently scheduled for launch in early 1987; the date for this launch will therefore have to be brought forward as much as possible.

Eutelsat takes the view that the failure of the V15 launch is a risk of the kind normally involved with a series of satellites such as the five ECS spacecraft, four of which are planned to be placed in orbit with the fifth remaining on the ground as a spare.

Eutelsat believes that the satellites still to be launched will enable it to complete all of its programmes as planned.

Satellite TV system

It is not generally known that there are many TV channels already available via satellite, nor that the equipment required to receive these channels is available at affordable prices. Interest from the general public is, however, increasing rapidly and Satellite TV Antenna Systems Ltd, based in Middlesex, foresee an increase in the demand for low cost home satellite systems in the near future.

To encourage this interest and to enable installers and retailers to enter and promote this new market, the company has introduced a low cost satellite terminal complete with easy to follow instructions, the Satvrn home satellite system.

To enable dealers to demonstrate satellite TV the company are also offering an introductory start up package of a complete system plus full instructions, manual, sales guide, sample programming guide, and free satellite reception licence for £875.00 plus VAT, including delivery.

The company do point out, however, that some satellite TV programmes require the permission of the programme organisation before they can be received. In some cases free access will be granted, in others a subscription fee may be levied.

Further information is available from: *Satellite Antenna Systems Ltd, 10 Market Square, Staines, Middlesex. Tel: (0784) 61234/52155.*

World's largest TV

Mitsubishi Electric Corporation started marketing domestically a 35 inch colour television set, the largest in the world, in early October.

Development of the giant picture tube was announced in December last year. With the diffusion of videocassette recorders (VCRs) and video disc players, consumer demand for large-screen TVs which can provide cinema ambience is increasing. However, safety and technical problems have previously limited the screen size to 26 inches at the largest. Mitsubishi Electric solved these problems with its original technology and design using computer simulation.

The fine-pitch, square picture tube features a horizontal resolution of 560 lines. The TV set features three video input terminals, one video output terminal and speaker terminals for connecting VCRs, video disc players, a tuner and other audio-video equipment.

VLSI design system

Plessey Semiconductors has announced Plessey Megacell, a versatile semi-custom VLSI design system that permits systems design engineers to implement complex chips with up to 25,000 gates or 100,000 transistors to be fabricated using the firm's two-micron CMOS technology.

The company believes that with tens of thousands of gates or transistors on a single IC, and soon-to-be hundreds of thousands, it is no longer feasible for the system designer to simply hand over his CAD-generated logic design and net list to an IC designer. A successful end product now depends on the placement, layout and routing of cells and metal on the silicon, as these factors strongly influence system performance.

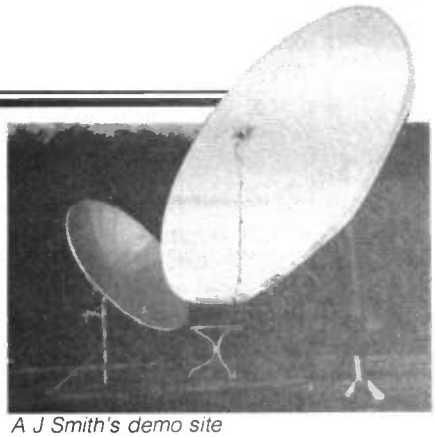
According to Plessey, the only alternative to a system like Megacell is to attempt to train IC designers in systems and applications engineering, which is not practical.

More technical information is available from Plessey.

More satellite TV

A J Smith (Satellite) Limited, of Pershore in Worcester, formed in April 1984, specialises in satillite television systems. The company's technical director, Tony Smith, has been experimenting and testing developments in the satellite field for some years. In fact, the company claim to eat, sleep and live satellite television!

A J Smith Limited operates two demo TVRO units. One is a full band Ku system with a 3 metre motor-driven Andrew dish on a polar mount, one of the few steerable Ku band systems operational in the UK and, as far as the company are aware, the only Andrew dish of this type in the country. A Canal Plus descrambler for TV5, etc is part of the demo.



A J Smith's demo site

The other demo unit is a C band 1.9 metre system, at the moment locked on to Gorizont 7.

Whatever your business requirements may be in satellite television, the company claim to be able to give technical back-up. Ku or C band systems are also available for short term hire.

Further information is available on (0386) 553285.

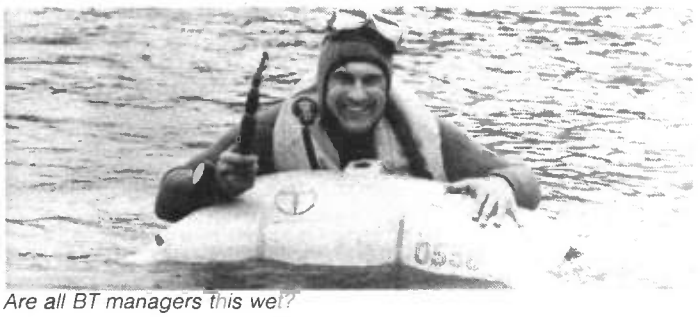
In at the deep end

When West Country British Telecom manager John Horne heard that an optical fibre cable was to be laid under the large tidal estuary of the River Dart in Devon, he couldn't wait to dive in to help the operation. It was the first of its kind in the UK.

John, who is Exeter area manager and a member of the British Sub Aqua Club, joined a team of divers on 24 September who started the tricky job of laying 500 metres of cable under the fast-flowing river, from Dartsmouth to Dittisham.

The cable, when it is operational next year, will be capable of carrying nearly 8,000 calls simultaneously, providing speech and data channels, and bringing the latest advances in telecommunications technology.

The original under-river cable was laid around 1890, and taken up from the same river bed a few years ago.



Are all BT managers this wet?

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AA NI-CAD CHARGER KIT
12-0-12 Transformer on PCB with diodes ex-unused euip series resistor, battery clips & holder, mains lead & purpose designed plastic housing box full instructions.....£3.50

BUTTON BATTERIES 1.5V for watches, cameras, calculators, lighters etc. 4 types any mix £1.50. AG13-11.58dia x 5.4mm AG12 11.58x4.2mm AG10-11.58x3mm AG3-7.87x3.6mm. Any 8 for £2.50.

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● 3 1/2 DIGIT DISPLAY
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HIGH TORQUE 40W Reversible 1000 rpm per V 3V-18V 2A max working, dia 28x50mm – (shaft 15x2.3mm dia) Torque at 2A = 0.54 lb inch approx £2.90.

TINY virtually inertia-less motor ie no iron in rotor. 1.5-3V 15mm dia x 30mm - shaft 6x1.6mm. With governor – can be bypassed £1.50.

NOMINAL 12V motor works down to 1V ex-unused equip. VCR transport mech 33mm dia 30mm o/a + shaft 12 x 2mm a bargain at 75p ea or 3 for £1.75.

MINI TOY motors 1-3V 19x18x9mm 50. ea or 5 for £2

MINI-DRILL KIT & SPEED CONTROLLER
High torque motor, 12V to 18V, 40W reversible 1000 rpm perV. 5 pole rotor, carbon brushes. 50x28mm dia. Chuck & set of Collets. 3 HSS Bits. 1mm 0.8mm & 0.6mm Speed controller kit & transformer - 3m of flex. Instructions £11.95

OR ITEMS MAY BE PURCHASED SEPARATELY Speed Control £4.50 Transformer £2.90 Motor £2.90 Chuck & 3 precision collets £2 HSS Drill bit with shanks 1mm-5bits £1.50 0.8 or 0.6mm – 5 bits £2.50 (bits not recomm for glass fibre)

TUNGSTEN CARBIDE BITS 1mm ideal for glass fibre PCB's (⅛in shank) £1.20 ea or 5 for £5

MINI DRILL 9-16V 2Amp 18000rpm 70W chuck 3.5mm max £16.50

FLEXIBLE SHAFT for Mini Drills. 55cm long complete with chuck & 3 precision collets £5.95

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20 millisecond response 6V 60mA Lamp & cadmium photo-resistor housed in small metal can for PC8 mnts. Will drive medium current relay **£1.50ea or 5 for £5**

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SOLAR CELL PANELS 3.75 x 2.5ins with multi-cellular lens and rear terminals. Gives 100mA @ 0.42V in weak sunshine **£3.95ea**
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CARBON POTENTIOMETERS
Mixed values some miniature some standard size **15 for £1.50**

RESISTORS
Bag of 400 mixed values & Watts mainly 1/4 & 1/2W **£1**

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2N3773 **£2.50ea**
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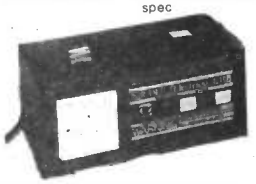

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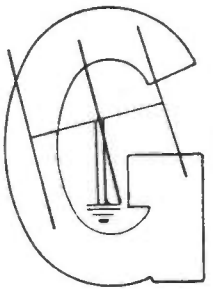

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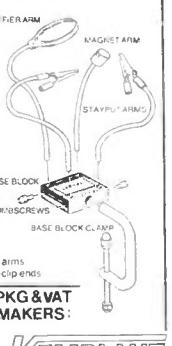

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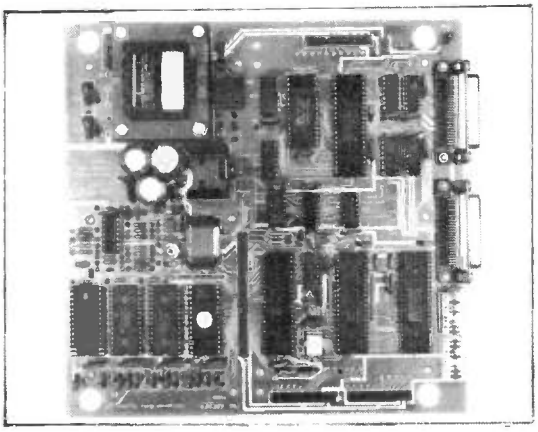

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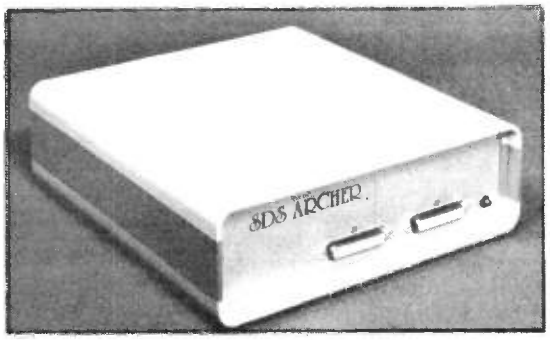

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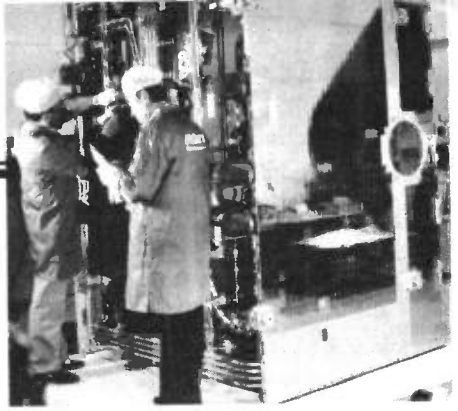


Working on the transposer packages on Germany's DBS TV-SAT, to be launched in 1986

After some delay France launched its new mobile radio system (Radiocom 2000) in November. Radiocom 2000 differs in concept from cellular systems being installed or already in service in other European countries, such as the TACS system in the UK, the German C-450 system and the variations of the NMT system that are found in Scandinavia, Benelux, Austria and Spain.

The two cellular networks in the UK, Cellnet and Vodafone, both provide a carphone service in which the user in effect has a normal telephone facility in his car. Private mobile radio (PMR) networks, on the other hand, are designed to allow individual businesses such as taxi firms, delivery companies, and a host of other types of users to have a 'closed' or private radio network. On a PMR network radio communication is 'within' the organisation and direct access to the public switched telephone network (PSTN) is not normally available.

In the UK the two types of mobile radio service (carphone with Radiophone 4 or cellular, and PMR) are operated separately. The frequencies used for each are different too. Radiophone 4 operates at around 160MHz, the cellular networks at 900MHz and the PMR bands (low, mid, high and UHF) are spread across the spectrum from 70MHz up to 460MHz. In contrast, the new French Radiocom 2000 system provides both carphone and PMR (business radio) services on the same radio network using a common set of frequencies. It is this 'dual purpose' aspect (carphone and PMR) of Radiocom 2000 that makes it different from systems being operated elsewhere in Europe.

Share and share alike!

The Radiocom 2000 network operates in two parts of the spectrum. A nationwide network of base stations is being built at UHF (414.8-418.0MHz mobile transmit and 424.8-428.0MHz base transmit), and regional networks for major cities such as Paris, Lyons and Marseilles are being installed using Band III frequencies around 200MHz. The regional 200MHz repeaters are sharing Band III TV frequencies with transmitters from France's new fourth channel, Canal Plus.

In Paris the Canal Plus TV transmissions are on channel 06 (183-191MHz). The Radiocom 2000 frequencies for the Paris region at 192.5-199.5MHz for mobile transmit and 200.5-207.5MHz for base transmit are adjacent to the Paris Canal Plus channel. These two Parisian mobile bands roughly correspond to TV channels 07 and 08, which are being used by Canal Plus elsewhere in France. Channel 07 (191-199MHz), for example, is being used by Canal Plus 10kW main transmitters at Rouen and Troyes. These two TV transmitters are both within 100km of the outer edge of the Paris Radiocom 2000 service area, and may eventually be the source of interference problems.

This sharing of Band III frequencies by mobile radio services and TV broadcasters at relatively short distances within France will serve as a useful test-bed for studying cross-Channel (not to be confused with co-channel!) interference problems that might arise between France's network of VHF Band III transmitters and the new Band III mobile services in the UK (since the beginning of 1985 there have been no TV transmissions in Bands I and III in the UK. Band III in the UK will eventually be used for a mixture of new mobile radio services).

Radiocom 2000 : quasi-cellular

Although Radiocom 2000 is being heralded in the French press and in the publicity hand-outs as 'cellular', it does lack the one key feature of every other cellular system, ie the ability to 'hand-off' a mobile between cells during a conversation. The French PTT and the system's designers Matra argue that because in the French system the cells are somewhat larger than are being used in other countries, the lack of hand-off is not a problem.

In practice, a Radiocom 2000 user who goes out of range of a base station during a conversation will have to re-establish communication by pressing a single 'repeat last number' button.

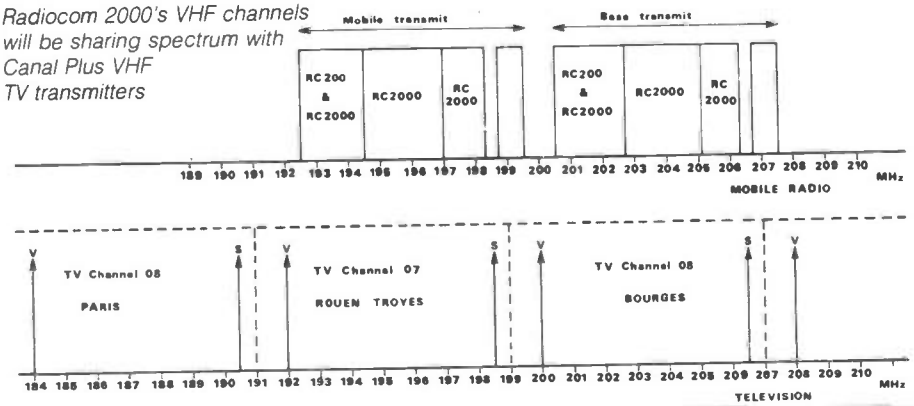
The PTT expect to be installing some 500 repeaters across France, which should cover 80% of the population by the end of the decade. So far the PTT have ordered 200 repeaters from Matra. The total system capacity is expected to be 300,000 mobiles split half and half between the two services (carphone and PMR). In the early stages, however, the PTT expect the demand for the carphone service to be greater than for the business radio service because of the pent-up demand created by the under-capacity of the present Téléphone de Voiture system.

Téléphone de Voiture

France was one of the first countries in the world to introduce a 'direct dial' car telephone service: the Téléphone de Voiture. Even in its early days the system suffered from a shortage of channels at 160MHz. The first Téléphone de Voiture network was put into service in Paris in 1973, and networks were then progressively installed in major cities across France. Today there are ten regional areas with access to the network. However, once outside these areas a mobile cannot access the system, and there is no national or even motorway coverage on the Téléphone de Voiture network. The capacity of the French 160MHz system totals 10,000 subscribers, 5,000 of whom are in the Paris area.

Conscious of the severe capacity problems inherent in the Téléphone de Voiture networks, the French PTT asked the French electronics company Matra to find a solution that would provide the urgently needed national carphone service in as short a timescale as possible. The new service would also fill the gap until a pan-European system comes into operation in the mid '90s. The Franco-

Radiocom 2000's VHF channels will be sharing spectrum with Canal Plus VHF TV transmitters



German project to build a truly cellular analogue network was finally abandoned last year, and France and Germany are now working together in close co-operation in preparatory work for a future pan-European digital cellular network. In the mean time it is Radiocom 2000 that will have to support the ever-growing demand for mobile communications in France.

The new network, Radiocom 2000, opened its first VHF 200MHz (regional coverage) repeaters in the Paris area in November 1985. The first UHF 420MHz (national network) repeaters were expected to be on-air in January 1986.

HDTV : global debate

High definition television (HDTV) is the cause of intense international debate. Basically the world divides into two camps. Not the usual 'East/West' or 'North/South' divisions that colour most other international debates. No, for the international HDTV controversy the two camps are quite different. It is the number of 'cycles' in your mains supply that determines which camp you are in for the great HDTV debate! The two blocks are therefore the 60-cycle USA and Japan camp against the rest of the world 50-cycle camp, which includes Europe and the USSR.

The differing mains frequency standards have had a direct effect on television standards. In countries where the mains is at 50 cycles a 50Hz field rate has been used, and 60-cycle countries use a 60Hz field rate.

The number of lines on today's TV systems is either 525 or 625. Future HDTV systems will provide a TV picture with a larger number of lines and hence much improved picture definition. HDTV is defined roughly as a TV system having in excess of 1,000 lines. A Japanese development and pre-production HDTV system currently exists which uses 1125 lines and a 60Hz field rate, and the picture clarity and sharpness has to be seen to be believed. The Japanese broadcasting authority NHK has been closely involved with the development of this HDTV system.

Geneva confrontation

The current world debate on HDTV, which is being held in Geneva as these words hit the page, centres around the choice of a world-wide TV studio production standard for HDTV.

Broadly, TV technology divides into three main areas: the studio where programmes are made, the transmission system to transport the signal to the viewer, and finally the viewer's receiver. The subject of the current Geneva debate centres around finding an agreed standard for the production studio end of the television process, the idea being that if every TV studio in the world was working with the same standard (ie no more conversions from PAL to SECAM or NTSC to PAL etc) then the interchange of programmes between broadcasters would be made much simpler and cheaper. Standards conversion would no longer be necessary at the international programme exchange level.

However, the present 50/60Hz problem stems from the fact that it is a Japanese 1125-line 60Hz system that is being proposed. Since 1973 the Japanese have been working on the development of HDTV. The Japanese system, in a slightly modified form, is being backed by the US, which is also a 60-cycle mains country.

The heart of the 50/60Hz problem is that every TV system, as well as having a given number of lines, also has a characteristic field frequency. This is the number of times that the screen is scanned per second. The use of 'interlacing' means that in effect the screen is scanned twice to produce one picture frame. In the 50-cycle mains world the TV field rate is 50Hz and there are 25 frames per second. In the US and Japan the field rate is 60Hz and there are 30 frames per second. If a 60Hz system was chosen as a world standard then every TV station in the 50-cycle world would have to convert the 'standard' 60Hz field signal to the 'local' 50Hz field frequency before transmission. It is this conversion process that is at the heart of the problem. Converting from 50Hz to 60Hz systems, or vice versa, presents a major problem in the form of the 'flicker' effect. There is a 10Hz 'beat' between the two field frequencies which causes problems in the conversion process.

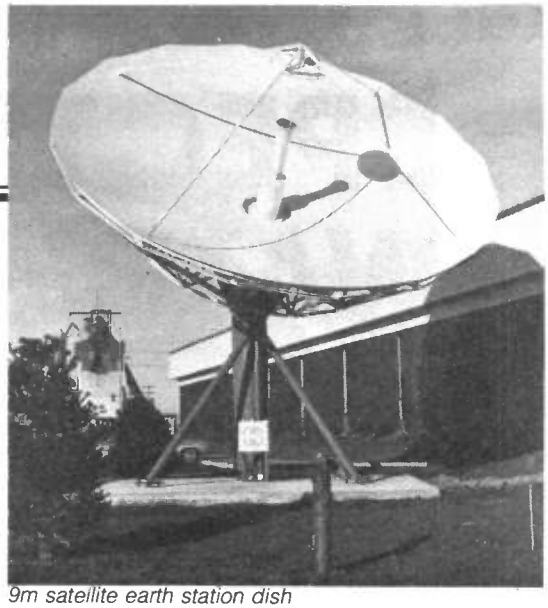
Pride & principle

As well as the practical problems of conversion there is the question of cost (not to mention pride and principle!) involved in half of the world having to convert all material produced to the new standard before being able to transmit it on their own systems. The question of transmission of HDTV pictures is also far from clear.

But on the question of a world-wide HDTV studio production standard, there is a strong lobby of opinion that it is still too early to adopt a true world-wide standard. The UK broadcasters are among those that argue that only the following generation of TV standards which will be digital, will provide the opportunity for a true world-wide standard.

An added complication to the current debate is the fact that the only system for which equipment is currently available is the Japanese system. There are therefore strong commercial forces pushing for the adoption of this standard.

The HDTV debate will continue for several years, but a current high point in the confrontation is the Geneva meeting of the CCIR, which is the part of the ITU that deals with TV-related matters. On the agenda of that meeting was the question of making a recommendation for the adoption of a world-wide studio standard for HDTV. The outcome of this important HDTV debate is awaited with interest.



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HDTV : transmission

The extra lines and more detail contained in an HDTV picture means that more bandwidth is required to transmit the signal. This is another major problem in itself. Where in the radio spectrum could an HDTV signal be transmitted? With baseband bandwidths of anything up to 30MHz, the only practical solution for the broadcasting of HDTV will come with DBS satellites. But even the apparently unlimited expanses of bandwidth available in the microwave frequencies will not easily meet the requirements of HDTV.

The 14/12GHz satellite broadcast frequencies have already been allocated on a country-by-country basis for DBS and cable TV distribution. In the European region most countries have an allocation of five DBS channels each. The extra bandwidth required for the transmission of HDTV would mean that the number of channels per country (if they were distributed on the same basis as WARC '77 DBS channels) would be reduced to '2.5' channels per country. So if HDTV transmission does become a reality there is unlikely to be room for its transmission in the 14/12GHz region.

The next frequency band available internationally for satellite broadcasting is the 40.5-42.5GHz band. Practical technology for broadcasting at these frequencies is still a number of years away. In ITU Regions 2 and 3, ie everywhere other than Europe, Africa and the USSR, there is also a satellite broadcast allocation at 22.55-23GHz, which in many respects would be an ideal medium for the eventual transmission of HDTV, but in the UK these frequencies are already allocated for fixed link use by Mercury.

Many questions, both technical and commercial, still surround HDTV. It is sure to be a lively topic of debate for many years to come. REW

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Other features include a 10 channel memory able to store operating frequencies, Simplex or Duplex. A memory lock-out function allows the memory scan to skip programmed channels when not required. The IC-3200E has a built-in duplexer and can operate on one antenna for both VHF and UHF. Options include IC-PS45 DC power supply, HS-15 mobile mic, SM6 and SM8 desk mics, SP-10 external speaker and UT-23 speech synthesizer.

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Arrow Electronics Ltd., Chelmsford, Essex. 0245-381673 26
Beamnte, Cardiff. 0222-486884
Booth Holding (Bath) Ltd., Bnstol. 02217-2402
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Dressler (UK) Ltd., London (Leyton). 01-558 0854
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Photo Acoustics Ltd., Buckinghamshire. 0908-610625
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Radio Shack Ltd., London NW6. 01-624 7174
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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 25KHz option

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.

IC-735, The Complete HF Radio

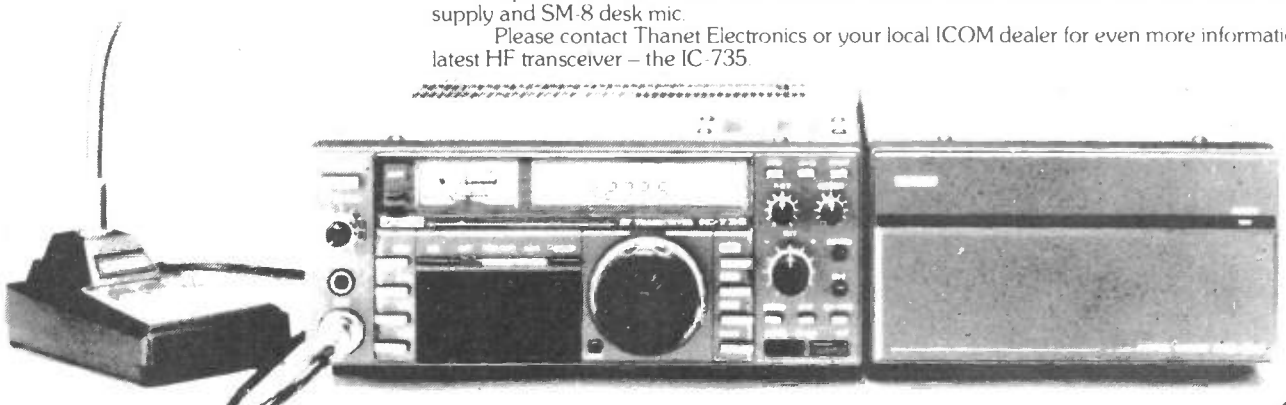
This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC-735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100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



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CONSTRUCTING POWER SUPPLIES

In this penultimate instalment Roger Alban GW3SPA parallels up his transformers to give the required output

Figure 33a shows four transformer secondaries connected in parallel. The main disadvantage with this circuit is that slight discrepancies in the secondary voltages will cause circulating currents to occur in two or more of the transformer secondaries.

The circuit in *Figure 33b* was constructed out of four separate unregulated power supplies connected in parallel. Each power unit consisted of a transformer, rectifier and reservoir capacitor. The main disadvantage of this circuit configuration is that discrepancies between the output voltages of each power unit will result in the load current not being equally shared amongst the four power units.

The circuit selected for the power supply is shown in *Figure 33c*. This circuit consists of the same four power units as described in *Figure 33b*, and to encourage load-sharing each power unit has its own pass transistor and combined load-sharing resistor. The bases of all four pass transistors are connected together and receive base current from the output of the voltage regulator connected to one of the power units. With pass transistors such as the 2N3055 costing only 25p each, this must be the easiest and cheapest way of paralleling up individual power units to ensure that they share the load current equally .

With each individual transformer only capable of supplying a maximum continuous current of 2.61A the constraints put upon the rectifier and reservoir capacitor are minimal. The diodes selected for the bridge rectifier were manufactured by International Rectifier, type 60S6, rated at 6A, 600V working. From the previous discussion on the requirements of the choice of diodes for the power supply you will observe that this diode is quite suitable. The diodes were discovered on a trader's stall, and a bag containing 25 cost £1.00: not a bad bargain!

The value of the reservoir capacitor using the rule of thumb discussed earlier works out to be 9,000μF, the nearest preferred value being 10,000μF. Again, suitable items were discovered on a trader's stall, probably ex-computer equipment, with a price tag of 25p each and rated at 40V. The voltage rating of the reservoir capacitor must be in excess of the maximum open circuit peak voltage of the secondary of the transformer.

The voltage regulator

A number of voltage regulator circuits were examined, and the two that came out on top were the L723 and LM338 ICs. The L723 was eventually rejected because of its low output current of 150mA maximum, and also because its adjustable voltage range varies between 2V and 37V. If you recall, it was my intention to construct a variable voltage power supply adjustable between zero and 20V.

The IC finally selected (found on a trade stall for 50p!) was the LM338, which has a maximum output current of 5A, more than adequate for driving directly four 2N3055 pass transistors, and an output voltage range adjustable between 1.2V and 32V. With 0.6V being dropped by the pass transistor the minimum terminal voltage will be 0.6V, pretty close to zero and considered acceptable.

The four pass transistors, 2N3055s, were connected to two large heatsinks as shown in *Figure 34*. Again the heatsinks were purchased for £1.00 each at the local mobile rally and are similar in construction to the 1.1°C/W shown in *Figure 20*.

To calculate the maximum heat dissipated by each pass transistor, we need to know the maximum voltage drop across each transistor together with the maximum emitter current. Let's assume that the power supply is delivering a load current of 10A at a terminal voltage of 5V. The voltage drop across the pass transistors will be 25.1V−5V=20.1V, and the emitter current will be 10÷4 = 2.5A. The power dissipated in each pass transistor is given by W = V×I and is therefore 20.1V×2.5A = 50.25W.

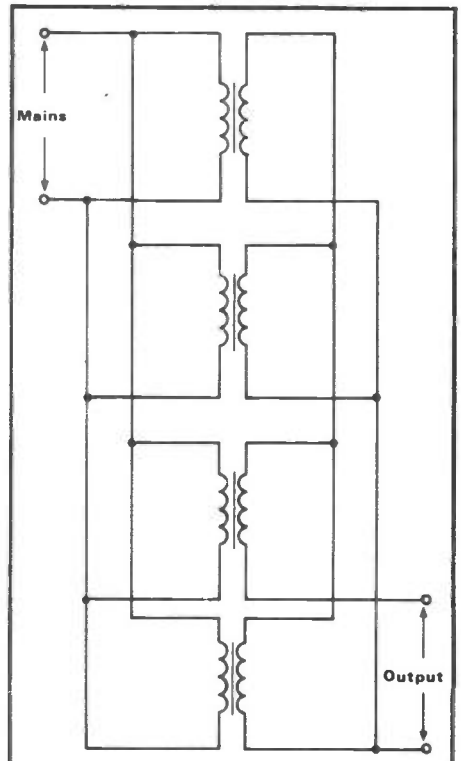


Fig 33a *Transformer secondaries in parallel*

In the author's power supply two 1.1°C/W heatsinks have been used with two 2N3055 pass transistors attached to each heatsink as shown in *Figure 34*. The maximum power radiated by each heatsink is calculated from the formula discussed earlier, viz:

$$\text{Power radiated} = \frac{200 - 25}{(1.5 + 0.5) \times 0.5 + 1.1}$$

$$= 83.3\text{W}$$

Therefore the maximum power that each pass transistor can dissipate is 83.3W÷2 = 41.6W. It can be seen that the heatsink used in my design will not provide a continuous load current of 10A at 5V without damaging the pass transistors. The maximum load current that can be handled at a terminal voltage of 5V is 41.6÷20.1×4 = 8.3A.

However, at the common terminal voltage of 13.8V used for mobile equipment, the power dissipated by each pass transistor at maximum load current will be (25.1−13.8)×2.5=28.25W. Therefore the heat to be radiated by each heatsink will be 28.25×2=56.5W, well within its capabilities.

Load-sharing resistors

I intended incorporating a variable current limiting circuit within the power supply. The idea was to use the voltage

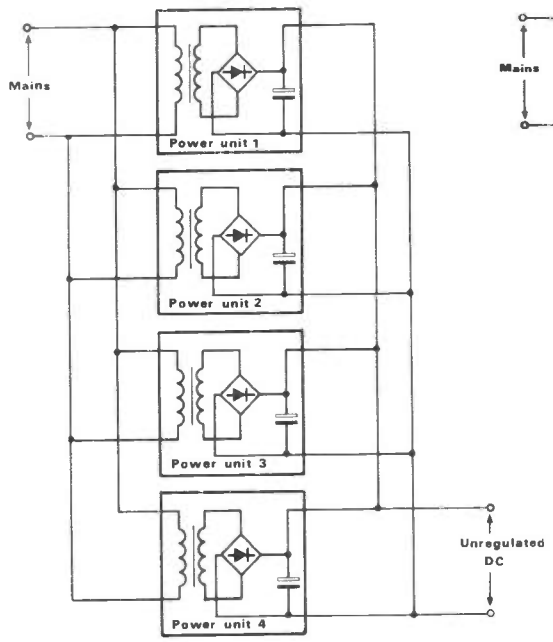


Fig 33b *Separate power units in parallel*

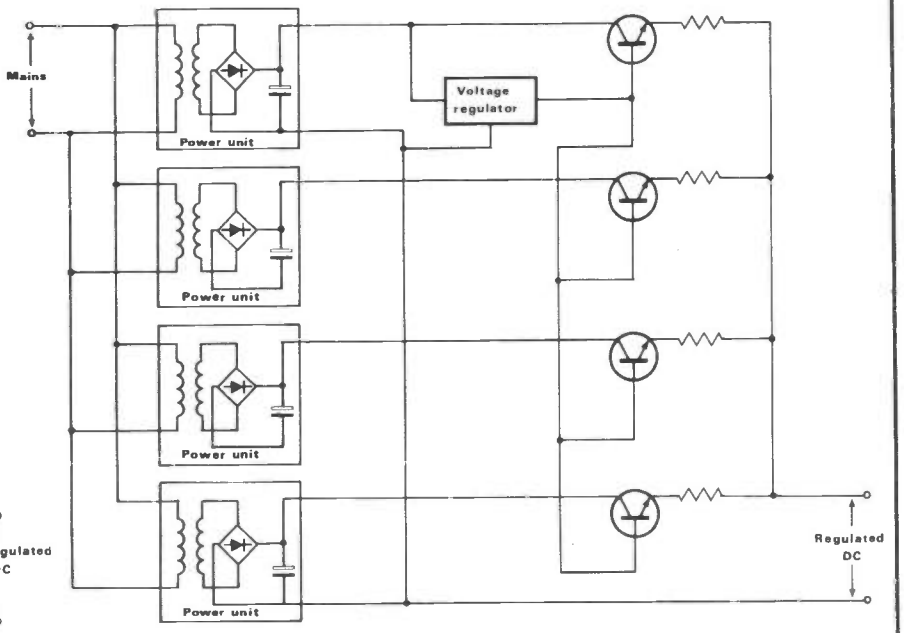


Fig 33c *Power units connected in parallel via separate pass transistors*

dropped across one of the load-sharing resistors to provide the forward bias to cause the current limiting transistor to conduct. From my previous discussions on this subject you will recall that we require approximately 0.6V before the transistor will conduct. In *Figure 31* we used a 0.3 ohm load-sharing resistor. Tr2 would start to conduct when a load current of 0.6÷0.3 = 2A flows.

It was intended to provide current limiting down to under 1 amp. Also remember that we are using four pass transistors and therefore the current passing through each load-sharing resistor will be a quarter of the load current. Therefore the value of load-sharing resistor to drop 0.6V at a quarter of 1 amp will be 0.6÷0.25=2.40 ohms. At maximum load current the load-sharing resistor will drop 2.5×2.4 = 6V and will dissipate 6 × 2.5 = 15W. A total of 60W will be dissipated within the power supply cabinet.

A compromise had to be made to reduce not only the power dissipated in the load-sharing resistors but also to improve regulation. It is not a good idea to have the power supply terminal voltage drop by 6V when full load current is applied. The compromise reached was to make each load-sharing resistor 0.6 ohms. The minimum current limiting will occur with a load current of 0.6÷0.6×4 = 4A, and the maximum voltage drop across the resistor will be 0.6 × 10 ÷ 4 = 1.5V. The power dissipated in each load-sharing resistor at maximum load current will be 1.5 × 10÷4 = 3.8W, giving a total of 15W to be dissipated within the power supply cabinet. The load-sharing resistors were constructed by winding 34 turns of 36swg wire on a half-watt solid carbon rod resistor.

Current limiting circuit

The current limiting circuit eventually chosen is similar to the circuit shown in *Figure 31*, with the addition of a 5 kilohm potentiometer inserted across one of the load-sharing resistors with the slider connected to the base of Tr2 to provide the facility of adjusting the current limiting between 4A and full load.

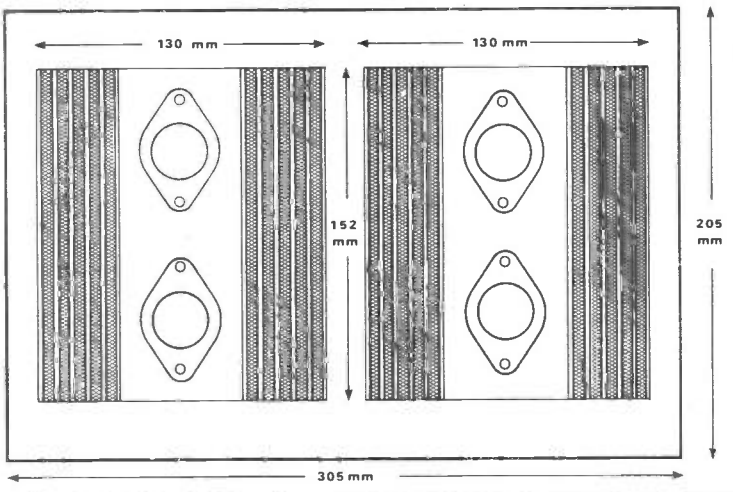
It was mentioned earlier that approximately 0.6V is required to forward bias Tr2. In practice this can vary considerably, and is recommended that Tr2 should be selected for its minimum forward bias voltage. I used a versatile BFY50, having rejected a few because they did not conduct until 0.7V was applied. For the diode D2 I used one of the International Rectifier power diodes type 60S6.

The specification called for variable over-voltage protection to be provided. The circuit illustrated in *Figure 28* was used, with the addition of a light-emitting diode connected to a spare normally-open contact belonging to RLA1 and connected via a 3.3 kilohm resistor to the unregulated supply of the power unit to give a front panel indication when the relay has become energised.

The final instalment

We conclude the *Power Supplies* series next month with details of nuts and bolts, setting up, etc. REW

Fig 34 *Dimensions of the heatsinks used, attached to the back panel*



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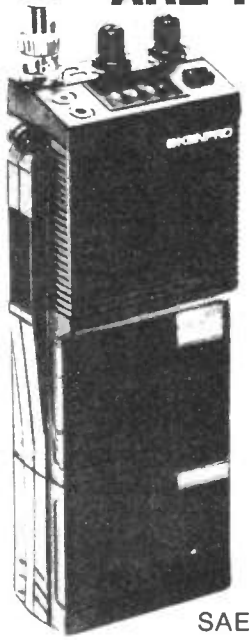

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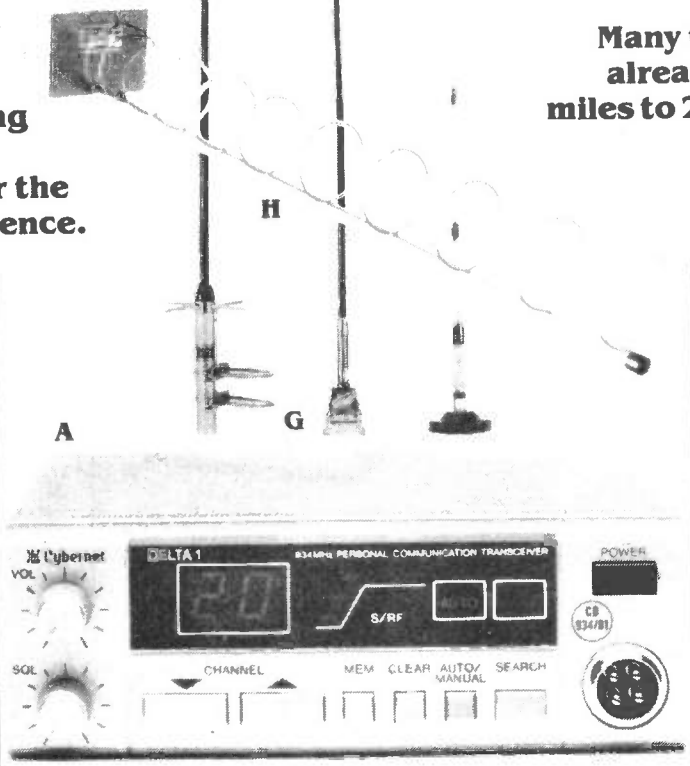

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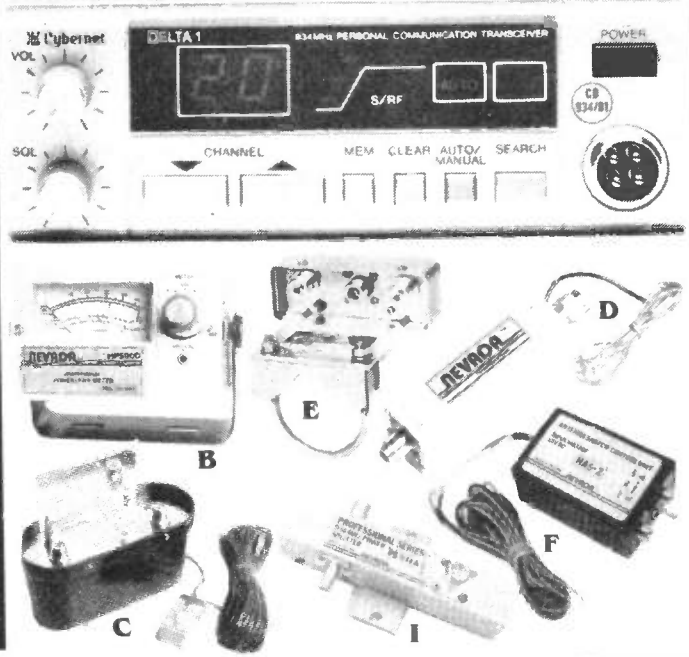

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BD184 – 1 three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
BD185 – 4 ferrite rod aerials 8" × ⅜" rods with long and medium wave coils
BD186 – 1 3 wafer switch: 18 pole 2 way, 12 pole 3 way, 9 pole 4 way, 6 pole 6 way, 3 pole 12 way, your choice
BD187 – 2 2 wafer switches 12 pole 2 way, 8 pole 3 way, 6 pole 4 way, 4 pole 6 way, 2 pole 12 way, any 2 your choice
BD188 – 1 plastic box sloping metal front, size 160 × 95mm average depth 45mm
BD189 – 2 double pole 20 amp 250v flush mounting switches – white

Ex-Electricity Board. Guaranteed 12 months.

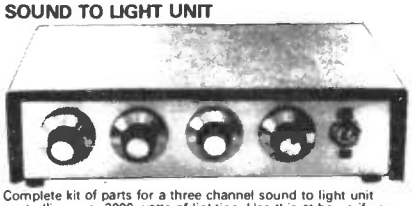
VENNER TIME SWITCH

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 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

12 volt MOTOR BY SMITHS

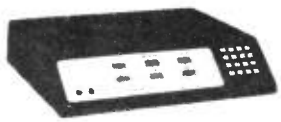
Made for use in cars, etc. these are very powerful and easily reversible. Size 3½" long by 3" dia. They have a good length of ¼" spindle –
1/10 hp £3.45
1/8 hp £5.75. 1/6 hp £7.50

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.

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 then complete, except for 7 plug in i.c.s and price is only £14.95 (less than the value of the modem included).

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 £20 post paid
2.5 Kw KIT Still available: £4.95 + £1.50 post
or have 3 for £16 post paid.

FROZEN PIPES

Can be avoided by winding our heating cable around them – 15 mtrs connected to mains costs only about 10p per week to run. Hundreds of other uses as it is waterproof and very flexible. Resistance 60 ohms/metre. Price 28p/metre or 15m for £3.95.

CORDLESS TELEPHONES

"IT'S FOR YOU-OU" even if you are in the bath, its an infinite extension any room and even in the garden – have one on approval or come and try one here. BT approved £120 not yet approved £80. plus £2 post.
SOCKETS PLUGS ETC for BT phones
Master socket (has surge arrestor – ringing condenser etc) and takes B.T. plug £3.95
Extension socket £2.95
Dual adaptors (2 from one socket) £3.95
Cord terminating with B.T. plug 3 metres £2.95
Kit for converting old entry terminal box to new B.T. master socket, complete with 4 core cable, cable clips and 2 BT extension sockets £11.50

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

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 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 – 170KHz, medium wave band 525 – 1650KHz, 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 £4.95**

COMPUTER DESKS

Few still available

Computer desks – size approx 4' × 2' × 2'6" high formica covered, cost over £100 each. Our price only £9.50 – you must collect – hundreds supplied to schools.

TWO POUNDERS

Following the popularity of our BAKERS DOZEN £1 PARCELS, we are now introducing some BAKERS DOZEN £2 PARCELS. We feel that you will agree that most are exceptional bargains but you can still get a bit extra, as with the £1 parcel, if you buy 12 you get another free!

2P1 – 24 hour time switch with 2 on/offs, an ideal heating programmer
2P2 – Wall mounting thermostat, high precision with mercury switch and thermostat
2P3 – Variable and reversible 8-12v power supply, ideal for model control
2P4 – 24 volt psu with separate channels for stereo made for Mullard UNILEX Amplifiers.
2P5 – 12 volt psu 750 ma output – plastic cased
2P6 – 100 watt mains to 115 volts auto-transformer with voltage tappings
2P7 – Mini key, 16 button membrane keyboard, list price over £12, as used on PRESTEL
2P8 – Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
2P9 – Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters, battery chargers etc
2P10 – 12 volt 5 amp mains transformer – low volt winding on separate bobbin and easy to remove to convert to lower voltages for higher currents
2P11 – Power amp module Mullard Unilex EP9000 (note stereo pre-amp module Unilex 9001 is BD216
2P12 – Disk or Tape precision motor – has balanced rotor and is reversible 230v mains operated 1500 rpm
2P13 – Sun Lamp switch stays on for ½ hr or 1 hr depending on setting of grub screw
2P14 – Mug Stop kit – when thrown emit piercing squawk
2P15 – Interupted Beam kit for burglar alarms, counters, etc
2P16 – Lockable metal box with 2 keys, ideal for your tools
2P17 – 1 rev per minute mains driven motor with gear box, ideal to operate mirror ball
2P18 – Liquid/gas shut off valve mains solenoid operated
2P19 – Disco switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
2P20 – 20 metres extension lead, 2 core – ideal most Black and Decker garden tools
2P21 – 10 watt amplifier, Mullard module reference 1173
2P22 – Motor driven switch 20 secs on or off after push
2P24 – Clockwork operated 12 hour switch 15A 250V with clutch
2P25 – 1000 watt flasher mains motor driven
2P26 – Counter resettable mains operated 4 digit
2P27 – Goodmans Speaker 6 inch round Bohm 12 watt
2P28 – Drill Pump – always useful couples to any make portable drill
2P29 – 24 position Yaxley switch contacts rated 5A – ¼ spindle
2P30 – 15 metres 6 way telephone or interconnecting wire
2P31 – 4 metres 98 way interconnecting wire easy to strip to use the cores separately
2P32 – Hot Wire amp meter – 4½ round surface mounting – old but working and definitely a bit of history
2P33 – 0-30 amp meter 2" round panel mounting with shunt ex ministry equipment
2P34 – Solenoid Air Valve mains operated
2P35 – Battery charger kit comprising mains transformer, full wave rectifier and meter, suitable for charging 6v or 12v
2P36 – 20 Amp meter, with shunt unused but ex-equipment
2P37 – 0-100 micro amp meter, 2" square flush mounting good make
2P38 – 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc.
2P39 – Gear train size approx. 6½" × 3½", 2 brass pillars for motor mounting (1.9" fixing centres), first wheel made of fibre, 3 other steel and brass wheels. 80 turns of fibre wheel give one turn of final drive shaft which is ¼" dia. rod
2P40 – 12 volt motor – can be fitted to 2P39 gearbox

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.

MORE BAKERS DOZEN £1 PARCELS

BD189 – 2 double pole 20 amp 250v flush mounting switches – white
BD190 – 2 double pole 20 amp 250v surface mounting switches with neon indicators – brown
BD191 – 6 B.C. lamp holder adaptors white
BD192 – 3 B.C. to 2 pin lamp holder adaptors
BD193 – 6 5 amp 3 pin flush sockets brown
BD194 – 3 5 amp 3 pin switched sockets surface mounting, brown
BD195 – 5 B.C. lampholder bakelite threaded entry
BD196 – 1 in flex simmerstat for electric blanket soldering iron etc
BD197 – 2 thermostats, spindle setting – adjustable range for heaters ovens etc
BD198 – 1 rod thermostat for water heater etc 11" rod
BD199 – 1 mains operated solenoid with plunger
BD200 – 1 10 digit switch pad for telephones etc
BD201 – 8 computer keyboard switches, with knobs, pcb or vero mounting
BD202 – 1 solenoid mains operated air valve 110v coil
BD203 – 2 8 push button switch banks 6 interlocking and two independent locking less knobs or one with knobs your choice
BD204 – 1 3 push mains voltage switch with knobs
BD205 – 1 ultra small 12v relay 3A gold-plated contacts normally open
BD206 – 20 metres 80 ohm coax, off white
BD207 – 20 metres high voltage flex 14.0075
BD208 – 1 Photo multiplier tube RCA 4555
BD209 – 1 Metal box approx. 7½ × 4½ × 1½
BD210 – 4 Transistors type 2N3055
BD211 – 1 Electric clock mains driven, always right time – not cased
BD212 – 1 Double 8v ½ amp mains transformer ideal for dimming or strobing fluorescent tubes
BD213 – 2 Curly 5 core leads for mobile telephones, transmitters etc
BD214 – 3 sub-miniature toggle switches spdt
BD215 – 5 miniature slide switches dpdt with chrome dolly
BD216 – 1 Stereo preamp Mullard EP9001
BD217 – 100 push on tag connector ¼ straight
BD218 – 100 push on tag connector ¼ right angled
BD219 – 100 soldercon terminals make IC sockets any length and width
BD220 – 3 Heat sinks for flat ICs predrilled size 40 × 40 × 25mm matt black, four sided

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Letters from readers are always welcome. Particularly so was one from Dave Ackrill G6VMQ, of Kings Norton. He writes: 'I have been very interested in your last two columns in *R&EW* magazine. From these I get the impression that you are keen to encourage the use of CW. Since 1 April 1985 I have made 46 contacts with different stations using CW. These have been very enjoyable.

G-QRP Club Award

'Most of my working from home is on the key using an FT290R and either a long wire antenna and ATU for 2 metres or a four element yagi. The only time that the microphone gets used is when I give the statutory identification using phone.' Dave goes on to say that he hopes to make at least fifty contacts using the key to be able to qualify for the G-QRP Club Award for novice CW operators. The 46 contacts referred to above make up his total for April, May, June and July.

This award is only open to stations during the first twelve months that they are licensed. Contacts may be made on any amateur band for which the applicant is licensed, but they must all be on CW. For the purpose of the award the applicant must have contacted fifty other stations.

Two classes of award are issued. For class A, all contacts must be made when the applicant is using a dc power input which does not exceed 5 watts or 3 watts RF output.

Class B is issued to applicants who use anything above these powers to make their QSOs.

Frequencies

The frequencies used by the G-QRP Club include: 3.560MHz; 7.030MHz; 10.106MHz; 14.060MHz; 21.060MHz and 28.060MHz. On the 2 metre band numerous frequencies are used, including: 144.155MHz; 144.520MHz; 144.525MHz and 144.575MHz.

The present Communications Manager of the club is G8PG, 37 Pickerill Road, Greasby, Merseyside L49 3ND, to whom applications for the award should be made. A fee of 50 pence in UK stamps must accompany the application.

For more information on the G-QRP Club contact Alan Lake G4DVW, 7 Middleton Close, Nuthall, Nottingham NG16 1BX.

NASA versus the ESA

Those readers who follow the fortunes of the shuttle and the Ariane rockets launched by the ESA may have felt at times that there was a bit of rivalry going on between the two camps. Possibly the media gave this impression, but in view of the cost of launching a satellite these days, and the likelihood of free rides for amateur radio satellites becoming harder and harder to get, the matter is of more than just contemplative concern to those interested in the future of the amateur radio spacecraft scene.

It was interesting, therefore, to receive an ESA news release the other day entitled: 'Decision of US President ends assertions by US companies against Ariane commercial launch policies'. It appears that an investigation has been going on in the USA to determine whether the policies and practices of the ESA and its member states in regard to Arianespace were unfairly competing with the US private industries in the provision of launching services. This investigation was initiated on 4 July 1984 by Transpace Carriers Inc, a newly incorporated US launcher concern. The petition contained a number of allegations of unfair trading on the part of Europe in this field.

The investigation was brought under Section 301(a) of the US Trade Act of 1974. The allegations were to the effect that Arianespace uses a two-tier price policy, charging foreign customers less than ESA member states, that the French National Space Agency (CNES) subsidises launch facilities, and that Arianespace mission insurance rates are subsidised.

Presidential decision

While this investigation was taking place the ESA had discussions with the US Government with a view to coming to some agreement over the matters in dispute. A presidential decision was subsequently announced on 17 July last, determining that 'the practices of the member states of the ESA with respect to the commercial satellite launching services of Arianespace are not unreasonable nor a burden or restriction on US commerce'. Furthermore, where allegations made lacked any evidence to the contrary and where practices of government assistance were found, as publicly admitted by the ESA, these were entirely compatible with US Government practices in the same area.

An 'aide-memoire' sent by the ESA to the President to conclude the matter expressed the view that: 'it is in the mutual interest of both the US and European governments and industries to foster an international climate in which the shuttle, the US expendable launch vehicles and Arianespace, and any other launch system operators can openly and fairly compete for commercial and foreign customers on the basis of their respective launcher merits and their commercial activities.'

The satellite scene

RS8 is definitely in trouble. There seems to be a problem with the command facility on the satellite and the Russians are unable to control it. The opinion at the moment is that they are unlikely to be able to correct the fault, so RS8 looks like being 'dead' now.

RS5 and RS7 are still performing satisfactorily. They went into eclipse again at the beginning of October, so by the time you read this a new schedule will have been introduced to deal with this situation. Wednesday continues to be 'recharge day', when the satellites are 'off'. Monday is 'QRP day'.

RS9 and 10 are still in preparation. Some problems have to be sorted out with RS9 and no launch plans can yet be announced. RS10 is progressing well with no problems and its launch is expected in the new year.

Rumours are rife at the time of writing that another of the ISKRA type Russian satellites is about to be launched. It was thought that this might have a 10/15 metre transponder aboard, but this is apparently not the case. Even so, these satellites are interesting to track and listen to. At the time of the launch of the last ISKRA satellite the Russians announced that they proposed launching a series of twenty or so such satellites. It is said that these are built by various 'technical colleges' in the USSR teaching space technology. A very practical way of creating enthusiasm in their students and proving just how good their work is!

Oscar 10 is still running well. It has had its apogee over the southern hemisphere for some time now giving very

short periods of workability in this part of the world, which are at very unsocial hours. Its operating schedule has been altered from time to time so that the least possible strain is put on the satellite during its eclipse periods. One danger is apparently that its batteries might actually freeze up during long eclipse periods. Oscar 10 was two years old on 16 June last.

Community role

One seems to recall that the first accurate account of what was happening when the Americans intervened in the troubles in Grenada came from an amateur radio station. The more recent events on the cruise liner *Achille Lauro* were said on the early morning radio news bulletins to have come from a ham radio operator who had been monitoring radio messages from the vessel.

The Mexico earthquake, however, provided the best recent example of what amateur radio can do to help the community in such a catastrophe. Amateur radio really went to town on that occasion, with almost world-wide co-operation. An announcement on the RSGB News Service bulletin on the following Sunday morning requested that the frequencies 14.130, .135, .175, .220 and .320MHz should be kept clear throughout the world for emergency traffic connected with the earthquake rescue, and that 14.279MHz should be kept clear for Red Cross traffic from their HQ in Geneva.

Listening on these frequencies proved a most interesting experience, and it was quite obvious that full use was being made of amateur radio communication facilities for humanitarian purposes. A subsequent letter from a radio amateur friend in California began with: 'I meant to write sooner, but it seems like everything gets in the way! I am right now waiting for message traffic into and out of Mexico City. I have been doing it for eight days and nights now and I am getting hoarse!' Which really says it all!

There can be little doubt that the media coverage of the radio amateur activities from recent shuttle missions, especially on slow scan TV, has increased amateur radio's credibility with both the public and officialdom very considerably.

The recent relaxation of the 'third party' message handling embargo on UK radio amateurs by our licensing authority for the Scouts' 'Jamboree-on-the-Air' events shows an appreciative attitude by our authorities towards amateur radio. The DTI relaxed this embargo just in time for the Scouts' JOTA. They authorised the passing of messages by non-licensed Scouts and Guides participating in this event to other Scouts and Guides taking part in the event in Canada, the USA and the Falkland Islands, 'in order to demonstrate to as wide an audience as possible the effectiveness of amateur radio's ability to bring together the young people of other countries in a common interest'. Messages of greeting could be sent on the condition that they were not longer than two minutes, and were limited to one message per non-licensed person.

An interesting QSO

Many thanks to Michael Walsh of Eccles, who wrote in to say that on Wednesday 4 September he heard a QSO on 14.130MHz between a vessel filming the wreck of the *Titanic* and a base station on shore.

The station operating from the vessel, an NOAA research ship, was calling itself 'station collect'. The callsign of the radio operator was KA1HOM and the shore station was WW4LA, which had 'patching' facilities enabling the vessel's crew to talk to wives and friends, etc. Reception of both stations was excellent. Congratulations, Michael. REW

LOOKING BACK

Through the eyes of SIR DOUGLAS HALL Bt KCMG

The *Radio Constructor*, grandmother of the present magazine, started life with 28 small pages in August 1947. It was produced by Data Publications, of which Arthur C Gee, still a regular contributor today, was an early director. Another early director, J H Burrows, now lives in retirement near London. For 25 years *Radio Constructor* continued under the same title, growing as the years passed, until by its 25th birthday it had 64 much larger pages.

Electronics intrusion

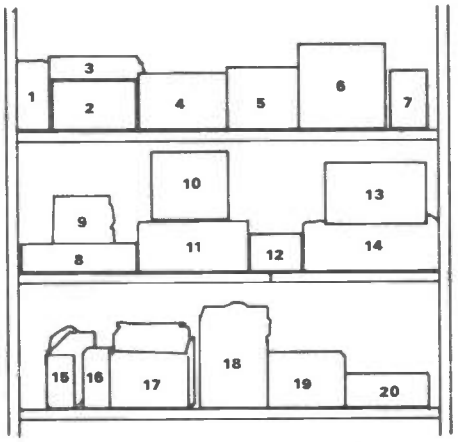
In August 1972 it changed its title to *Radio and Electronics Constructor*, but continued to be published by Data Publications. The new title recognised the intrusion into the hobby of electronic matters other than radio, but while this trend continued to be reflected until the last copy, for Aug/Sept 1981, the magazine also continued to cater for a readership which included a large number who were interested in the construction of radio receivers and amplifiers, especially of the simple variety. Indeed by 1981 there were few other sources of help in this more ancient branch of the hobby.

For much of the life of the magazine under its earlier titles, it was privileged to have JR Davies as its Technical Editor. Speaking as a contributor, 'Dave' Davies was a wonderful editor to deal with – always courteous and helpful, and almost magical in his ability to spot errors or possible causes for confusion. Perhaps his greatest talent was his ability to write simply about technical matters, so that the beginner could understand and progress. Alas, he died, in February 1981 at the young age of 57 only a few months before the magazine changed its name again and, for the first time, its publishers.

Simple radio equipment

The writer has had over 100 articles published in the magazine between 1962 and 1981, most of them comprising detailed constructional descriptions of simple radio receivers and amplifiers. Many of the original prototypes, or early copies, are still held by me including every design published between 1974 and 1980 inclusive (see photo). All this lot have been modified since publication, mostly in minor detail only, but all have retained their original basic design.

None of the circuits used had been used before, so far as I am aware. I believe that quite a number are still in use both in this country and overseas, and would be pleased to provide advice and details of modifications to them, or any earlier designs, to anyone who might wish to get in touch with me through this magazine. This would be a free service (in exchange for a stamped addressed envelope) but clearly the offer must be restricted to my own designs. REW



1 Quasistor tuning head
2 Biflexette portable
3 Double reflex SW personal
4 3 waveband portable
5 Slide rule capacitance meter
6 Drachma SW and VHF portable
7 Superalphadyne
8 P & S stereo amp
9 M5 pocket receiver
10 Jubilee AM/FM receiver
11 Cascode M & L receiver
12 Mains microamp
13 Hybrid all-wave
14 6S3T SW receiver
15 Band II portable
16 Doric SW receiver
17 Doric 9-band receiver
18 Watersport ML portable
19 Diodyne receiver
20 Lisa 2-band portable

INTEGRATED CIRCUITS

AN124	2.50	MC1351P	1.50	STK435	7.95	TBA651R	2.50	TDA2581	2.95
AN214Q	2.50	MC1357	2.35	STK437	7.95	TBA720A	2.45	TDA2582	2.95
AN239	2.50	MC1358	1.58	STK439	7.95	TBA750Q	2.65	TDA2593	2.95
AN240P	2.80	MC14518CP		STK461	11.50	TBA800	0.89	TDA2600	6.50
AN264	2.50		7.50	TA706IAP	1.50	TBA810AS	1.65	TDA2610	2.50
AN612	2.15	MC1495	3.00	TA7108P	1.50	TBA810P	1.65	TDA2611A	1.95
AN362L	2.50	MC1496	1.25			TBA820M	0.75	TDA2640	3.50
AN7140	3.50	MC145106P		TA7120P	1.65	TBA820Q	1.45	TDA2680A	2.75
AN7145	3.50		7.95	TA7129P	2.50	TBA890	2.50	TDA2690	2.45
AN7145M	3.95	MC1723	0.50	TA7130P	1.50	TBA920	1.65	TDA3310	2.95
AN7150	2.95	MC3357	2.75	TA7137P	1.00	TBA950/2X		TDA4600	2.50
BA521	3.35	MC3401L	2.50	TA7176AP	2.95		2.35	TDA9503	3.15
CA1352E	1.75	ML231B	1.75	TA7193P	3.95	TBA990	1.49	TDA3560	3.95
CA3086	0.46	ML232B	2.50	TA7203	2.95	TBA990Q	1.49	TEA1009	1.35
CA3123E	1.95	MSM5807	8.75	TA7204P	2.15	TCA270	1.50	UPC566H	2.95
CA314OT	1.15	PLL02A	5.75	TA7205AP	1.15	TCA270SQ		UPC575C2	
ETT6016	2.50	SAA500A	3.50	TA7222AP	1.80		1.50		2.75
HA1339A	2.95	SAA1025	7.25	TA7227P	4.25	TCA650	2.50	UPC1025H	
HA1366W	2.75	SAS560S	1.75	TA7310P	1.80	TCA800	2.95		1.95
HA1377	3.50	SAS570S	1.75	TA7313AP	2.95	TCA830S	1.95	UPC1028H	
HA1156W	1.50	SAS580	2.85	TA7314P	2.95	TCA900	2.50		1.95
HA1551	2.95	SA/SB/T/U		TA7137P	1.00	TCA940	1.65	UPC1032H	
LA1230	1.95		1.00	TA7314P	2.95	TDA440	2.20		1.50
LA4102	2.95	SL901B	7.95	TA7321P	2.25	TDA1001	1.95	UPC1156H	
LA4140	2.95	SL917B	6.65	TA7609P	3.95	TDA1002A	1.95		2.75
LA4031P	1.95	SL1310	1.80	TA7611AP	2.95	TDA1003A	3.95	UPC1158H	
LA4420	1.95	SL1327	1.10	TAA310A	1.95	TDA1004A	5.95		0.75
LA4430	2.50	SL1327Q	1.10	TAA320A	1.95	TDA1006A	2.50	UPC1167C2	
LA4400	4.15	SN76003N	3.95	TAA350A	1.95	TDA1010	2.15		1.95
LA4422	2.50	SN76013N	3.95	TAA570	1.95	TDA1035	2.50	UPC1181H	
LA4461	3.95	SN76023N	3.95	TAA661B	1.95	TDA1037	1.95		1.25
LC7120	3.25	SN76033N	3.95	TAA700	1.70	TDA1044	2.15	UPC1182H	
LC7130	3.50	SN76110N	0.89	TBA120AS/B/C	1.00	TDA1170	1.95		2.95
LC7131	5.50	SN76115N	1.25	TBA395	1.50	TDA1190	2.15	UPC1185H	
LC7137	5.50	SN76131N	1.30	TBA396	0.75	TDA1270/03	3.95		3.95
LM1011	3.15	SN76226DN		TBA440N	2.55	TDA1327	1.70	UPC1191V	1.50
LM324N	0.45		2.95	TBA480Q	1.25	TDA2002	1.95	UPC1350C	
LM380N8	1.50	SN76227N	1.05	TBA510	2.50	TDA2003	2.95		2.95
LM380N8	1.75	SN76533N	1.65	TBA510Q	2.50	TDA2010	1.95	UPC1353C	
LM383T	2.95	SN76544N	2.65	TBA520	1.10	TDA2020	2.95		2.45
LM390N	3.50	SN76570N	1.00	TBA520Q	1.10	TDA2030	2.80	UPC1365C	
M51513L	2.30	SN76650N	1.15	TBA530	1.10	TDA2140	3.95		3.95
M5155L	2.95	SN76660N	0.90	TBA530Q	1.10	TDA2151	1.95	UPC2002H	
M51521L	1.50	STK014	7.95	TBA540	1.25	TDA2160	2.50		1.95
MB3712	2.00	STK015	5.95	TBA540Q	1.35	TDA2190	3.95	555	0.35
MB3756	2.50	STK025	11.95	TBA550Q	1.95	TDA2521	3.25	556	0.60
MC1307P	1.00	STK043	9.50	TBA560C	1.45	TDA2522	1.95	723	0.50
MC1310P	1.95	STK078	11.95	TBA560Q	1.45	TDA2523	2.95	741	0.35
MC1327	1.70	STK415	7.95	TBA570	1.00	TDA2524	1.95	747	0.50
MC1327Q	0.95	STK433	5.95	TBA641A12		TDA2530	1.95	748	0.35
MC1349P	1.20	STK435	7.95		3.50	TDA2532	1.95	7808	0.60
1C1350P	0.95					TDA2540	1.95	7805	0.65
						TDA2541	2.15	7812	0.65
						TDA2560	2.15	7815	0.65
						TDA2571	2.95		

NEW BRANDED CATHODE RAY TUBES– Please allow additional £3 per tube for carriage

A1865/20	65.00	D14-173GR	55.00	M19-103W	55.00	M50-120GV	65.00
AW36.11	25.00	D14-181GH/98	65.00	M23-110GH	55.00	M50-120LC	65.00
CME822W	19.00	D14-181GJ	55.00	M23-112GM	55.00	M61-120W	75.00
CME822GH	25.00	D14-181GM	53.00	M23-112GV	55.00	S6AB	45.00
CME1428GH	45.00	D14-181GM50	59.00	M23-112GW	55.00	SE4/D-P7	45.00
CME1428W	39.00	D14-182GH	59.00	M23-112KA	55.00	SE42BP31AL	55.00
CME1523W	39.00	D14-200BE	89.00	M23-112LD	55.00	SE42BP31	55.00
CME1431GH	39.00	D14-200GA/50	85.00	M24-120GM	59.00	SE5Fp31	55.00
CME1431W	39.00	D14-200GM	75.00	M24-120LC	59.00	T937	65.00
CME202GH	45.00	D14-210GH	75.00	M24-120WAR	59.00	T948N	65.00
CME2024W	45.00	D14-270GH/50	75.00	M24-121GH	55.00	T948H	65.00
CME2325W	45.00	D14-310W	110.00	M28-12GH	55.00	V4150LC	55.00
CME3128W	45.00	D14-320GH/82	85.00	M28-13LC	49.00	V5004GR	59.00
CME3132GH	45.00	D14-340GH/KM	45.00	M28-13LG	49.00	V5004LD	59.00
CME3155W	45.00	D14-340KA	45.00	M28-13GR	49.00	V6001GH	65.00
CRE1400	25.00	D16-100GH	65.00	M28-131GR	55.00	V6007DP31	59.00
CV429	89.00	D16-100GH/65	69.00	M28-133GH	55.00	V6008GH	59.00
CV1450	35.00	D16-100GH/67	65.00	M31-101GH	55.00	V6034WA	59.00
CV1526	19.00	D16-100GH/79	69.00	M31-182GR	55.00	V604CLA	59.00
CV2185	15.00	D16-100GH97	65.00	M31-182GV	53.00	V6048J	49.00
CV2191	19.00	D18-160GH	69.00	M31-184W	65.00	V6052GR	65.00
CV2193	15.00	D21-10GH	65.00	M31-184GH	65.00	V6064BP31	55.00
CV5119	85.00	DB7.36	35.00	M31-184P31	65.00	V6064CLA	55.00
CV5320	85.00	DB7.36	55.00	M31-186W	69.00	V6069GH	55.00
CVX389	55.00	DG7.5	55.00	M31-190GH	55.00	V6070P31	49.00
D9-110GH	39.50	DG7.32	45.00	M31-190GR	55.00	V7016A	65.00
D10-210GH	45.00	DH3.91	55.00	M31-190LA	55.00	V7030	59.00
D10-210GH68B	65.00	DH7.91	45.00	M31-191GV	55.00	V7031GH	59.00
D10-230GH	35.00	DP7.5	35.00	M31-220W	59.00	V7031/67A	59.00
D10-230GM	35.00	DP7.6	35.00	M31-270GY	65.00	V7035A	49.00
D10/293GY/90	55.00	DN13.78	35.00	M31-271P31	65.00	V7037GH	45.00
D13-30GH	49.50	F16-101GM	75.00	M31-271GW	65.00	V8004GR	65.00
D13-47GH/26	69.00	F16-101LD	75.00	M31-271W	65.00	V8006GH	65.00
D13-47GH	55.00	F21-130GR	75.00	M36-141W	75.00	V8010A	65.00
D13-51GL/26	85.00	F21-130LC	75.00	M36-170LG	75.00	VCR139A	11.50
D13-51GM/26	85.00	F31-10GM	75.00	M38-103GR	65.00	2BP1	13.50
D13-450GH/01	55.00	F31-10GR	75.00	M38-120W	65.00	3BP1	11.50
D13-471GH/26	55.00	F31-10LC	75.00	M38-120WA	65.00	3DP1	11.50
D13-600GM	59.00	F31-10LD	75.00	M38-121GHR	65.00	4EP1	30.00
D13-610GH	59.00	F31-12LD	75.00	M38-121LA	65.00	3H/OBM	55.00
D13-611GH	59.00	F31-13GR	75.00	M38-122GW	65.00	3WP1	18.50
D13-611GM	59.00	F31-13LD	75.00	M38-140LA	65.00	5BP1	9.00
D13-630GH	59.00	F31-13LG	75.00	M38-142LA	65.00	5BHP1	30.00
D14-150GH	75.00	F41-123LC	185.00	M38-341P31	65.00	5BHP1FF	30.00
D14-150GM	75.00	F41-141LG	185.00	M38-344P39	65.00	5BHP31	30.00
D14-172GH/84	59.00	F41-142LC	185.00	M40-120W	59.00	5CP1	10.00
D14-172GR	55.00	M7-120W	19.00	M43-12LG/01	65.00	6EP7/S	39.00
D14-172GV	55.00	M14-100GM	45.00	M44-120LC	65.00	13BP1	13.50
D14-173GH	55.00	M14 100LC	45.00	M44-120GR	65.00	13BP4	17.50
D14-173GM	53.00	M17-151GVR	175.00	M50-120GH	65.00	17DW/P4	25.00
		M17-151GR	175.00	M50-120GR	65.00	32J/1085	69.00
						88D/88B/89D/89L	15.00
						1273	39.00
						1564	39.00
						1844	45.00
						55451GM	75.00
						9442E1	80.00
						95447GM	75.00
						95449	75.00
						7709631	79.50

SEMICONDUCTORS

AAY12	0.25	BC182	0.10	BD242	0.65	BFY51	0.21	TIP34B	0.95
AC126	0.45	BC182LB	0.10	BD246	0.75	BFY52	0.25	TIP41A	0.45
AC127	0.20	BC183	0.10	BD376	0.32	BFY90	0.77	TIP41C	0.45
AC128	0.28	BC183L	0.09	BD410	0.65	BLY48	1.75	TIP42C	0.47
AC128K	0.32	BC184LB	0.09	BD434	0.65	BR100	0.26	TIP47	0.65
AC141	0.28	BC204	0.10	BD437	0.75	BR101	0.49	TIP120	0.60
AC141K	0.34	BC207B	0.13	BD438	0.75	BR103	0.55	TIP125	0.65
AC142K	0.45	BC208B	0.13	BD520	0.65	BR303	0.95	TIP142	1.75
AC176	0.22	BC212	0.09	BD538	0.65	BRC4443	1.15	TIP146	2.75
AC176K	0.31	BC212L	0.09	BD597	0.95	BRY39	0.45	TIP161	2.95
AC187	0.25	BC212LA	0.09	BD701	1.25	BT100A/02	0.85	TIP2955	0.80
AC187K	0.28	BC213	0.09	BD702	1.25	BT106	1.49	TIP3055	0.55
AC188	0.25	BC213L	0.09	BD707	0.90	BT116	1.20	TIS91	0.20
AC188K	0.37	BC214	0.09	BDX32	1.50	BT119	3.15	TV106/2	1.50
AD142	0.79	BC214C	0.09	BF115	0.35	BT120	1.65	ZRF0112	16.50
AD143	0.82	BC214L	0.09	BF119	0.65	BU105	1.95	2N1100	6.50
AD149	0.70	BC237B	0.09	BF127	0.39	BU108	1.69	2N1308	1.35
AD161	0.39	BC238	0.09	BF154	0.20	BU124	1.25	2N1711	0.30
AD162	0.39	BC239	0.12	BF158	0.22	BU125	1.25	2N2219	0.28
AD161/2	0.90	BC251A	0.12	BF160	0.27	BU126	1.60	2N2905	0.40
AF106	0.50	BC252A	0.15	BF167	0.27	BU204	1.55	2N3053	0.40
AF114	1.95	BC258	0.25	BF173	0.22	BU205	1.30	2N3054	0.59
AF121	0.80	BC258A	0.39	BF177	0.38	BU208	1.39	2N3055	0.52
AF124	0.65	BC284	0.30	BF178	0.26	BU208A	1.52	2N3702	0.12
AF125	0.35	BC300	0.30	BF179	0.34	BU208D	1.85	2N3703	0.12
AF126	0.32	BC301	0.30	BF180	0.29	BU326	1.20	2N3704	0.12
AF127	0.65	BC303	0.26	BF181	0.29	BU326S	1.50	2N3705	0.20
AF139	0.40	BC307B	0.09	BF182	0.29	BU407	1.24	2N3706	0.12
AF150	0.60	BC327	0.10	BF183	0.29	BU500	2.25	2N3708	0.12
AF178	1.95	BC328	0.10	BF184	0.28	BU508A	1.95	2N3733	9.50
AF239	0.42	BC337	0.10	BF185	0.28	BU526	1.90	2N3773	2.75
AU106	4.50	BC338	0.09	BF194	0.11	BU807	2.25	2N3792	1.35
AU107	3.50	BC347A	0.13	BF195	0.11	BUY20	2.15	2N4280	3.50
AU110	3.50	BC461	0.35	BF196	0.11	BUY69B	1.70	2N4427	1.95
AY102	2.95	BC478	0.20	BF197	0.11	MJ3000	1.98	2N4444	1.15
BC107A	0.11	BC527	0.20	BF198	0.16	MJE340	0.40	2N5294	0.42
BC107B	0.11	BC547	0.10	BF199	0.14	MJE350		2N5296	0.48
BC108	0.10	BC548	0.10	BF200	0.40	MJE520	0.48	2N5298	0.60
BC108A	0.11	BC549A	0.10	BF241	0.15	MJE2955		2N5485	0.45
BC108B	0.12	BC550	0.14	BF245	0.30	MPSA13	0.29	2N5496	0.95
BC109	0.10	BC557	0.08	BF257	0.28	MPSA92	0.30	2SA329	0.95
BC109B	0.12	BC557B	0.08	BF258	0.28	MRF237	4.95	2SA715	0.80
BC109C	0.12	BC558	0.10	BF259	0.28	MRF450A		2SC495	0.80
BC114A	0.09	BC639/10	0.30	BF271	0.26		13.95	2SC496	0.80
BC116A	0.15	BCY33A	1.60	BF273	0.18	MRF453	17.50	2SC931D	0.95
BC117	0.19	BD115	0.30	BF336	0.34	MRF454	26.50	2SC1096	0.80
BC119	0.24	BD124P	0.59	BF337	0.29	MRF455	17.50	2SC1106	2.50
BC125	0.25	BD131	0.42	BF338	0.32	MRF475	2.95	2SC1172Y	2.20
BC132	0.20	BD132	0.42	BF355	0.37	MRF477	10.00	2SC1173	1.15
BC140	0.31	BD133	0.40	BF362	0.38	OC16W	1.95	2SC1306	1.40
BC141	0.25	BD135	0.30	BF363	0.65	OC23	1.50	2SC1307	1.75
BC142	0.21	BD136	0.30	BF371	0.25	OC29	2.25	2SC1364	0.50
BC143	0.24	BD137	0.32	BF394	0.19	OC36	2.25	2SC1449	0.50
BC147A	0.12	BD138	0.30	BF422	0.32	OC42	0.75	2SC1678	1.25
BC147B	0.12	BD139	0.32	BF423	0.25	OC44	0.75	2SC1909	1.45
BC148A	0.09	BD140	0.30	BF457	0.32	OC45	0.55	2SC1945	2.65
BC148B	0.09	BD144	1.10	BF458	0.36	OC70	0.45	2SC1953	0.95
BC149	0.09	BD150C	0.29	BF467	0.68	OC71	0.55	2SC1957	0.80
BC153	0.30	BD159	0.65	BF595	0.23	OC75	0.95	2SC1969	1.95
BC157	0.12	BD160	1.50	BF597	0.25	OC81	0.50	2SC2028	1.15
BC158	0.09	BD166	0.55	BFR39	0.23	OC16W	2.50	2SC2029	1.95
BC159	0.09	BD179	0.72	BFR40	0.23	R2008B	1.45	2SC2078	1.45
BC161	0.28	BD182	0.70	BFR81	0.25	R2010B	1.45	2SC2091	0.85
BC170B	0.15	BD201	0.83	BFR88	0.30	R2322	0.58	2SC2098	2.95
BC171	0.09	BD202	0.65	BFR90	1.50	R2323	0.66	2SC2166	1.95
BC171A	0.10	BD203	0.78	BFR91	1.75	R2540	2.48	2SC2314	0.80
BC171B	0.10	BD204	0.70	BFT42	0.35	RCA16334	0.90	2SC2371	0.36
BC172	0.10	BD222	0.46	BFT43	0.35	RCA16335	0.80	2SC931D	0.95
BC172B	0.10	BD223	0.59	BFW61	0.60	S2060D	0.95	1SD234	0.50
BC172C	0.10	BD225	0.48	BFW92	0.85	SKE5F	1.45	2SD325E	1.65
BC173B	0.10	BC232	0.35	BFX29	0.30	TIP29	0.40	3N211	2.95
BC174	0.09	BD233	0.35	BFX84	0.26	TIP29C	0.42	3SK88	0.95
BC174A	0.09	BD234	0.35	BFX85	0.32	TIP30C	0.43		
BC177	0.15	BD236	0.49	BFX86	0.30	TIP31C	0.55		
BC178	0.15	BD237	0.40	BFX88	0.25	TIP32C	0.42		
		BD238	0.40	BFY50	0.21	TIP33C	0.95		

VIDEO SPARES

3HSS £29.50

4HSS £32.95

PS3B £39.50

HEADS

Suitable for Ferguson 3V00, 3V01, 3V06, 3V16, 3V22, 3V23, 3V24, 3V29, 3V30, 3V31, 8903 and many JVC, Akai, Nordmende, Telefunken.

Suitable for National Panasonic NV333 340, 2000, 3000, 7000, 7200, 7500, 8170, 8400, 8600, 8610F, 8620. Blaupunkt RTV 100E, 200, 202, 211, 222, 322, RTX100, 200, 224.

Suitable for Sony C5, C6, C7, 8000, 8080 Toshiba V5470, V8600, V8700.

Sony DSR-10R BETA £35.00
Suitable for SLC5, SLC6, SLC7

NEW

VIDEO BELT KITS

Akai VS 9300/9500/9800	£3.75
Ferguson 3V16	£4.50
JVC HR 3330/3600	£4.50
JVC HR 3360/3660	£4.50
Panasonic NV 300	£4.00
Panasonic NV 2000B	£3.75
Panasonic NV 3000B	£3.75
Panasonic NV 7000	£3.50
Panasonic NV 8600B/8610B/V011	£3.75
Sanyo VTC 5500	£3.75
Sanyo VTC 9300	£3.75
Sanyo VTL 9300P	£3.90
Sharp VC 6300	£3.75
Sharp VC 7300	£3.75
Sharp VC 8300	£3.75
Sharp VC 9300	£3.75
Sony SL 3000B	£3.75
Sony SL 8000/8080	£4.50
Sony SL C7/J7	£4.00
Toshiba V7540	£4.50

TAPE HEADS

Mono Head	1.50
Auto Reverse	3.50
Stereo Head	2.95

ELECTRO-OPTICAL

9677M	22.00
P4231BAM	19.00
XP1002	29.00
XP1117M	24.00
XP42040	35.00
9524H	25.00

DIODES

AA119	0.08	BY223	0.90	1N23ER	5.00
BA115	0.13	BY298-400	0.22	1N23WE	5.00
BA145	0.16	BY299-800	0.22	IN4001	0.04
BA148	0.17	BYX10	0.20	IN4003	0.04
BA154	0.06	BYX36-150R			
BA156	0.15		0.20	IN4004	0.05
BA157	0.30	BYX38-600R		IN4005	0.05
BAX13	0.04		0.60	IN4007	0.06
BAX16	0.06	BYX55-600	0.30	IN4148	0.02
BB105B	0.30	BYX71-600	1.10	IN4448	0.10
BT151	0.79	BZX61	0.15	IN5401	0.12
BY126	0.10	BZY88	0.10	IN5402	0.14
BY127	0.11	BZY95C30	0.35	IN5403	0.12
BY133	0.15	CS4B	4.50	IN5406	0.13
BY164	0.45	CS10B	8.45	IN5407	0.16
BY176	1.20	OA47	0.09	IN5408	0.16
BY179	0.63	OA90	0.05	ITT44	0.04
BY182	0.55	OA91	0.06	ITT923	0.15
BY184	0.35	OA95	0.06	ITT2002	0.10
BY199	0.40	OA202	0.10		
BY206	0.14	1N21DR	5.00		
BY208-800	0.33	1N23B	5.00		
BY210-800	0.33	1N23C	5.00		

BASES

B5D	5.50
B7G	0.25
B7G SKTD	0.25
B8G	0.35
B8H	0.70
B9A	1.50
B9ASKTD	0.40
B9G	0.75
B10B	0.20
B13B	0.50
B14A	3.00
12 Pin CRT	0.95
Nuvistor	2.95
Octal	0.35
SK610	35.00
UK5	1.75
Valve Can	0.30
8 Pin Dil	0.14
14 Pin Dil	0.15
16 Pin Dil	0.17
18 Pin Dil	0.18
Socket for 813	9.50

WIREWOUND RESISTORS

4 Watt 2R4-10K	0.20
7 Watt R47-22K	0.20
11 Watt 1R5-15K	0.25
17 Watt 1R-15K	0.30

ZENER DIODES
BZX61 0.15
6V2 7V5 8V2 9V1 10V
11v 12V 13V 15V 16V
18V 20V 22V 24V 27V
30V 33V 36V 39V 47V
51V 56V 68V 75V

BZY88 0.07
27V 3V 3V3 3V6 3V9 4V3
4V7 5V1 5V6 6V2 6V8
7V5 6V2 9V1 10V 11V 12V
13V 15V 18V 20V 24V
27V 30V

THERMISTORS

VA1040	0.23
VA1056S	0.23
VA1104	0.70
VAT8650	0.46
VA1097	0.25

BATTERIES
7V Power Mike batteries
TR175 £2.25 ea
other prices on request

LINE OUTPUT TRANSFORMERS

DECCA 100	7.95
DECCA 1700 MONO	9.95
DECCA 1730	8.95
DECCA 2230	8.25
GEC 2040	8.95
GRUNDIG 1500	15.45
GRUNDIG 5010-6010 2222.5011-6011	13.45
ITT CVC20	8.20
ITT CVC30	8.25
PHILIPS G8	8.50
PHILIPS G9	8.99
PHILIPS G11	13.39
PYE 725	10.95
RBM T20A	12.40
TANDBERGE 90	11.15
TELEFUNKEN 711A	11.15
THORN 1590	9.50
THORN 8000	23.50
THORN 9000	9.95
THORN 9800	22.40
THORN MAINS TRANSFORMER 3000/3500	9.70

SOLDERING EQUIPMENT

25W Antex Iron	4.59
Weller Instant Heat Gun	11.30
240V Weller Marsman	4.74
½ Kilo Solder 60/40	6.95

EHT MULTIPLIERS

ITT CVC20	6.35
ITT CVC30	6.35
PHILIPS G8550	6.96
RANK T20A	6.91
THORN 3000/3500	7.57
THORN 8500	5.50
THORN 9000	8.00
UNIVERSAL TRIPLER	5.45

REPLACEMENT ELECTROLYTIC CAPACITORS

DECCA 30 (400-400/350V)	2.85
DECCA 80/100 (400/350V)	2.99
DECCA 1700 (200-200-400-350V)	3.55
GEC 2110 (600/300V)	2.25
ITT CVC20 (220/400V)	1.80
PHILIPS G8 (600/300V)	2.25
PHILIPS G9 (2200/63V)	1.19
PHILIPS G11 (470/250V)	2.35

POTENTIOMETERS

STANDARD VERTICAL POTS	0.12
MIN. VERTICAL POTS	0.12
STANDARD HORIZONTAL POTS	0.12
MIN. HORIZONTAL POTS	0.12
CONVERGENCE PRE-SETS	0.30
SLIDERS LOG	0.48
SLIDER LINEAR	0.48

SPARES & AIDS

HEAT SINK COMPOUND	1.00
FREEZE IT	0.95
SOLDA MOP	0.64
SWITCH CLEANER	0.85
WD40	1.25
PUSH PUSH MAINS SWITCH (DECCA, GEC, RANK, THORN ETC)	1.02
PYE IF GAIN MODULE	6.99
ANODE CAP (27KV)	0.69

PUSH BUTTON UNITS

DECCA, ITT, CVC20 6 WAY	7.95
ITT CVC5 7 WAY	10.19
PHILIPS G8 (550) 6 WAY	14.49

VARICAP TUNERS

ELC1043/05 MULLARD	8.65
ELC1043/06 MULLARD	8.65
U321	8.25
U322	8.25
U324	8.25

20MM ANTI SURGE FUSES

100MA-800MA	15p each
1A-5AMP	12p each

20MM QUICK BLOW FUSES

100MA	8p each
200MA-5AMP	5p each

AUTOMATIC TONEBURST FOR THE IC-2

John F Rowles G4ZUH describes a mod to avoid the tedium of manual toneburst operation

The Icom IC-2 must be one of the most popular 2m handhelds in use in the UK. The only complaint the author has heard levelled against this particular handheld is the lack of an automatic toneburst. The existing manual toneburst, while adequate for accessing those repeaters requiring only an initial tone to open, becomes tedious in use for those repeaters requiring audio and tone for initial access or tone to reset the timer.

The answer to these problems lies with the automatic toneburst, as found on the majority of VHF transceivers. Icom do in fact produce a version of the IC-2 with auto-tone, but this does not appear to be available in the UK. Luckily however the same PCB is used by Icom for all versions of the IC-2, so it becomes merely a case of removing the components for the manual toneburst and adding those for the automatic version. Be warned at this point that the PCBs of the IC-2 are of high density, and it requires a fine-point soldering iron and a steady hand to succeed with this conversion.

Before proceeding with the details of the conversion let us first consider the toneburst circuits themselves.

The manual toneburst as fitted by Icom *(Figure 1)* is activated by the push-button incorporated in the volume control. Pressing the tone switch turns on Q33, supplying power to IC3 (the toneburst generator), and switches the unit into transmit mode via D6. The output from the tone generator (pin 2, IC3) is injected into the microphone amplifier.

The auto-tone version *(Figure 2)* uses the same toneburst generator circuit (IC3 and associated components) which is switched by Q30 and Q31 as follows: power is supplied to IC3 via Q31 which is switched on by Q30 for up to about two seconds (varied by R74), and as Q30 is powered from the duplex/simplex switch it is activated in duplex mode only. Q24 is a microphone muting switch which turns off the microphone while the toneburst is being transmitted.

To convert to auto-tone it is necessary to remove Q33, R83, D6 and the link adjacent to C56, and add Q30, Q31, R72, R73, R74, R75, R76, C68. Do not install Q24, R53, R54 or C56 (the microphone-mute circuit) for use on repeaters requiring audio and toneburst for access. In addition it is necessary to desolder and rewire the toneburst switch wire. You may think that this is simple, but before attacking your IC-2 read on – there are one or two pitfalls to avoid.

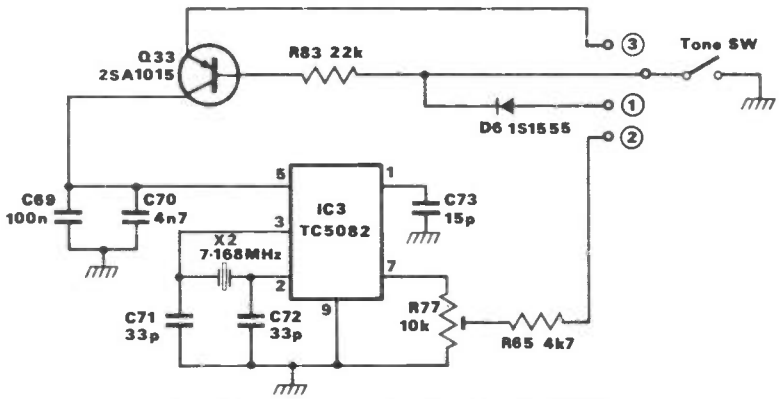
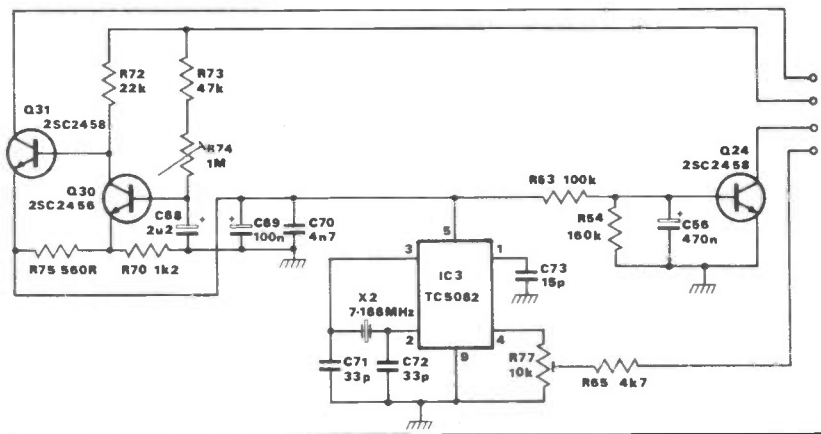


Fig 1 *Icom's manual toneburst for the IC-2E*

Fig 2 *The IC-2E automatic toneburst*



Removal of components

Before commencing any work carefully study the component layout *(Figure 3)* and identify the components to be removed with the help of the following notes:

Diode D6 is located adjacent to coil L7 – take care that you do not remove D2 which is just above D6 and also next to L7.

Just above D6 is capacitor C56, and to the right of this a wire link will be seen – this is to be removed.

Transistor Q33 is shown on the Icom layout as Q31 and is to be found immediately below crystal X1. Take care here as there is another Q31 shown by Icom to the left of IC3 at the bottom of the board, but this location should be vacant. Resistor R83 (22k) is located to the right of Q33.

The toneburst switch wire (orange) is to be found above the centre of IC3.

Once you are sure that you have correctly identified all the above, then desolder and remove D6, wire link, Q33 and R83. The orange lead can be desoldered at this stage ready for relocation.

Adding auto-tone components

All the new components to be added are located just above and to the left of IC3. You will find that these positions on the board are vacant but that due to the flow soldering used in manufacture all the holes will be filled with solder.

The first job is to identify all locations to be cleared, again by careful study of *Figure 3*, and then to clear the holes ready for the new components.

The easiest way to clear these holes is with either a length of enamelled wire or a dressmaker's pin. Simply heat the PCB pad, insert the wire or pin into the hole to be cleared, remove the iron and wiggle the pin or wire in the hole until the

surrounding solder has cooled, remove the wire/pin and you will have a clear hole to insert the new component. This method is easier than a desoldering pump on the crowded board and usually needs the heat applied for a minimal amount of time.

You should now be ready to install the new components. Again referring to *Figure 3*, insert and solder R72, R73, R74, R75, R76, and C68 and relocate the orange lead desoldered above in its new position at the top end of R72.

Q30 may now be installed (immediately to the left and a little below IC3), but *do not* install Q31 as shown on the Icom layout. The Q31 shown on the Icom layout (just above and to the left of Q30) is that used in the American version of the IC-2 with touch tone encoder (the IC-2AT). Although the Q31 we wish to install occupies the same position it must be inserted with the base connected to the place shown, but the emitter and collector positions reversed (the transistor shown on the layout is a pnp type, but the type we are installing is npn).

Finally trace the orange wire (relocated above) to the volume control/manual tone switch and cut off as close as possible to the switch. This wire is relocated to the centre pin of the +600/−600 switch. This will then give auto-tone in either repeater shift position. If it is desired to have auto-tone only in the normal −600 position then solder the orange lead to the right hand pin (as viewed from the track side of the board) of the +600/−600 switch.

Microphone mute

You should now have auto-tone installed in your IC-2, but without the microphone mute facility. As at least one repeater in the UK requires audio and tone to access there is little point in installing the microphone mute, but if you wish to do so then read on.

Referring again to *Figure 3*, install Q24, R53, R54 and C56. These are all located in the region of D6 and the wire link removed initially. In addition it is necessary to insert the link labelled JUMPER (EUR) just above C68 installed above.

COMPONENTS

Auto-tone

Q30,31	2SC2458 (see text)
R72	22k ⅛W
R73	47k ⅛W
R74	1M 6mm format preset (see text)
R75	560R ⅛W
R76	1k2 ⅛W
C68	2μ2 tantalum

Microphone mute

Q24	2SC2458 (see text)
R53	100k ⅛W
R54	150k ⅛W
C56	0.47μ tantalum

Setting up

The only adjustment required, provided you have disturbed nothing else, will be the duration of the toneburst, set by R74. This is simply done either with the use of another radio to monitor your signal or with a voltmeter.

In either case connect a well-smoothed and regulated 8 to 9 volt power supply and a dummy load to the IC-2. Set the IC-2 to low power and duplex mode and tune your receiver to the transmitter frequency of the IC-2 (remembering you are in duplex mode and the transmitted signal will be + or − 600Hz of that shown by the thumb-wheels). Key the IC-2 into transmit and check the duration of the toneburst. Adjust as necessary with R74.

If you do not have monitoring facilities then connect the IC-2 to a power supply and dummy load as above and connect a voltmeter (10V range) between earth and pin 5 of IC3. Key up on transmit as before: the meter will read when a tone is being transmitted. As before adjust as necessary with R74.

Components

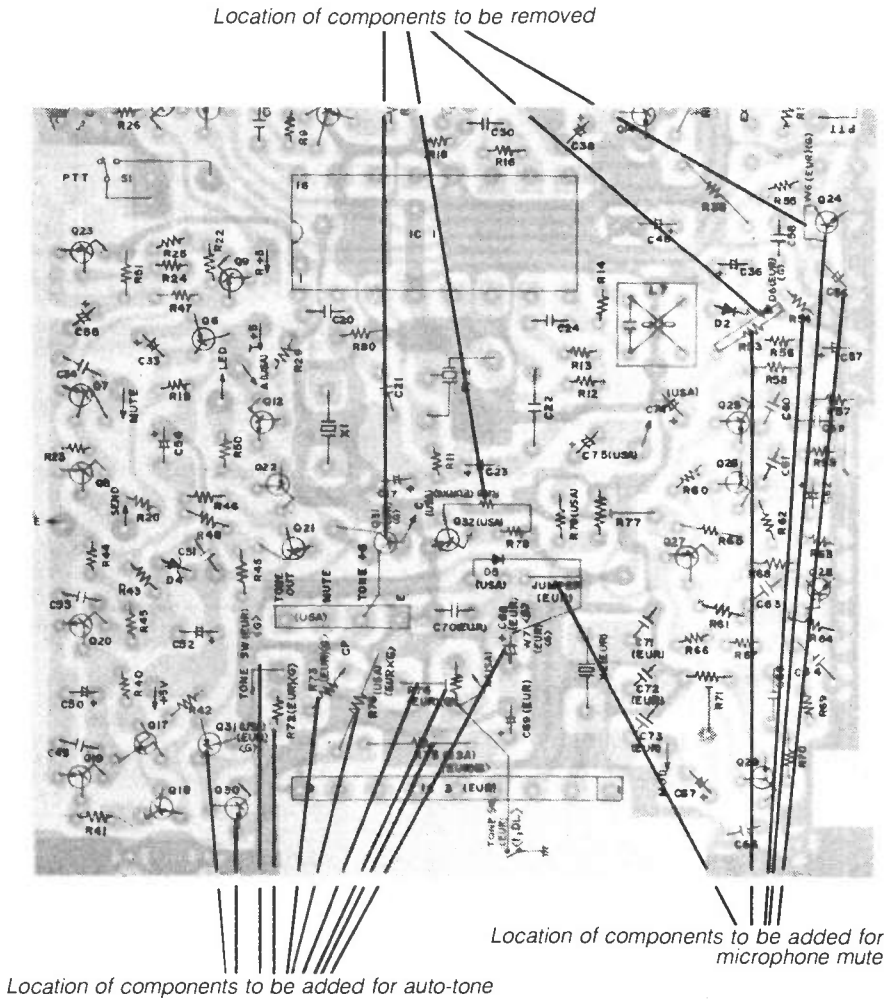
If you wish to have the above conversion to Icom specification it will be necessary for you to locate a source of 2SC2458 transistors and a 6mm format 1M preset. But if you are happy to just make the conversion then general purpose switching transistors should function perfectly well in this application. The author has only tried BC108, CIL108 (ceramic cased BC108) and ZTX108 on a breadboarded mock-up of the circuit, but others of similar specification should work. If in doubt then obtain the correct item.

With regard to the 1M preset, this does not appear to be generally available, but a 470k 6mm format preset is available from Cirkit, stock number 48-47403, which serves perfectly well. All other components are of standard type and supply should be no problem.

But remember . . .

Remember that any modifications or alterations may invalidate any warranty applicable to the apparatus, and may also have an adverse effect on the resale value. REW

Fig 3 *Part of the IC-2 main unit board layout*



UK FREQUENCY ALLOCATIONS

25.6–1710MHz

Martin Ehrenfried G8JNJ

The allocation of radio frequencies in the UK seems to have been shrouded in some mystery, and most official publications only briefly outline specific details. In contrast, the USA has no such limitations; frequency information is easily obtained. Now, due to the Government's proposed Frequency Management Policy, whereby users are charged according to their spectrum occupancy, it is proposed that the Frequency Allocation Table for the UK be published soon.

It seems likely, however, that any such publication would merely be an amalgamation of previously published information. It is hoped that the table given below will to some extent forecast the Government's proposals and stimulate discussion amongst users of the radio spectrum. Any anomalies which may have arisen are as a result of conflicting sources of information, and any amendments or corrections would be gratefully received.

CLASSIFICATIONS

Amateur
Allocation–Blocks of frequencies allocated for the purpose of self-training, intercommunication and technical investigations. Carried out by individuals having the relevant qualifications, and authorised to do so.
Type of operation–Single or split frequency. Repeater transmission permitted.
Type of transmission–AM, FM, SSB, Morse, data, television and facsimile.

Aeronautical radio communication
Allocation–On channelised basis for ground-to-air or air-to-air voice communication.
Type of operation–Single frequency.
Type of transmission–AM.

Aeronautical radio navigation
Allocation–On channelised basis for the purpose of navigation, including obstruction warning.
Type of operation–Single frequency beacon (ILS/VOR) or split frequency transponder (DME/IFF).
Type of transmission–AM, FM and data.

Broadcasting
Allocation–Blocks of frequencies allocated for transmissions which are intended for direct reception by the general public. May include sound, television or other types of transmission.
Type of operation–Single frequency.
Type of transmission–AM, WBFM.

BT radiotelephone
Allocation–On channelised basis for the purpose of voice communication between mobile stations and those connected to the national telephone network.
Type of operation–Split frequency (duplex). Large area covered by each base station, limited number of channels in each area.
Type of transmission–FM and data.

CB
Allocation–On channelised basis for the purpose of short range personal communication.
Type of operation–Single frequency.
Type of transmission–FM in the UK. AM, FM and SSB in other countries.

Cellular radio
Allocation–On channelised basis for the purpose of voice communication between mobile stations and those connected to the national telephone network.
Type of operation–Split frequency (duplex). Small area covered by each base station, automatic switching between base stations when out of coverage area.
Type of transmission–FM and data.

Fixed/mobile
Allocation–Unclear. Not fitting any of the other categories, but assigned internationally for the purpose of radio communication.

Home Office
Allocation–On channelised basis for the purpose of radio communication by Government services.
Type of operation–Single or split frequency.
Type of transmission–AM, FM and data.

Industrial, scientific and medical
Allocation–Blocks of frequencies allocated for the operation of equipment designed to generate and use radio frequency energy for industrial, scientific or medical purposes other than radio communication.
Type of operation–Localised radiation, therefore little frequency control.
Type of transmission–Continuous or pulsed carrier.

Marine
Allocation–On channelised basis for the purpose of navigation or voice communication by maritime stations.
Type of operation–Single or split frequency (duplex).
Type of transmission–FM.

Paging
Allocation–On channelised basis for the purpose of alerting the user to the fact that someone wishes to contact him.
Type of operation–Single frequency (one-way) or split frequency if acknowledgement facility required.
Type of transmission–AM, FM and data.

Private message handling
Allocation–On channelised basis to companies offering a range of radio communication services including limited connection to the national telephone network.
Type of operation–Single or split frequency (duplex).
Type of transmission–AM or FM.

Private Mobile Radio (PMR)
Allocation–On channelised basis for the purpose of providing radio communication between commercial users, where other forms of communication would not be practical.
Type of operation–Single or split frequency. Multi-user 'community repeater' systems in operation. Trunked systems to be introduced.
Type of transmission–AM, FM and frequecy division multiplex (FDM) systems where several voice or data channels can be carried on one radio channel.

Telemetry
Allocation–On channelised basis for the purpose of remote data collection and control.
Type of operation–Single or split frequency.
Type of transmission–AM, FM and data.

UK FREQUENCY ALLOCA

[ ] Indicates frequency pairing when applicable
( ) Indicates additional information

25.600 11m broadcast band
26.100 Fixed/mobile
26.960 US CB allocation/UK model control band
27.280 US CB allocation
27.405 Fixed/mobile
27.600 UK CB allocation
28.000 10m amateur band
29.700 Fixed/mobile
30.005 NASA (space to Earth)
30.015 Fixed/mobile
35.000 UK air model control band
35.200 Fixed/mobile
40.020 NASA (space to Earth) 40.660-40.700MHz ISM allocation
41.000 Broadcasting/PMR (to be allocated)
47.450 UK cordless phones (h/set Tx) (Base Tx 1.642-1.782MHz)
47.550 Broadcasting/PMR (to be allocated)
49.820 Low power devices
49.900 Broadcasting/PMR (to be allocated)
50.000 US 6m amateur band (UK limited to 50.0-50.5MHz)
54.000 Broadcasting/PMR (to be allocated)
68.000 Fixed/mobile
70.025 4m amateur band
70.500 Fixed/mobile
71.500 PMR Low Band (mobile Tx) [-13.5MHz]
72.800 Fixed/mobile/radio astronomy
74.800 Aeronautical radio navigation (marker beacon)
75.200 Fixed/mobile
76.950 PMR Low Band (mobile Tx) [-10.0MHz]
78.000 Fixed/mobile
80.000 Home Office
84.000 Fixed/mobile
85.000 PMR Low Band (base Tx) [-13.5MHz]
86.300 PMR Low Band (simplex low power)
86.700 Fixed/mobile
86.950 PMR Low Band (base Tx) [-10.0MHz]
88.000 VHF FM broadcast Band II
97.600 Home Office
102.100 VHF FM broadcast Band II
104.600 Medical telemetry
105.000 PMR Mid Band (mobile Tx) [+33.0MHz]
108.000 Aeronautical radio navigation (VOR)
117.975 Aeronautical radio communication
136.000 Space satellite (space to Earth)
138.000 PMR Mid Band (base Tx) [-33.0MHz]
141.000 Fixed/mobile
144.000 2m amateur band
146.000 Home Office
148.000 Fixed/mobile/radio astronomy
Space navigation (Earth to space) 148.0-149.9MHz
Radio navigation satellite (space to Earth) 149.9-150.05MHz
150.050 Radio astronomy
153.000 BT national radiopaging
154.000 Home Office
156.000 Int VHF marine band (ship/shore Tx) [-4.6MHz]
157.450 Marine/fixed/mobile
157.850 Int VHF marine band ch37 (marina use only)
Marine/fixed/mobile
158.250 BT radiotelephone service (mobile Tx) [-4.5MHz]
159.925 Private message handling (mobile Tx) [-4.5MHz]
160.600 Int VHF marine band (shore Tx) [-4.6MHz]
161.000 Paging acknowledgement (low power)
161.125 Marine fixed/mobile
161.500 Int VHF marine band (shore Tx) [-4.6MHz]
162.050 Marine/fixed/mobile
163.000 BT radiotelephone service (base Tx) [-4.5MHz]
164.425 Private message handling (base Tx) [-4.5MHz]
165.050

INTERNATIONAL MILITARY CLOSE AIR SUPPORT ALLOCATION

168.250 PMR High Band (base Tx) [+4.8MHz]
168.950 Fixed/mobile
169.850 PMR High Band (simplex) (low power)
173.050 PMR High Band (mobile Tx) [-4.8MHz]
173.200 Low power devices
173.350 Telemetry (<1mW)
173.600 Radio deaf aids
174.000 Radio microphones
176.500 PMR (simplex)
183.500 PMR B1 (base Tx) [-8.0MHz]
184.500 PMR (simplex)
191.500 PMR M1 (mobile Tx) [-8.0MHz]
192.500 PMR (simplex)
199.500 PMR M2 (mobile Tx) [-8.0MHz] - (some channels allocated)
200.500 PMR (simplex)
207.500 PMR B2 (base Tx) [-8.0MHz]
208.500 PMR (simplex)
215.500 PMR B3 (base Tx) [-8.0MHz]
216.500 PMR (simplex)
223.500 PMR M3 (mobile Tx) [-8.0MHz]
225.000 PMR (simplex)
322.000 UHF ground - air communications
328.600 UHF ground - air communications/radio astronomy
335.400 Aeronautical radio navigation (ILS glide path)
339.900 UHF ground - air communications
402.000 Satellite (space to Earth)
406.100 Satellite (Earth to space)
410.000 Radio astronomy/fixed/mobile
425.000 Fixed/mobile/radio location
425.500 PMR UHF Band (mobile Tx) [+20.5MHz]
429.000 PMR UHF Band (mobile Tx) [+14.5MHz]
430.000 Fixed/mobile
432.000 70cm amateur band/radio location/PMR (London)
440.000 70cm amateur band/radio location
443.500 PMR UHF Band (base Tx) [-14.5MHz]
445.500 Fixed/mobile
446.000 PMR UHF Band (base Tx) [-20.5MHz]
446.500 PMR UHF Band (simplex) (low power)
449.750 PMR reserve
450.000 Space operations NASA telecomand (Earth to space)
453.000 Home Office
454.000 PMR UHF Band (base Tx) [+6.5MHz]
454.475 Private radiopaging (base Tx)
456.000 PMR reserve
457.000 PMR UHF Band (base Tx) [+5.5MHz]
457.500 UHF point to point links [+5.5MHz]
458.500 UHF telemetry links (scanner station) [-5.5MHz]
458.800 UHF model control band/telemetry/intruder alarms (<0.5W)
459.500 Private paging (on-site)
460.500 PMR UHF Band (mobile Tx) [-6.5MHz]
461.500 UHF point to point links
462.500 PMR UHF Band (mobile Tx) [-5.5MHz]
463.000 UHF point to point links [-5.5MHz]
464.000 UHF telemetry links (outstations) [-5.5MHz]
467.000 Home Office
468.000 UHF point to point links
470.000 PMR reserve
582.000 UK UHF TV Band IV 14 x 8MHz channels
590.000 Aeronautical radio navigation (ground radar) * Until 1985
598.000 Aeronautical radio navigation (ground radar)
606.000 Aeronautical radio navigation (ground radar) * Until 1995
854.000 UK UHF TV Band V 31 x 8MHz channels
886.000 Fixed
890.000 Industrial/scientific/medical
900.000 Cellular radio (Vodaphone) (mobile Tx) [+45.0MHz]
910.000 Cellular radio (Cellnet) (mobile Tx) [+45.0MHz]
915.000 Cellular radio (reserve) (mobile Tx) [+45.0MHz]

PROVISIONAL ALLOCATION

TIONS, 25.600 – 1710MHz

[ ] Indicates frequency pairing when applicable
( ) Indicates additional information

934.000	Fixed/mobile
935.000	UK UHF CB Band
945.000	Cellular radio (Vodaphone) (base Tx) [–45.0MHz]
955.000	Cellular radio (Cellnet) (base Tx) [–45.0MHz]
960.000	Cellular radio (reserve) (base Tx) [–45.0MHz]
962.000	Aeronautical radio navigation (DME/IFF guard band)
1025.000	DME reply (Y channels) (aircraft Tx) [+63.0MHz]
	DME interrogation channels (ground Tx) [±63.0MHz]
1030.000	IFF interrogation channel (ground Tx)
	DME interrogation channels (ground Tx) [±63.0MHz]
1090.000	IFF reply channel (aircraft Tx)
1150.000	DME interrogation channel (ground Tx) [±63.0MHz]
1213.000	DME reply (X channels) (aircraft Tx) [–63.0MHz]
	Aeronautical radio navigation (DME/IFF guard band)
1215.000	Radio navigation satellite (space to Earth)/radio location
1240.000	23cm amateur band/radio location
1300.000	23cm amateur band/ground radar/airborne transponders
1325.000	Ground radar/airborne transponders
1350.000	Fixed/mobile/radio location
1400.000	Radio astronomy (hydrogen line)
1427.000	Space operations (Earth to space)/fixed/mobile
1429.000	Fixed/mobile
1450.000	PMR fixed links (telephone + FDM up to 36ch)
1462.500	PMR reserve
1467.500	PMR fixed links (telephone + FDM up to 8ch)
1472.500	PMR fixed links (telephone single ch or 1+1)
1479.000	PMR mobile telemetry + control (short range)
1484.000	PMR fixed links (telephone single ch or 1+1)
1487.000	Mobile/transportable links (unidirectional)
1492.000	PMR fixed links (telephone single ch or 1+1)
1498.500	PMR mobile telemetry + control (short range)
1503.500	PMR fixed links (telephone single ch or 1+1)
1506.500	

1507.500	Unidirectional links
1512.500	PMR fixed links (telephone or FDM up to 8ch)
1525.000	PMR fixed links (telephone or FDM up to 36ch)
1530.000	PMR reserve
1535.000	Fixed/mobile
1544.000	Maritime mobile satellite (space to Earth)
1545.000	Mobile – satellite (distress only) (space to Earth)
1559.000	Aeronautical mobile satellite (space to Earth)
1610.000	Aeronautical – radio navigation satellite (space to Earth)
1626.000	Aeronautical radio navigation
1645.000	Maritime mobile satellite (Earth to space)
1646.000	Mobile – satellite (distress only) (Earth to space)
1660.500	Aeronautical mobile satellite (Earth to space)
1668.400	Radio astronomy
1670.000	Radio astronomy/meteorological aids
1672.000	Meteorological satellite (space to Earth)
1676.000	PMR reserve (fixed links)
1686.000	Meteorological satellite (space to Earth)
1690.000	PMR reserve (fixed links)
1710.000	Meteorological satellite (space to Earth)

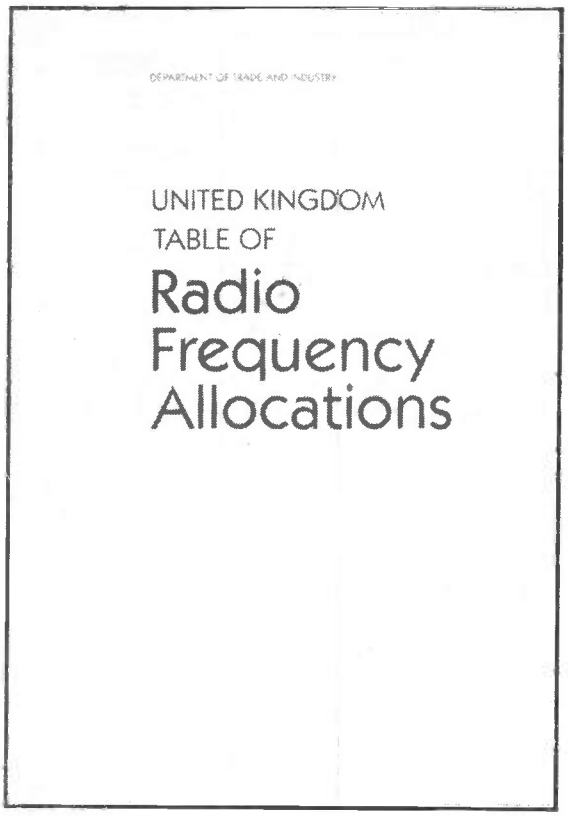
INTERNATIONAL VHF/UHF EMERGENCY COMMUNICATION FREQUENCIES

40.500	Military close air support emergency (FM)
121.500	Aeronautical distress frequency (AM)
123.100	Aeronautical search/rescue frequency (AM)
156.000	Coastguard (FM)
156.375	Marine rescue coastguard (FM)
156.800	Marine calling/emergency frequency (FM)
243.000	Aeronautical distress/survival craft/rescue (AM)

Since the compilation of this article, the Government publication mentioned in the introduction has been produced. This 308-page book covers allocations from 9kHz to 4GHz in each of the three ITU Regions, with extra details of the UK allocations. There are comprehensive notes, as well as a lengthy glossary of terms and definitions. It is available from booksellers and Government Bookshops:

49 High Holborn, London WC1V 6HB
13a Castle Street, Edinburgh EH2 3AR
Princess Street, Manchester M60 8AS
Southey House, Wine Street, Bristol BS1 2BQ
258 Broad Street, Birmingham B1 2HE
80 Chichester Street, Belfast BT1 4JY

It is priced at £12.00



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A COMPLETE SECURITY SYSTEM FOR ONLY £39.95 + V.A.T.

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Control Unit	CA 1250
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EXTENDED SYSTEM CS 1480 Price £62.50 + V.A.T.

This system contains, in addition to the CS 1370, an ultrasonic detector type US 5063 - its enclosure, an additional horn speaker and a further 2 magnetic switches. This system represents outstanding value for money for the high level of security provided.
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SELF-CONTAINED ULTRASONIC ALARM UNIT CK 5063 only £37.00 + V.A.T.

Requires no installation. Easily assembled using our professionally built and tested modules.
- Adjustable range up to 25ft
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- Built-in timed alarm
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- Fully self-contained
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Now you can assemble a really effective intruder alarm at this low price using tried and tested Riscomp modules. Supplied with full instructions, the kit contains everything necessary to provide an effective warning system for your house or flat. With a built-in LED indicator and test position the unit is easily set up requiring no installation. It may simply be placed on a cupboard or desk. Movement within its range will then cause the built-in siren to produce a penetrating 90dbs of sound or even 110dbs with an additional speaker. All parts included and supplied with full instructions for ease of assembly. Size 200 x 180 x 70mm. Order as CK 5063.

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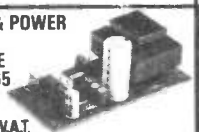
The heart of any alarm system is the control unit. The CA 1250 offers every possible feature that is likely to be required when constructing a system, whether a highly sophisticated installation or simply controlling a single magnetic switch on the front door.
- Built-in electronic siren drives 2 loud speakers
- Provides exit and entrance delays together with fixed alarm time
- Battery back-up with trickle charge facility
- Operates with magnetic switches, pressure pads, ultrasonic or I.R. units
- Anti-tamper and panic facility
- Stabilised output voltage
- 2 operating modes full alarm/anti tamper and panic facility
- Screw connections for ease of installation
- Separate relay contacts for external loads
- Test loop facility

HAROWARE KIT HW 1250

only £9.50 + V.A.T.

This attractive case is designed to house the control unit CA 1250, together with the appropriate LED indicators and key switch. Supplied with the necessary mounting pillars and punched front panel, the unit is given a professional appearance by an adhesive silk screened label. Size 200 x 180 x 700m

SIREN & POWER SUPPLY MOUDLE PSL 1865



only £9.95 + V.A.T.

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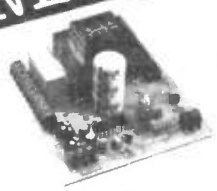

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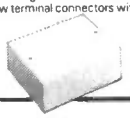

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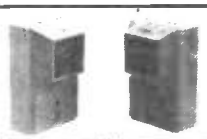

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DATA FILE . . .

Ray Marston concentrates on JFET devices and applications in this latest edition of 'The File'

In last month's *Data File* we discussed the basic principles of the field effect transistor (FET), and gave introductory explanations of the JFET, the IGFET, and the VFET. In the present edition of 'The File' we continue the FET theme with basic 'usage' information of the junction-type field effect transistor, or JFET.

JFET basics

The JFET is a low-power general purpose 3-terminal (gate, source, and drain) 'amplifier' device featuring an ultra-high input impedance (typically 1000 megohms) between its gate and source terminals. Signal voltages applied between the gate and source terminals control the magnitude of signal current flowing between the drain and source terminals of the device, which thus functions like a voltage-to-current converter. Typical JFET 'conversion' or 'transconductance' sensitivity is of the order of a few milliamps of output current per volt of input voltage.

JFET devices invariably operate in the so-called 'depletion' mode, meaning that the device passes maximum current when its gate bias is zero, and its current is reduced or 'depleted' by reverse biasing its gate terminal, as indicated in the graph of typical n-channel transfer characteristics in *Figure 1*.

Practical JFETs are available in both 'n-channel' and 'p-channel' versions, just as bipolar transistors are available in 'npn' and 'pnp' versions. *Figure 2* shows the standard symbols of the two basic types of JFET.

The two best known JFET devices are the 2N3819 n-channel device, and the 2N3820 p-channel device, which are usually housed in TO92 plastic packages with the outlines and connections shown in *Figure 3*. All of the 'applications' circuits discussed in the present article are based on the 2N3819, and *Figure 4* lists the general characteristics of this particular device.

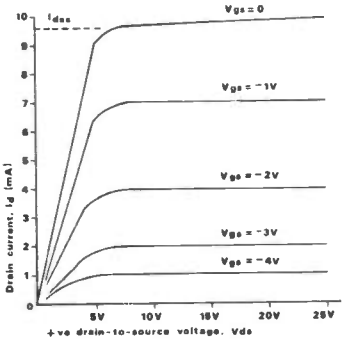


Fig 1 *Typical transfer characteristics of an n-channel JFET*

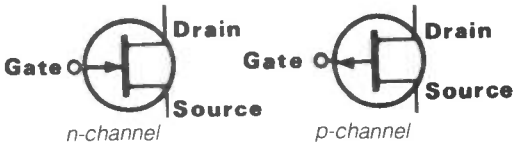


Fig 2 *Standard JFET symbol*

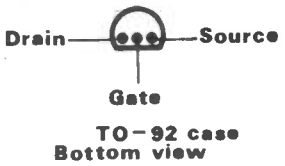


Fig 3 *Outline and connections of the 2N3819 and 2N3820 JFETs*

V_{DS}	=	+25V	(= max drain-to-source voltage)
V_{DG}	=	+25V	(= max drain-to-gate voltage)
V_{GS}	=	−25V	(= max gate-to-source voltage)
V_P	=	−8V max	(= gate-to-source voltage needed to cut off I_D)
I_{DSS}	=	2 to 20mA	(= drain-to-source current with V_{GS} = 0V)
I_{GSS}	=	−2nA max	(= gate leakage current at 25°C)
I_G	=	10mA	(= max gate current)
g_m	=	2.0 to 6.5mmho	(= small signal transconductance)
C_{iss}	=	8pF max	(= common source input capacitance)
P_T	=	200mW max	(= power dissipation in free air)
f_T	=	100MHz	(= gain-bandwidth product)

Fig 4 *General characteristics of the 2N3819 n-channel JFET*

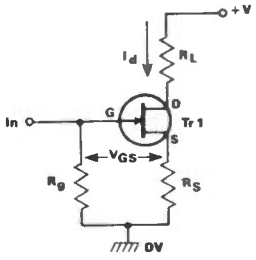
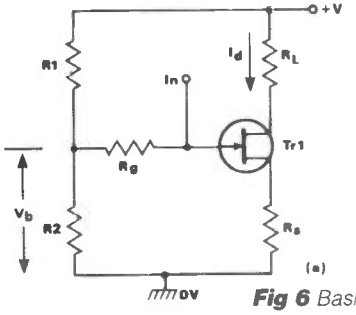


Fig 5 *Basic JFET 'self-biasing' system*



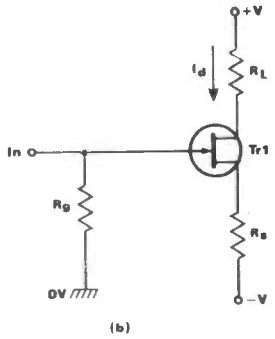


Fig 6 *Basic JFET 'offset-biasing' system*

JFET biasing

The JFET can be used in both digital and analogue applications. In the latter case the device must, if it is to act as a low-distortion amplifier, first be biased into its linear region by reverse biasing its gate relative to its source terminal. Three basic JFET biasing techniques are in common use. The simplest of these is the so-called 'self-biasing' system shown in *Figure 5*.

In *Figure 5*, the gate is tied to ground via R_G, and R_S is wired between the source terminal and ground. Any current flowing in R_S causes the source to go positive relative to the gate, so the gate is now effectively reverse biased.

Suppose that we want to set I_D at 1mA, and know that a V_{GS} bias of −2V2 is needed to set this condition. The correct bias can be obtained by wiring a 2k2 resistor in the R_S position, since I_D flows in R_S, and a current of 1mA through an R_S of 2k2 gives the required V_{GS} of −2V2. If I_D tends to decrease for some reason, V_{GS} automatically decreases as well and so causes I_D to increase and counter the original change. Thus the bias is self-regulating via negative feedback.

In practice, the precise value of V_{GS} needed to set a given I_D may vary widely between JFETs of the same type, and the only sure way of setting a precise I_D value in this system is to either select R_S by trial and error or to replace it with a variable resistor. The basic self-biasing system has, however, the advantage of low cost and is sufficiently accurate for most applications, and is the most widely used of the three biasing techniques.

A more accurate way of biasing a JFET is to use the 'offset' gate biasing system shown in *Figure 6a*. Here, potential divider R1-R2 applies a fixed positive bias to the gate via R_G, so the potential on the source terminal is equal to this bias voltage minus the negative V_{GS} value. Thus if the positive gate voltage is large relative to V_{GS}, I_D is controlled mainly by the values of R_S and the gate voltage, and is not greatly influenced by variations of V_{GS} between individual JFETs. This system thus enables I_D values to be set with good accuracy and without the need for individual component selection. Similar results can be obtained by connecting the gate to ground and taking the bottom end of R_S to a large negative voltage, as shown in *Figure 6b*.

The third type of biasing system is shown in *Figure 7*. Here, the normal source resistor is replaced by npn transistor Tr2, which is wired as a constant-current generator and thus determines the value of I_D. The value of this constant current is determined by the voltage on Tr2 base (set by potential divider R1-R2) and by the value of emitter resistor R3. In some cases, R2 may be replaced by a Zener diode or some other voltage reference device. Thus in this

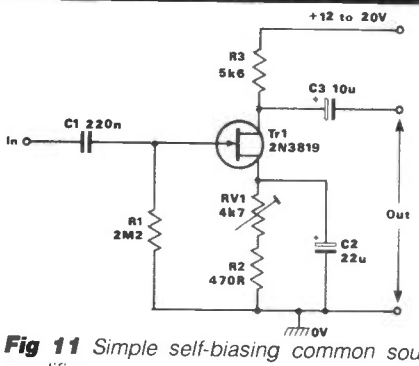


Fig 11 *Simple self-biasing common source amplifier*

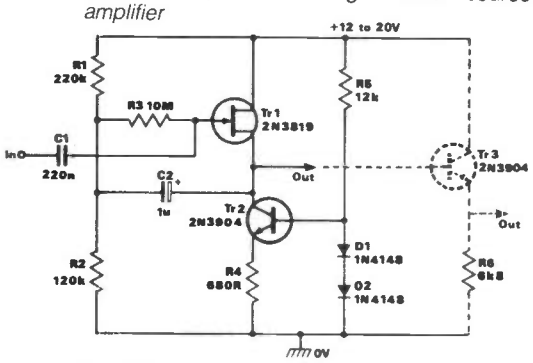


Fig 10 *Hybrid source follower. Z_{IN} = 500M*

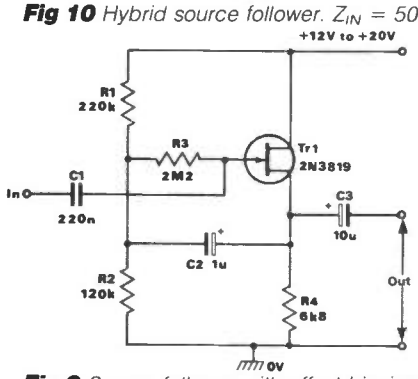


Fig 9 *Source follower with offset biasing. Z_{IN} = 44M*

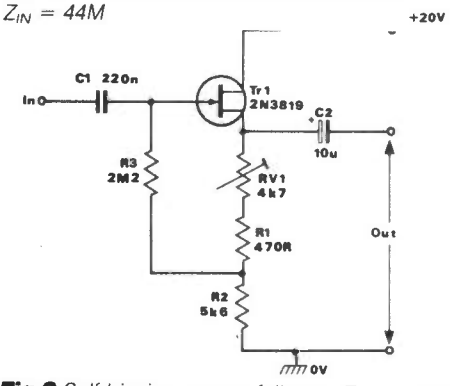


Fig 8 *Self-biasing source follower. Z_{IN} = 44M*

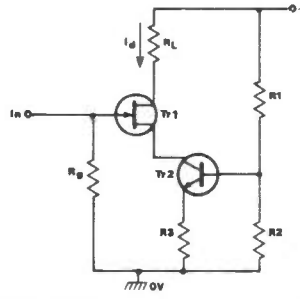


Fig 7 *Basic JFET 'constant-current' biasing system*

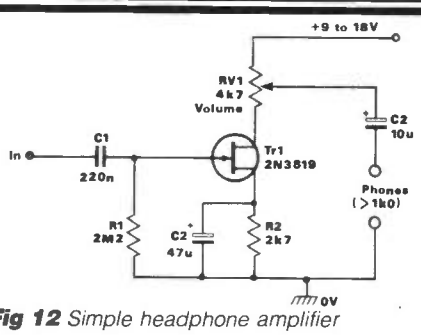


Fig 12 *Simple headphone amplifier*

system I_D is independent of the JFET characteristics and excellent biasing stability is obtained, but at the expense of increased circuit complexity and cost.

In the three biasing systems described, R_G can have any value up to about 10 megohms, the maximum limit being imposed by the pctential drop across this resistor caused by gate leakage currents, which may upset the biasing conditions.

Source follower circuits

When JFETs are used as linear amplifiers, they are usually used in either the 'source follower' (common drain) or the common source modes, these being the JFET equivalents of the bipolar emitter follower (common collector) and common emitter modes respectively. The main features of the source follower circuit are that it gives a very high input impedance and it provides near-unity overall voltage gain (hence the alternative title of 'voltage follower').

Figure 8 shows a practical example of a simple source follower circuit. Here, a self-biasing system is used, and the drain current can be varied via RV1. The circuit can be used with any supply in the range 12 to 20V, and RV1 should be adjusted so that the quiescent voltage across R2 is 5V6, giving a drain current of 1mA. The circuit gives an actual voltage gain of 0.95 between input and output.

Due to the potential divider action of the RV1-R1 to R2 chain, a degree of 'bootstrapping' is applied to R3, increasing its effective value by about 5 times. The actual input impedance to the circuit is thus approximately 10M shunted by 10pF, ie it is 10M at very low frequencies, falling to 1M at about 16kHz, and to about 100k at 160kHz.

Figure 9 shows an alternative version of the source follower circuit. In this case gate offset biasing is used, so individual component adjustment is not required. Overall voltage gain is approximately 0.95. C2 is a bootstrapping capacitor, and raises the effective value of gate resistor R3 by about 20 times. C2 can be omitted from the design, if preferred.

With C2 removed from the circuit, the input impedance of the design is about 2M2 shunted by 10pF. With C2 in place, the input impedance is raised to about 44M shunted by 10pF. Alternative impedance values can be obtained by changing the R3 value, up to 10M maximum.

Finally, *Figure 10* shows a hybrid (JFET plus bipolar) version of the source follower circuit which gives an input impedance of about 500M shunted by 10pF. Here, offset biasing is applied via the R1-R2 potential divider, as in the case of *Figure 9*, but the R4 source resistor of *Figure 9* is replaced by the Tr2-R4 network. The Tr2-R4-R5-D1-D2 network causes the Tr2 'source load' to act as a constant-current generator that has a very high output (collector) impedance and causes Tr1 to pass a quiescent drain-to-source current of about 1mA.

Thus Tr1 is wired as a source follower, and the collector of Tr2 serves as its source load and appears as a very high impedance. Because of the very high effective value of this load, the JFET gives a voltage gain of about 0.99. C2 passes a bootstrap signal from Tr1 source to the R1-R2 end of R3, and because of the high voltage gain of the circuit this bootstrap signal increases the effective value of R3 by about 100 times, ie to 1000M. Thus the actual input impedance of the circuit is equal to this value shunted by the JFET's gate impedance (about 1000M), and works out at about 500M shunted by 10pF.

Note that if the high effective value of source load (and thus the high input impedance) of this circuit is to be maintained, the output must either be taken to external circuits via an additional emitter follower stage, as shown dotted in the diagram, or must be taken only to fairly high impedance loads.

Common source amplifiers

Figure 11 shows the practical circuit of a simple self-biasing common source amplifier that can be used with any supply in the range 12 to 20 volts. In use, RV1 should be adjusted so that a quiescent voltage of 5V6 is developed across R3, indicating a drain current of 1mA. Note that the RV1-R2 biasing network is decoupled via C2.

The *Figure 11* circuit gives a typical voltage gain of about 21dB (= ×12), and has a frequency response that is flat within 3dB from 15Hz to 250kHz. The input impedance of the circuit is 2M2 shunted by 50pF. This comparatively high value of shunt capacitance is due to Miller feedback from drain to gate, which effectively increases the value of the JFET's internal gate-to-drain capacitance in proportion to the voltage gain of the amplifier, ie by ×12 in this particular case.

The *Figure 11* circuit uses a variable biasing component (RV1) which can be adjusted to enable the circuit to accept, with minimal distortion, strong input signals that generate large output voltage swings. In cases where only low-level input signals are to be accepted (such as in preamplifiers, etc), this 'adjustable bias' facility can be eliminated and a fixed-bias network used in its

place. *Figures 12* and *13* show examples of circuits of this type.

The *Figure 12* circuit is that of a simple headphone amplifier, for use with phones with an impedance of 1k0 or greater. The circuit has an input impedance of 2M2 and features an integral volume control (RV1), and can be used with any supply in the range 9 to 18 volts.

The *Figure 13* circuit is that of an add-on preamplifier, and can be added to any existing amplifier that provides a single-ended supply in the range 9 to 18 volts. The circuit provides a voltage gain in excess of 20dB, has a bandwidth in excess of 100kHz, and has an input impedance of 2M2.

JFET common source amplifiers can, when exceptional biasing accuracy is required, be designed using either the offset biasing technique or the constant current biasing technique. *Figures 14* and *15* show circuits of these types. Note here that the 'offset' circuit of *Figure 14* can be used with supply voltages in the range 16 to 20 volts only, while the 'hybrid' circuit of *Figure 15* can be used with any supply in the range 12 to 20 volts. In each case the circuit gives a voltage gain of 21dB, has an input impedance of 2M2, and has a −3dB bandwidth that extends from 15Hz to 250kHz.

dc voltmeters

Figure 16 shows how a JFET can be used as the basis of a simple 3-range electronic analogue voltmeter giving a basic sensitivity of 22M2 per volt. The maximum full-scale voltage sensitivity is 0.5V, and input resistance is constant at 11.1 megohms on all ranges.

In *Figure 16*, R6-RV2 and R7 form a potential divider across the 12 volt supply, and cause 4V to appear across R7. The top end of R7 is connected to the 'ground' of the circuit, which can be regarded as the zero volts line, so the bottom end of R7 is effectively at −4V and the top of R6 is at +8V. Tr1 is wired as a source follower with its gate taken to ground via the R1 to R4 network, but the source of Tr1 is connected to the −4V line via source load R5, so the JFET is effectively given offset gate biasing; and its drain current is automatically set at about 1mA.

R6-RV2 and Tr1-R5 act as a Wheatstone bridge network, and RV2 is adjusted so that the bridge is balanced and zero current flows in the meter in the absence of an input voltage at Tr1 gate. Any potential applied to Tr1 gate then causes the bridge to go out of balance by an amount proportional to the input voltage, which can then be read directly on the meter. R1 to R3 form a simple range multiplier network, giving full-scale deflection ranges of 0.5V, 5V and 50V. Alternative networks can be used if preferred, but close tolerance components must be used if good accuracy is required. R4 acts as a safety resistor, and

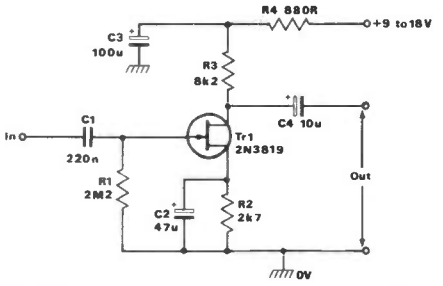


Fig 13 *General purpose add-on preamplifier*

prevents damage to Tr1 gate if excessive input voltage is applied.

To use the *Figure 16* circuit, first adjust RV2 so that the meter reads zero in the absence of an input voltage, and then connect an accurate 0.5V input and adjust RV1 so that the meter reads precisely full scale. Repeat these adjustments until consistent zero and full-scale readings are obtained: the unit is then ready for use.

In practice, this simple circuit tends to drift with changes in temperature and supply voltage, so fairly frequent readjustment of the zero control is required. Drift can be greatly reduced by using a Zener-stabilised 12 volt supply.

A low-drift version of the JFET voltmeter is shown in *Figure 17*. Here, Tr1 and Tr2 are wired as a differential amplifier, so any drift occurring on one side of the circuit is automatically countered by a similar drift on the other side, and very good stability is obtained. The circuit works on the 'bridge' principle, with Tr1-R5 forming one arm of the bridge and Tr2-R6 forming the other.

It should be noted in this circuit that Tr1 and Tr2 should, ideally, be a matched

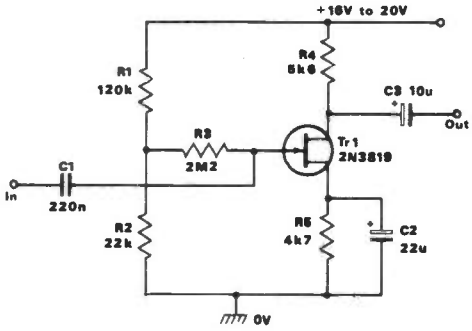


Fig 14 *Common source amplifier with offset gate biasing*

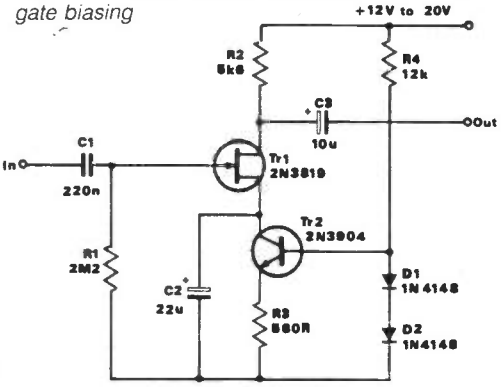


Fig 15 *'Hybrid' common source amplifier*

pair of JFETs, with their I_{DSS} values matched within 10%. The circuit can be used with any supply in the range 12 to 18V, and the setting up procedure is similar to that of *Figure 16*.

Miscellaneous circuits

To conclude this edition of *Data File*, *Figures 18* to *21* show miscellaneous of useful JFET application circuits.

Fig 16 *Simple 3-range dc voltmeter*

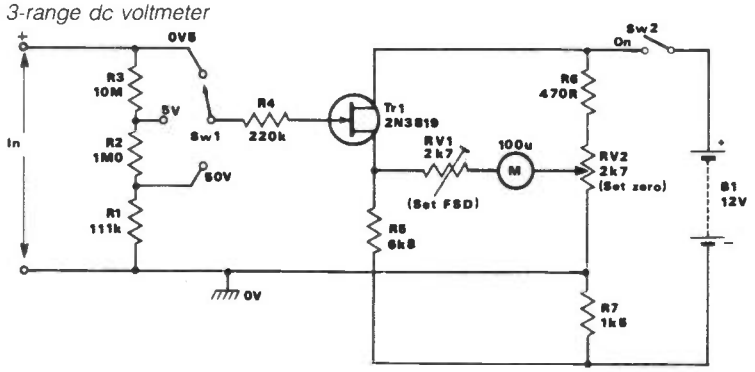
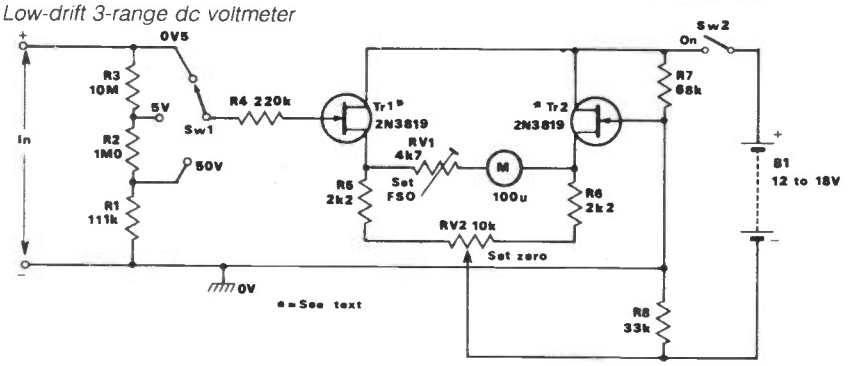


Fig 17 *Low-drift 3-range dc voltmeter*



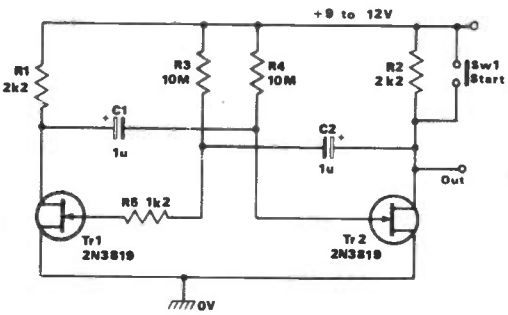


Fig 18 *VLF astable multivibrator*

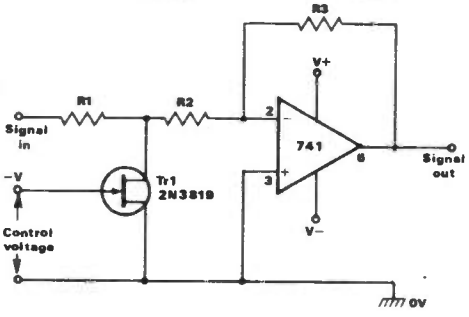


Fig 19 *Voltage controlled amplifier/attenuator*

The *Figure 18* circuit is that of a very low frequency (VLF) astable or 'free-running' multivibrator which generates a squarewave output. The on and off periods of the circuit are controlled by the C1-R4 and C2-R3 time constants. Because of the ultra-high input impedances of the JFETs, the 'R' parts of these time constants can be very large, enabling very long cycling periods to be obtained while using fairly low values of 'C'. With the component values shown, the circuit cycles at a rate of once per 20 seconds, ie at a frequency of 0.05Hz. Note that 'start' button S1 must be held closed for at least one second to initiate the astable action, so this circuit should be regarded as an 'experimental' design.

Figure 19 shows, in basic form, how an n-channel JFET can be used in conjunction with a 741 op-amp to make a voltage-controlled amplifier/attenuator. Here, the op-amp is wired as an inverting amplifier, with its gain determined mainly by the R2/R3 ratio, and the JFET is used as a voltage-controlled resistor that (in conjunction with R1) can attenuate the input signal to the amplifier.

The action of the *Figure 19* circuit is such that when a large negative control voltage is fed to the JFET gate, the JFET acts like a near-infinite resistance, and causes no signal attenuation, so the circuit gives high overall gain. When, on the other hand, the gate bias is reduced to zero, the JFET acts like a resistance of only a few hundred ohms, so the input signal is heavily attenuated and the circuit gives an overall signal loss. Intermediate values of signal attenuation and overall gain or loss can be obtained by varying the control voltage.

Figure 20 shows how the above 'voltage-controlled attenuator' technique can be used to make a 'constant-volume' amplifier which produces an output signal level change of only 7.5dB when the input signal level is varied over a 40dB range (from 3mV to 300mV rms). The circuit can accept input signal levels up to a maximum of 500mV rms.

In *Figure 20*, JFET Tr1 and R4 are wired in series to form a voltage-controlled attenuator that controls the input signal level to common emitter amplifier Tr2, which has its output signals buffered by emitter follower Tr3. Part of the Tr3 output signal is used to generate (via C5-R9-D1-D2-C4-R5) a dc control signal that is fed to the gate of JFET Tr1, thus forming a dc negative feedback loop that automatically adjusts the overall voltage gain so that the output signal level tends to remain constant as the input signal level is varied.

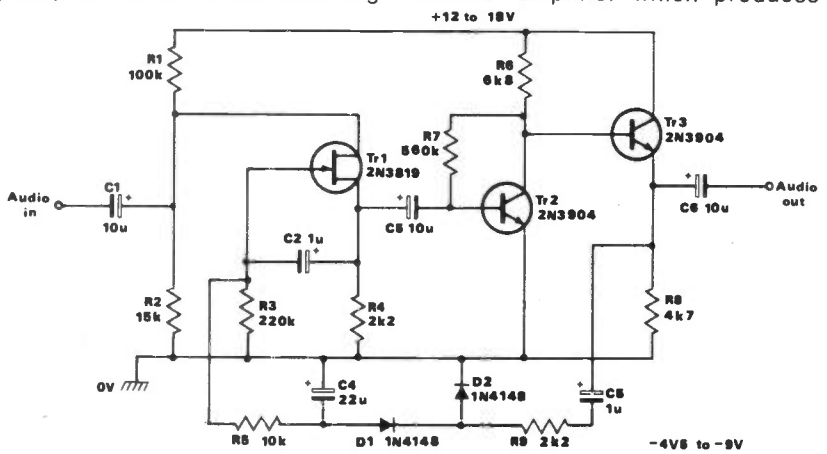


Fig 20 *Constant volume amplifier*

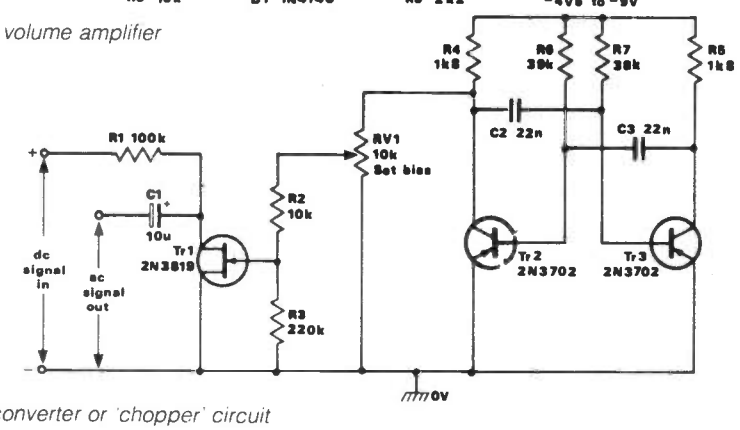


Fig 21 *dc-to-ac converter or 'chopper' circuit*

The whys and wherefores

The circuit action is as follows. When a very small signal is applied to the input of the *Figure 20* circuit, the output at Tr3 emitter is relatively small, so negligible negative bias is developed and fed to Tr1 gate. Under this condition Tr1 appears as a low resistance, so very little attenuation occurs in Tr1-R4, and almost the full input signal is applied to Tr2 base. When, however, a large input signal is applied, the Tr3 output signal tends to be large, so a large negative bias is developed and fed to Tr1 gate. Under this condition Tr1 appears as a large resistance, so considerable attenuation occurs in Tr1-R4, and only a small part of the input signal is applied to Tr2 base. Because of dc negative feedback, the output level stays fairly constant over a wide range of input signal levels. This characteristic is useful in tape recorders, intercom circuits, telephone amplifiers, etc.

And finally, a chopper

Finally, to complete this edition of *Data File*, *Figure 21* shows how a JFET can be used to make a dc-to-ac converter or 'chopper' circuit, which produces an ac squarewave output with a peak amplitude equal to that of the dc input signal. In this circuit, Tr1 acts like an electronic 'switch' that is wired in series with R1 and is repeatedly switched on and off at a 1kHz rate via the Tr2-Tr3 astable circuit, thus providing the dc-to-ac conversion.

Note in the *Figure 21* circuit that the gate-drive signal amplitude to Tr1 can be varied via RV1. If too large a signal is fed to Tr1 gate its gate-to-source junction starts to avalanche, causing a small 'spike' voltage to break through the drain, thus causing a small output signal to occur even when no dc input is connected. To prevent this, the circuit must be set up by connecting a dc input to the circuit and then adjusting RV1 until the amplitude of the output just starts to decrease. When set up in this way avalanching does not occur, and the circuit can be used to chop voltages as low as a fraction of a millivolt. REW

PACKET RADIO

R J Redding G3VMR outlines the features of the Tucson Terminal Node Controller and offers some thoughts on packet operation in the UK

The buzz word in data transmission several years ago was 'packet', and it has now invaded amateur radio. Clearly it opens up immense possibilities in data communication, and in order to understand and attempt to develop them we must be clear what it is and where it has come from.

There is no better way than hands-on experience, so this article describes the features of a terminal node controller and recent experience with it. The main conclusion is that it undoubtedly has some most interesting facilities: but is it really a new mode or just a clue to other ways of using data on radio?

What is packet operation?

If a single channel, be it a pair of wires or a radio frequency, is shared by a number of users, we must make arrangements so that one does not corrupt the signal of another. One method that is particularly suitable for data transmission is to speed up the information and then send it in very short bursts. This means that many users can be accommodated before the chances of clashes are great.

If each burst includes information about 'from' and 'to' and a check system to prove that it is intact, then the receiving end can ask for repeats of any doubtful or 'failed' packets and assemble the message, and neither keyboard operator need be aware of what is happening!

The advantages of this will be obvious to any amateur who has operated RTTY or other forms of slow data. By reducing the air time the chances of clashing with another station or of atmospheric interference are reduced. Nothing is displayed unless it checks out with what was sent. The theme of error detection and 'repeat until correct' is already known in AMTOR, but packet goes much further because each small segment has a 'from' and 'to' address. This means that, subject to licensing permission, a message could find its way via intermediate stations and repeaters and appear in a fully confirmed form at a destination for which a direct path is not possible.

The 'terminal node controller' described below does all this, and it came into being as follows.

The Canadians have one of the first authorities to permit the use of ASCII code instead of the earlier Murray and Baudot codes on radio, and this led to an upsurge of activity, particularly in the Vancouver Amateur Digital Communications Group. A similar group became active in Tucson, Arizona, and these formed a club and later a commercial organisation to promote the activity, the Tucson Amateur Packet Radio Corporation. This is a non-profit research and development corporation which keeps a register of interested parties, and currently has a membership of 1,000 worldwide.

They designed and prototyped a terminal node controller and made this available in a kit (and later a boxed form) which is now being commercially used, and Heathkit are now marketing a kit version.

The TAPR TNC-1 kit

A number of boards and the ROMs for the processor were obtained by G4NNS and the remaining chips were obtained locally. This proved to be rather expensive because some of the chips are rare ones, and the supplier had a minimum order charge. The instruction book is a magnificent loose-leaf binder nearly three inches thick which goes into great detail on the design, background and instructions for assembling and testing the board and operating it on both the Tucson and the Vancouver packet systems. These are based on amateur versions of the protocol X25 for PTSN packet switching and use the same 'high level data link control' (HDLC) chip WD 1933.

A 6809 is the central processor, with ample read-only and user memory and with protocol storage on a NOVRAM. The facilities are most comprehensive, and there are many short cuts which greatly simplify the procedure – once it is understood.

The TNC-1 is extremely versatile. One can use virtually any terminal from a teletype upwards at any input speed up to 19,600 baud, and any radio transceiver. The rate of transmission is 1200 baud using Bell 202 tones and there is an in-built modem for this purpose with its own calibration and test facilities. Even this can be altered to other frequencies and shifts, and provision is made for the easy connection of an external modem if that is available.

Although the complexity of the unit is almost frightening, the operation can be extremely simple because of the stored intelligence. Essentially it takes in data from any machine in ASCII form at any rate, stores that in a memory, arranges it in packets together with the necessary addresses and control information and transmits each packet, then waits for an acknowledgement before proceeding to another.

Incoming info

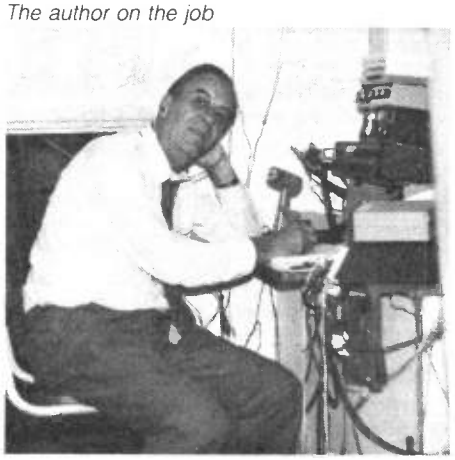
The incoming packets are treated in the inverse way and the TNC is virtually 'transparent', apart from a delay and the fact that the sound of the transmission and its display as characters is not coincident, particularly if packets have to be repeated. Details of one's callsign, baud rate, requirements or word lengths, screen lengths, number of nulls and so on are all set up in advance and stored within the TNC in a NOVRAM, even to the extent of characterising the switching delay to suit the transmitter or a repeater's announcement.

Automatic callsign generation in CW and 'beacon' announcements are also built in, but can be disabled easily, and so is a monitor system by which one can choose what callsigns are to be monitored. In all, some fifty options can be set or left at default.

However, the speed of communication is very slow – about the same as a simple QSO with a Morse key. The system spends most of its time waiting and listening. The data content of a packet is not more than 100 characters.

A conversation requires discipline – one must wait for some signal that one man has finished before typing in a reply, otherwise the conversation gets confused. No doubt solutions to this will arise out ot practice. The transmission of a previously prepared file is possible, of course, but here again the data will be broken into very small segments and no

The author on the job



doubt there is an optimum length for the packet which is different on radio from telephone practice.

UK competition

There is strong competition in the UK to this Canadian and American development in the form of the BBC computer, because this versatile machine has an output port intended for cassette recording which is usable as modem tones. In practice the tones are 1200 and 2400Hz instead of the conventional 1200 and 2200Hz used on telephone systems. Whilst there is a suggestion that the harmonic relationship which is advantageous for magnetic recording causes problems in radio transmission, there is no doubt that these tones can be used as a radio modem.

Software can be written to provide the necessary 'packeting' and perhaps a form of error correction. Thus there is the possibility of making a packet system without the expense of a hardware terminal node controller. This approach is very economical. A number of articles have described programs and made software available to amateurs so that at present the bulk of packet exchange in the UK is by this means. Usually the operating rate is 300 baud – slower than the 1200 recommended by the ARRL and agreed internationally – but this is determined by the fact that the software uses Basic and consequently the processor would be too hard-put to operate at the higher rate.

In some versions of 'BBC packet' the screen is split to show clearly what messages have been received and which ones are waiting, so as to permit typing ahead. A mixture of systems will be heard most evenings on the allocated data channel of 144.675MHz, but not hearing each other.

So, to summarise, the American evolved packet system based on telephone line practice works well, and hardware is available to suit any existing equipment, but at a cost. Currently the original TNC-1 is about £400 in the UK, but TAPR have recently announced they are going into production of a TNC-2 using a Z80 chip and the benefit of experience to produce a unit at $185 complete.

This, however, is still considerably more to pay than the cost of a program (if you have a BBC computer) to produce something very close, with distinctly more compatible stations within range, particularly on 2 metres. Against this, both systems are no faster than simple Morse for communicating one-to-one, and surely there must be better uses of data transmission than this.

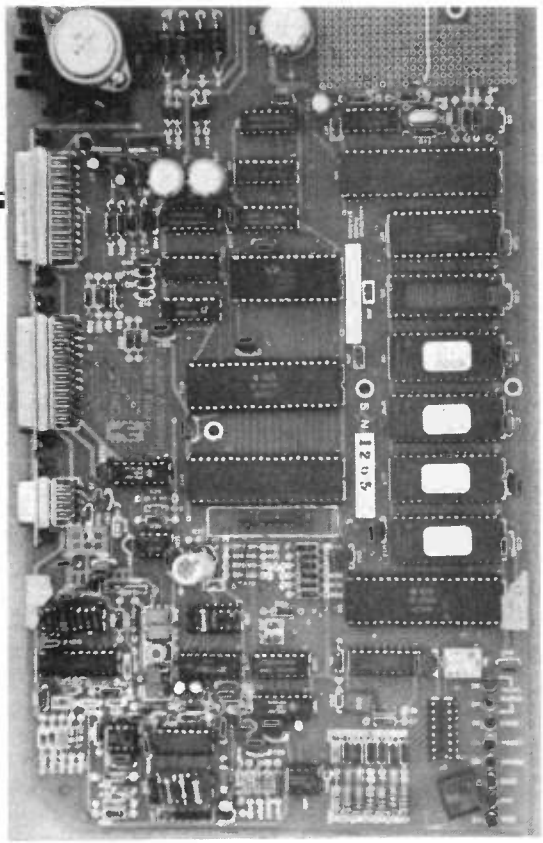
I am convinced that we should be dumping prepared files at high speed into the ether. The opportunity exists to offer lectures, newsletters and up to the moment data by means of high speed data output for receipt by anybody who is interested, for response if they feel like it by other means if they cannot transmit, even if this smacks of broadcasting.

In a nutshell, the great advantage of packet is that it gives completely error-free transmission, be it at the expense of speed and the need for an answering return signal. Where two keyboards are connected this is fine, because the operators need not be aware of what happens in between. Is this really applicable to amateur radio? Does the odd error really matter? Perhaps conversation is better if we sometimes query something rather than taking everything sent as gospel! Of course, it is a different matter if we are dealing with vital statistics, but commercial communications seem to be well catered for elsewhere.

The missing link

What seems to be missing is a fast and easy method of communicating thoughts and ideas in bulk for later examination 'off-line'. I think this requires the transmission of a burst of data, but in a more or less conversational vein in which the odd spelling mistake and misuse of words is of no importance. This is where data has not yet had much trial.

For example, I have transmitted a draft of this article to a number of interested



The assembled terminal node controller

amateurs for comment. Using 1200 baud it takes less than one minute. To see this appearing as it is sent directly on a printer at a distance is quite impressive, but well within the scope of an ordinary VHF radio. If the data goes into the memory of a computer, it does not have to be printed or even read – one can just search and see what has been said about one's pet topic, and whose callsigns are mentioned etc. . .

If the RSGB put out a few minutes of data occasionally, giving the new callsigns and their owners, we could each have an up to the minute callbook on-line at our fingertips.

So I am not entirely sold on this American import. But we must watch it because they have one stage further in what is called 'softcasting'. This is the sending of high speed data by local FM radio broadcast stations in the off-peak hours. Perhaps the local FM radio stations in the UK would like to do what is informally happening on amateur radio now and call it 'landcasting', ie Local Area News in Data broadCASTING. REW

FREQUENCY CONVERTER

for mathematical PAL

Impressed by Pete Carliell's SPG in the October issue? ('course you were!). Then feast your eyes on his second project . . .

Before starting the description of this frequency converter I would like to thank my colleague at BBC Television, Mr P C Vince. He gave me the idea on which it is based and convinced me that in theory it would work.

Any system for generating the subcarrier and sync pulses required for PAL TV transmission comes up against the problem of the PAL equation, which states:

$$f_{subcarrier} = \left(\frac{567}{2} + \frac{1}{4}\right) \times f_{line} + 25c/s$$

Conventional methods of locking the subcarrier frequency to line frequency may require complex filtering and modulation processes to get round the 25c/s offset.

The system described in this article is quite straightforward to construct, very reliable, and easily set up using dual-channel oscilloscope. The idea could also be applied to changing other frequencies in some cases, as will be described later.

The idea is shown diagramatically in *Figure 1*. A sinewave of frequency f_{in} is applied to a delay line terminated in R_T. The line has a delay of one cycle of f_{in} and is tapped evenly for at least 4 taps. If the taps are selected by a continuously rotating switch, the output of the switch will be the input waveform either stretched or compressed in time, depending upon the direction the switch is rotating. The idea that a sinewave which is constantly changing in phase is the same as a sinewave of another frequency may be slightly difficult to grasp, but it works.

It will take 8 cycles of f_s to step the switch through 8 taps and thus 360° of f_{in}. Hence with a clockwise rotation of the switch,

$$f_{out} = f_{in} - \frac{f_s}{8}$$

If f_s = 200c/s, $f_{out} = f_{in}$ – 25c/s. Of course, the simple scheme shown in *Figure 1* would result in definite phase jumps – 45° with the 8 taps shown. With jumps of more than 90° the waveform will no longer be consistent, which is why there must be at least 4 taps on the delay line.

To achieve a smooth continuous sinewave output with the simple scheme of *Figure 1*, an infinite number of taps would be necessary. The alternative that I have adopted, however, is outlined in *Figure 2*. Here the taps are selected by two switches driven by anti-phase squarewaves and the outputs of the switches are fed to a pair of modulating amplifiers. The modulators have balanced inputs and are fed with the same modulating triangle wave in such a way as to achieve opposing results.

The modulating amplifiers constantly mix linearly between the two switch O/Ps. The modulation depth is virtually 100%, and when one output is 100% on,

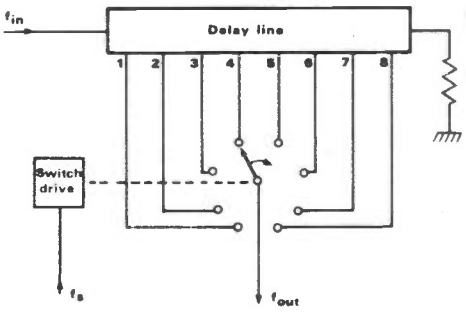


Fig 1 *The basic idea*

the other switch will be changing over to the next tap. The outputs of the switches leapfrog each other by 45° and the final output is a smooth, constant change in phase.

The resultant sinewave signal can be amplified and divided by 1135 to make ¼× line frequency. When a PLL is added, as in *Figure 3*, an SPG can be mathematically locked to subcarrier frequency. My SPG can run from a 1.25MHz drive and so a CMOS 4046 PLL is ideal. An LF/4 squarewave is so easy to obtain that any SPG could be used even if the converter's PLL has to be changed (the maximum oscillator frequency of a 4046 PLL is typically 1.5MHz).

It must be admitted that the ÷1135 stage is actually a ÷1134. The configuration of counter and AND gate in CMOS clocked at 4,433,593.75Hz results in one clock edge being missed before the reset pulse has ended. The amplifier driving this stage is very simple but must be a 4011UB type.

The prototype was built on a Vero 'VQ'

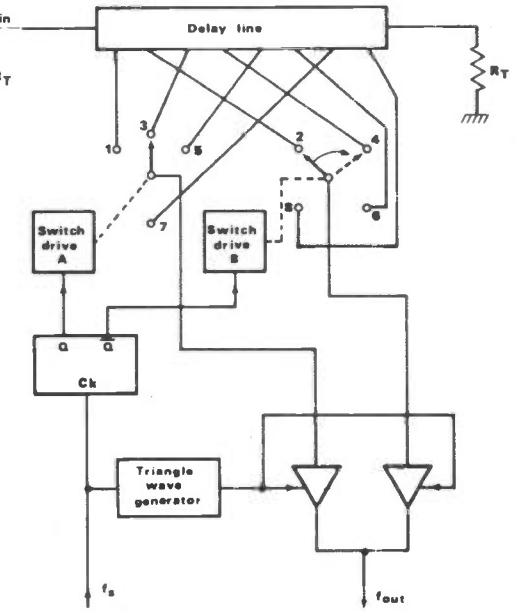
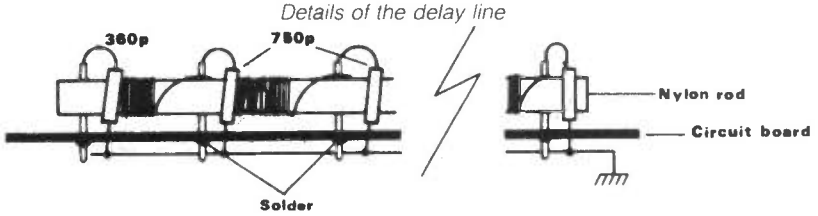


Fig 2 *Improvements for a smooth output*

board of approximately 6 × 3 inches, but this led to a very cramped unit. An area of roughly twice the above is recommended and a suitable layout is shown in *Figure 4*.

Prospective constructors should not be daunted by the delay line. A 5 inch length of ¼inch diameter nylon spindle is pierced by a 0.8mm PC drill every ½inch starting ¼inch from one end (this is the only difficult part) and wire-wrap or other long pins inserted. The pins

Details of the delay line



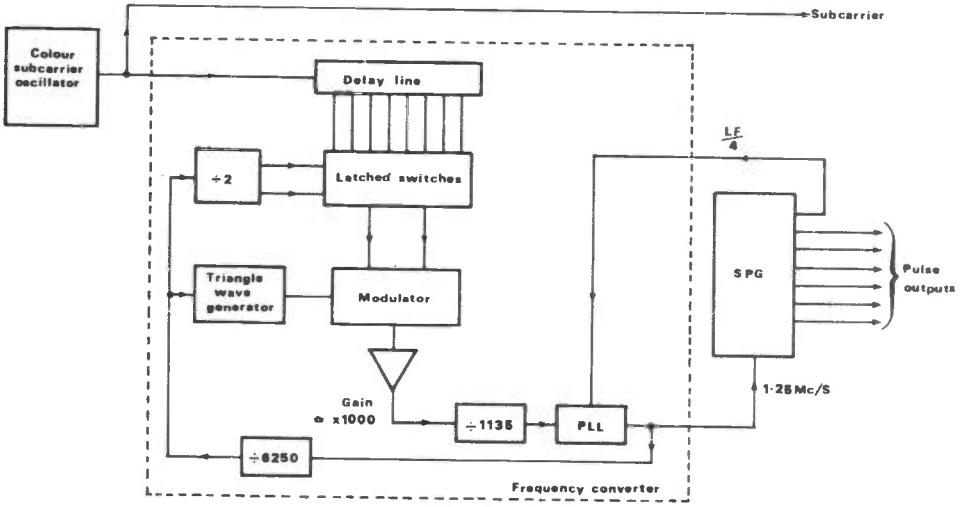


Fig 3 *The addition of a PLL to lock an SPG to the subcarrier*

support the line and form tap connections for 24swg enamelled wire close-wound in 14 turns between each one. Eight 750pF and two 360pF polystyrene capacitors (one at each end), all returned to a common ground, complete the line.

The modulators used were MC1496G with 10-lead bases, although 14-pin DIL packages are available. All other ICs were mounted in holders.

Alignment

Apply a 1 volt subcarrier input. Monitor the level at the input of the delay line TP2 and adjust RV1 for 0.6 volts (the level will be modulated by the system's switching action).

Trigger the oscilloscope from TP10 (IC8 pin 11) at 5ms/div and monitor TP3 (IC6 pin 10). Adjust RV2 for the minimum variation of signal amplitude with switching. RV2 will have much more effect on TP3 than TP4. The residual variation of signal amplitude will be about 20%.

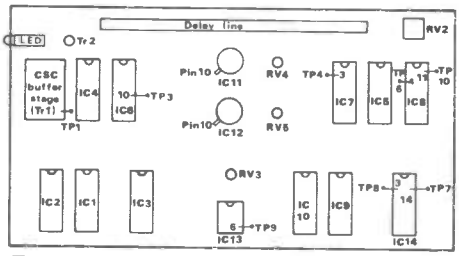
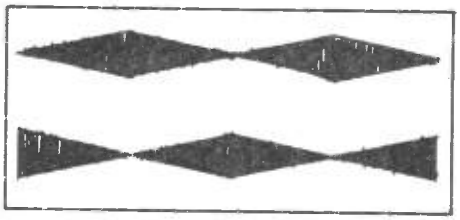


Fig 4 *Layout and test points (not to scale)*

Still using TP10 as the trigger source, display 2 cycles of the triangle wave at TP9 and set this to 0.4V with RV3. Check for a dc of half supply voltage at this point. Now monitor dual-channel IC11 pin 9 and IC12 pin 9. Set RV4 and RV5 fully clockwise, then back off to obtain the sort of trace illustrated:



SPG UPDATE

While we were in the pub (oops!) an error crept into *Figure 1* of Pete Carliell's article, *TV Synchronising Pulse Generator,* in the October issue. The 2 outputs of IC9 which go to part of IC11 should be labelled A and D, not B and D as shown.

There are also some other points concerning IC7 and ICs 6 and 8 which the author feels may be rather ambiguous. The outputs of IC7 relate to a data book which lists them as 1 to 12, not 0 to 11. For ICs 6 and 8 the switches are shown at input 4 in all cases. Also the INH and V_{EE} inputs (pins 6 and 7) should be grounded, and some data sheets show the control inputs as A and B.

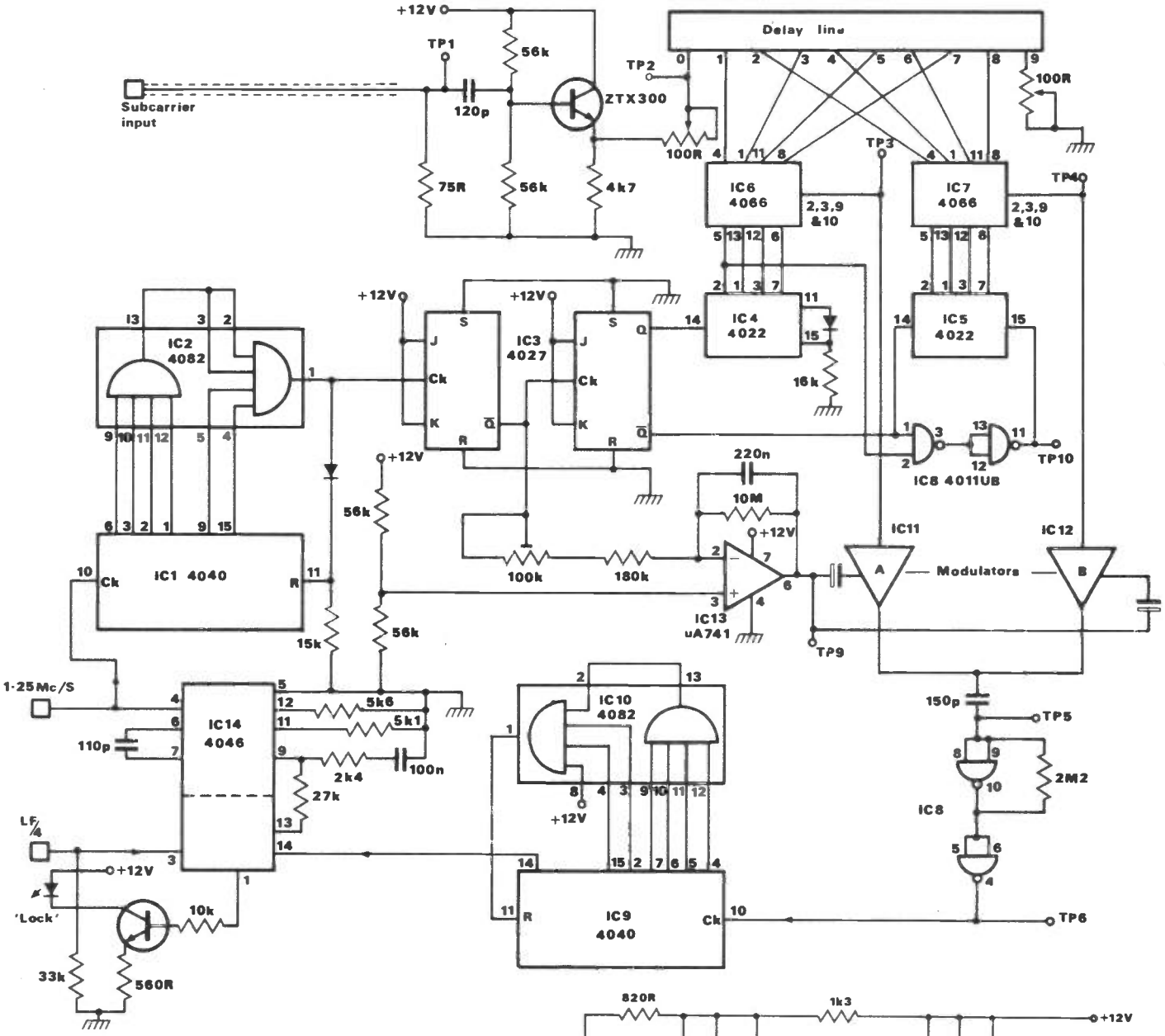


Fig 5 *The circuit diagram*

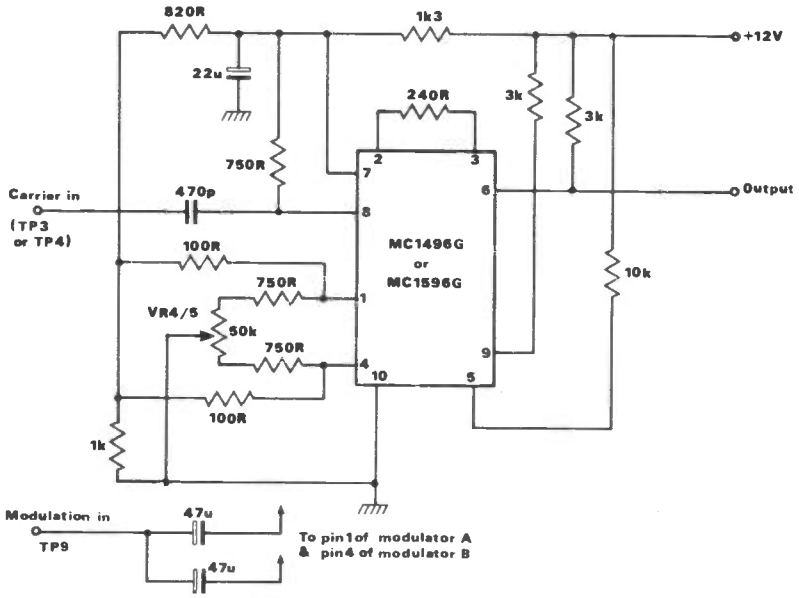


Fig 6 *Details of the modulators*

Just less than 100% modulation is ideal. Finally check for 500mV of sine-wave at TP5 and 8 volts at TP6.

As mentioned before, this frequency converter could be used on frequencies other than PAL subcarrier. One constraint is that the delay from tap 1 to tap 8 of the line must be one cycle of f_{in}. If f_s is altered then the amplitude of the simple triangle wave generator will change and must be corrected by altering the feedback capacitor. A frequency increase could be achieved by wiring the taps to each of the switches IC6 and 7 in reverse order.

As well as its TV application, the device offers a reliable method of creating small frequency offsets to signals in a range of probably 1 to 10MHz. REW

ATV

ON THE AIR

Andy Emmerson G8PTH puts you in the picture

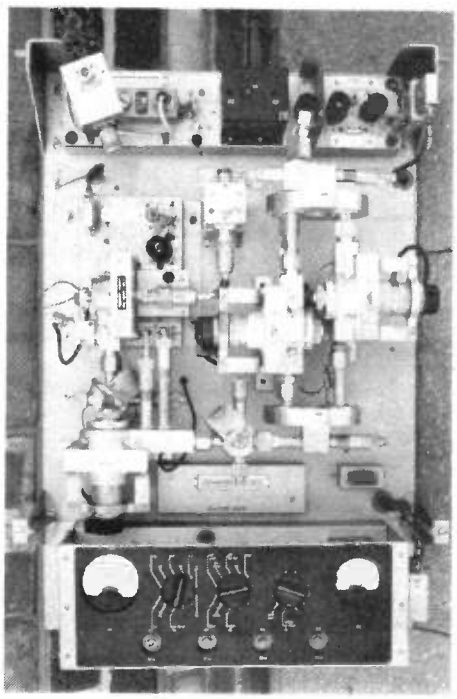
Welcome to Britain's only monthly ATV rubric – you've got some meaty reading this time about all kinds of alternative TV!

Stoke repeater comes to life!

Yes folks, by the time you read these words GB3UD should be beaming TV down to Stoke on Trent and surrounding parts. G3OHH was due to switch it on at midday 19th October, so tune your FM receivers to 1318.5MHz and turn your beams towards Mow Cop in Staffordshire. The box is under new management, so to speak, and is now under the auspices of the Stoke on Trent Amateur Radio Society.

Well done lads, that leaves just one of the originally licensed repeaters to come on the air. GB3UT, located at the University of Bath, is said to be coming along well and is licensed for operation on channel RMT1 with AM output. How long will it take them to change to FM, I wonder?

GB3GV (RMT2) has been operational at its new location at Markfield, Leics for some time now. It changed from AM to FM a while back (loud cheers all round!) and has greatly improved coverage from its new site next to the M1 motorway north-west of Leicester – it gets in well to Nottingham and to Northampton (just). The aerials have been raised and the transmitter is currently operating on lower power. Further technical improvements are in hand.



This superb example of microwave 'plumbing' is destined to become Britain's first 2.3GHz video beacon. If plans come to fruition the beacon will be co-sited with GB3GV, the Leicester TV repeater, and radiate the output of that box whenever it is in use and a testcard at other times. The original hardware was made by GEC some 15 years ago for use on point-to-point links

GB3TV on Dunstable Downs is also on RMT2. Activity was high throughout the summer and equipment reliability has been high.

An application is in hand at the DTI for GB3CT, to employ FM operation on RMT2 from near the centre of Crawley in Sussex. Regular attended (ie non-repeater) operation already takes place. Other proposals, about to go to the DTI, include:

GB3AF to cover the Durham, Newcastle upon Tyne and Sunderland areas (RMT2).

GB3GW to cover the western part of Glasgow (RMT2).

GB3PV to cover Cambridgeshire with 1 kilowatt ERP (RMT2).

GB3SX to cover eastern Sussex and south-west Kent (RMT1).

GB3HV on a special RMT3 channel to cover the western Home Counties. Input will be on 1248MHz and output on 1308MHz, the frequencies being specially selected to avoid in-band QRM from a high powered radar at Heathrow airport.

Channel PC49

And now I'll pick up on a recent topic of 'strangers in our midst', or perhaps we should call them guest transmissions on 'our' TV bands. In Germany our ATV colleagues have just had 2350-2385MHz turned over to police surveillance TV: this might make interesting watching! Back in this country you might see something on the next band down, but if you did you would rapidly tune into something else and not mention it to anyone (except a magistrate or competent tribunal of the law or whatever the licence says).

These other uses of our shared bands are of course fully legal, whereas a new threat to ATV has just appeared in the USA. Over there they have a number of low power broadcast stations (LPTV), and one of these has petitioned the Federal Communications Commission to use 434MHz for outside broadcast links. As justification the operator cites the much lower cost of amateur equipment and the relatively little use of the frequency for ATV. Hopefully he will not succeed, but this is a warning: in future we may well find the radio spectrum – including 'our' bands – in the hands of the highest bidder. Our own government has already proposed this for some PMR (private mobile radio) frequencies.

DIY pirate TV

This little example also indicates the scant regard which some commercial concerns have for the status quo. And speaking of which, did you see the picture and mention of the Mastertronic Video Plus in October's ***R&EW***? This gadget is a nice little sound and vision transmitter designed to enable you to receive your video recorder on any TV in your home. What the literature doesn't also tell you is that using the Video Plus could cost you a fine of £2000 or three months in prison. The newly pirate-conscious Radio Investigation Service would probably take a considerable interest in the use of these devices.

Actually, I cannot see how they can avoid QRM. If they work well they are bound to radiate next door as well as upstairs, and if this is on channel 36 it is bound to carve up your neighbour's TV if he happens to be using the VCR. If on the other hand the range is much shorter I cannot see the utility of the device at all!

More polemic

One of the satisfactions of ATV is that it does not appeal to everyone. This has the advantage that you can usually make a video contact without too much hassle from other radio users and enjoy the experience. This is a double edged sword, and other amateurs who have not seen the light (or don't even have a TV allocation in their country) tend to be somewhat anti-ATV. Back in 1981 the IARU Region 1 VHF Committee passed a recommendation to the effect that ATV should be removed from 70cm at some time. Fortunately for us the wording was open to more than one interpretation, and in this land of traditional British compromise no harm has come to ATVers. On the Continent all is not so well, and the Germans in particular are at pains to change this ruling.

The original reason for banishing ATV from 'seventy' was that the 432MHz band was none too wide and satellite working (Mode L) was considered to be incompatible with ATV. Subsequent experiments have tended to disprove

this, and in Germany they have gone to the length of switching off ATV repeaters with computer-controlled time-switches at the appropriate times. Nonetheless, this vexatious Recommendation 1 remains 'on the statute book' and the German Amateur Radio Club has proposed an amendment.

The original text runs as follows:

In view of the future satellite use of the 432MHz band it is recommended that amateur television should move to higher bands in the coming years.

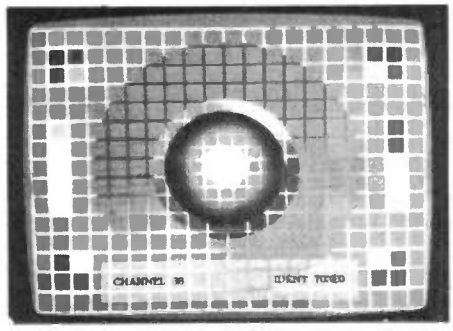
The new proposal runs like this:

In view of future satellite use of the 432MHz band it is recommended that amateur television should avoid the use of the spectrum occupied by satellites while these are transmitting.

Avoidance

The new text nicely avoids the question of who has greatest claim to the frequency. The Germans also point out that the WARC document of 1979, which said the 432MHz band was 'the lowest frequency on which wideband television transmissions are permitted, and for this reason alone the width of the present allocation is of great importance', would be materially prejudiced by any IARU decision which removed the fundamental basis for the size of the allocation. In other words, it's only a wideband mode – ie ATV – which can justify keeping all of 70cm. And as for moving up to higher bands, radar on 23cm makes interference-free communication on this band impossible in some parts and 2.3 and 3.5GHz are hemmed in by restrictions, in Germany at least. REW

DX-TV RECEPTION REPORTS



Compiled by Keith Hamer and Garry Smith

Although sporadic-E activity was noticeably on the decline during August, reports of exotic signals continued to come in. There were a few new test cards too, but more about these later.

Tropospheric DX suffered, mainly due to the abundance of low-pressure systems lurking around for most of the month. One or two weak signals were logged from the Low Countries and Eire, mainly at the beginning and during the last week of August.

Meteor shower DX became very apparent towards the middle of the month thanks to the Perseids. This shower reached a peak on the 13th with pings of reception from many European countries. There were no reports of any reception in Band III – perhaps everyone forgot to look!

Exotic reception

On August 4th during a sporadic-E opening from the south-east, Kevin Jackson of Leeds became aware of a programme carrying Arabic subtitles on channel E2 at 0951. No further clues as to its origin could be gleaned, but Kevin reckons that it must have been Iran since it's the only Middle Eastern country using this channel apart from Dubai.

Another DXer in Leeds, Mark Dent, witnessed a similar event on the 14th at 0959GMT. The signal was weak but steady with very little fading. In fact it resembled a tropospheric signal. The programme consisted of a man wearing Islamic dress sitting in an empty room. He appeared to be reading the news, and this continued for five minutes. Again, Iran on E2 seems to be the most likely contender.

New test cards

A new test pattern has been noted by several DX-TV enthusiasts on the Italian channel A during intense sporadic-E openings. It resembles the familiar FuBK pattern but it features a prominent chequered strip at the top. Several Italian private stations are known to transmit this test card but none of them operate on this channel. Our conclusion is that Nord Center Television (NCT) is using it as an alternative to the chessboard pattern which has been seen regularly throughout the season. The new pattern has been received at least twice during August.

TVE from the Canary Islands has been identified on four occasions. Their test patterns have undergone subtle changes during the summer months. The GTE pattern no longer carries the black strip across the bottom of the pattern which was used to delete any Spanish mainland identification. Instead, local ident now appears. This reads 'canarias 1' at the bottom and 'tve' in the upper half of the pattern.

DX-TV log for August

William Maries of Studley in Warwickshire has once again sent in his DX-TV log. Although conditions during the month have been down on recent times, William has still managed to receive an interesting selection of stations.

1/8/85: NOS-1 (Netherlands) on test with the PM5544 with programmes noted later on channel E4; TSS (Russia) with their colour electronic test pattern on R1 at 1126 via sporadic-E.

2/8/85: NOS-1 on E4 with the PM5544 test card; NRK (Norway) on test with the PM5534 test card including the transmitter identification 'KONGSBERG' on E4 via meteor shower at 1147; SR/SVT (Sweden) via meteor shower on E2 at 1332 with the PM5534 pattern.

3/8/85: RAI (Italy) at 1132 with sample teletext pages from the 'Videotext' service. Reception was via sporadic-E on channel IA; NOS-1 on E4 from the transmitter at Lopik with the Philips test card.

4/8/85: RAI with programmes at 1754 on channel IA via sporadic-E; TVE-2 (Spain) with programmes on channel E2 at 1827 via sporadic-E; TVE-1 on E3 via sporadic-E with programmes from 1828; JRT with a news bulletin from 'TV ZAGREB' at 1842 on channel E3 from Yugoslavia; CST (Czechoslovakia) with a news programme just finishing at 1900 on channel R1. Reception was via sporadic-E.

6/8/85: SR/SVT on test with the PM5534 on channel E2 at 1741; MTV (Hungary) with the clock caption at 1828 on R1; TVP (Poland) with the 'TP 1' identification caption followed by the clock caption and a news programme during the evening on channels R1 and R2; RAI with programmes on IA at 2049 via sporadic-E.

9/8/85: RAI radiating the PM5544 test card with 'RAI 1' identification at 0805 on channels IA and IB.

10/8/85: TSS with a cartoon at 1126 on R1 followed by the current affairs programme called 'HOBOCTN'; NOS-1 on test with the PM5544; TVE-2 on E2 with the GTE colour test card; TVE-1 on E4 at 1401 with the news programme 'Telediario'; MTV with an identification caption showing an owl at 1530 on channel R1.

11/8/85: NOS-1 on E4 with test transmissions; NRK received via meteor shower with the PM5534 test cards carrying 'KONGSBERG' and 'BREMANGER' identifications, both on channel E4; TVP on R1 with a news programme.

12/8/85: Many 'pings' of reception were noted via meteor showers but signals could not be identified because all stations were radiating programmes.

17/8/85: Unidentified sports programme on E2/R1 at 0930; TVE on E2 and E4 with programmes at 1300. The 'Telediario' news programme was noted at 2000; RTP (Portugal) with a subtitled film in the afternoon on channel E3; TVE-2 with the GTE colour test card at 1354 on channel E2; ARD (West Germany) with programmes at 1623 on E2; CST with athletics coming to an end at 1640 on R1 and R2; RAI with a sports programme at 1644. The news programme 'TG1' (Telegiornale) was received at 2100 on IA and IB; JRT with programme schedules on E3 and a news programme from the Zagreb studios; MTV with the clock caption at 1908, received on channel R1. All reception was via sporadic-E.

18/8/85: TSS with programmes on channel R1 and noted at 1000; NOS-1 on E4 with the test card; RTP on test with the FuBK and digital clock on E3; TVE with a religious programme at 1005 on E2, E3 and E4; NRK from Melhus, Gulen, Bagn, Gamlen and Hemnes with the PM5534 test card; 'Televizija Krakow' caption noted at 1247 from TVP in Poland.

20/8/85: NOS-1 during the evening with programmes on E4 via tropospherics; Canal Plus (France) with scrambled programmes received on channel L6 at 2025 via trop.

29/8/85: NOS-1 on test with the PM5544 at various times during the day on E4 via trop; ORF (Austria) on channel E2a with the PM5544 test card at 1300; CST on R2 with the 'RS-KH' electronic test card; Canal Plus with programmes on L6 and L9 via trop; YTV (Yorkshire, UK) with programmes on E25 (received via a Band I dipole); TVS (UK) with programmes received on E42; Anglia TV on E24 with strong interference.

30/8/85: Canal Plus on L6 and L9 with scrambled programmes from 0700; TF-1 (France) on test with the PM5544, received on channel L22; Antenne 2 (French 2nd network) radiating the PM5544 on L59, L29 and L25 via enhanced tropospherics. Two unidentified French test patterns were noted with the identification 'CENEX BCH'; NOS-1 on E4 with the PM5544; HTV West (UK) with programmes during the morning on channel E61.

31/8/85: Canal Plus with programmes on L5, L6 and L9; NOS-1 on E4 with the PM5544; RTBF 1 (French language service in Belgium) with teletext pages on E8 from Liège.

Our thanks to William for sending in his

DX-TV log, which reflects typical conditions noted during the month.

French farce

The French TV authorities have once again decided to change the prefix given to Canal Plus channels in Bands I and III. First of all it was 'C', then 'F' and now it's 'L'. It makes you wonder whether those in charge know what they're doing. In case they don't, they still have 23 possible prefixes to play around with.

Fortunately the transmission frequencies haven't been tampered with, unlike a couple of years ago. We have received several reports that the French Band I outlets have been received within the UK. These transmitters use very low powers, in the order of only a few watts ERP. John Bray of St Neots noted one outlet on channel L2 just slightly HF of E3 during August while Simon Hamer of Wales received one on channel L3. This is just above channel E2.

Reception reports

Ian Waller (Lincoln) has upgraded his DX-TV aerial system. He now uses a 5-element wideband Band I array and a Triax 13-element Band III system to complement an Antiference XG18 at UHF. Ian employed a couple of aerial contractors to install his new Band I array. They initially doubted that he would be able to receive TV signals from Europe, and were amazed when programmes from Spain and Russia appeared with near-perfect pictures.

Two receivers are used. One is a 22-inch Finlux multiband set with automatic PAL/SECAM selection. It has manual sound switching for the UK (system I) and Western Europe (systems B and G). The other set is a 10-inch SABA colour portable, again PAL/SECAM with sound switching. It can also receive French system 'L' transmissions. Ian took this portable together with an Antiference XG14 and a Jaybeam 8-element Band III array to Southwold on the Suffolk coast. He successfully received good quality pictures from France (Lille, Boulogne and Dunkirk), Belgium and the Netherlands. This attracted much attention from some of the local population, especially from those who couldn't even receive satisfactory pictures from their local relay!

Caption from SBT in Syria, received on E3

Kevin Jackson of Leeds has reported several new identifications used on the Russian colour electronic test card. The ident which is often seen reads 'UT 0167' and it appears just above the upper horizontal shaded band. On August 1st, the pattern was noted carrying a digital clock prefixed by 'UT'. On July 30th and August 9th the inscription was 'UT 2578'. Studio identification was incorporated during one opening with the name 'Leningrad' in Cyrillic script.

The 9th was a particularly packed day with signals from most European countries being received on test card. At 1237GMT Kevin resolved a Yugoslavian PM5544 pattern carrying the identification 'JRT SKPJ RTV SKOPJE' on channel E4. Various other E4 transmissions also appeared, notably West Germany showing their 'VIDEOTEXT FUR ALLES' caption. Another Yugoslavian outlet was logged with reception of the 'JRT ZGRB 1' FuBK test card. At 1301 the mystery Italian test card mentioned earlier was seen on channel IA. Shortly after fading out the NCT chessboard pattern appeared at 1309.

Mark Dent (also of Leeds) saw the mystery pattern on the 9th but the signal was too weak to be able to read any identification. It popped up again on the 23rd. Long-haul DX from the south occurred on the 6th and 9th when the Canary Islands made an appearance on E3 with the 'RTVE IZANA 3' bar pattern.

Midnight oil

Even the rare TSS outlet at Tallin on channel R2 showed up on the colour block-board pattern. This displayed the words 'EESTI TV TALLIN'. With the help of the midnight oil and his D-100 DX-TV converter, Mark managed to receive DX from RUV in Iceland on channels E3 and E4 shortly after 0100GMT via auroral-E reflection. A couple of hours later the Russian TV opening caption 'CCCP TB' was located on R1 at 0354GMT. Although a clock caption wasn't seen, and in view of the early start of programmes, Mark is wondering if the transmission emanated from a different time zone within Russia.

Simon Hamer of New Radnor in Wales has provided us with a log covering August, and there are several interesting highlights. The 17th was an excellent day with the MUF attaining a very high level. Magyar Televizio (MTV Hungary) appeared on three channels, namely R1 (Budapest), R2 (Pecs) and R4 (Tokaj). The latter transmitter, which operates in Band II, is fairly rare. Albania (RTS) has appeared again in Simon's locality on channel IC. So far, RTS hasn't shown up in Derby at all this season! The same opening produced ORF from Austria from the 100W channel E3 outlet at Birkfeld. The same programme was also noted on the more familiar channel E2a at the time, but this was eventually swamped by a Russian signal.

To round off the month for Simon, the Finnish FuBK test card with the identification 'YLE 1' appeared on channel E3 on August 25th. 'A rare catch', commented Simon.

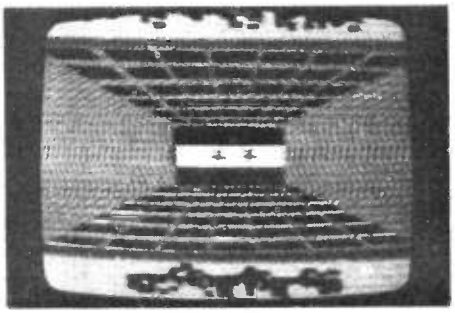
We were recently very surprised to hear from a DX-TV enthusiast in Hungary. His name is Bakos Gabor and he lives in Rudabanya. Several photographs were enclosed showing DX reception from Jordan and Syria on channel E3 during the 1985 season. Various logs detailing reception of 'exotic' signals have made interesting reading. Jordan radiates both the PM5544 and PM5534 test patterns. The former carries the abbreviation 'JTV' at the top and 'AMMAN' in the lower black rectangle. The PM5534 version includes transmitter identification in the lower block. In the case of the channel E3 outlet the identification is 'SUWEILEH'. At least three other patterns are radiated by JTV. One is a colour bar pattern, another is in the form of a white cross-hatch with white dots inside the squares, and the third consists of a multi-burst signal, otherwise known as a frequency grating pattern.

Arabic script

The Syrian patterns and captions are equally interesting. The main test card is the PM5534 with Arabic script in the top box and 'ORTAS DAMAS' at the bottom. Another pattern, which is referred to as a caption, consists of a white grid (7 vertical lines by 9 horizontal) with various rectangles, each a different colour.

Syrian programmes start at 1000GMT and continue throughout the day. Advertisements are shown from time to time. Jordan TV normally starts a little later, with what appears to be a pause in transmissions between 1919 and 1924GMT. During this period the test card is radiated. We aren't sure whether this is a regular feature with JTV but it certainly happened on June 3rd.

Bakos' receiving system consists of a 4-element wideband array for Band I sporadic-E DX, embracing channels E2 to R3. His TV receiver is an Orion-60, which is made in Hungary. Surprisingly it will resolve both the 5.5MHz and 6.5MHz sound systems, namely transmission systems B and D.



Syrian caption noted on E3

DX-TV RECEPTION REPORTS

Apologies not received!

We feel that our apologies should be extended to anyone watching transmissions from the BBC – mainly because they don't seem in a rush to apologise themselves! What on earth is happening to the BBC's standards?

First of all the BBC-2 Ceefax pages radiated instead of the test card were severely off centre over a fairly lengthy period. Then, when all seemed back to normal, the BBC-1 pages were given the same treatment. No explanation from the BBC was forthcoming.

Next, viewers of BBC-2 from the Waltham transmitter on channel 64 can hardly have missed strange vertical lines superimposed on the picture. These resemble a form of ringing and alter in severity depending upon the picture content. The interference is definitely not due to unusual atmospheric conditions. This strange fault has been in evidence for over two months.

And while on the subject of strange patterns, has anyone noticed a set of standard colour bars which seem to constantly appear, if very weak, in the background of some programmes? We have noticed it more on BBC transmissions but they are also lurking on Channel 4. The colour bar pattern is more noticeable on dark scenes.

Finally, when the BBC journalists had their one day strike which knocked news bulletins for six, why did the BBC have to stick out a caption all day saying that their beloved Ceefax couldn't be broadcast? It would have been an ideal opportunity for them to prove that they still have the digital Test Card 'F' generator somewhere!

Anglia E10 mystery continues . . .

We recently alerted readers concerning Anglia TV programmes which were being re-broadcast on channel E10 in Band III. Transmissions were traced to the Lincoln area by two Nottingham DX-TV enthusiasts, Colin Frost and Roger Pates.

A letter arrived from Ian Waller, who resides five miles to the east of Lincoln. He too has noted Anglia TV on channel E10 for a period of five days followed by a two week break and then signals once more for a further three days. The signal wasn't too strong, although it peaked with the aerial directed towards the Belmont transmitter. What Ian finds really puzzling is that he cannot receive the normal UHF Anglia TV outlets unless there is a good lift in tropospheric conditions. The programmes on E10 were off-air and carried teletext information.

Service information

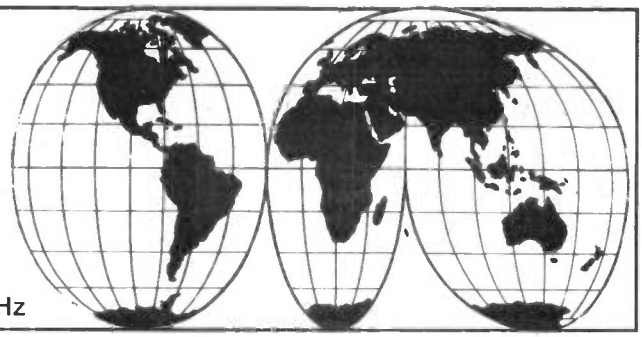
France: The French Government announced on July 31st that spare TV channels would be allocated to new private television services. These stations are expected to be operated on a local basis with some communities hiring air-time from the FR-3 network.

Spain: A new regional TV service started on July 24th in the province of Galicia. The service is known as 'Television Gallega' and is identified by the abbreviation 'TVG'. There are two other regional TV services in operation. These are ETB and TV-3.

West Germany: There are several new low-power relay stations in service as follows: Langenzenn on channel E8 with 8W ERP broadcasting ARD-BR programmes; Riedern with 10W for ARD-BR on E32 (later to move to channel E36); Pilsach on E35 with 70W for ARD-BR; Schorndorf-Schornbach on channel E57 with 10W relaying programmes from ARD-SDR.

This month's service information was kindly supplied by Alan Duchatel (France) and Alexander Wiese (Munich, West Germany). REW

SHORT WAVE NEWS FOR DX LISTENERS



By Frank A Baldwin

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

It is now the time of year to collate the latest information and to listen for some of the 60 metre band stations broadcasting from the Far East. Indeed, the 'season' for the reception of signals emanating from this area of the world commenced during the latter part of last month. However, as the season progresses signal strengths should increase, and as long as a lack of solar activitiy does not preclude audible levels, some of us may be fortunate enough to log the following listed transmitters – mostly those of Radio Malaysia.

Radio Pyongyang in North Korea operates on **4770** with a power of 120kW. The best chance for listeners here in the UK of hearing the Foreign Service programmes in Korean would be during the 1400 to 1430 transmission. The writer logged this on two occasions during the last season and found it on a measured **4771**. Other DXers similarly reported Radio Pyongyang.

If good luck prevails

Radio Thailand in Bangkok is rarely featured in the SWL press. For those readers who wish to try and listen to the gongs and cymbal music sometimes heard on **4830** – should good luck prevail – the Home Service schedule is from 2245 to 1600, the power being 10kW. Tune to the channel from around 2245 and again at 1530 or so.

Another seldom logged station for us in these sea-girt islands is the Radio Malaysia transmitter at Kuching in Sarawak. It programmes the Home Service in Malay from 2200 to 0120 and from 0800 to 1600, part of these two periods being those most likely to be heard here in the UK. The power is 10kW and the frequency is **4835**.

In contrast to the above, the Radio Malaysia station located in Kuala Lumpur operating on **4845** is frequently logged and featured in DXers' reports. With a power of 50kW, this station broadcasts the Indian languages services and may be heard from Monday to Friday at some time in the 2100 to 0100 slot and also prior to closing in the 0800 to 1500 period. On Saturday and Sunday it opens at 2100 and finally signs off at 1500, the extent of transmission periods differing from those on weekdays.

Blocked

Not often logged by reason of co-channel QRM is the Radio Malaysia transmitter based in Kuching, Sarawak and radiating on **4895** with a power of 10kW from 2200 to 2300 and from 1000 to 1500 with programmes in Iban. The 50kW Ashkabad, Turkman, USSR transmitter more often than not effectively blocks the signals from Sarawak on this channel.

On **4950** is the Radio Malaysia station at Kuching which radiates programmes in Chinese from 2200 to 0100 and in English from 1400 to 1600. With a power of 10kW, and like the following two Malaysians, it does not often appear in European DXers' reports but is occasionally heard when conditions for reception of the area are good.

Radio Malaysia, Kota Kinabula, transmits programmes in Malay on **4970** with a power of 10kW from 2130 to 2400 and in English and Malay from 1130 to 1600.

In Penang, Radio Malaysia is scheduled on **4985** with transmissions in English and local vernaculars from 2200 to 0100 and from 0900 to 1600.

The **5005** channel is that of Radio Malaysia located in Sibu, Sarawak. Also rated at 10kW, it features programmes in Iban from 2200 to 2300 and from 1000 to 1500. Take care during the latter session, however, that the signals logged are indeed those of Radio Malaysia and not Radio Nepal. The latter station closes at 1720, the power is 100kW and there is an English newscast at 1450. It follows therefore that the chances of hearing the signals from Sibu are few and far between – but it has been done from time to time.

The remaining Malaysian station on the band is listed on **5030** and is sited in Kuching, Sarawak. At 10kW, it is on the air from 2220 to 2400 and from 1030 to 1500 radiating programmes in a local vernacular.

A better chance of logging a station in the general area is offered by listening for Singapore on **5010**, at which point on the dial it transmits the Home Service in English from 2200 to 0100 and from 1000 to 1605 with a power of 10kW, identifying as Radio One. The parallel **5052** channel is a better bet in that it is rated at 50kW and is scheduled from 2200 through to 1605. The latter transmitter can be used as an indicator of Malaysian reception conditions. Simply tune from time to time to the **5052** channel and assess the result obtained – good, bad or indifferent!

AROUND THE DIAL

In which is presented the information enabling interested readers to tune to the frequencies specified at the times stated, when hopefully current conditions will result in successful loggings being made.

AFRICA

Angola

ER do Huambo on **4820** at 2225, OM with a pop song in Portuguese, OM with announcements and station identification at 2230. This one is best heard after the co-channel Radio Botswana signs off at 2100. ER do Huambo was formerly operating on **5061** (nominal **5060**). It has a power of 10kW and the schedule is thought to be 0400 to 2300 – most certainly it closes at the time mentioned.

Ascension Island

BBC Relay on **17880** at 1609, OM with a newscast in English during a programme directed at East Africa from 1600 to 1745.

Cameroon

Radio Bertoua on **4750** at 1918, OM with a talk in French in a Home Service presentation. The power is 20kW and the schdule is from 0430 to 0800 and from 1600 to 2200. There are programmes in English from 0615 to 0645 on Sunday and from 1800 to 1840 weekdays, a newscast being relayed from Yaounde at 1830.

Egypt

Cairo on **15475** at 1550, OM with a talk in Arabic in a Voice of the Arabs programme. Such transmissions are timed on this channel from 0800 through to 1900.

Cairo on **17690** at 1537, quotations from the Holy Quran during the Urdu programme beamed to southern Asia from 1530 to 1700.

Liberia

ELWA Monrovia on **4760** at 1832, OM with a sermon then hymns in vernacular. This transmitter radiates the Home Service in English from 0555 (Sunday from 0600) to 0802 (Friday until 0817, Saturday and Sunday until 0832) and from 1725 to 2302 (Sunday until 2247). A vernacular slot is timed from 1725 to 1900 and there are relays of newscasts from the BBC at 0700 and VOA (Voice of America) at 2200. The power is 10kW.

Morocco

RTM Rabat on **15335** at 1557, OM with a song in a vernacular then a single 'pip' time-check at 1600, OM with the station identification and a newscast in Berber. This was a relay of the Domestic Service directed in Europe, the Middle East, West Africa and Mauritania which is on this

channel daily from 1000 through to 0100. This particular transmission was also logged in parallel on **15360** and **17595**.

Nigeria

Lagos on **4990** on 0325, OM with a talk in English all about the South African internal problems. FRCN Lagos is on the air from 0430 to 2310 with the Home Service in English and vernaculars, the power being 50kW.

Tanzania

Dar-es-Salaam on **5050** at 1932, YL with a local pop song in Swahili, OM with announcements. Radio Tanzania is on channel with the National Service in Swahili from 0300 to 0700 and with the Commercial Service from 1300 to 2015. The power is 10kW.

Togo

Radiodiffusion Television Togolaise, Kara on **3222** at 1920, OMs with a pop song in French followed by a rendering of 'La Paloma'. The Home Service in French and vernaculars is radiated on this frequency from 0525 to 0830 and from 1630 to 2305 with a power of 10kW.

CENTRAL AMERICA

Honduras

La Voz Evangelica, Tegucigalpa on **4820** at 0320, OM with announcements in Spanish followed by a programme of guitar music and songs. This one operates in Spanish from 1030 to 0600 and features an English programme on Mondays from 0300 to 0600. The power is 5kW.

NORTH AMERICA

USA

WYFR (Family Radio), Okeechobee, Florida on **17845** at 1613, OM with a religious programme in English for Europe and North Africa, scheduled from 1545 to 2245.

SOUTH AMERICA

Brazil

Radio Difusora de Amazonas, Manaus on **4805** at 0010, OM with a time-check and station identification in Portuguese then OM with a talk. Now reactivated, this one is thought to be operating from 2230 to 0200 with a power of 5kW.

Radio Difusora Acreana, Rio Branco on **4880** at 0032, OM with a talk in Portuguese with several mentions of Brasilia, the comparatively new capital city. RD Acreana is on the air from 0900 to 0530 with a power of 5kW.

Ecuador

Emisora Gran Colombia, Quito on **4911** at 0141, OM with a talk in Spanish with many mentions of local placenames. At 10kW, this transmitter radiates programmes in Spanish from 1100 through to 0600.

Radio Rio Amazonas, Macuma on **4870** at 0352, OM with announcements in Spanish, promos then local pops on records. Programmes in Spanish and a local vernacular are timed from 1000 through to 0400 with a power of 5kW.

Peru

Radio Andina, Huancayo on **4996** at 0317, OM with a folk song in Spanish. Huancayo is scheduled on the air via Radio Andina from 0900 to 0400 at 2kW, being part of the Emisoras Cruz del Peru network.

Venezuela

Radio Occidente, Tovar on **3225** at 0001, YL and OM with a discussion in Spanish. The schedule is from 1000 to 0400 with a power of 1kW but the channel is surrounded by utility QRM (interference).

Radio Mundial, Ciudad Bolivar on **4770** at 0250, OM with an announcement in Spanish then into a programme of folk songs complete with guitar backing. This 1kW transmitter is on the air from 0900 through to 0400.

ASIA

Bangladesh

Dhaka on **11552** (measured) at 1842, OM with a talk in English about local sea fishing and those who go down to the sea in ships *(Eh? – Ed)*, all in an English programme for Europe, timed from 1815 to 1900. At 1900 OM with the station identification and a newscast at dictation speed in English until 1915.

China

Radio Beijing on **9945** at 1444, OM with a talk in the Vietnamese programme, timed from 1400 to 1500.

Radio Beijing on **11500** at 1850, Chinese music then OM with announcements, frequencies and times during the German programme for Europe, scheduled from 1800 to 1900. Interval signal then OM with the English transmission for Europe timed from 1900 to 2000.

India

AIR (All India Radio) Hyderabad on **4800** at 0039, YL with the local news in English until 0040 then OMs with songs in Hindi with a backing of local-style music. This is the South Regional Service which is on the air from 0025 to 0215 and from 1200 to 1741 and includes English newscasts at 0032, 1230, 1530 and 1730. The power is 10kW.

Pakistan

PBC Karachi on **17660** at 1529, OM with songs, OM with announcements during the Urdu presentation to the Near and Middle East, scheduled from 1330 to 1600. Also logged in parallel on **15595**.

Vietnam

Hanoi on **15010** at 1355, local-style music, YL with a song in Vietnamese during an English programme intended for South-East Asia and timed from 1330 to 1400.

NEAR & MIDDLE EAST

Kuwait

Radio Kuwait on **9840** at 1448, YL with songs in Arabic in a programme of the Domestic/External Service which is on this channel daily from 0225 to 0015.

Saudi Arabia

Riyadh on **15060** at 1402, YLs with a discussion in Arabic in a relay of the Domestic Service timed on this frequency from 1100 to 1700.

EUROPE

Belgium

Brussels on **6050** at 1450, interval signal, YL with the station identification prior to the French programme for Africa and Europe, timed from 1500 to 1545.

Monte Carlo

TWR (Trans-World Radio) on **9495** at 0810, a recorded Canadian religious programme followed at 0820 by OM with the station identification and frequency as **9500**. I still made it **9495**!

CLANDESTINE

Radio Chad on **6009** at 2012, OMs with a song, drums, OM with a talk in a local vernacular.

Radio Chad, the Voice of the Liberation, operates from 1800 to 2030 in French, Arabic and two vernaculars. Thought to be located in Libya, it is hostile to the present government of Chad and supports a Transitional National Union organisation.

NOW HEAR THIS

Radio Inca, Lima, Peru on a measured **4762** at 0338, OM with announcements in Spanish then OM with a folk song. Radio Inca is on the air from 0800 on occasions but mostly works around the clock. The power is 1.8kW.

NOW LOG THESE

Radio Nueva America, La Paz, Bolivia on a measured **4796.6** at 0027, OM with a talk in Spanish with several references to La Paz and Bolivia, pronounced Bolevya. Radio Nueva America is scheduled from 1000 to 1430 and from 2200 to 0400 (Sunday from 1030 to 2245 varying to 2300). The power is 1kW.

RFO Cayenne, French Guiana on a measured **5055.6** at 2215, OM with a talk in French followed by YL with announcements and a programme of French pops. Cayenne is scheduled on the air from 0900 (Sunday from 1000) to 1100 an from 2000 to 0100 (Saturday until 0300, Sunday until 0200) with a power of 10kW.

DOTS & DASHES

Switching to the CW mode and settling on the 1.8MHz band on several occasions brought forth the following signals: EA3VY, OH0MA, OK1DTM, I4IKW, PA3BZC, PY1RO, RA6AOS, RB5IIM, RC2WCN, SM0KV/0, SP5GF, UQ2MU, VE1ZZ and YU3MM.

Changing to the 7MHz band resulted in CO2VG, HB9ASJ/OX, LU1PGF, PY4HF, VP2MDY and YB4ZL being logged. REW

MEDIUM WAVE DXING

by Steve Whitt

Welcome to the December MW-DX column, where this month there is a slight change in emphasis. Over the last few months I have mainly dealt with the what, when and where of MW-DX, but to make the most of DXing some technical knowledge can prove very valuable.

In fact the bane of the DXer's life is probably radio interference, originating either from other radio stations or from extraneous sources such as television timebases or other electrical equipment. This month we look at one form of interference which, with a little effort, can in fact be almost totally cured; namely the problem of hetreodyne whistle interference.

Technical corner

On the MW band no pretence at high fidelity audio is made and the audio bandwidth is usually restricted to a 4 or 5kHz upper limit. This means that up to 9 or 10kHz of radio bandwidth is required to accommodate both sidebands of the AM radio signal. Consequently, to minimise interference between stations, the channels used on MW are separated by 9 or 10kHz (different standards are used in various regions of the world). If the sidebands of two different stations overlap there is usually nothing that an ordinary radio can do to separate them again since, both signals will simultaneously fall within the receiver's bandwidth 'window', thereby resulting in interference.

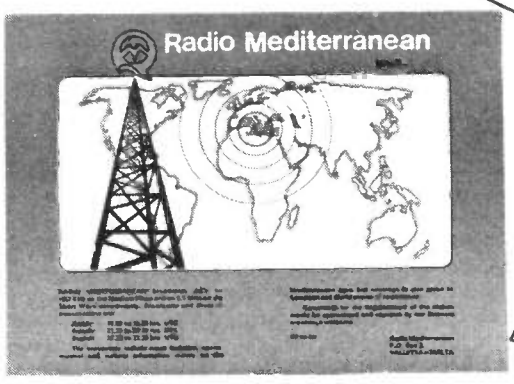
A particularly severe form of interference arises when two signals are received simultaneously on slightly different frequencies. Not only are both signals heard mixed together, but a beat or heterodyne frequency is generated in the receiver which becomes audible as an annoying whistle. The pitch of the whistle is equal to the frequency separation of the two interfering signals; for example, a listener tuned to Guinea on 1404kHz would hear a 2kHz heterodyne whistle caused by the off-channel Libyan transmission on 1402kHz.

Heterodyne interference is subjectively very annoying and, in practice, for a weak signal interfering with a strong signal a heterodyne whistle will be more noticeable than the actual interfering audio. In order to eliminate the heterodyne problem stations are chanelised, since in theory two signals operating on exactly the same frequency will generate no heterodyne whistle. However, in practice so-called co-channel stations can be separated in frequency by a few tens of Hz before the heterodyne becomes a problem – such low frequencies are just not audible!

Unfortunately, from an interference point of view (but fortunately from a MW-DX standpoint!), a consistent set of MW channels are not in use world-wide. This means that the European DXer will encounter signals between the 9kHz local channels, but the resulting heterodyne whistle could render the already weak signal totally unintelligible. However, there is a simple solution to this problem, namely the audio notch filter.

An audio notch filter is a circuit that ideally attenuates a single frequency whilst passing all other frequencies unaltered, but to ensure its versatility such a circuit needs to be adjustable so that the notch can be tuned to different frequencies to remove any undesirable heterodyne whistle. Simple notch filters can be made where manual adjustment is used to set things up, but this can be quite tedious.

However, more sophisticated notch filters are available that automatically lock onto a heterodyne tone and then notch it out, leaving behind the desired audio. I have recently added such a unit (a Datong FL2/A filter) to my communications receiver and it has proved to be invaluable. Not only does it eliminate heterodynes but it will remove test tones that are transmitted by many stations after normal programmes have closed down. In fact it can recommend a range of add-on audio filters manufactured by Datong Electronics (Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE) which are very simply connected between a receiver and a pair of headphones.



DX file

This winter's DX season has got off to an excellent start with some UK firsts being reported. Reader John Fauikner, from Mansfield, reports his activities as part of a six man DXpedition to the north of Scotland during the first fortnight of October. Operating from a farmhouse near Cape Wrath, and using a Trio 9R59DS and a Drake R7 together with a selection of Beverage aerials (all over 1,000 feet long), the following UK firsts were heard at around 0400GMT on 5 October.

KBRW Barrow, Alaska with 5kW on 680kHz
CJCA Edmonton, Alberta with 50kW on 930kHz
CFGP Grand Prairie, Alberta with 10kW on 1050kHz

As far as I'm aware this is the very first UK logging of any Alaskan MW station and although these stations were heard at a low noise QTH using aerials that most of us just dream about, this highlights the good MW-DX conditions that are associated with the approaching sunspot minimum.

In fact Alaskan stations are not usually heard in theUK because the great circle path the radio waves must follow to get here passes close to the magnetic north pole, where commonly a high absorption region of the ionosophere is to be found.

LATEST LITERATURE

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

BBC ADVANCED REFERENCE GUIDE

By Bruce Smith

The BBC Micro Advanced Reference Guide, due to be published on 21 November, is a mine of information for those with a detailed knowledge of BBC programming. It is not a 'how to' book, but rather a set of lists containing all the information that usually takes tedious searching to uncover.

It is divided into four parts (despite the cover blurb mention of five – never trust publishers' hype!), these covering Basic, Assembler, the Machine Operating System, and the Hardware. Because of the intended readership, serious advanced programmers, the lists are little more than that (ie, no extensive explanations), and there are therefore plenty of lists and no wasted space. Coverage includes Basic commands, error messages, windows, variable storage, the 6502/6512 instruction set, filing systems (including the ROM FS), ports and interfaces, etc.

As a one-volume source of useful info, this is bound to become a well-thumbed book.

Collins Professional & Technical Books, ISBN 0 00 383223 6, £10.95

MODERN ANTENNA DESIGN

By Thomas Milligan

This hard-bound 408-page textbook, written by a senior staff engineer at Martin Marietta Denver Aerospace, is intended to impart a thorough understanding of the properties of antennas and the limits of design. It is worth noting, however, that to gain the most from this text some knowledge will be required of the reader: to quote the preface, 'an understanding of electromagnetics in the relation of fields and boundary conditions, an ability to add signals expressed as amplitude and phase, and some understanding of the vector nature of fields'.

The book's aim of being essentially a practical manual has resulted in a minimum of superfluous theory. It begins with a description of the properties of antennas, and is written in a style that will be familiar to all science undergraduates. Like any self-respecting textbook it has numerous examples and references (Chapter 11, for example, covering travelling wave antennas, lists 47 references).

Antenna types are listed and described after an outline of radiation structures, and aperture theory for the approximate analysis of antennas is detailed and used later in the chapters on specific antennas.

This book is aimed a little above many readers of *R&EW*, but if you know any engineers involved in antenna design or analysis you could do a lot worse than buy it as a Christmas present.

MacGraw-Hill Book Company (UK) Ltd, ISBN 0 07 042318 0, £44.50

68000 MACHINE CODE PROGRAMMING

By David Barrow

This volume covers Motorola's 68000, 68008, 68010 and 68020 microprocessors, a family of chips seeing ever more widespread use in small computers (the 68008 is in the QL, for instance, and the 68000 in the Atari 520ST and Commodore Amiga). These microprocessors are quite an advance on their predecessors, and as the author says of their structuring, 'each newer member of the family stands on the shoulders of the last, and practically all programs that will run on early implementations will also run, without change, on later models'.

An impressive family like the 68000 series deserves a decent volume describing its details to do it justice, and David Barrow has delivered with this book. He begins with details of architecture, data storage and access and the inbuilt 'self-consciousness' of the hardware (which allows it to carry out much of the system control). This is followed by an outline of assembly language and then examples of instructions and addressing modes. The extensive appendices list such useful information as registers, assembler conventions and instructions.

Anyone familiar with the author's column in the excellent *Personal Computer World* magazine will appreciate his business-like style. This will be a useful addition to the computer buff's library.

Collins Professional & Technical Books, ISBN 0 00 383163 9, £12.95

SOUND AND TV BROADCASTING

Rohde & Schwarz, the West German equipment manufacturers, have just published this 377-page English language catalogue of their products. Reading more like a book than the usual style of catalogue, it outlines the company's range of transmitters, receivers, antennas, test equipment, and ancilliary equipment. One of the appendices gives details of CCIR and FCC TV standards. The production is excellent throughout, with superb photos and clear diagrams.

To receive a copy, contact your nearest Rohde & Schwarz representative or the company themselves, giving your name and company or field of activity.

Rohde & Schwarz, Postfach 80 14 69, D-8000 Muenchen 80, W Germany

IEE

Good documentation is a vital and integral component of any successful computer system. A publication which provides practical guidance on this complex subject is published by the Institution of Electrical Engineers. The documentation of all the software aspects of a project, from the initial user's requirements to the operation and maintenance of the system, is covered.

Guidelines for the Documentation of Software in Industrial Computer Systems is principally aimed at the new user of computer based control, automation or monitoring systems, but it will equally be of interest and value to experienced users and suppliers who are already aware of the critical relationship of good documentation to successful project implementation.

A number of comprehensive checklists are included, thus ensuring that no major topic is overlooked. Advice is given on how to apply the guidelines to systems ranging from simple PLCs to large complex computer systems. The book is £15.00.

The Institution of Electrical Engineers, PO Box 26, Hitchin, Herts SG5 1SA.

B&R

B&R's latest components catalogue lists eight sections of popular 'same-day' despatch items and also contains a completely new section with comprehensive technical details of a vast selection of more specialised relays, switches, timers and LEDs from the company's range of over half a million part numbers.

B&R say they are in a unique position to meet both the smallest and largest of orders, thus obviating the need to change suppliers when progressing from development work to full-scale production. There is no minimum order charge and bulk orders attract substantial discounts.

Catalogue recipients will have two opportunities to win Sinclair QL computers complete with business software. The catalogue is available free of charge.

B&R Electrical Products Ltd, Templefields, Harlow, Essex CM20 2BG.

Bernard Babani

Bernard Babani (publishing) Ltd has just produced its 1986 edition of *Babani Electronics, Radio and Computer Books,* which lists all the technical books available from this publisher.

Data and reference books are on offer, plus those on circuits and constructional projects, amateur radio and communications, aerials, hi-fi, theory and calculations, TV and video, computing, fault-finding and calculators.

Bernard Babani (publishing) Ltd, The Grampians, Shepherd's Bush Road, London W6 7NF. Tel: (01) 603 2581/7296.

Online

Online's new catalogue offers a specialist service in electronic component distribution, providing a broad range of passives, semiconductors, cables, connectors and electromechanical products from a small selected group of market-leading franchises.

These include Mullard, Texas Instruments, Mitel, ITT Cannon, Allen-Bradley Electronics, Harmin and Erg.

Online Distribution Ltd, St Martins Way, Cambridge Road, Bedford MK42 0LF.

QSO

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

Border Award

The Oswestry and District Amateur Radio Club are currently publicising a new award, the Border Award for 144MHz and above, which will be presented for working 10 Shropshire stations and 5 in each bordering county (Clwyd, Cheshire,. Staffordshire, Hereford and Worcester, and Powys), plus one club member (ie a total of 36 stations).

All contacts must be on one single band using one single mode, as permitted by the licensing conditions, and contacts via repeaters are not valid. The award begins on 1 January 1986.

Certificates will be numbered according to the band and mode used.

Club events using G4TTO, G1ORA or special callsigns are eligible for the award along with any mobile or portable stations.

Claimants should forward their lists of stations worked/heard (including band, mode, date, QTH), certified correct by two licensed operators or short wave listeners, plus £1.75 to: *Oswestry and DARC Awards Manager, Mr T Parsons G6XPO, 90 Castle Street, Oswestry, Salop.*

Ghost in the machine?

If ghosting, co-channel reception or electrical interference are spoiling enjoyment of television or radio programmes help is available from a new guide published by the Department of Trade and Industry.

Called *How to improve television and radio reception*, it is available free of charge from main post offices.

The guide is aimed at giving DIY solutions for reception problems, as nearly half of all reception problems are due to deficiencies or faults in the radio or television, the aerial lead or aerial, many of which can be remedied by the owner.

The first part of the illustrated guide is for householders and explains how to check equipment, diagnose the type of interference and gives simple and safe ways of solving the most common problems.

If, however, the problem is more complicated the second part of the guide is a technical section to help TV and radio dealers identify and resolve the interference. It deals with classes and sources of interference, check charts and information about filters, aerials and the relevant British Standards.

Electronic love

Here is a lighthearted piece spotted in the October issue of WACRAL'S (World Association of Christian Radio Amateurs and Listeners) newsletter:

If she wants a date – meter; if she comes to call – receiver; if she needs an escort – conductor; if she's been cheating – detector; if she's too fat – condenser; if she's too thin – feeder; if she's extravagant – limiter; if she's in error – rectifier; if her hands are cold – heater; if she's bossy – resistor; if she's bored – exciter; if she refuses – rejector.

For more information contact: *Len Colley (Secretary), Micasa, 13 Ferry Road, Wawne, Nr Hull. Tel: (0482) 822276.*

EGM proposal

As RSGB members will, no doubt, already know, an Extraordinary General Meeting has been proposed by G4AJJ, G6JNS and G3GJW with the aim of putting forward ideas for change within the society which they believe will be beneficial to all members and the long term future of the hobby.

In a document by Ingemar Lundegard G3GJW, entitled 'The RSGB: A Need For Reorganisation', he points out that 'a minority of people are on too many committees and staying on them for too long', which prevents the introduction of fresh ideas. A motion will be set out before the EGM to limit members' service on council and/or committees to six years.

It will also be proposed that council members, the vice-president and the president should be elected by secret postal ballot. Candidates must provide a statement giving not only biographical details but also a clear idea of what he/she would hope to achieve if elected. As G3GJW points out, 'There is no point in electing people about whom you know nothing at all'.

To guarantee impartiality, all ballots would be supervised by the Electoral Reform Society.

Copies of this document and the agenda for the EGM can be obtained from: *T I Lundegard G3GJW, 'Saxby', Botsom Lane, West Kingsdown, Sevenoaks, Kent.*

Follow the bear

Gale force winds and torrential rain have flattened hopes of setting a long distance world record for transmitting on 2 metres VHF. The West Kent Amateur Radio Society abandoned their Heineken-sponsored attempt (see *R&EW*, October) after their tents and equipment were battered by weather, which never gave them a hope of keeping to their schedules.

Perched 1,500 feet up a Galway mountainside, the 11 member group had no protection from the Atlantic gales which ravaged the coast all summer. Having lost one tent in a gale which almost blew down their aerial mast, most of the group retrieved what was left of their equipment and came home (maybe now they'll become Skolars?).

However, some members travelled on to the Arran Islands to carry out test transmissions from the protection of a stone cottage.

One of the expedition organisers, Nigel Peacock, commented: 'The weather was absolutely diabolical – we were totally washed out. We had to burn one of the tents as it was not worth bringing back, and had we tried to carry on I think we would have lost everything else. It's obviously disappointing after so much preparation.'

Oswestry and District Amateur Radio Club

BORDER AWARD

Band

Mode

Award No

Award No

THIS CERTIFIES THAT

has submitted satisfactory evidence of having worked/heard 10 stations in Shropshire and 5 in each bordering county, plus one club member using a single band and mode on 144.M.H.z. and above.

As Heineken appears to have failed to refresh parts sufficiently during this attempt, the club would be well advised next time to 'follow the bear'.

Scouts and stout

The Denby Dale and District Amateur Radio Society have sent us a copy of their latest newsletter, *CQ*, which, although generally interesting reading, incorporates, curiously, a 'ladies' corner'.

This latest edition has a recipe for Guinness cake – something for the radio amateur 'widows' to do on those long lonely nights, perhaps? OK, but if she has an interest in radio, how's the XYL supposed to make Guinness cake *and* study for the RAE?

The club was involved in two JOTA (Jamboree-on-the-air) stations in October with the local scout group.

Very few scouts can ever hope to actually attend one of the events, but with the help of local radio amateurs scouts all over the world can contact others in similar organisations.

For more information on the society contact: *G Edinburgh G3SDY (Secretary), 37 Westerley Lane, Shelley, Huddersfield HD8 8HP. Tel: (0484) 602905.*

Packet radio modem

In their continuing endeavour to promote and foster packet radio, the Sydney Amateur Digital Communication Group have commenced development of a complete Australian designed amateur packet radio system.

Rather than enter into conflict with various groups that have purchased semi-commercial equipment, the SADCG have set their design objectives around a system that they believe will satisfy most groups. The terminal node controller has improved software handling both Vancouver V2 and ARRL AX25 version 2, allowing multiple digipeating. This TNC will be available in the next few weeks.

The SADCG have just completed design of a high performance AFSK radio modem board based on the AMD7910 World Modem chip. This modem provides both CCITT and Bell modem frequencies. It is tailored for use on UHF, VHF and HF voice grade channels and incorporates a PTT Watch Dog timer. The AMD7910 was selected because of its ability to handle noisy conditions, as found on HF and satellite operations.

This modem will interface via RS-232/V24 to a TNC or computer, and can be interfaced to amateur transceivers. The circuit has the option to generate a DCD signal from either the external squelch signal from the radio or internally generated DCD from the 7910, or both. Various connections are available for LED monitoring of circuit conditions such as CTS, TXD, etc.

The radio modem printed circuit board, together with construction information, is available for $22, post free, from: *SADCG, PO Box 231, French's Forest, NSW 2086, Australia.*

Dutch radio

Radio Nederland Wereldomroep is responsible for the publication of three very interesting booklets: *Infodutch* (Information Of Direct Use To Computer Hobbyists), *Shortwave Software* and *The Booklist – A worldwide survey of SW related publications.*

Infodutch, edition 2, is aimed at SWLs who use a home computer in conjunction with a short wave receiver. It includes hints on software, hardware and bulletin boards, plus radio related software information and suppliers' addresses.

Shortwave Software, edition 2, contains three computer programs that have a direct connection with short wave radio. The listings are printed and in most instances it will be a case of typing them into the computer.

The Booklist, edition 8, is a guide to the growing number of books, tapes and magazines available for short wave listeners.

Further details are available by sending an SAE to: *Radio Nederland Wereldomroep, PO Box 222, 1200 JG Hilversum, Holland.*

G3DWW and G3ESH operating a home-built Heathkit SB101 and a MK123 Resistance type suitcase transmitter at the Wimbledon and District ARS summer camp at Chessington, Surrey. Information about the club may be obtained from the secretary, George Cripps, 115 Bushey Road, London SW20 0JN. Tel. (01) 540 2180

The European DX Council Committee is organising a survey with the help of Radio Nederland Wereldomroep, with the aim of checking the use of radio related software amongst computer enthusiasts.

The results of the survey will be made available both to the software manufacturer and the hobbyist.

A copy of the questionnaire is available at the aforementioned address.

Computer Night

The Maltby Amateur Radio Society's Computer Night is on 6 December, so if you are interested in this aspect of the hobby take your computer along.

Other events taking place in December are the Christmas junk sale on the 13th and a social gathering on the 20th.

Further information is available from Ian Abel G3ZHI (Secretary) on Rotherham 814911. All events are in the Church Buildings, Church Lane, Rotherham.

Softcasting

We need a name or generic term for the sending of information in the form of data by radio, for receipt by a number of people in an area for resolution using home computers. It is highly likely that what is being done in 'amateur nets' will become a feature of broadcasting, and it seems fairly advanced in the USA where a thousand FM stations have been enlisted for a thirty minute broadcast at night of news as 1200 baud data. This represents an enormous amount of data, so one would need to be selective in how much of this is grabbed from the airwaves, although a fairly simple automatic timing system or even an intelligent receiver could match a profile of interests in an unattended mode.

The USA has started to use the term 'softcasting', which is an interesting combination of sending software and broadcasting, but I would suggest that 'landcasting' would be even better for what we are thinking about in the UK. The idea is that everybody has heard of LANs, and we are talking about a local area network, not on telephone lines because they imply one to one operation and are comparatively expensive, but on the widely available airwaves.

The local FM radio stations have 'cellular' coverage and seem ideal for the type of news that is only of interest over a comparatively small area, say a 20 mile radius, and appear to operate without interference, so further transmitters or frequencies are not a problem.

So it is not so much a network as a Local Area News and Data service, so I propose the name 'landcasting'.

Any better ideas, comments and so forth would be welcomed on 144.725MHz FM from 7.30pm any Sunday evening at 1200 (or, if you must, 300) baud.

G3VMR

NEXT ISSUE

Radio & Electronics World

The communications and electronics magazine

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James Archer outlines the possibilities of proposals to transmit data along with entertainment broadcasts

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A novel approach to trap dipoles, complete with computer program for the calculations, by G Roberts

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FOR SALE

■ RGB colour monitor 14inch Hantarex, complete with isolating transformer and BBC type plug. No case but works well, £70 incl delivery. Acorn Electron Viewsheet ROM cartridge, unused in box, £15 ono. Cheetah speech board for BBC. Easy to program cost £25 want £15. 16K sideways RAM board for BBC from *E&CM* design, £18. Clares the Key and Replica 2 absolutely unused, £4 and £5. Graham, 10 Leadhall Road, Harrogate, N Yorks HG2 9PE. Tel: (0423) 872045

■ Two Jaybeam 13-element wideband, Band III arrays for TV DX nearly new £12 each. Tel: Roger, Nottm (0602) 200481

■ Lowe SRX30 general coverage receiver 500kHz 30MHz USB LSB AM preselector, RF gain clarifier, analogue readout, excellent condition, £85 buyer to collect. No offers. Mr Kenneth Pullen, 210 Hollet Rd, Penfilia Est, Treboeth, Swansea SA5 9ER S Wales

■ Linear HF amp, prof built, 2 x 813, 950 watts, will deliver reasonable distance, bargain £150 ono. I Butterworth, 32 Maybury St, Manchester M18 8GP. Tel: (061) 231 5870

■ Box containing 14 PCBs assorted condition ex AM10/W15AM £16.00 inc P&P. Handbooks Johnson Messenger 122/123, 323A, 320/323, 323M, 123 4 books £3.00 ea inc P&P. Sommerkamp FT277B handbook £2.50 inc P&P. Cossor VHF/FM marine ME12/18 handbook £10.00 inc P&P. Pye VHF/AM F27 Txer only + patch panel £20.00 status unknown but complete. Buyer collects Tel: C R Cooper, (0705) 386254

■ Sony ICF76000 gen cov receiver digital readout mint con with power supply boxed £115. S Devine, 6 Millburn Rd, Renfrew PA4 8UN Tel: (041) 885 0550

■ Heath H19 video terminal, RS232 serial interface with baud rates up to 9600. Good specification with many useful features. Very good condition with full documentation for operation and maintenance. Has two disc drives mounted next to screen but these can easily be removed. Price depends on whether disk drives required. For terminal alone, £140 ono. D Russell, 9 South Beach Road, Ardrossan, Ayrshire KA22 8AY. Tel: (0294) 64144

■ B40 wartime receiver, operators circuit diagram and handbook, weighs 100lbs. Frequency range 650kHz-30.5MHz, in working order. Modes are AM r/t CW SSB, price £70 ono or p/x for S27 VHF receiver, or any receiver that covers the frequency range 27.3 to 144MHz. No time wasters please. Write or call anytime Keith Winward, 120 Fairholme Court, Hemlington, Middlesborough, Cleveland TS8 9LE

■ Exidy Sorcerer 48K plus monitor, £200. Drae 4 amp 12V PSU as new, £20. Rx ATU G3WPO design, £10. Sabtronics 2037A DMM touch hold and thermometer, £20. Casio HR10 calc plus print, £10. Collect or post extra. Brian, tel: (0274) 497438. Bradford, W Yorkshire

■ Epson RX80 printer, serial or Centronics input, £150. Also Alphacom printer £45. Both as new and boxed. Post or carr extra. Last, 4 Hillside, Marham, Kings Lynn, Norfolk. Tel: (0760) 337463

■ National Panasonic communication receiver DR48 model No RF4800LBE mains/12 volt. Good condition and performance £200 ono. Akai stereo reel to reel recorder model 4000DS MkII £75. Kiff, tel: Swanley 62995 (Kent)

■ EPROMs, all erased, ex project, 2516, 2716, 2532, 2732, and 2764 all tested. Contact Don on (0843) 33398 after 6pm only

■ Epson PX-8 computer 64K lap CP/M Basic etc sale or swap for TRS80 Model 100 and printer. Trio SM220 station monitor £200. Thandar TF200. TP600 case s/manual £210. Welz SP400 130-150MHz power meter. Toyo T435 145MHz 435MHz SWR power meter £20. Dual beam scope 10MHz with manual plus sep Compowet tester 4D10A £60. Advanced Mill V 77B test meter 0.001-300V £15. 2m pre amp SME VHF ATU. UHF cavity filter tuneable. All above plus post ring anytime: (0473) 85526

■ Murphy five band communication receiver with handbook. Good condition, £70. Tel: (0297) 33999 (Devon)

■ AR2001 scanner. VHF/UHF, covering military frequencies £280. Eddystone 770U MkII Rx 150-500MHz with manual and in original condition requires some attention £85. Mobile CBs. Both AM & FM £20. 150MHz frequency display module with choice of IF offsets £20. Gary, 9 Stonebow Avenue, Solihull, W Mids B91 3UP Tel: (021) 705 9351 after 6.00pm

■ Creed 444 teleprinter and dust cover. PAG terminal unit leads paper and interface for Trio and Icom £100 ono. G0CFB, tel: Ubbeston (Suffolk) 403

■ Realistic Pro-2002 50 channel programmable scanner receiver. Bands covered, VHF-Air ham VHF-Lo VHF-Hi UHF-Hi UHF-Lo. Mains 12V dc operation with VHF UHF indoor scanner aerials £150. Stuart Thompson, 118a Albyn Road, Deptford, London SE8 4ED Tel: (01) 692 0944

■ Sony ICF2001 portable receiver, 150kHz to 29 999kHz (2,000 to 10m). AM/SSB/CW. FM 87.5 to 108MHz. Amateur bands. Full SW coverage. Digital display. PLL. Synthesised. Spare new whip antenna. Instruction and service manuals. Original box. Ideal serious short wave listener. Could post extra. £85. Nicads, and ac mains power pack extra. Alan Edwards, 32 Heldhaw Road, Bury St Edmunds, Suffolk IP32 7ES. Tel: (0284) 60984

■ Yaesu FT227R 2m FM 10W £100. Collins UHF Rx 200-400MHz £80. 28-144MHz transverter Europa £30. All good condition, working. Tel: Leeds 677101

■ Hewlett Packard 1GHz sampling oscilloscope model 185B. Plus delay line £250. Tel: (01) 586 0357

■ 1 channel (SU8) 70cm Pye base station in 19inch rack, 1 channel (SU8) 70cm Westminster, 1 channel (SU8) 70cms H/H, 10ele 70cm beam, 8ele 2m beam, rotator, 10amp PSU, desk mic, coax, odd Pye boards, £100. Hallicrafter HT-32 HF Tx and auto transformer needs attention, £25, buyer collects or pays postage. Martin. Tel: Haverhill 61410 between 5.30pm and 9.30pm

■ FT790R nicads and charger, £250 ono, pair 813s with bases £45.00, pair 572B £65.00, TB3 one month old £160, 50 foot telescopic tilt-over tower £250.00, 3 el 20m mono-bander £80.00, KR400RC £100.00, all as new and ono. Tel: (0792) 401058

■ Computer-Sinclair ZX Spectrum 'Plus', interface 1, microdrive, joystick interface, with ROM port, joystick, books, software, (ZX printer not working) – £175 ono or will split, will deliver local. 161 Palatine Road, Blackpool, Lancashire FY1 4DX. Tel: Blackpool (0253) 295603

■ Epson computer 64K PX-8 with 6 ROMs, Wordstar CP/M, Basic calc, cardbox file, just months old, will swap for TRS80 mod 100 32K. Fitted plus cables and programs printer or will sell, £600. Also will consider condition of FT290 and FT790 both. Tel: (04738) 5526 any time

■ TR3500 with base unit, charger, speaker, mic, £250.00. FT290R nicads, muTek, case, £275.00. Tel: (0628) 75266 or (0628) 37409

■ Eight track cartridge player, £10. Cartridges £1.50 each. Stereo record player, £15 with speakers. Caravan aerial VHF TV, £12. Cassette tapes, pre-recorded £1.50 each. CB legal £20. Two metre receiver £50. Xtalled portable CB, four channel, £25. CB FM with base station box, £30. Pre-amp 2-30MHz £10. Tandy two metre receiver 'Highwayman' £40. Colour TV, portable £75. Power supply 3 amp £10. Mike, 14 Doverfield Road, Brixton, London SW2 5NB. Tel: 01 674 0513, 6-8pm

■ FT101B, two spare sets PAs and driver, Shure 401A mic good rig £285, five 7360 brand new £5.00 each, six 811A for that linear, £6.00 each. Two 813 with bases, heater xformer and Labgear anode choke, £35.00. Labgear WBC £5.00 5B254M min 807 (14) at £7.50 each. 5B258M two £7.50 each, six EL34 £3.00 (pair), KT88 two £10.00 (pair), postage extra. G3VCV QTHr. Tel: Huntingdon (0480) 51232 after 6pm or (0480) 52451 ext 5654

■ Hitachi V152F, 15MHz oscilloscope with manuals and dust cover. Very good condition still under guarantee, £220. LM1, 16 channel logic monitor, unused still in original packing, new price £47.50 + VAT. Will accept £30. Antex soldering iron with ST4 stand, good condition £4.50. W Mackay, 77 Erskine Hill, Polmont, Falkirk. Tel: Polmont (0324) 713037

■ Icom IC701 with IC701PS ac PSU and IC-SM2 desk mike. Only six months use and in mint condition, £475. Willy Wilson. Tel (031) 445 2612

■ Ex-WD receivers: R1155, £15. R107 1-18MHz, 250V, £20. R208 10/60MHz, 250V, £20. R308 20-140MHz, 250V, AM-FM, 5 bands, £45. Collins R278 225/400MHz, 1750 chan, 250V with all info, £85. Scope Type II 3in, 250V, £10. Sig Gen SG-IA-ARN 88-190MHz, no PSU, boxed with diagram, £20. Buyer to inspect and collect please. All wkg. Mr C R Dugdae, 10 Shirdley Road, St Neots, Hunts, Cambs PE19 2DS. Tel: (0480) 214428.

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■ DX-TV equipment, two Wolsey Colour King wideband UHF aerials with Triax stacking filter, £40. Wolsey Quantum 260 UHF masthead amp with PSU, £25. AR1002 heavy duty aerial rotator with control unit, £35. All excellent condition, boxed. D Bird, 5 Dean Road, Woodthorpe, Nottingham.

■ 25MHz to 512Hz scanning Rx, exchange for Sony 2001 scanner Rx, cash adjustment possible, 0.51-30MHz plus VHF 76-108MHz. H McArt, 38 Mimosa Road, Wavertree, Liverpool LI5 6OF. Tel: (051) 722 3563.

■ Yaesu converter 7700D, includes 2 metre and air bands, post paid £30. Datong 2 metre converter with 12 volt supply unit, post paid, £32. Both in good condition. Letters only please. Mr Moore, 76 High Street, Ide, Exeter, Devon EX2 9RW.

■ Saba main all valve mains push-button radio. German (west) made. Has a plaque on cabinet front commemorating a military wedding in 1953. Price £10 (needs attention). Philips 206A valve mains radio (1946) – nice bakelite case, £10. Marconiphone T19A, valve mains radio (1948) £15. A collectors item. Buyer collects. Peter Titlow, 13A High St, Leiston, Suffolk. Tel: (0728) 83161C.

■ SR9 2m monitor, £20. Vega MW, LW, SW 6 band radio, £10. J D Mendham, 12 Henton Road, Edwinstowe, Notts NG21 9LB. Tel: Mansfield 823 001.

■ Hitachi V422 40MHz dual trace oscilloscope, less than year old, £350 ono or swap for 70cms multimode transceiver. Three low band boot mount Pye Westminsters, AM with control gear etc. £30 each or £75 lot. Suit ATC or similar group. John Moxham, 22 Whiting Road, Glastonbury, Somerset BA6 8HP. Tel: (0458) 34105.

■ Hitachi scope V-422, 40MHz, dual trace, never been used, includes manual and probes, bargain must be seen, £700 ono. Paul Turner, 146 Heronswood Road, Welwyn Garden City, Herts. AL7 3EU. Tel: Welwyn Garden 338582.

FREE CLASSIFIED ADS

■ Amstrad CPC464 with monitor plus £100 of software, Knightlore etc, Joystick, excellent condition boxed £185 or would like deal on Yaesu 757 etc or Cobra 148 GTLDX for 2m conversion. Tony Carr, 16 Formby St, Formby. Tel: (07048) 77322.

■ Retired and now seeking Yaesu FL400 transmitter to go with my FR400 receiver. Someone must have one under the bench full of earwigs and things. Must pass Morse before I can use it. Mr DC Buckland, G1HUN, 35 Chaston Road, Cambridge CB2 5AS. Tel: Cambs 840831.

■ Trio R1000 general coverage receiver, £140, AR2001 scanner 25-550MHz, no gaps, £240. Tel: Mark, (0628) 781075 (Maidenhead) after 6pm weekdays, anytime weekends.

■ Yaesu FRG7 receiver, unmodified, £125. Also Yaesu FRT770D tuner, £30 Realistic PRO2008 UHF/VHF scanning receiver with Discone antenna plus coax cable, £115 ono. Everything in mint condition, boxed and with full instructions. Tel: (0732) 882982 after 6pm please.

■ IC271E, fitted muTek front end, superb Icom 2 metre multi, £575. Densai base mic, used once, unwanted gift, £45. Bremi 5A-7A PSU, £15. Free Adonis AP-1 mic preamp with IC271E, use any mic. G6IAT, QTHr. Tel: Luton (0582) 23750.

■ Commodore 64 with C2N cassette, joystick, programmer's reference guide, ROM disassembly and other books. Many games and utilities, extended Basic. RTTY program. VGC, £180 ono. Andrew Panter, 2 Minerva Way, Wellingborough, Northants. Tel: Northampton 43611 (office hours)

■ General coverage receiver, must be working or repairable. Old valve model considered, must be cheap, up to £30 paid. Case condition could be poor as long as complete. Please write or phone what have you. Also cheap scope required, same condition as above. Mr M Day, 39 Valnord Lane, Saint Peter Port, Guernsey, Channel Islands. Tel: (0481) 26168.

■ BBC bits and pieces: 100K Tandon disc drive, £25. BB backup disc, vers 4, £4. BBC Viewsheet, unused. £25. Clares Replicaz and key, unused, £3. Disc cases for ten, £0.75. Cheetah speech board, £12.50. 5 volt 5 amp reg chip, £1. EPROMs 27128 250ns, unused, £3.25. Static RAMs 8K 6264 LP150, £3.75. Atari tracker ball, unused with leaflet on how to use as mouse, £12. D Graham, 10 Leadhall Road, Harrogate, N Yorks. Tel: (0423) 872045.

■ Acorn Electron ROM cartridge, Viewsheet £12 ono. 16K RAM board for BBC *E&CM* design, £15. Atari tracker ball, £12. Centipede and Missile Command cartridge, £1. Tandon disc drive top heads and various non-working drives, any offers. Tandon and MPI disc drive. PCBs, pot luck, any offers. D Graham, 10 Leadhall Road, Harrogate, N Yorks, Tel: (0423) 872045.

■ Murphy 27MHz CB, model CBH1500 base station, £30 or will exchange for rotator. Mr Berridge, 33 Wesley Drive, Worle, Weston Super Mare BS22 0TJ. Tel: (0934) 512609.

■ Trio 9R 59 DS, band spread 0.55-30.00, SSB, CW, AM. Built-in power pack, S meter, BFO, RF, AF gain. Receiver boxed and in good condition, hardly used, £40. Pensioner forced to sell. W Pettifer. 7 Brisbane Court, Croft Pool, Bedworth, Warcs CV12 8RF. Tel: Coventry 310466.

■ Telephone answering machine, twin cassette, BT approved, records two-way conversation, dictation, monitors incoming calls, announcement only facility, payphone delay, automatic shutdown, call taken indicator, automatic voice level circuit, accepts incoming message tapes of any length. Use as cassette player/recorder, cost new £115, never used. £75. Please phone Windsor (0753) 864828.

■ RSGB bulletins, now *Radio Communication* July 1951 to December 1982. Complete volumes No 27 to Vol 58, £25. Buyer collects. Hooper G3KSP, 73 Oxcliffe Road, Heysham LA3 1LY. Tel: (0524) 52275.

■ Uher Dia-Pilot F423 ¼in tape/slide synchroniser, £22 carriage paid. Wanted: info on Grundig TK5 belt replacement. Coil winder for wave winding. HF linear. FL2100, KW1000 etc, condition immaterial. Teac model 2 audio mixer. Thruline elements (250H, in particular). Tel: (0772) 37815.

■ Yaesu FRG9600 VHF/UHF receiver, 60-950MHz multimode including SSB/CW. Still under warranty with manual, discone and mobile aerials. Complete with power supply and mounting bracket. Excellent condition, £380 ono. Amstrad CPC464 computer with green monitor, manuals and lots of software. Ideal for beginners or professionals alike. Complete with RS232 port, £200. Can deliver within reasonable distance. Call Mike or Jill on Titchfield, Hants (0329) 47112 anytime.

■ AR2001 wide range scanning receiver, 25-550MHz (AM/NFM/WFM), 240V or 12V, digital readout, £190 (worth £375), for details write to Stein Ydstebo, House 52, Room 2, Castle Irwell Student Village, Cromwell Road, Salford.

■ Icom IC240, fitted seven repeater channels, seventeen simplex channels, mobile carrier, manual, mint, £110.00 ono or WHY. Reg Lever, 4 Hambleton View, Wigginton, York YO38PN. Tel: (0904) 768545.

■ Have Leak 2100 stereo amplifier, 200W very good working condition, cost £850 new. Also Sony video monitor, 22in b/w, sound, PL259 plugs sockets. Ideal for RTTY, or computer VDU. Perfect working order. Want in exchange Icom / Trio / Yaesu transceiver with 1.8 to 30MHz coverage, with ATU. Will consider any reasonable swap, for either monitor or amp-am interested in 2 mtrs. Alan Humphreys, Flat 1, 90 Brook Drive, Kennington, London SW11 4TS.

■ Rotator: Kenpro KR400RC, Jaybeam 2 metre 8 X/Y beam, 2 inch mast, wall brackets, some cable, all excellent condition. Buyer collects. £100 ono. Tel: Bristol (0272) 692558. Evenings/weekends.

■ BC221AH wavemeter, good condition, complete with calibration charts and components to make mains PSU to suit, £20 ono. G8MRN QTHr. Tel: Fareham (0329) 287333.

■ FT901DM with WARC kit, £500. FV901DM, £95. FC901, £65. SP901P £45. FT901 series workshop manual, £20. Together, £700. VGC buyer collects, Hampshire. AR22R rotator, new, £25. Belco AFR100 RF/audio signal generator 19Hz to 300MHz, £15. 24-element X or XY yagi, new, £20. Jaybeam 12XY/70, £30. 5XY/2m £25. Both with phasing harnesses. Sentinel 10m preamp £10. G3AAG. Tel: (0730) 892143 or 893534.

■ Unused capacitors, 50 for 80p. Unused resistors, 100 for 60p. 1inch vidicon, £3.50 1inch vidicon scan coil, £2.50. Two ACR13 CRTs, £5 each. One CRM123 TV tube, £5 (CRTs unused). One 21inch round USA type colour CRT (nearly new), £5. Assorted TTL chips, 10 for 60p. Various small mains transformers, cheap. Space needed. All items ono, carriage extra. Bubez, 4 Southway, Burgess Hill, W Sussex RH159ST. Tel: (04446) 2974.

■ IC271E complete with muTek board and in original packing, £575. Reason for sale going HF. Wanted: Trio 430S. Phone Peter Crosland on (0905) 620041 any time.

■ Scope, single beam, 6MHz Scopex 456 with padded travelling case, manual, circuit, hardly used, £75. Leader LSG17 RF sig gen 100kHz to 450MHz, £50. GSC 4001 pulse generator rep rate 1Hz to 10MHz, pulse width 100ns to 1sec, £40. John. Tel: Bredon (0684) 73180 evenings.

■ 931A photomultiplier with base, £3. Ten 4-pin neon stabiliser tubes, 30p each or £2.50 the lot. Various valve bases, British octal B7G B9A, 20p each. 410SG and 410HL valves, what offers? Push-on push-off switches, suit PCB or panel mounting, 10p each. Ferrite rings approx 1½ins diam 30p each. All items postage extra. Bubez, 4 Southway, Burgess Hill, West Sussex RH159ST. Tel: (04446) 2974.

■ Ex-WD receivers: R1155, £15. R107 1-18MHz, 250V, £20. R208 10/60MHz, 250V, £20. R308 20-140MHz, 250V, AM-FM, 5 bands, £45. Collins R278 225/400MHz, 1750 chan, 250V with all info, £85. Scope Type II 3in, 250V, £10. Sig Gen SG-IA-ARN 88-190MHz, no PSU, boxed with diagram, £20. Buyer to inspect and collect please. All wkg. Mr C R Dugdae, 10 Shirdley Road, St Neots, Hunts, Cambs PE19 2DS. Tel: (0480) 214428.

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WANTED

■ Plug-in SSB unit for Grundig Satellit, early edition of Amateur Radio Techniques about 1960, practical oscilloscope book showing hook-ups for all applications, practical coil winding book giving lots of tables and diagrams, preselector for Racal RA17L, early valve and rectifier data book by Ball. Mr H Lear, Flat 86, Block 205 Wensley Road, Reading, Berks.

■ 250-0-250V 0.5A 6.3V transformer for 'scope. JD Mendham, 12 Henton Road, Edwinstowe, Notts NG21 9LB. Tel: Mansfield 823001.

■ Info on Grundig TK5 belt replacement. Coil winder for wave winding. HF linear, FL2100, KW1000 etc, condition immaterial. Teac model 2 audio mixer. Thruline elements (250H in particular). Tel: (0772) 37815.

■ Motorola radios, Clansman PRC320 or similar HF manpack, decent automatic modulation meter, eg Racal etc, Datong radio direction finder. Manual for Farnel modular signal generator, 10-512MHz oscillator to buy or borrow. Mark GW4YOM. Tel: Cardiff (0222) 29647 after 6pm.

■ ICL 1501 computer, hardware. Guts of a modern naval auto antenna tuner on aluminium chassis, beautifully made. Pye PF7. Multiway battery charger. Plessey Radar solid-state 'S' band microwave amplifier with micrometer tuning control, gain control, integral PSU and blower. Microwave solid-state signal source, scaled 3.45-8.66GHz with scope and PSU built-in. Sensible offers please. Swaps possible WHY. Mark GW4YOM. Tel: Cardiff (0222) 29647 after 6pm.

■ Circuit diagram or service data for Rochar A1149C counter timer. Galvin, 1 Grab Hay Cottages, Eastcourt, Malmesbury, Wilts SN16 9HN. Tel: Crudwell 7820.

■ Burndept VHF H/H. With charger and batteries. Jon, 51/57 Chase Side, London N14.

■ Wanted for spare parts your old Codar AT5 Txs and Heathkit RA1 Rxs. Send details, price and condition to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

■ Trio 430S. Phone Peter Crosland on (0905) 620041 anytime.

■ Data and help wanted for Mullard single board comms computer and Perdio L/M/S table radio. Computer is Mullard VM 5022 with Z80A Dart CTC and onboard modem 64K RAM. Also has slots for 1791 controller board and interfaces: IEEE, 80 col, graphics, RAM. Perdio radio has fault in that tuning off station causes distortion and lack of

volume which can only be regained by switching off and on again. Graham, 10 Leadhall Road, Harrogate, N Yorks HG2 9PE. Tel: Hgate 872045

■ Software and hardware for Heath or Zenith H89 or 290 computer system. Tel: Calne (0249) 816319 or write John Steinwand, 18 Atcherly Road, Compton Bassett, Nr Calne, Wilts

■ Aircraft items wanted for enthusiast's personal collection. Any aeronautical parts, instruments, manuals, charts, components, WHY? Anything to do with flying will be considered! Godfrey G4GLM, 63 The Drive, Edgware, Middlesex, HA8 8PS. Tel: (01) 958 5113

■ Any electronic components or damaged circuits or radios. Also any radio circuit plans or manuals, for newly formed Scouts electronic club. Postage will be refunded. Andrew Holter, 122 Stanley Road, Gloucester. Tel: Gloucester 500145

■ Urgent. Does anyone have any old Denco coils (ranges of all types) to fit B9A valve socket or info on Denco coils (will attempt to wind own). Also used var. caps (0-500pF). Newcomer to SWL wishing to build own short wave radios, most grateful if anyone can help with any info/components whatever willing to pay all P&P cost. PM Keirle, 27A Friarn Street, Bridgwater, Somerset TA6 3LH. Tel: (0278) 428633 (anytime)

■ Scopex 14D-10 oscilloscope power supply (functional) and/or circuit diagrams for all or part of the instrument. Alan Payne, Jo-al, 22 Buckhurst Way, East Grinstead, Sussex RH19 2AF Tel: 312329

■ ATU such as FRT7700 or AT1000 or one suitable for QRP. Must be unmarked so fair price paid. Phone Tom on (0536) 522007 or write to 5 Centre Parade, Kettering, Northants NN16 9TL

■ Short wave Rxs in any cond decent prices offered to anyone wanting to get rid of their old SW Rxs. Would especially like to hear from anyone who has an Eddystone S640 and would like to part with it. If you can help new SWL please write stating type and price of Rx for sale. All letters replied to. For details contact Martyn EDX16, PO Box 5, Livingstone EH54 6TT, Scotland

■ Does anyone have any of these Rxs: Grundig Yachtboy 310; Audio Sonic TKS 325; Vega Selena 210 or 212; Philips D1835; Silver XF1900. Decent prices offered for these or similar Rxs. Condition is not important, all letters will be answered. Rxs *must* have SW coverage. For further info please write stating make of Rx and asking price. Martyn Whyte, 5/4 Greendykes House, 14 Greendykes Road, Edinburgh EH16 4JJ, Scotland

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■ Disc drive for CBM64. Also suitable printer or any other add-ons. Tel: (0662) 46837

■ KW2000 B or E with PSU. Similar rig might suit. Also require parts for VHF/UHF valve linear 2C39A. 4CX250B bases etc. Tel: (0662) 46837

■ Royal Navy 'Electra' receiver. RAF equipment: R1124C, R1125, R1084, test oscill type 12, TR-1196, A-1134a junction box. Control unit 10A. For museum. Need not to be working will collect. Cash or swap with other WW2 equipm. OZ8RO Rae Otterstad, Vejdammen 5, DK-2870 Holte, Denmark. Tel: 010 452 801875

■ Circuit diagram for Tektronic 531 oscilloscope D Lucas, 38 St Vincent Crescent, Glasgow G3 8NG (041) 221 1172

■ I want the most expensive radio going, so if anyone has got the nine of hearts on a black background from Super Kings, they too could buy the most expensive radio in the whole of the UK. Mr P Coulson, Streatham, London SW16. Tel: (01) 769 1204

■ Modern solid state HF transceiver suitable for mobile or base preferably with GC receive. Cash waiting for right rig. John Clemence G3YHK Tel: Felixstowe 286616

■ For museum: R1124C receiver, R1125 marker receiver, R1084 ground stn receiver, 10A/11841 control unit, type 12A test osc, type 5A test set, TR1196 Tx/Rx, A-1134a junction box, AR-77 receiver, German WW2 equipment, manuals etc, will collect. Rae Otterstad OZ8RO, Vejdammen 5, DK-2840 Holte, Denmark. Tel: 010 452 801875

■ WW2 British airborne radio collection requires R1116, T1115, R1082, T1083, H2S, Gee Mk1, also loan of any RAF manuals for these sets (will photostat and return). Also need bits and pieces for these and other airborne set-ups WHY? Willing to swop items or buy, collection possible if in Midlands. Colin Baker, 71 Sunnyhill Ave, Derby DE3 7JR. Tel: Derby 769404

■ Heath RA1 Rx for modifying for special project. Must be working, but ok if paint work is a bit 'tatty'. Please phone Slough 75780

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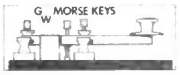
Ensure that you have included your name and address, and/or telephone number

CONDITIONS: Your ad will be published in the first available issue. We will not accept trade advertisements. We reserve the right to exclude any advertisement.

SMALL ADS

GW MORSE KEYS



4 Owen Close, Rhyl, Clwyd LL18 2LQ
Tel: 0745 54763

"NEW" THE GW LIGHT KEY "NEW"

This is the key for the 30wpm + man, very light with no piviot to slow the key down. Only **£34.99** inc VAT. Available in a kit, inc slate base only **£23.50** inc VAT.

THE GW BRASS KEY

Still the best selling brass key in the UK today, a joy to use and to look at. Only **£34.99** inc VAT.

VIBROPLEX KEYS

The Presentation only **£129.62**

Original Std.....	**£70.54**	Delux	**£82.74**
Vibro key Std	**£63.98**	Delux	**£78.09**
Lambic Std.....	**£63.98**	Delux	**£78.09**

Brass Racer Lambic only **£54.59**
All + £2.00 post and packing

WHY PAY £60.00 + FOR A PEP METER

Most radio amateurs possess a power meter and the **GW PEP Module** allows them to carry out a simple modification at little cost and provide themselves with a **true PEP METER**. Only **£9.95+ 60p** P&P.

Come along at anytime and have a day out at Rhyl.

STAR MASTERKEY £49.95 · SPC 300 ATU £164.00 · SPC 3000 ATU £205.00 · Dipole of Delight All versions ex stock · CW and Rtty interface · New Audio Filters for CW

B45HG VIDEO

Transmit from your video recorder throughout the house. Price £8.90 + P&P 50p. SAE for leaflet:

Electronic Mailorder
62 Bridge Street, Ramsbottom
Lancs BL0 9AG
Tel: 070682-3036

SERVICE MANUALS

Ham Concorde 2, Ham multimode 2, Ham Jumbo 2, Ham Viking, Ham Puma, Cobra 148 GTL DX, PC 879 and PB010. Colt 1600 DX, Tristar 777, York 863, York 861.

All above at **£6.00** + **£1.00 p&p** each. Other, rigs and spare parts available. 10m conversion for FMCB rigs **£30** + **£1.50 p&p**
Details on request.

CBT
RE1, 1 Prince of Wales Road, Swansea. Tel: (0792) 463821.

MORSE READER PROGRAMMES

SPECTRUM · BBC 'B' · DRAGON · CBM 64 · VIC 20 · ZX81 16K · ATARI 600/800XL · AMSTRAD 464

Sinclair computers need NO interface, others use simple one transistor (BC107 or similar) interface. Programmes self tracking 8/30 WPM. All connections to existing sockets. Cassette with full instructions and interface circuit where required £6.00 inc P&P. Interface built and tested £2.50 inc P&P.

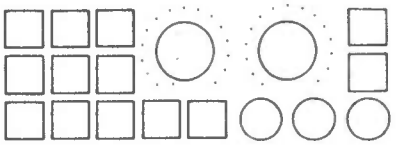
RTTY

FOR YOUR 48K SPECTRUM

Menu driven, 10 programmable memories, split screen, morse ident, four baud rates, etc etc. NO TERMINAL UNIT, just a simple filter! Cassette with full instructions, circuit and filter layout £8.50 or SAE for full details. Filter unit built and tested £6.00.

JEP ELECTRONICS
NEW ROAD COMPLEX
NEW ROAD
KIDDERMINSTER DY10 1AL
TEL: 0562 753893

COUNTY GUIDE



★ SERVICE MANUALS ★

For **ALL** electronic equipment. Any age, make, model. Amateur Radio, Test Equipment, Televisions, Colour & Mono, Vintage Wireless, Audio, Music Centres, Video etc. Thousands stocked.
sae enquiries and quote BY RETURN.
MAURITRON TECHNICAL SERVICES
DEPT REW, 8 Cherry Tree Road, Chinnor, Oxon, OX9 4QY.

YEASU FT 757 GX CAT CONTROL PROGRAM FOR BBC COMPUTER

Full control of transceiver, with selectable freq step rates. 300 memory storage per file. Split and A/B Vfo selection. In fact all the extras that are missing from Yeasu. This is a boon to the SWL it allows scanning of all your special stations without twiddling the knob. This works with the Yeasu interface or we can supply one at less than half price. The prog is available on disc at £10 or 16K Rom at £15.00. We have thoughts on other programs for Yeasu 9600 and 8800 let us know your interest regarding other CAT progs.
Other products RTTY RC Boards units for the BBC Com 64 Amstrad and many mor computers. Also AMTOR for the BBC. Amtor timing Pc boards now available.

Please SAE or Ring
J MELVIN G3LIV
2 Salters Court,
Gosforth, Newcastle,
Tyne & Wear NE3 5BM
TEL: 091 2843028

NOTTS

Thanet Electronics — ICOM
95 Mortimer St, Herne Bay
Tel: 02273-69464
Open: Mon, Tues, Wed 9-5
Thurs 9-1, Fri, Sat 9-5.30
All mail order & service enquiries to head office, 143 Reculver Rd, Tel: 02273-63859

AIRLINK TRANSFORMERS

Manufacturers of torodial and standard transformers.
Competitive prices. Fast delivery.
Phone Mike Dornan
Newmarket (0638) 662989

KIM 1 Single Board Computer Wanted,
Good Price Paid
PHONE: MR CLARKE 01-346-9271
Office Hours

Telephone the advertising department on: 0277 219876 for details

COUNTY GUIDE

Ad sizes
20mm x 59mm = single County Guide
40mm x 59mm = double County Guide

Total prepayment rates	Ad space	3 issues	6 issues	12 issues
	single	£47.00	£88.00	£158.00
	double	£94.00	£176.00	£316.00

RADIO & ELECTRONICS WORLD COUNTY GUIDE ORDER FORM

TO: Radio & Electronics World · Sovereign House · Brentwood · Essex · CM14 4SE · England · (0277) 219876

print your copy here .....

.....

.....

.....

.....

NUMBER OF INSERTIONS REQUIRED

Single County Guide	3 ..... £47.00 ☐	6 ..... £88.00 ☐	12 ..... £158.00 ☐
Double County Guide	3 ..... £94.00 ☐	6 ..... £176.00 ☐	12 ..... £316.00 ☐

PAYMENT ENCLOSED £ —

Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

Conditions — Payment must be sent with order form. No copy changes allowed. Ads accepted subject to our standard conditions, available on request.

Registered No 2307662 (England)

C P I

Radio & Electronics World
The communications and electronics magazine

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
Jan 86	14 Nov 85	20 Nov 85	22 Nov 85	12 Dec 85
Feb 86	9 Dec 85*	13 Dec 85*	17 Dec 85*	9 Jan 85
Mar 86	16 Jan 86	22 Jan 86	24 Jan 86	13 Feb 86
Apr 86	13 Feb 86	19 Feb 86	21 Feb 86	13 Mar 86

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

NEW 1985/86 Catalogue is now available – range of components greatly increased – over 136 pages fully illustrated. Price £1.00 per copy (free upon request with orders over £15.00). Includes 50p Credit Note, Special Offer Sheets, Order Form and Pre-Paid Envelope. Order your copy now – will be despatched within 7 days.

PLUGS & SOCKETS

Metal Co-ax Plug	0.18
Plastic Co-ax Plug	0.14
Metal Line Socket	0.32
Single Junction Socket	0.80
Plastic Phono	0.10
F M Plugs	0.20
PL259 Plugs	0.38
Reducer	0.15

FUSEHOLDERS

20mm Panel Mounting	0.28
20mm Chassis Mounting	0.06
1¼" Panel Mounting	0.35
1¼" Chassis Mounting	0.12
Carline 1¼" Holder	0.10

TELEPHONE SPECIAL

BT App Telephone Plug – 3m Lead	1.25
BT App Master Socket Inc. Wiring Instrns	2.85
BT App Secondary Socket	1.95
4 way plug	0.58ea 10/£5.50
BT 4-Core Cable per metre	.15
100 metres	12.00
Cable clips for above	100/75p

NI-CAD

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

RECHARGEABLE BATTERIES

AA (HP7)	0.85 ea	10/0.75 ea.
C (HP11)	1.75 ea	10/1.65 ea.
D (HP2)	2.05 ea	10/1.95 ea.
PP3	3.80 ea	10/3.70 ea.

SPEAKERS

4" round 1.6W. 4ohm	£1.50 pr
4" round 1.6W 4ohm Plus Mounting Bracket	£1.00 ea
2¼" round 0.4W 8ohm	£0.85 ea

MIN 'D' CONNECTORS

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

SPECIAL OFFER – NOV/DEC ONLY

DESOLDER PUMP – normally £4.50

NOW **£2.99**

only available with orders of £10.00 and over

Look for our 'Special Offer' for each month

Terminal Blocks

2 amp	12 way	0.20
5 amp	12 way	0.24
15 amp	12 way	0.42
32 amp	12 way	0.88

ZENER DIODES

400mW Plastic 3V-30V **8p each 10/70p**

1/1.3W Plastic 4.7V-120V

12p each 10/£1.10

*1.5W Plastic 11V-75V **1.25 each 10/11.50**

*2.5W Plastic 75V-75V **0.75 each 10/7.00**

*15W Plastic 12V-30V **85p each 10/8.00**

*20W Metal 7.5W-68V **1.32 each 10/11.60**

*Only Available while Stocks Last

*Zener Diode Pack-400mW-5 each-value-11 values-individually packed & marked

55 Zener Diodes **3.50 per pack**

Soldering Section

XS25W Iron Kit/complete with stand & plug attached	10.00
CS 18W as above	9.90
Antex 15W iron	5.25
Antex 18W iron	5.50
Antex 25W iron	5.75
Antex elements	2.75
Antex bits	0.90
Antex stands	2.10
Soldersucker	4.50
Spare nozzles for Soldersucker	0.65

SERVICE AIDS

Switch Cleaner	1.18
Circuit Freezer	1.34
Foam Cleanser	1.18
Aero Klene	1.10
Plastic Seal	1.28
Excel Polish	1.12
Antistat Spray	1.18
Aero Duster	1.40
Super 40	1.82
Video Head Cleaner	1.06
Fire Extinguisher	3.06
Silicone Grease Aer	1.42
Ditto Tube	1.64
Heat Sink Compound	1.08
Solda Mop 0.12mm	0.74
Ditto 0.06mm	0.76

PRESETS

0.25W Type 100R-4m7 V&H **10p ea 10/90p**

0.1W Type 100R-1M V&H **7p each 10/65p**

CMOS

4000	0.19
4001	0.24
4002	0.24
4006	0.68
4007	0.24
4008	0.59
4009	0.44
4010	0.39
4011	0.23
4012	0.24
4013	0.35
4014	0.58
4015	0.58
4016	0.38
4017	0.54
4018	0.59
4019	0.59
4020	0.78
4021	0.58
4022	0.68
4023	0.30
4024	0.49
4025	0.24
4026	0.89
4027	0.44
4028	0.44
4029	0.73
4030	0.33
4031	1.28
4033	1.25
4034	1.40
4035	0.68
4036	2.48
4038	0.73
4039A	2.70
4040	0.58
4042	0.48
4043	0.42
4044	0.48
4046	0.58
4049	0.38
4050	0.34
4051	0.68
4052	0.58
4053	0.58
4066	0.44
4068	0.24
4069	0.24
4070	0.24
4071	0.24
4072	0.24
4073	0.24
4075	0.24
4076	0.68
4077	0.24
4078	0.24
4081	0.24
4082	0.24
4085	0.58
4086	0.58
4089	1.22
4093	0.37
4094	0.70
4095	0.93
4096	0.98
4097	2.65
4098	0.78
4099	0.75
4161	0.96
4162	0.96
4163	0.96
4174	0.96
4175	1.00
4195	0.99
4501	0.38

INTEGRATED CIRCUITS (C) EACH

709	0.35
741	0.25
747	0.70
AN214Q	3.80
AN240P	3.42
BTT6218	1.98
CA301AT	2.88
CA58E	0.66
CA810CM	1.20
CA3020	2.10
CA3065	1.60
CA3080E	0.68
CA3130E	0.90
CA3140	0.45
HA1366W	1.59
LA4422	3.20
LC7131	4.90
LC7137	5.40
LM324N	0.45
LM380N8-P	1.15
LM380N14-P	1.80
LM1011N	3.20
LM1458N	0.98
LM3900N	0.65
M51513L	2.30
M51515L	3.18
MC1307P	1.99
MC1327P	1.50
MC1330P	1.60
ML23213	2.10
ML23713	2.30
NE555	0.25
SAA1025	4.00
SAS560	2.50
SAS570	1.65
SAS580	2.85
SN76023N	2.00
SN76033N	2.50
SN76131N	1.99
SN76226DN	1.70
SN76227N	1.10
SN7666ON	0.75
SN76666NO	1.40
STK015	6.20
TA7146P	4.60
TA7203P	2.76
TA7204P	1.50
TA7205AP	1.30
TA7222P	2.32
TAA550	0.50
TAA611A12	3.50
TAD100	2.90
TDA120A	0.80
AS/S/SB/T/U	0.80
TDA120B	1.30
SA/SQ/UQ	1.30
TBA520	1.50
TBA530	1.20
TBA540	1.64
TDA560C	1.50
TDA800	0.80
TBA810S	1.20
TBA950/2A	3.05
TCA270SA	4.02
TDA1003A	5.50
TDA1004	4.95
TDA1006A	2.45
TDA1035S	2.20
TDA1170S	1.99
TDA1352A	1.80
TDA2002	1.80
TDA2020	4.00
TDA2030	1.90
TDA2140	2.90
TDA2160	2.50
TDA2522	2.75
TDA2530	2.20
TDA2532	2.80
TDA2543	3.20
TDA2581	4.60
4502	0.58
4503	0.38
4507	0.45
4508	1.28
4510	0.54
4511	0.54
4512	0.54
4514	1.10
4515	1.20
4516	0.60
4517	2.70
4518	0.48
4520	0.50
4521	1.10
4522	1.20
4526	0.58
4527	0.64
4528	0.68
4531	1.20
4532	0.64
4536	2.50
4538	0.76
4539	0.80
4541	0.94
4543	0.70
4549	3.96
4553	2.40
4554	1.80
4555	0.34
4556	0.54
4557	2.40
4558	1.10
4559	3.90
4560	1.50
4562	3.48
4566	1.60
4569	1.75
4583	1.00
4584	0.54
4585	0.55
40100	2.10
40101	1.20
40102	1.30
40103	3.95
40104	1.15
40105	2.10

74LS

74LS00	0.24
74LS01	0.24
74LS02	0.24
74LS03	0.24
74LS04	0.24
74LS05	0.24
74LS08	0.24
74LS09	0.24
74LS10	0.24
74LS11	0.24
74LS12	0.24
74LS13	0.33
74LS14	0.48
74LS15	0.24
74LS19	0.44
74LS20	0.24
74LS21	0.24
74LS22	0.24
74LS24	0.28
74LS26	0.24
74LS27	0.24
74LS28	0.24
74LS30	0.24
74LS32	0.24
74LS33	0.24
74LS37	0.24
74LS38	0.24
74LS40	0.24
74LS42	0.50
74LS47	0.79
74LS48	0.85
74LS51	0.24
74LS55	0.24
74LS73	0.30
74LS74	0.33
74LS75	0.44
74LS76	0.38
74LS78	0.38
74LS83	0.68
74LS85	0.82
74LS86	0.35
74LS90	0.48
74LS91	0.90
74LS92	0.54
74LS93	0.54
74LS95	0.60
74LS96	1.20
74LS107	0.40
74LS109	0.44
74LS112	0.44
74LS113	0.40
74LS114	0.39
74LS122	0.68
74LS123	1.00
74LS124	1.25
74LS125	0.52
74LS126	0.50
74LS132	0.60
74LS135	0.26
74LS136	0.42
74LS138	0.44
74LS139	0.58
74LS145	0.93
74LS147	1.64
74LS148	1.28
74LS151	0.70
74LS153	0.70
74LS155	0.55
74LS157	0.45
74LS158	0.58
74LS160	0.62
74LS161	0.68
74LS162	0.70
74LS163	0.68
74LS164	0.74
74LS165	1.10
74LS166	1.50
74LS168	1.48
74LS170	1.40
74LS173	0.98
74LS174	0.75
74LS175	0.70
74LS190	0.82
74LS192	0.98
74LS193	0.98
74LS194	0.75
74LS195	0.74
74LS 196	0.84
74LS197	0.96
74LS221	0.85
74LS240	0.80
74LS241	0.80
74LS242	0.94
74LS243	0.94
74LS244	0.80
74LS245	1.20
74LS247	1.00
74LS251	0.75
74LS257	0.73
74LS258	0.75
74LS259	1.20
74LS266	0.53
74LS273	1.20
74LS279	0.70
74LS283	0.80
74LS353	1.10
74LS365	0.50
74LS366	0.50
74LS367	0.50
74LS368	0.50
74LS373	1.00
74LS374	1.00
74LS375	0.70
74LS377	1.25
74LS378	0.95
74LS390	0.60

RESISTORS – CARBON FILM 5%

¼W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
½W 1RO to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 1OM (E12 Range)	7p each. 40p/10. 3.50/100
2W 10R to 1OMm (E6 Range)	8p each. 60p/10. 5.00/100

RESISTOR KITS – each value individually packed

¼W pack 10 each value E12 – 10R – 1M 610 pieces	5.75
¼W pack 5 each value E12 – 10R – 1M 305 pieces	3.35
½W pack 10 each value E12 – 2R2 – 2M2 730 pieces	7.95
½W pack 5 each value E12 – 2R2 – 2M2 365 pieces	4.75
1W pack 5 each value E12 – 10R – 1OM 365 pieces	15.00
2W pack 5 each value E6 – 10R – 1OM 365 pieces	18.50

RESISTORS – WIREWOUND Generally 5%

2.5W 0.22 to 270R	15p each 1.40/10
4W 1RO to 10K 1RO to 680R	14p each
1K – 3K3	15p each
4K7 – 6K8	18p each
10K	22p each
7W 1RO to 22K 1RO to 5K6	15p each
6K8 – 12K	16p each
15K – 22K	17p each
11W 1RO to 22K 1RO – 4K7	18p each
6K8 – 10K	19p each
15K – 22K	22p each
17W 1RO to 22K 1RO – 10K	24p each
15K – 22K	25p each
Support pillars for 4W/7W/11W/17W/	4p each 30p/10
25W 0.47R – 47OR	1.48 each 12.50/10
50W 0.47R – 47OR	1.85 each 13.00/10

CHART RECORDER SPECIAL

Brand new 3 channel pen recorders complete with charts. Full spec upon request once only price **£40 – £10 p&p – VAT**

SCREENED CURLY LEADS

Black – 3 core (2 metres extended) **75p each £6.00/10**

CAPACITORS

Mixed Dialectic

01mf 1000V	0.30
022mf 1000V	0.20
1mf 1000V	0.48
47mf 1000V	0.78

POTENTIOMETERS

Carbon Track. Rotary 0.25W Log & 1 in values. All ¼in Spindle. 20ml body dia. Shaft 2" long.

4K7-2M2 Single Gang Log	40	10/3.80
1K – 2M2 Single Gang Lin	.38	10/3.50
5K – 2M2 Single Gang DP Switch Log	1.05	10/9.50
5K – 2M2 Double Gang Log & Lin	1.25	10/10.50

DE-LUXE EMERGENCY LITE

Operates from 12V DC. comes complete with 4 metres of cable and cigar lighter plug for easy operation. Magnet base and solid state controlled blinking switch are incorporated **99p**

CERAMIC CAPACITOR PACK

50V. Ceramic Capacitors – 5 each value

25 values – each value individually marked and packed – 125 total **£3.50** per pack.

D.C MOTORS (Min)

6-12V **75p £3.00/5**

FUSES Prices per 10

20mm Quick Blow 100 125 160 200 250 315 400 500 630 800mA 1. 1.25 1.6 2 2.5 3.15 4 5 6.3A **40p 20mm Time Delay** 100 125 160 200mA **£1.80** 250 315 400 500 630 800mA **£1.00** 1 1.25 1.6 2 2.5 3.15 4 5 6.3A **85p 1" Mains** 2 3 5 13A **85p**

TRANSISTORS DIODES

Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
AC127	0.28	BC125	0.14	BC440	0.36	BF158	0.30	BRY56	0.42	BYX10	0.20	TIS43	0.88
AC128	0.30	BC140	0.27	BC441	0.40	BFR160	0.23	BSX19	0.32	BYX36/150	0.40	TIS88	0.50
AC128K	0.34	BC141	0.26	BC461	0.58	BF167	0.32	BSX20	0.30	BYX36/600	0.48	TIS90	0.27
AC141	0.58	BC142	0.24	BC478	0.24	BF177	0.42	BSX59	0.78	BYX48/300	0.70	TIS20	2.45
AC141K	0.38	BC143	0.26	BC516	0.48	BF178	0.26	BSX76	0.65	BYX55/600	0.30	Y728	0.14
AC142	0.56	BC147	0.18	BC547	0.12	BF180	0.27	BSY52	0.35	BYX71/600	1.18	Y969	2.80
AC142K	0.38	BC147B	0.14	A or B	0.10	BF181	0.27	BSY95A	0.25	BYZ212	0.78	ZE75	0.60
AC151	0.45	BC148	0.10	BC548	0.12	BF182	0.32	BT100A/02	0.90	C106D (400V)	0.48	ZTX107	0.14
AC152	0.45	BC148B	12	A B or C	0.10	BF183	0.32	BT101 300	2.75	C106F (50V)	0.36	ZTX502	0.22
AC153	0.57	BC149	0.10	BC549	0.10	BF184	0.30	BT101 500	3.25	D40C1	1.08	IN4001	0.04
AC153K	0.46	BC149C	0.14	A or B	0.10	BF185	0.28	BT102 300	3.60	D40N1	1.12	IN4003	0.05
AC176	0.30	BC157	0.10	BC550	0.10	BF194A	0.15	BT106	1.15	E1222	0.30	IN4004	0.05
AC176K	0.38	BC158	0.12	A or B	0.10	BF195	0.12	BT108	1.25	E5024	0.30	IN4006	0.07
AC187	0.28	BC159	0.12	BC557	0.10	BF200	0.30	BT109	1.15	GET872	0.60	IN4007	0.07
AC187K	0.38	B/C	0.14	BC558A	0.10	BF222	0.38	BT116	1.20	GET881	1.70	IN4148	0.04
AC188	0.28	BC160	0.30	BCY70	0.16	BF224	0.16	BT119	3.30	GET882	1.90	IN5400	0.12
AC188K	0.38	BC161	0.30	BCZ10	£3.21	BF224J	0.20	BT120	3.50	ITT2001	0.18	IN5402	0.13
ACY22	1.50	BC168B	0.20	BCZ11	£2.60	BF240	0.30	BT121	2.99	ITT2003	0.34	IN5405	.16
AD142	0.88	BC169C	0.12	BD124P	0.70	BF241	0.30	BT138/600	1.30	MCR106/5	1.20	IN5406	0.17
AD143	0.88	BC170	0.16	BD129	0.90	BF244	0.34	BT151/560R	0.90	ME0413	0.70	IN5408	0.19
AD149	0.72	A B or C	0.16	BD130Y	0.68	BF244A	0.30	BTY79 400R	2.80	ME6002	0.26	IS44	0.06
AD161/162	1.20	BC171	0.10	BD131	0.36	BF257	0.22	BU100A	2.30	MEU21	0.62	IS920	0.07
AD162	0.52	A or B	0.10	BD132	0.36	BF258	0.26	BU104	1.80	MJ400	0.45	2N1306	1.42
AF114	1.20	BC172	0.12	BD135	0.26	BF259	0.30	BU105	1.20	MJ2955	1.00	2N2122A	0.34
AF115	2.10	B or C	0.12	BD136	0.26	BF262	0.34	BU105/02	1.55	MJ3000	1.80	2N2222	0.30
AF116	2.10	BC177	0.24	BD137	0.28	BF263	0.30	BU108	1.75	MJE340	.0.46	2N2904A	0.48
AF121	0.56	A B or C	0.24	BD138	0.30	BF270	0.30	BU124AE	0.98	MJE520	0.44	2N2926G	0.14
AF124	0.42	BC182	0.10	BD139	0.30	BF271	0.28	BU126	1.40	MJE2955	1.60	2N3053	0.30
AF125	0.58	A B or C	0.10	BD140	0.28	BF273	0.22	BU133	1.90	MJE3055	1.40	2N3054	0.60
AF126	0.58	BC182L	0.12	BD142	1.26	BF274	0.34	BU204	1.30	MPSA05	0.30	2N3055	0.65
AF127	0.38	LA LD LC	0.12	BD145	1.82	BF294	0.46	BU205	1.30	MPSA12	0.30	2N3703	0.10
AF139	0.40	BC183	0.10	BD150B	0.72	BF336	0.32	BU206	1.50	MPSL01	0.34	2N3773	2.80
AF178	2.28	A B or C	0.10	BD160	1.58	BF337	0.28	BU208	1.40	MPSU05	1.05	2N3904	0.20
AF239	0.50	BC183L	0.10	BD165	0.45	BF338	0.28	BU208A	1.40	MPSU06	1.18	2N3906	0.20
AF279S	1.40	LA LB LC	0.10	BD183	0.70	BF355	0.37	BU208'02	2.05	MR502	0.40	2N5294	0.80
AL100	5.40	BC184	0.10	BD201	0.52	BF363	0.35	BU326S	1.75	MR854	0.86	2N6107	0.80
AL102	4.40	A B C L LC LB	0.10	BD202	0.57	BF367	0.24	BU407	1.10	NKT SER18	1.68	2SB337	1.80
ASY80	5.20	BC207	0.15	BD204	0.50	BF371	0.27	BUX80	3.70	OA91	0.07	2SC1098	0.64
ASZ17	2.00	BC212	0.10	BD222	0.80	BF422	0.20	BUY20	2.75	OA210	0.66	2SC1172Y	1.70
AU110	2.80	A B or C	0.10	BD225	0.40	BF450	0.38	BUY69A	2.60	OC26	2.65	2SC1173Y	0.88
AY102	4.32	BC212L	0.09	BD232	0.45	BF457	0.36	BUY69B	1.98	OC35	4.75	2SC1279	0.50
B40C2200	1.03	LA LB	0.10	BD234	0.30	BF458	0.37	BY100	0.80	OC36	1.75	2SC1306	0.92
BA110	0.68	BC213	0.10	BD235	0.30	BF459	0.35	BY103	0.50	OC44	0.72	2SC1307	1.50
BA115	0.14	A B or C	0.10	BD236	0.38	BFR51	0.36	BY122	0.60	OC72	0.70	2SC1413A	2.70
BA121	0.40	BC213L	0.10	BD237	0.38	BFR61	0.32	BY126	0.10	OC81	0.68	2SC1449	0.60
BA129	0.38	LA LB LC	0.10	BD410	0.76	BFR90	0.86	BY127	0.08	ORP12	0.85	2SC1507	0.60
BA148	0.16	BC237	0.11	BD434	0.58	BFT41	0.68	BY133	0.08	R2008B	1.20	2SC1678	1.00
BA155	0.12	BC238	0.12	BD438	0.58	BFT43	0.86	BY135	0.35	R2010B	1.20	2SC1758	0.88
BA157	0.28	BC251	0.14	BD439	0.85	BFW11	0.64	BY161	0.45	R2010B	1.20	2SC1909	1.20
BB105B	0.30	AB	0.14	BD441	1.00	BFW44	0.88	BY179	0.56	R2540	2.71	2SC1923	0.30
BB105G	0.48	BC262	0.26	BD507	1.05	BFX29	0.28	BY182	0.80	TIC45	0.45	2SC1945	2.88
BB110B	0.42	AB	0.28	BD520	1.20	BFX48	0.76	BY184	0.38	TIC47	0.70	2SC21953	0.70
BC107	0.10	BC301	0.30	BD687	0.88	BFX80	6.46	BY187	0.65	TIC29	0.30	2SC1957	0.70
A or B	0.12	BC302	0.30	BD707	0.88	BFZ85	0.35	BY189	6.75	TIP30A	0.32	2SC1969	2.80
BC108	0.10	BC303	0.30	BDX18	1.00	BFY50	0.22	BY198	0.64	TIP31C	0.39	2SC2028	0.73
A B or C	0.13	BC307A	0.16	BDX32	1.48	BFY51	0.22	BY199	0.72	TIP32	0.35	2SC2029	2.70
BC109	0.10	BC317A	0.12	BF115	0.32	BFY52	0.22	BY206	0.14	TIP33A	0.55	2SC2078	1.05
A B or C	0.14	BC323	0.90	BF117	0.50	BFY90	0.80	BY207	0.16	TIP34A	0.70	2SC2091	0.70
BC113	0.42	BC327	0.16	BF119	0.82	BFY90S	1.34	BY210/400	0.21	TIP41C	0.42	2SC2098	2.90
BC115	0.12	BC328	0.16	BF120	0.36	BR100	0.25	BY210/600	0.24	TIP42	0.44	2SC122A	3.20
BC116	0.12	BC337	0.12	BF125	0.42	BR101	0.40	BY210/800	0.28	TIP47	0.42	2SC2314	0.80
BC117	0.22	BC338	0.12	BF127	0.41	BR103	0.50	BY227	0.22	TIP121	0.63	2SC2335	1.50
BC118	0.16	BC350A	0.24	BF154	0.14	BR303	2.75	BY228	0.48	TIP2955	0.70	2SK135	3.60
BC119	0.28	BC351	0.16	BF157	0.46	BRY39	0.50	BY238	0.65	TIP3055	0.58	3N211	3.52

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BC158	10p
BC159	10p
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BC173	10p
BC174	10p
BC183	10p
BC184	10p
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BC207	10p
BC212	10p
BC213	10p
BC214	10p
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BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
SN76110N	£1.00
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	60p
SN76228N	£1.00
SN76270	£1.00
SN76532N	50p
SN76544N	£2.00
SN76545	£3.50
SN76546	£1.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76650	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1.00
SN7670N	75p
SN76708AN	75p
SN76720	£1.00
UA783P3C	40p
BT100A/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA640	£1.00
TCA660	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£4.00
TCA830	£1.00
TCEP100	£2.25
TCE120CQ	£1.00
TDA440Q	£1.00
TDA1003A	£1.00
TDA1010	£1.00
TDA1060A	£1.50
TDA1072	£1.00
TDA1151	30p
TDA9170	£1.00
TDA1190	£1.00
TDA1200	75p
TDA1327A	£1.00
TDA1365	£3.00
TDA1412	50p
TDA2003	80p
TDA2004	£2.00
TDA2010	£1.00
TDA2140	£3.50
TDA2030	£2.00
TDA2525	£1.00
TDA2640	£2.00
TDA2522	£1.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2571AQ	£2.50
TDA2575A	£1.00

10 Mixed TV & radio speakers £4.00
2x Hi-Fi Philips car tune up tweeter EN8320 £10.00
ITT CVC45 8 way resistor unit for v/cap £3.00

4700/10v x 10	50p
68/16 x 10	50p
150/16 x 10	50p
47/25 x 10	50p
220/25 x 10	50p
1/250 x 10	50p
G8 Speaker	£1.00

TDA2581	£2.50
TDA2590	£1.00
TDA2593	£1.00
TDA2560	50p
TDA2600	£5.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA2653	£1.00
TDA2002	£1.00
TDA2640	£2.00
TDA2680	£1.00
TDA2690	£1.00
TDA2593	£1.00
TDA3190	£1.00
TDA3560	£4.00
TDA3571Q	£1.50
TDA9403	£3.00
TDA3651AQ	£3.00
UPC1365	£3.00
SN74LS125AN	30p
SN174LS248	50p
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	30p

Philips Cartridges

GP412	£6.00
GP412/11	£6.00
GP406	£6.00

Transistors

A1222	15p
A1223	15p
AC106	15p
AC121	15p
AC124	15p
AC128	15p
AC137	15p
AC151	15p
AC131	15p
AC138	15p
AC152	15p
AC153K	15p
AC142K	15p
AC169	15p
AC176	15p
AC176K	15p
AC178K	15p
AC179	15p
AC186	15p
AC187K	15p
AC188	15p
AC188K	15p
ACY21	25p
AD143	50p
AD149	50p
AD161/162	pair 40p
AF139	25p
AF181	£1.00
AF239	25p
AF367	25p
AL102	£1.75
BC161	30p
BD507	50p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p
BD646	50p
BD676A	30p
BD678	50p
BD681	25p
BD807	20p
BD826	50p
BD948	30p
BDX75	20p
BDX32	£1.25
BF115	20p
BF121	20p
BF127	20p
BF137	20p
BF157	20p
BF160	20p
BF161	20p
BF164	50p
BF179	30p
BF180	20p
BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	18p
BF244	40p
BF245b	20p
BF256	10p
BF257	20p
BF258	25p
BF262	15p
BF263p	25p
BF264	15p

Philips Electret stereo headphone N6325 £12.00
Philips stereo headphones min £3.50
Philips solder irons, 25w mains £4.00

8000/30v	50p
470/40v x 10	£1.00
22/100v x 10	£1.00
100/350v	70p
400/350v	70p
47/500v	25p
1/600v	25p
.022/1kv	10p

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With interface panel and data command panel
New £6 Post £2
12 Volt Aerial Changer over Relays 144 Mc/s 45 watts 50p

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V/Cap tuner, after 1979 Series £8.00
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Replacement for Touch Button Unit £8.00

MODEM
Line Terminal Unit
VM6501 £6.00
Designed to work at 1200/75 or 1200/1200. Diagram and Connection Data Supplies

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8 Seg Display FND500 20p
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BLW60C £4.00
Mullard Broadband R.F. power modules
UHF. BGY22E £10.00
PT4236C. PT8706C.
PT9783 £3.00
ITT Micro Phone M5 50p
with switch
Sub-min Relay low voltage 50p
Mains relay coil 230v 30p
Philip PP3 batteries 10 for £3
12v battery holders A.A 50p 1.5 battery
TA/12v 2 pin battery lead 30p

Various Tools and Accesories

VM6103 Mullard Teletex Decoder	£4.00
T/VV/Aerial 300Ω	£1.50
L.C.D. clock display with alarm	75p
−4 D/P push mains switch	20p each
Mains lead & two pin socket for radio cassette	35p
3 Video Leads	£1.00
Xcelitr cutter	£3.90
T/V loop aerial	75p
Radio Telescope Aerial	£1.00
Philips Neon Lamps for TV sets	5p
Freeze	£1.20
Foam Cleaner	£1.20
Contact Cleaner	£1.20
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Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt	£1.00
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Sellotape PVC Electric Insultation 50mm x 20M	70p
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20 GEC Service Manuals & Rank	£5.00
Red E.H.T. LAED and Anode Cap	£1.00
10 x G11 Cap 470/250	£15.00
Weller solder iron 15 watt/25 watt	£5.00
2 way baby alarm/intercom with long leads	£5.00
Philips universal battery tester/charger, fuse/bulb tester ... to clear	£4.00
Hitachi 7.2v/1.8A Nicad pack 7.2v/1.6A	£6.00
Hitachi TP007 Battery pack 7.2v/1.6A	£7.00
Hitcachi Silver Oxide Battery G 13 UCC357 IEC SR44 1.5V	80p
70ML Silicone Sealer (clear)	£1.00
100 Coax Plugs	£10.00
De-solder pump + 2 nozzels	£5.20
Plastic box for i.c.s. 6"x3"x 1/2"	50p
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 232266298009	75p
GEC Mains Power Supply R.E.G.	£3.00
1Kg reel of solder	£8.00

100 W/W Res	£1.50
BF 199	20 for £1.00
10x20 Turn 100k pots. Rank	£2.00
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	£5.00
20 Knobs	£1.00
40 Pots, 1/4" +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	50p
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