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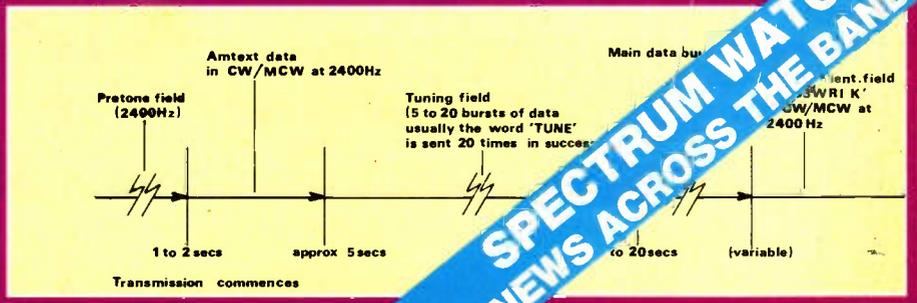
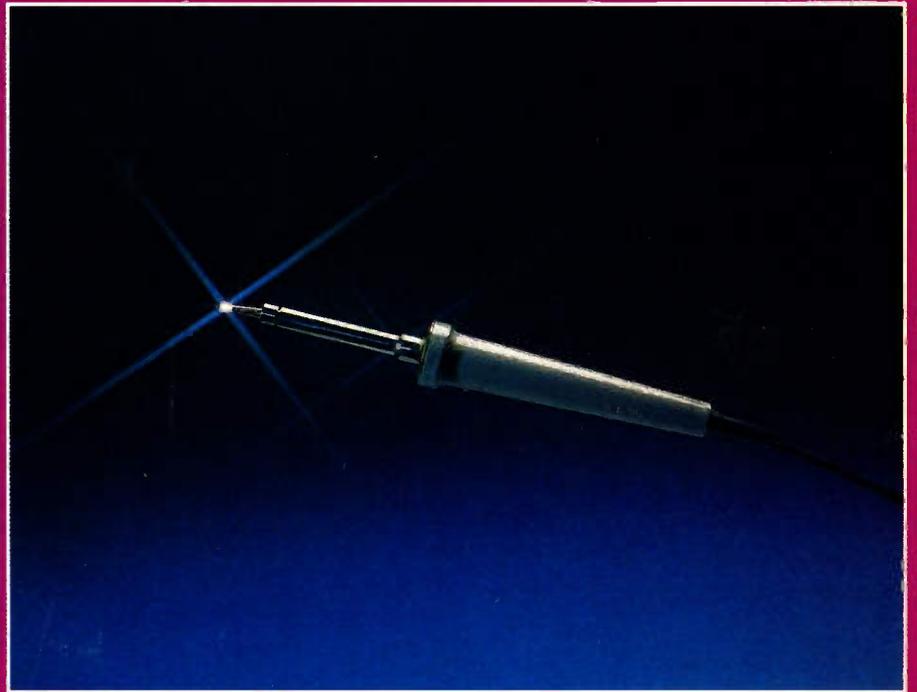
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THE 'OPEN CHANNEL'?**

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TRANSISTORS			DIODES			VOLTAGE REGULATORS			VALVES		
Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
AC127	0.35	BC108	0.10	BD244A	0.65	BT101/300	1.15	78L05	0.40	6X4	0.85
AC127	0.30	BC108	0.10	BD303	0.32	BT101/500	1.25	78L08	0.60	6X4	0.85
AC128	0.30	BC113	0.14	BC307	0.10	BT102/300	1.35	78L12	0.30	6X4	0.85
AC128K	0.30	BC114	0.12	BC308A	0.10	BT102/500	1.85	78L15	0.52	6X4	0.85
AC132	0.55	BC115	0.12	BC323	0.99	BF270	0.30	78L20	0.52	6X4	0.85
AC141	0.28	BC116	0.15	BC327	0.75	BF271	0.30	78L25	0.52	6X4	0.85
AC141	0.28	BC117	0.12	BC331	0.99	BF272	0.30	78L30	0.52	6X4	0.85
AC141K	0.40	BC118	0.17	BC337	0.12	BF273	0.18	78L35	0.52	6X4	0.85
AC142	0.26	BC119	0.17	BC338	0.12	BF274	0.32	78L40	0.52	6X4	0.85
AC142K	0.48	BC120	0.12	BC350	0.12	BF275	0.32	78L45	0.52	6X4	0.85
AC151	0.45	BC140	0.28	BC340	0.14	BF323	0.92	78L50	0.60	6X4	0.85
AC152	0.45	BC141	0.42	BD509	0.53	BF336	0.26	78L55	0.60	6X4	0.85
AC176	0.28	BC142	0.12	BD510	0.48	BF337	0.26	78L60	0.32	6X4	0.85
AC176K	0.48	BC143	0.30	BC451	0.32	BF338	0.26	78L65	0.48	6X4	0.85
AC187	0.42	BC147	0.08	BC452	0.12	BF355	0.42	78L70	0.04	6X4	0.85
AC187K	0.48	A or B	0.10	BC454	0.12	BF367	0.24	78L75	0.11	6X4	0.85
AC188	0.44	BC148	0.08	BC459	0.12	BF371	0.27	78L80	0.12	6X4	0.85
AC188K	0.50	A or B	0.10	BC550	0.18	BF422	0.38	78L85	0.12	6X4	0.85
AC190	0.88	BC149	0.12	BC550C	0.12	BF423	0.18	78L90	0.12	6X4	0.85
AD142	1.10	BC157	0.10	BC558	0.12	BF450	0.38	78L95	1.20	6X4	0.85
AD143	1.10	BC158	0.10	BC558	0.12	BF457	0.33	7905	0.05	6X4	0.85
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AD182	0.42	BC217	0.30	BCY72	0.15	BF176	0.40	7973	0.05	6X4	0.85
AD182	0.42	BC218	0.30	BCY72	0.15	BF177	0.40	7974	0.05	6X4	0.85
AD182	0.42	BC219	0.30	BCY72	0.15	BF178	0.40	7975	0.05	6X4	0.85
AD182	0.42	BC220	0.30	BCY72	0.15	BF179	0.40	7976	0.05	6X4	0.85
AD182	0.42	BC221	0.30	BCY72	0.15	BF180	0.40	7977	0.05	6X4	0.85
AD182	0.42	BC222	0.30	BCY72	0.15	BF181	0.40	7978	0.05	6X4	0.85
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Safety in the shack

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

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

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

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of this magazine are accurate, we assume no responsibility for any effect from errors or omissions.

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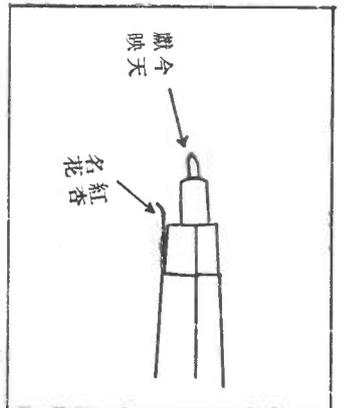
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PRODUCT NEWS

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

'PRECISION GOLD'

With homes, offices and businesses becoming increasingly involved and aware of electronic systems and equipment, Maplin Electronics have developed a new range of high quality, cost effective test measurement meters.

The Maplin 'Precision Gold' test meters are designed to serve all situations where fast and accurate measurements are required. Initially the range comprises five products, but further items will be added over the next few months.

The range comprises: a pocket multimeter – a rugged, compact, general purpose multimeter, £6.95; the M102BZ – a wide range multimeter with a 90° three-colour mirrored scale and a double jewelled precision moving

coil movement, £14.95; the M-2020S – a professional quality, comprehensive multimeter with a 90mm full 90° mirrored two-colour scale and knife-edged pointer needle and, in addition to the usual multimeter functions, a transistor and diode checking facility, £19.95; the M-5050E electric multimeter – an accurate VVM type, £34.95; and the M-5010 – a high-performance digital multimeter, £42.50.

This range of test gear is available by mail order direct from the company, or from the Maplin retail stores in Southend, London, Birmingham, Manchester and Southampton.

*Maplin Electronic Supplies,
PO Box 3,
Rayleigh,
Essex SS6 8LR.
Tel: (0702) 552911.*



DOT MATRIX PRINTER

Just arrived at Rapid Terminals is Digital's new receive-only multimode dot matrix printer, the LA210 RO Letterprinter.

This sleek low-profile unit, which is fully compatible with all Digital computers, offers draft and letter quality printing as well as bit-map graphics capabilities and IBM PC compatibility. In draft mode the print speed is 240cps with a 7 x 9 dot matrix; in 'near-letter-quality' mode, speed is 40cps with a 33 x 18 dot matrix. The bit-map graphics capabilities include 74-330 x 72 dots/inch (133 x 216 in IBM emulation mode) and eight variable graphics aspect ratios.

A feature of the LA210 is the paper tractor which is supplied as standard with the printer. The tractor can handle wide as well as four-part paper (original plus three copies). Paper feed can be either from the back of the printer (single-part only) or through a slot in the bottom of the machine.

The printer is supplied with three standard font/character set ROMs – Courier 10,

INTERFACE BOARDS

Cybermation Ltd has supplied the first production batch of a specially designed error correction interface board to Dynatech Communications Ltd. Suitable for data transmission applications using either land lines or other forms of link, these boards will be marketed suitably boxed as self-contained units by Dynatech.

To achieve efficient error correction, Cybermation

made clever use of bit redundancy. Typically, use of a board improves a raw error rate of one in 10,000 to one in 2,000,000 – an improvement factor of 200. The system will cope with an error rate of one in 300 which it improves by a factor of six, while at the other end of the scale a rate of one in 100,000 is improved by a factor of 2,000.

A microprocessor-based system on each printed circuit board embodies a block

encoder/decoder with a nominal 0.8 rate code. This converts data from an asynchronous state to a synchronous one with error correction at speeds of up to 9,600bps, for full duplex operation. Data interleaving is provided according to a basic 32 x 8 block matrix, with block interleaving varied automatically according to data rate.

The completed unit, the 1950, is available throughout Europe via the Dynatech sales organisation and distribution network.

*Cybermation Ltd,
Ashley House, Ashley Road,
St Albans, Herts AL1 5JR.
Tel: (0727) 25102.*

Courier 10 multi-national overlay and VT100 line drawing set. Up to two additional font cartridges may be added at any time by means of the multi-font adaptor, enabling users to specify their own characters and fonts – a notable feature, and rare on other machines. A 2K input buffer is standard.

An unusual and practical design feature of the LA210 is the position of the font chimney. It is at the back of the printer – easily accessible but out of sight.

The machine is controlled by a simple push-button panel which facilitates speed chan-

ging – users can quickly obtain proof copies of documents and then easily transfer to produce letter quality final copies.

A serial printer, the LA210 is supplied with a standard EIA RS232C interface. An optional external parallel interface can be added which enables the machine to be connected to an IBM PC. In the IBM PC mode the LA210 can emulate the Epson MX80 printer (with or without Grafrax) and the IBM graphics printer.

Options for the LA210 include international, scientific and other character sets and fonts, correspondence

mode (80cps with 33 x 9 dot matrix), bi-directional tractor feed, single tray cut sheet feeder, stands and paper catchers.

*Rapid Terminals,
Rapid House,
Denmark Street,
High Wycombe,
Bucks HP11 2ER.
Tel: (0494) 450111.*

MAGNETIC MOUNT

How many times have you heard the story of the man who put a 7/8th aerial for 2 metres on to a magnetic mount and then found that every time he travelled at more than 30 miles per hour the magnetic mount parted company with the car. Now Waters & Stanton Electronics claim to have found a magnetic mount that should put an end to this sorry tale of woe.

This new magnetic mount (which Waters & Stanton say could aptly be named 'the limpet') is more than three times stronger than the con-

ventional magnetic mount. Its special design means that for normal car mounting surfaces and up to the legal driving limit the aerial will stay put. Tests have indicated that there is every likelihood of the aerial base breaking before the adhesion between the car metal work and base is lost.

The SO239 mount comes complete with 50 ohm cable and PL259 plug. Made in Japan and selling for around £15.00, this unit will be found in most good amateur radio shops from March. Alternatively, the unit can be ordered direct from the importers at £16.75 including carriage.

*Waters & Stanton Electronics,
18-20 Main Road,
Hockley,
Essex.
Tel: (0702) 206835.*

NETWORK ANALYSER

Hewlett-Packard's newest microwave scalar network analyser, the HP8757A, incorporates operating and performance features that the manufacturer believes will increase user productivity in traditional measurements of microwave components as well as in other applications.

The HP8757A analyser, combined with a swept-frequency signal source, microwave bridge and detectors, measures transmission and return loss from 10MHz to 26.5GHz in co-ax and to 40GHz

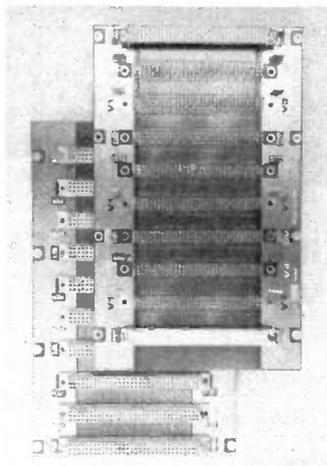
in waveguide (with provisions for still higher frequencies).

Its main features are: 76dB measurement dynamic range for all channels (three measurement channels are standard, with a fourth channel optional); large 9 inch (23cm) diagonal CRT display with up to four annotated traces and direct transfer of

MICROBUS BACKPLANES

Fully assembled and tested 96-way multilayer microbus backplanes are now available from BICC-Vero Electronics.

The backplanes are compatible with BICC-Vero's KM6



card-frame system and, in addition to being supplied with 96/96 DIN 41612 connectors, are equipped with push-on power pick-up points.

All BICC-Vero multilayer backplanes feature a patented tracking arrangement whereby each of the 42 signal lines on each side of the board has a guard track between it and the next track. These guard tracks are individually plated down to the central 0V ground plane via holes.

The three-layer bonded multilayer construction consists of a central 0V ground plane sandwiched between the signal layers. This inner plane is a maximum copper construction with a lattice trace around all the connector pins. This construction, coupled with the guard tracks, affords the highest degree of protection against cross-talk in a working microprocessor system.

Up to four power rails are available on the backplanes, any of which can if required be connected to the 0V plane by means of jumper links. In addition, each of the power rails is capable of carrying the total current requirement of all connector pins. To achieve this, several feeders should be used to distribute the load evenly.

Off board termination is achieved by the use of a standard backplane stub terminator board plugged on the rear of the two end connector positions.

The backplanes are available in 15.24 and 20.32mm pitches. The 15.24mm pitch version has a single width of 20 slots, whilst the 20.32mm variants have widths of 5, 10, 15, 20 and 21 slots.

The separation of the signal layers from the 0V plane is 1mm and the signal track width is 0.3mm. This yields a theoretical characteristic impedance Z_0 of 100 ohms $\pm 5\%$. This reduces to between 20 and 25 ohms when the backplane is fully loaded with boards.

*BICC-Vero Electronics,
Hedge End Industrial Estate,
Flanders Road,
Hedge End,
Southampton SO3 3LG.
Tel: (04215) 60211.*

data to printer or plotter; new detectors that measure both modulated (ac) and unmodulated (dc) test signals, permitting the user to choose the best format for specific measurement applications.

Its firmware features simplicity and speed measurements:

1. built-in limit lines for 'pass/fail' testing;
2. save/recall of front-panel settings, operating state and associated calibration data;
3. 'adaptive normalisation' that applies broadband calibration data to narrower band measurements;
4. automatic search for selected response levels such as 3dB points, 3dB bandwidth and filter shape factor.

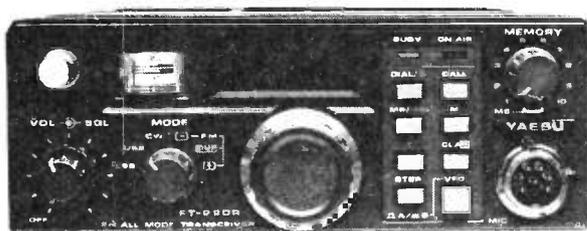
Add a computer (such as the HP9000 series 200) and the HP8757A becomes the heart of a fast, accurate, versatile automatic scalar-measurement system. Companion system software such as HP85015A lets the operator develop and implement complete test procedures without programming.

*Hewlett Packard Ltd,
Eskdale Road,
Winnersh, Wokingham,
Berkshire RG11 5D2.
Tel: (0734) 696622.*



FREE FINANCE*

HAMPSHIRE, DERBYSHIRE, LOTHIAN, STAFFORDSHIRE



FT290R "MULTIMODE PORTABLE"

Multimode 2M Transceiver
Dual VFOs
Microprocessor Control
Selectable Synthesiser Steps
Large LCD Display
Ten Memory Channels
'+' & '-' Repeater Function
Nicads for Portable Available
2.5W / 0.5W RF Output
58(H) × 150(W) × 195(D) mm

FT730R UHF "MOBILES"

Synthesised FM Transceivers
Full Microprocessor Control
Dual VFO's
Ten Memory Channels c/w Priority
Selectable Synthesiser Steps
LCD Readout / Analogue 'S' Meter
Switchable '+' & '-' Repeater Split
Better than 0.25uV for 12dB Sinad
Outputs – 10W FT730R
58(H) × 150(W) × 174(D) mm



FT726R "MULTI BANDER"

Synthesised Multimode Base Station
10W Output on HF, VHF & UHF, Possible Full Duplex! (Crossband, with Option)
Continuous RF Power Control (0-10W)
Dual VFOs – Crossband Operation
Eleven Memories – Mode & Frequency
LED Displays, Dual Meters (S. & P.O.)
8 Bit Microprocessor Control
IF Shift / Width System
129(H) × 334(W) × 315(D) mm



FT730R UHF "MOBILES"

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SMC (Leeds)
257 Otley Road,
Leeds 16, Yorkshire
Leeds (0532) 782326
9-5.30 Mon-Sat

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SMC (Jack Tweedy) Ltd
102 High Street
New Whittington,
Chesterfield
Chest. (0246) 453340
9-5.30 Tues-Sat

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Chwyd
Buckley (0244) 549563
10-5 Tues-Fri
10-4 Sat

STOKE
SMC (Stoke)
76 High Street
Talks Pts, Stoke
Kidsgrove (07816) 72644
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(SMC) Grimsby
247A Freeman Street
Grimsby, Lincs
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

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SMC (Jersey)
1 Belmont Gardens
St. Helier, Jersey
Jersey (0634) 77067
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 Large LED Display / 'S' Meter
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 Optional FM (or AM Unit)
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 Matching Antenna Tuner Available
 Matching Scanner VFO/ Memories
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 Fully Computer Compatible
 Dual VFOs
 100% Duty Cycle
 General Coverage Rx
 FM & CW Narrow as Standard
 Programmable Memory Scanning
 All Mode Squelch
 Triple Microprocessor Control
 Matching Automatic ATU (Opt)
 Full Break-in CW
 93(H) × 238(W) × 238(D) mm



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Communications Ltd.



PRODUCT NEWS

WIRE STRIPPER

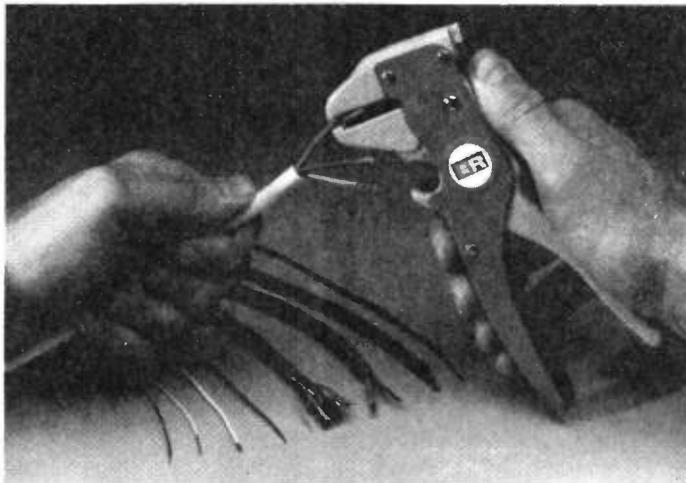
B&R Electrical Products Ltd have introduced a high-quality, self-adjusting wire stripper/cutter (model TC1017) at a price which is claimed to be about one third of that of comparable tools on the market. Equally useful for householders, electrical contractors and manufacturers of

electrical equipment, its trade price (subject to discount) is £4.30 + VAT.

The new tool is robustly constructed and self-adjusts during operation to enable fast and accurate stripping of insulation from most types of insulated wire (solid or stranded) with outside diameters from 0.5 to 5mm,

without damaging the wire. For particularly hard or soft insulation materials, a manual adjustment is provided to alter the force on the blades, but such adjustment is not normally necessary and the tool will strip efficiently time after time.

The tool operates in one continuous action by gripping the insulating material in its metal jaws, simultaneously cutting through it and removing the insulation by the sliding action of the blades. Moulded into the jaws of the tool are graduations in millimetres and inches to assist measurement of the length of insulation to be stripped. The tool also incorporates a pair of tempered-steel cutting blades to enable the wire to be cut and trimmed to length before stripping.



*B&R Electrical Products Ltd,
Temple Fields,
Harlow,
Essex CM20 2BG.
Tel: (0279) 443351.*

POWER SUPPLIES

A range of PCB mounted power supplies has recently been introduced by Lascar Electronics.

All types have an encapsulated low profile transformer giving a compact and rugged construction.

The range includes single rail, twin rail and triple rail types, some of which are fitted with card handles and connectors for rack mounting. Other features include: over-current, over-temperature and output short circuit protection; terminal block inputs and outputs; and an input of 220-240V 50-60Hz, which may be changed to 110-120V 50-60Hz by moving an on-board link. The 202 single rail types also have crowbar protection of an overvoltage input.

*Lascar Electronics Ltd,
Module House,
Whiteparish,
Salisbury,
Wiltshire SP5 2SJ.*

NEW PYROMETER

A simple, self-contained pyrometer which provides easy and immediate indication of a soldering iron's tip temperature has been added to the Greenwood Electronics' Oryx range of soldering tools and equipment.

Designed to provide an insurance against poor quality soldered joints by ensuring accurate tip temperature, the pyrometer is a low cost instrument. The average user can expect to recover this cost within a matter of days simply by avoiding the need to resolder poor joints which mostly arise because of incorrect soldering temperatures.

The pocket-size instrument does not require any power supply. It has a detachable thermocouple probe which has a lead insulated with non-flammable neoprene and it features a clear digital LCD readout scale that provides accurate indication of temperatures from 200°C to 450°C.

*Greenwood Electronics Ltd,
Portman Road, Reading,
Berks RG3 1NE.
Tel: (0734) 595844.*

100MHz OSCILLOSCOPE

New from Electronic Brokers is the Philips PM3267 100MHz oscilloscope which has powerful triggering facilities, a dynamic input range of 2mV to 10V/div, and a host of other display and measuring capabilities, all on two time-bases.

The PM3267 oscilloscope has an 8 x 10cm cathode-ray tube (CRT) display which is parallax-free and features continuously-variable illumination.

Triggering facilities available include automatic triggering whereby the trigger level range is automatically derived from the peak-to-peak signal amplitude; a trigger view capability which allows very accurate setting of trigger levels; and stable triggering in multi-pulse environments, where if an incorrect display is obtained all that is required is a simple adjustment of the trigger hold-off control until the 'overwriting effect' disappears. Other triggering capabilities include filtering, automatic triggering on video waveforms, composite triggering for displaying asynchronous signals, and

independent triggering.

Time measurements can be made easily and accurately using the combination of a precise delay time multiplier control and the alternate timebase mode. Use of the latter ensures that the successive pulse edge settings are always made at the relevant pulses.

Another facility offered by the PM3267 is Z-modulation, which can be used to suppress superfluous display information or as a valuable additional time reference. In the latter case, this is done by blanking parts of the displays at time intervals determined by the Z-modulation input signal.

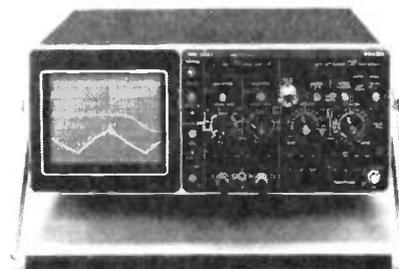
The PM3267 also features a

very fast trigger circuit that allows glitches and spikes as fast as one nanosecond (nS) to be detected. Glitch or spike detection is indicated on the front panel.

Weighing only 10.6Kg the instrument is easily portable. The front panel comprises a wide range of push-button controls ergonomically designed and colour-coded for easy operator use.

A host of standard and optional accessories are available including external battery pack, oscilloscope camera and current and FET probes.

*Electronic Brokers Limited,
140-146 Camden Street,
London NW1 9PB.*



MICROFRAME

Gordon Micro Ltd recently announced the Microframe, which is not only a disc controller interface for use on any model of the Spectrum, but a micro-sized version of the mainframe computer, thus allowing the serious user the opportunity to learn and experiment with real computer applications.

The Microframe plugs directly into the back of the Spectrum. The signals to and from the computer are then buffered before being BUSSED to a 5 slot card frame on 64 way DIN ac Euroconnectors. All relevant processor signals can be found on this BUS, enabling the user the facility with the Gordon prototyping card to construct any circuits he might wish to experiment with. A list of interface cards presently in production and development is available on request.

When using a Microframe, the number of input/output ports is important. Unfortunately, the lower bits of the address lines which control input/output ports on a Spectrum are taken up with the control of its own peripherals (screen, keyboard, cassette interface, etc). However, by clever use of decoding circuits, the Microframe has access to 256 uncommitted

input/output ports. These are simply called in BASIC statements by the use of the IN and OUT instructions. The decoded signal lines are available on the Microframe BUS for use with the Gordon interface cards and any that the user may want to construct.

The operating system of the Microframe is held in a random access memory area of 16K, which shadows the same address space as that of the BASIC ROM of the Spectrum. This means that the disc control, data buffers and control registers take up no room in the user memory. A bonus of this is that the BASIC instruction set can be

increased by adding a series of new statements relative to the peripherals which need to be controlled.

The user, by reading the Microframe manual, will easily be able to add extra statements to the machine's BASIC by inserting machine code utilities on the system disc.

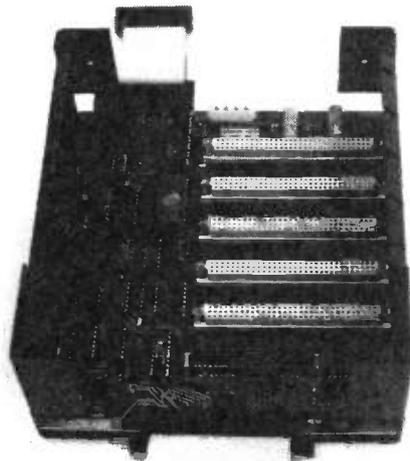
There is also a boot-strap ROM (Read Only Memory) which upon the receipt of a RESET or NEW command followed by RUN automatically calls up the file SYSTEM on disc 1 and loads it into the paged memory area.

The principle behind the operating system is that if the Spectrum fails syntax on a

BASIC statement (either as a single line or in a program), control is passed to this RAM where the system interrogates the statement to qualify it for the Microframe subset BASIC, and if correct actions the disc or peripherals on the Microframe, eg LOAD D1 'FILE NAME', which would normally fail syntax on the Spectrum (because of the D1), causes the paged RAM to switch on and the BASIC ROM to switch off. It then looks at the statement, finds the D1, actions the disc and loads the program 'FILE NAME' directly into the Spectrum.

The floppy disc interface will drive up to two disc units, either mini or micro floppy (providing it uses the standard 5¼in disc interface connections). A floppy disc interface enhances the Spectrum's capability tremendously. By adding another syntax operator to instructions already known, such as LOAD, SAVE, ERASE, VERIFY, MERGE and CAT, the disc will respond immediately and at speeds up to 100 times faster than using cassette tape.

*Gordon Micro Ltd,
3 Callendar Road,
Heathfield Industrial Estate,
Ayr KA8 9DJ.*



ORYX IRON

Greenwood Electronics have added an electronic temperature controlled soldering iron to their Oryx range.

They claim that the Platinum 45 electronic soldering iron is unique, offering a truly solid-state system to ensure that quality, reliability and mechanical strength combine to produce a tough iron, capable of maintaining stability in severe production conditions.

The iron is designed to allow development of many other soldering systems and will be used as the basis for future Oryx electronic stations.

Technical features include an ultra-stable platinum resistance temperature sensor; a high reliability cermet heating element with a full 45 watt rating; a zero crossing

detector for spike free switching of the heating element; proportional control electronics which avoids overshooting temperature; and in-handle electronics.

The Platinum 45 is available in 24V, 115V and 240V versions, temperature controlled to $\pm 8^\circ$. It is supplied with a long-life iron-plated tip and burnproof lead.

*Greenwood Electronics,
Portman Road,
Reading RG3 1NF.
Tel: (0734) 595844.*

'WORK-ALIKE' KEYBOARD

Now available from Diamond H Controls is an IBM personal computer 'work-alike' keyboard based on the low-profile membrane-switch technology developed by Oak Switch Systems Inc.

The new self-contained



keyboard assembly uses a full-travel membrane key-switch action with a choice of linear or tactile switching action. Reliability is very high, with typical life cycles in excess of 50 million operations, and the membrane technique provides environmental protection for the switching elements.

The keyboard incorporates cylindrical-surface keycaps with key legends printed using a sublimation process. The total assembly weighs only 1580g, including coil cord.

*Diamond H Controls Ltd,
Vulcan Road North,
Norwich NR6 6AH.*

PRODUCT NEWS

'SEE ALL ROUND' TV AERIAL

Following their success over the last several years in manufacturing TV aerials for the mobile market, the Norfolk firm Maxview Aerials have now announced the release of a new aerial of such original design that it is the subject of provisional patent applications.

Known as the 'Omnimax', it takes account of the fact that vehicles on the move will change their position relative to the position of the television transmitter, thus invalidating the use of a fixed, directive aerial. As its title implies, the Omnimax overcomes this problem by providing 'all-round looking' with omni-directional characteristics built into its design.

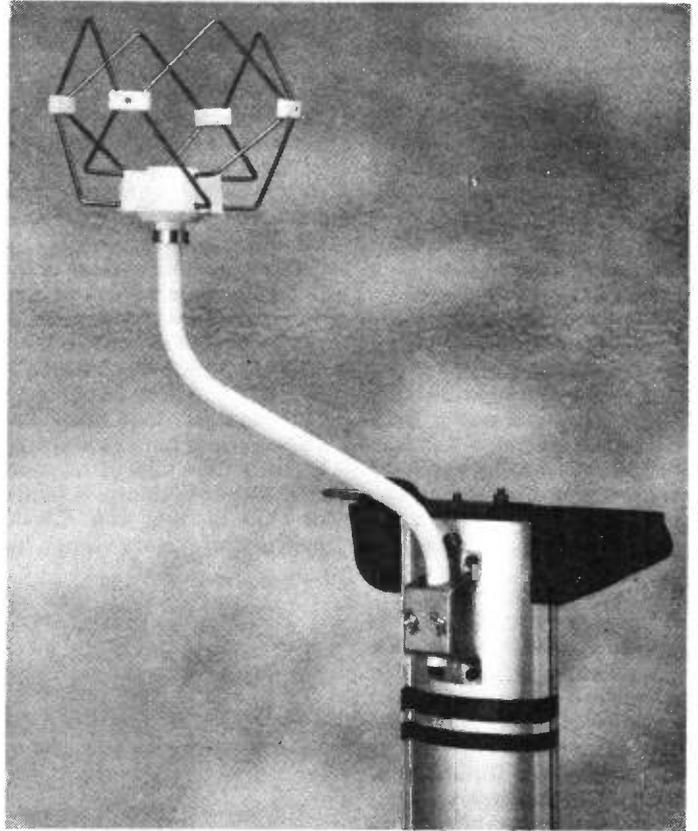
Apart from this all-round capability another feature of the Omnimax is that it resonates over the whole of the very wide international UHF television spectrum from 470 to 860MHz, channels 21 to 69, without change. Measurements taken on the Maxview

test range in Norfolk have shown that the signal variation when the aerial is turned through 360 degrees is so small as to have imperceptible effect on the received picture (less than 1dB change on any UHF channel).

Because the Omnimax may be operating in hostile environments, especially when used on waterborne craft, it is constructed in completely weatherproof materials: type 316 marine stainless steel, ABS plastic and a nickel-plated brass socket. It is filled with foam to render it permanently waterproof.

The Omnimax aerial is very compact, measuring 20 by 20 by 23cm; in other words less than a foot tall. It sells with amplifier at £39.50 including VAT and comes complete with 5 metres of low-loss cable fitted with standard TV plugs at both ends.

*Maxview,
Freepost, Kings Lynn,
Norfolk PE33 0AT.*



DEDICATED MONITORS

Two dedicated 12 inch monochrome monitors designed for the business computer user and the home computer enthusiast are the latest additions to the Ferguson range.

The green or amber phosphor cathode ray tubes, as used in the Ferguson monochrome monitors, MM02 and MM06 respectively, are recognised by the majority of computer operators for their clear character display and for being easy on the eye, especially during continuous use. Ferguson models MM02 and MM06 are also fitted with an anti-glare face plate to reduce unwanted reflections, thus reducing operator fatigue still further.

In an attractive stone and seal brown presentation, designed to harmonise with the business or home environment, the Ferguson monochrome monitors incorporate the following features: dynamic focus to ensure sharp focus of all characters and to maintain a consistency of spot size across the complete screen; comprehensive range of sync

inputs to allow maximum user flexibility; both linear and TTL input signals are acceptable and from a linear input it is capable of producing a shaded display; 80 characters per row and 25 rows per screen; fast line flyback (8 microseconds) makes it possible to display up to 100 characters per row; video bandwidth > 25MHz; video rise and fall < 20ns; line flywheel synchronisation.

Standard LTB/UK/Euro/US 15,625/15, 750KHz and field timebase UK/Euro/US 50/60Hz, with automatic height compensation between systems, enables the Ferguson monochrome monitors to handle most hardware/software configurations originating from those countries within these parameters.

Weighing 12lb (5.8Kg) with a power consumption of less than 30 watts, the new Ferguson monochrome monitors MM02 and MM06 are manufactured at the company's factory in Gosport, Hampshire. An advisory service to aid dealers and customers with queries or new developments in home computers, compatibility or

upgrading from one home computer to another has been established. The Ferguson Advisory Bureau can be contacted on (01) 807 3060.

*Thorn EMI Ferguson,
Cambridge House,
Great Cambridge Road,
Enfield,
Middlesex EN1 1UL.
Tel: (01) 363 5353.*

TEST CHART

Crow of Reading Limited has now introduced the Porta-Pattern eleven-step grey-scale test chart, which has been designed for setting up the latest colour television cameras. These include models designed for high definition television and are capable of handling 'brighter whites' and 'darker blacks' than the older models.

This chart provides accurate reflectance references in eleven steps from 83% (white) down to 2.7% (black). It carries two grey scales running in opposite directions, with an additional high-reflectance (89.9%) white bar for use in colour balance adjustments. Its reflectance

range is considerably wider than that of the standard nine-step logarithmic grey scale (60% peak white to 3% black), which has been in use internationally for more than thirty years.

Initially the new chart was developed by Porta-Pattern to meet the requirements of the ITE in Japan, where there is considerable interest in HDTV with a natural technical spin-off into the capability of standard broadcast colour cameras. The eleven-step grey-scale is, however, now in demand internationally and is available in most countries directly from Crow of Reading.

It is believed to be unique, as the manufacturers claim to be the only company in the world with the ability to manufacture the eleven-step grey scale and verify its accuracy.

The test chart is available as a 9 inch by 12 inch reflective chart for wall mounting or use in the Porta-Pattern system.

*Crow of Reading Ltd,
PO Box 36,
Reading RG1 2NB.
Tel: (0734) 595025.*

NEWS DESK

Diamond Jubilee

1985 marks the 60th anniversary in the UK of Philips Electronics. Their history makes fascinating reading, as in their 60 years they have become the holders of no less than 20,000 UK patents.

The firm first started in the UK in 1925 as Philips Lamps Ltd, and much of their early business concerned new forms of lighting. Soon they had expanded into the field of 'communications', which was still in its infancy, coming up with such achievements as the first practical all-mains radio receiver, the first really portable 'wireless' and the first 30-line TV set, used to test early transmissions from the BBC.

Their wartime efforts included helping to develop early radar systems and the mass-production of two-way radios for Allied infantry and tanks.

Achievements in the post-war years included developments in mobile radio telephones, 'walkie-talkies', portable transistor radios and compact cassette tapes.

Away from the consumer markets, they were involved in such high-tech enterprises as the first trans-Atlantic satellite TV transmissions and the wideband microwave receivers used in aircraft detection and defence systems.

As the years went on their innovation and large-scale production of new technology for popular 'consumption' helped to make Philips the 'household name' it is today. Colour TVs, VCRs (Philips produced the first domestic version), push-button and later mobile telephones, and recently LaserVision are all a continuation of the never-ending research into and development of new technology by Philips which began 60 years ago this year.

RIS action

Department of Trade and Industry Radio Investigation Service (RIS) officers took action in February against the unlicensed broadcasting sta-

tion 'Radio Jackie', located in South West London.

The RIS officers located the site of both the station's transmitter and studio. They entered both premises under the authority of search warrants granted under section 15 of the Wireless Telegraphy Act 1949. Persons found at the premises were interviewed with a view to prosecution under the act. In accordance with the powers granted under Part VI of the Telecommunications Act 1984, equipment and other material was seized as evidence of illegal broadcasting pending court proceedings.

The use of radio within the United Kingdom is regulated by the Wireless Telegraphy Acts 1949 and 1967 and the Telecommunications Act 1984 and their associated statutory instruments. These laws give the Secretary of State powers to issue and charge for licences for the installation and use of radio and to make and enforce regulations on requirements to be met by radio users. Unlicensed use of radio is an offence under section 1(1) of the 1949 act. The maximum penalties are currently a fine of £2,000 and/or three months' imprisonment. The court can also order forfeiture of the apparatus of the station involved in the offence.

The DTI's view is that for radio systems to work efficiently, they have to be carefully planned and regulated. Unlicensed and therefore unregulated use of radio can cause interference and annoyance to legitimate radio users who have licences and operate in accordance with them. Some unlicensed stations are also thought to have caused interference to emergency and safety-of-life services.

During 1984 the RIS took action on over 120 occasions against unlicensed broadcasting stations. This represents a sharp increase on the level of activity in previous years. Between 1972 and 1984 RIS action taken against Radio Jackie has resulted in the prosecution of 24 people.



Semi-Custom Design Centre

On 18 January Colin Southgate, Chief Executive of Thorn EMI Information Technology, opened the Gothic Crellon Semi-Custom Design Centre at the company's premises in Slough.

Gothic Crellon's move into semi-custom, the first UK distributor to have a total in-house facility, marks a new direction for distribution and highlights the company's determination to gain a firm foothold in a growing sector that will account for 40-50% of the IC market by 1990, according to analysts Dataquest. As a result of an agreement between Gothic Crellon and Mullard, designs produced for clients will be fabricated by Philips, ensuring high standards of quality control. Typically Gothic Crellon are quoting about 12 weeks lead time to fully tested working prototypes.

Andy White, Business Manager of the Semi-Custom Design Centre explained:

'The advantages of semi-custom are now fully appreciated to represent reductions in cost, size, weight and overall current consumption with improvements in reliability and design security. These advantages can now be offered to companies who previously would be unable to meet the high volume requirements of silicon manufacturers'.

Gothic Crellon's Semi-Custom Design Centre represents investment by the com-

pany of £150,000. Equipment includes two IBM XTs for schematic capture running Futurenet Dash 2 software and Philips Libraries.

A VAX has been purchased to run simulation, autoroute and place software with interactive graphics for simulation and layout using VT125 and VT241 terminals.

The Design Centre also has an extensive speech synthesis facility offering actual voice encoding on chip with better than 1Kbit per second density.

Technologies offered by the Design Centre include gate arrays and cell custom in five and three micron CMOS, ISL and ECL available in DIL, surface mounted (SO) PIN grid, plastic and ceramic packages.

Rapid distributors

Rapid Recall have been appointed distributors for Monolithic Memories (MMI), the world's largest PROM manufacturer and a leader in programmable array logic (PAL).

Under the agreement between the two companies Rapid will supply bipolar LSI products from MMI's wide range which includes PROMs; ROMs; character generators; programmable logic elements (PLEs); programmable array logic (PAL) and hard array logic (HAL) devices; and First-In First-Out (FIFO) cascade memories.

Tel: (0494) 26271

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EPROMS/MEMORIES

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 2716, 2708, 1702 EX EQUIPMENT £2
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A1/216 24v 150w £2.25
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MISCELLANEOUS

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 1.25" Panel Fuseholders 5/£1.00
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EUTELSAT's third satellite

A mere fifteen months after bringing its first satellite into service, the European Telecommunications Satellite Organisation (EUTELSAT) has decided to double the amount of in-orbit capacity available on its satellites for television distribution to the cable networks via transponder leases.

With a total of 22 transponders leased, including the two transponders operated exclusively by the European Broadcasting Union for Eurovision, EUTELSAT becomes one of the world's leading distributors of satellite TV programmes.

To satisfy the considerable demand from its signatories to meet domestic – but also international – requirements, the EUTELSAT Council has confirmed the decision taken in September 1984 to reserve a launch slot for ECS3 (the future EUTELSAT I-F3) on Ariane flight V15, by deciding to have a third satellite launched in August 1985.

The space segment capacity allocated for transponder leases will be divided between two satellites: EUTELSAT I-F1, which is already operational, and EUTELSAT I-F3, which will be launched in August. The EUTELSAT I-F2 satellite will be used essentially to provide the main mission services (telephony, telex, Eurovision transmission, Satellite Multiservice System (SMS), etc).

The EUTELSAT Council, which met in Paris, allocated capacity in the three-satellite system to the signatories of the countries that had submitted requests, namely Denmark, Italy, Luxembourg, Norway, Spain, Turkey and the United Kingdom.

At this last meeting in Paris the EUTELSAT Council also authorised the issuing of the international RFP for the organisation's second generation of communications satellites.

Three flight units will be involved, with the first launch scheduled for mid-1989; delivery of the second and third units could follow at a maximum interval of one year. In addition, EUTELSAT retains the option of ordering two additional units if necessary.

A look at the latest satellite news

The contract should be signed at the beginning of 1986.

The satellites will have a nominal in-orbit lifetime of seven years and will have 16 operational transponders using the 14/11 and 12GHz frequencies. The satellites are to be designed to be launch-compatible with Ariane 4 and the Space Shuttle (STS).

The technological improvements on the new generation will include, in addition to the virtual doubling of capacity, enhanced coverage of the service zones by means of shaped-beam antennae, greater operational flexibility for the transponders, and a number of improvements to the transponders' basic characteristics.

Procurement of the satellites and launch services will be the direct responsibility of the organisation. The missions allocated to this new series of satellites will be similar to those of the present generation: telephony, television, and business communications.

Satellite service

British Telecom have announced that oil and gas production platforms in the North Sea will have their own satellite communications system next year.

The system will be called SatStream Offshore. Contracts for the provision of a permanent service to a floating production platform in June 1986 have been signed by British Telecom and the North Sea Sun Oil Company. This will be the first service of its kind between the UK mainland and an installation in the North Sea.

British Telecom will be building a new satellite earth station near Aberdeen, using an 8m (36ft) diameter dish. This earth station will work to the European communications satellite, Eutelsat 1-F2. It will offer satellite facilities

to platforms in any part of the UK's offshore exploration and development areas.

SatStream Offshore is the outcome of extensive studies and development and has been designed to meet, economically, the special requirements of the offshore production industry.

It will provide all mainstream communications services, such as national and international direct dialling for telephone and telex. It will also offer customers high-capacity digital transmission at rates of between 64 kilobits per second (Kbit/S) and 2 megabits per second (Mbit/S).

TV-via-satellite technology

Marconi Defence Systems Limited, in collaboration with United Satellites Limited, have demonstrated the UK's first working transponder technology to representatives from the 'Club of 21' and other parties from home and overseas with an interest in direct TV broadcasting by satellite (DBS).

The demonstration took place at the company's 27,000sq ft space laboratory in Colonial Way, Watford, and utilised a pre-flight 17/21GHz transponder developed for Britain's first DBS spacecraft, UNISAT.

The computer-controlled simulation, employing state-of-the-art microwave integrated circuits and high stability, low-loss filters, showed how significant technical and operational benefits would be enjoyed by potential DBS operators and domestic users. The demonstrated video pictures, employing advanced C-MAC modulation techniques, showed:

1) how the satellite transponder (positioned in geostationary orbit some 22,000 miles above the equator) would bring high quality pictures and stereo sound services to viewers.

2) how stable, long-term sound and vision would be enjoyed by viewers, regardless of the 44,000 mile round-trip of signals between the satellite, the earth station and the domestic TV set.

3) how the technology would beam signals to the proposed 45/60cm diameter domestic dish aerials. The vast majority of viewers would receive a service of better technical quality than currently enjoyed.

The service will, of course, be immediately available to UK consumers once the satellite is placed in orbit.

FT by satellite

The *Financial Times* will print in the United States this summer using facsimile pages sent from London by British Telecom's SatStream North America small dish satellite service.

With printing due to start in July, the *Financial Times* will be the first UK publisher to use this facility in the production of either a newspaper or periodical. From July the *Financial Times* will no longer need to airfreight large quantities of the newspaper from Frankfurt for its American readership.

This new US service has been secured for the *Financial Times* by a single satellite link between the head office of the newspaper at Bracken House in London and a contract printer in the State of New Jersey, close to its border with the city of Philadelphia.

Every night facsimile pages will be sent at speeds of up to 128Kbit/S from Bracken House over digital circuits to British Telecom International's SatStream North America Earth terminal at Ealing, West London. From there signals will be transmitted to an Intelsat satellite, then on to a small dish terminal located at the printing works in New Jersey. This terminal will be operated by the American Satellite Company.

A low-speed return path using British Telecom's recently introduced International KiloStream service will be used by the *Financial Times* in London for the reception of confirmation signals from New Jersey.



NEC SHOW SPEC

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RSGB NATIONAL

The 1985 RSGB National Convention will be held on Saturday 13th and Sunday 14th April at the National Exhibition Centre in Birmingham. Last year's event was an outstanding success with well over 10,000 visitors in two days, and everybody is hoping that 1985 will set new records.

It is not difficult to see why the NEC exhibition ranks as *the* big event of the year: traders from all over Britain, large and small, are on hand with large stocks and special offers, brand new products and rare items; clubs and committees representing all the different interests of radio amateurs are in attendance, meeting old members and signing up new ones, spreading 'the gospel' and (of course) selling their specialist wares; lectures on a vast range of radio topics, whether for the beginner or the expert, are taking place throughout the two days – yes, all this and more, and all under the same roof!

The event is held in and around that high-tech aircraft hangar, Hall 3 of the NEC. The doors are open from 10am to 6pm (5pm on Sunday), and admission will be £2.50 (£1 for children). Judging by previous years it certainly pays to get there early: the queue which inevitably builds up before opening doesn't take too long to clear, and it does seem that the early birds always catch the most bargains (and manage to get a seat in the bar!).

What's on

Without doubt one of the big attractions of the NEC convention is the unique collection of traders together in one place. The 'big names' are always well represented, touting their full ranges of goodies from the latest all-singing, all-dancing Japanese 'black box', through a host of kits and add-ons to the simplest accessory. The NEC 'bash' is one of those affairs where nearly everybody appears to be walking around with a big grin on their face and an even bigger cardboard box containing their latest purchase under their arm. Perhaps it's time you treated yourself to a new toy...

Last year's event was particularly notable because of the amount of business being done by those intrepid souls in the space allotted to the 'table traders'. Here is an Aladdin's Cave where if you're prepared to look it seems that you can find almost anything. The tables are covered with trays of components, kits, secondhand equipment (whether working or not) and any conceivable gadget connected with radio and electronics (as well as many that are not!). It is certainly possible to spend the whole day in this part of the exhibition and completely miss out on everything else, so keep an eye on your watch (if you haven't got one, you'll be able to buy one here!).

Joking aside, Birmingham is a major event in the trade calendar, so keep an eye out for new equipment, latest models and special prices and deals: you could probably save the cost of getting to

Birmingham in the first place. With traders of all sizes offering their goods, there's bound to be something to suit everyone's needs *and* pocket.

It would be wrong to think that the NEC convention is only about buying and selling, since there is so much else to see and do during the day. Clubs and special interest groups, including RSGB Affiliated Societies and not forgetting the RSGB itself, are always on hand to promote their activities.

The RSGB is quite obviously there in force, and as well as organising the whole event and providing stewards and a central information point for the duration of the show, have a complete bookstall service on hand offering their full range of books, maps, RSGB paraphernalia and accessories.

The credit

While on the subject of the RSGB, it is worth remembering just how much work Norman Miller (G3MVB) and his committee put in to ensure the smooth running of the event: planning for the forthcoming show started even as the doors were closing on last year's success. Indeed, it is their forethought and close liaison with the people who run the NEC, backed up by the lessons learnt over the last two years, which augur so well for another triumph in '85.

Certainly the specialist clubs and societies who will be represented are more than ready to pass on details of their particular interest: you never know, after talking to such enthusiastic people you may find that it becomes your particular interest as well. If you're thinking about going into pastures new this year, Birmingham might just be the place to make a start.

All this and more . . .

With all this going on in the main hall, you might think that there would be neither time nor space for anything else – but there, my children, you would be wrong. Tucked away in several of the reception rooms that make up part of the Hall 3 complex takes place a comprehensive series of lectures on various amateur radio topics. It is these talks and forums that turn the NEC show into a 'convention' in the truest sense of the word.

Full details of the programme are not yet available, but it is hoped that as many as five lecture streams will be running, so there certainly should be something of interest for everyone. This year the talks will mostly be limited to one hour in length, to allow people time to sample as much as possible of what the convention has to offer. Careful note should be made



CONVENTION 1985



Exciting scenes from last year's show

of timings and locations of the discussions that interest you: obviously this will help to ease some of the problems of keeping to schedule, and prevent you from missing out.

A word of warning is definitely required here. Every year more lectures are offered with more repeats at different times for some of the more popular; every year more and more people want to hear the talks and the result is often chaos.

Don't be fooled by the number of people on the floor of the hall into thinking that no one else is going to the lecture that you want to hear, because if you don't get along nice and early you'll find out just how disastrously wrong that assumption can be.

Well worth it

If last year's talks are anything to go by, these lectures certainly are worth all the trouble it takes to get in to hear them: famous names and callsigns are there on show, waiting to be heard and later questioned. In my opinion the talks are of such a high standard that it is well worth organising the rest of your day at the NEC in order to fit them in.

This year's event also features something a bit different. If you happen to hear a stream of 12wpm Morse at some point during the day then the chances are that it will be Mr G H Williams (G3CYP), who will be at the NEC for the duration of the convention conducting BTI Morse examinations. There may still be time to pre-book, and all enquiries should be

sent to Mr C V Astley, BTI Radio Station, Worston Road, Highbridge, Somerset TA9 3JY. Perhaps the biggest NEC bargain of all will be for those who leave Birmingham with a class A licence on the way.

Facilities

Amidst all this talk of seeing and doing, buying and selling, one should not forget that the NEC also offers one of the largest gatherings of amateur radio enthusiasts of the whole year. The visitor certainly gets a feeling that he or she 'belongs' (unlike when a neighbour is busy complaining about TV!). The show's position as a big social occasion, though perhaps lacking some of the cosiness (and cowpats) of a Woburn or Longleat, is certainly helped by the facilities on offer at the NEC.

Full restaurant, bar and snack bar facilities are available, providing the bargain-hunter with a chance to sit down for a while, chat with old friends or make new ones. The 'discussions' between amateurs in these various locales are sometimes almost as interesting as the officially organised lectures!

A full range of accommodation is available for those who wish to take in both days, ranging in price and sophistication from simple bed & breakfast to the up-market Metropolitan Hotel, itself part of the NEC complex.

How to get there

Birmingham's central position, combined with the special travel facilities

provided for the NEC, help minimise the headaches involved in getting to the convention, even for those with relatively long journeys to make.

By road, there is easy access to the NEC from the many motorways which lead into the Midlands. The NEC itself is well signposted, with special exits taking visitors straight into the complex. Once again the RSGB has managed to obtain free parking for those driving to the exhibition, and on arrival there is a frequent and free shuttle bus to take you from the large parking area right to the entrance of the hall, and return you and your purchases to your car at the end of the day.

For rail travellers the destination is Birmingham International station, this being located within the NEC complex and linked to the hall by escalators and covered walkways. It is worth noting that the NEC is only 80 minutes by rail from London (Euston).

Jet-setters will find Birmingham Airport adjacent to the NEC, a short bus or taxi ride away. As well as shuttle flights to and from London, the airport has connections to many major European cities.

For the family

Unlike Woburn, which boasts a park full of wild animals to which the kids can be fed for the afternoon, there is not much natural beauty in the immediate surroundings of the NEC. So, if your trip to the convention cannot be accomplished without the presence of the XYL and/or other little passengers, it is worth noting that Birmingham New Street station is only 10 minutes away by rail, placing the city's shopping and entertainment facilities at their disposal. Other towns of interest are within easy reach by road or rail.

Don't miss it!

So there you go, hours of harmless fun awaiting you at Birmingham on 13-14 April. If you've been before you'll know just how interesting and worthwhile it can be: you certainly won't need to be reminded of the various bargains to be had. If you haven't been before, there's only one way to find out what you've been missing up to now, and that's to get along there and see for yourself.

Without doubt the NEC provides a great opportunity to look, listen, learn, do some shopping, mix with other amateurs, and have an enjoyable day while you're at it! See you there? 

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DX-103	3 element 10m Yagi	90.85
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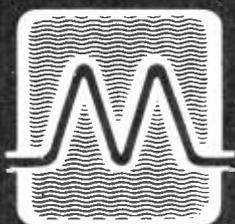
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SPECTRUM WATCH

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Traditionally the radio frequency spectrum has been controlled at national level by governments, and at international level by organisations set up by government bodies. The present trend towards de-regulation of the telecommunications industry, or rather its 're-regulation' as some prefer to call it, has led to a greater demand by outsiders, ie non-government bodies, to have a say in how the radio frequency spectrum is allocated.

Rather than regulating the entire spectrum from one central point, various possibilities are being considered whereby chunks of spectrum would be allocated to certain types of user or to sectors of industry, and whereby the detailed regulation of the frequencies within these chunks would be carried out by bodies other than the government.

This, combined with the 'free market forces' philosophy, leads to the notion that users of the radio spectrum might be charged a rental fee in proportion to the amount of the spectrum they use; so many '£ per KHz'! The more spectrum used, the greater the charge would be.

Usage charge

A 'spectrum usage charge' would be different from today's radio licence fees, which bear no relationship to the amount of spectrum used. The amateur radio 'A' licence on HF entitles the holder to the use of 3.340MHz of bandwidth between 1.8 and 30MHz. This represents some 12% of that part of the spectrum and must, in spectrum usage terms, be considered as excellent value for money!

Inefficient use of the spectrum, it is argued, would be avoided if users were charged for access to it on the basis of bandwidth used. It is also argued that such a spectrum usage charge would encourage spectrum users to strive further in seeking narrower bandwidth modulation techniques.

However ideal and egalitarian such a spectrum usage charge might seem in theory, in practice agreeing the basis for such a charge would be an impossible balancing act! Would amateur radio HF operators be able to claim a refund from their spectrum usage charge during years of low sunspot activity, when the 1.7MHz of bandwidth that constitute the 28MHz band would be unusable for long distance communication?

Discussions on the idea of a '£/KHz of bandwidth' charge for access to diffe-

rent parts of the radio spectrum can be expected to roll on for many years, but in the meantime there is no shortage of comings and goings in different parts of the spectrum.

VHF - Band III

Even though it is now some time since the UK's 405-line VHF TV transmitters in Bands I and III finally closed down on 5 January 1985, the exact use of these valuable pieces of spectrum has not been decided. The greater part of Band III (174-225MHz) is expected to be allocated to land mobile radio services.

What has not yet been announced is the type of land mobile services that will be allowed on these frequencies. Many proposals have been made to the DTI, and one of these came from Aircall UK which currently runs message handling and paging services.

Aircall UK proposed that a national multi-service trunked radio system using 300 channels be established in Band III. With something like 1,200 channels available in Band III (the exact figure depends on interference levels with overseas TV transmitters, which will continue broadcasting in Band III for the foreseeable future), Aircall reckon that there is plenty of room for two or three competing national networks as well as some local networks. There would also be room for advanced communication techniques, such as SSB (to the amateur radio operator who uses SSB day-in and day-out, it can seem strange to hear it described as an 'advanced technique!').

Scandalous

At a recent London conference on mobile radio, Walter Stevenson of Aircall described the present situation in Band III as 'a scandalous waste of a natural resource'. Since the early sixties, when the UHF TV network was first installed, it has always been a possibility that one day the VHF TV transmitters would be turned off and the frequencies returned to their previous occupants.

Before commercial TV transmissions started up in the UK in 1955, Band III was used by mobile services. The land mobile radio operators' return to these frequencies is seen as a 'home-coming' after nearly 30 years of absence.

Since the Merriman interim report in 1982 on the future use of the radio spectrum (30-960MHz), in which it was proposed that the Band III frequencies



The latest 25KW Marconi VHF TV transmitter, part of a new generation of transmitters intended for the export market

be taken away from the broadcasters (who could have re-engineered Band III into another national colour TV network) and given to mobile radio services, there have been numerous discussions and submissions concerning the re-use of these frequencies. The most significant of these was the Green Paper published in May 1984, and to which there were over sixty responses.

The only firm decision that has been made public so far concerning the re-use of Band III is that the new mobile radio networks established in Band III will not be allowed to compete with the new cellular (Cellnet and Vodafone) networks at 900MHz by having direct connection into the PSTN (Public Switched Telephone Network). The government feels that the operators of the new 900MHz cellular services should be given some time to breathe. Any new service in Band III that offered unimpeded direct access to the PSTN for mobiles would be in direct competition with the cellular duopoly.

Cellular spreads north!

Viewed from a few years distant it will be totally irrelevant which of the UK's two cellular radio operators got on the air first. But as reported in *Spectrum Watch* last month, Racal-Vodafone piped Cellnet to the post by switching on their London network just a few days earlier than Cellnet.

Not to be outdone, before the month was out Cellnet publicly demonstrated the first operation of their Birmingham cells. Although one or two radio cells are operational in Birmingham, it is understood that it is still the London switch that is used for connection to the network. Eventually both operators will have a main switch in Birmingham.



The Cellnet field strength measuring vehicle, which contains signal strength measurement and position fixing equipment. The field strength contours can be measured on the move

By mid-February both network operators were claiming that they each had about 1,000 subscribers connected to their respective networks.

There is still a long way to go both in terms of network infrastructure and customer base before the currently predicted level of 500,000 UK users of cellular radio is achieved.

Cellnet had 29 cells operational in mid-February, 27 of which were inside the London M25 ring, the other two being in Birmingham. Racal claimed 20 operational cells at the same date.

The two competing cellular network operators are using very different techniques for 'illuminating' their cells. Cellnet use omni-directional transmitting antennae at the centre of the cell, in conjunction with a number of receiving antennae each covering a different sector.

Racal-Vodafone on the other hand illuminate their cells from the edge. A typical Racal-Vodafone cell station has nine directional antennae in three arrays of three at 120° to each other. Each array of three consists of two antennae for diversity reception and one antenna for transmission.

The full national cellular network will probably consist of over 1,000 cells. As radiotelephone traffic increases in city areas, cells can be split down into smaller cells to achieve a greater capacity. The November 1984 issue of **R&EW** contained a description of some of the features of the UK's new cellular networks.

French private TV: 'Ouil'

Private TV stations in France were given the go-ahead in a TV broadcast given by President Mitterand during the cold snap that hit much of Europe in mid-January.

Presidential broadcasts in France are live. In order to avoid any risks of power cuts at the Presidential Palace due to the cold weather, the French TV transmission engineers decided to roll up a large generator to handle all the OB power

requirements for cameras, lighting and radio links for the Presidential address.

There were two main topics that the President wanted to handle during the address: the situation in New Caledonia and private TV stations in France.

Having dealt with the first he went on to say how satisfied he was with the performance of the three state-run TV channels in France (TF1, Antenne 2 and FR 3), but that there was also an evident need for private TV stations in France. He had therefore ordered an urgent study into how private TV stations could be set up.

The President's remarks about his satisfaction with the present TV channels were ominous. The Presidential address was going out live on Antenne 2. About 40 minutes into the programme, while the President was still in full flight, there was a sudden loss of picture. A quick cut to a map of the world. Then cut back to the President saying, 'Is it OK, can I go on?'

'Yes, Mr President.'

Then ten seconds later another cut. Back to an announcer in the studio: 'Er, er, there appears to be a problem'. Announcer grabs telephone on the desk. 'Oh, it's a power-cut at the palace'. Pause. Another glimpse of the map of the world. Cut back again to the President now looking a bit ruffled.

'Are we on again?'

'Yes, Mr President.'

Mitterand picks up where he left off, only to be cut off for the third and last time just 15 seconds later. End of Presidential address!

With the outside temperature hitting record lows of around -20°C, the fuel in the generator had frozen up!

Experience

In deciding how they are going to handle private TV stations, the French government has plenty of experience to draw on from the private radio stations which were first legalised in a hurry in the 1981 post-election rush to 'liberate the airwaves'.

Technically this 'liberation' has led to anarchy and chaos on the FM band in the Paris area. Private TV, unless properly organised from the start, could cause a lot more interference problems and abuse of the spectrum than the French private FM stations ever did.

Having made the political decision to go ahead with private TV stations in France, the major technical problem is to find space in the spectrum. France's VHF Bands I and III 819-line transmitters had all been taken out of service by early 1984. Canal Plus, France's new over-the-air pay TV service, started programme transmissions in November 1984 on a mixed VHF and UHF network (see January **R&EW**).

VHF Band III frequencies in France are also being used for new land mobile radio services in main city areas. So with the new mobile services and the spread of Canal Plus' new network there is unlikely to be any room available in Band III for private TV channels, except perhaps in some rural areas. So UHF has to be the main carrier for France's private TV stations.

On UHF, in order to avoid interference problems between stations within the same area there have to be at least two 'clear' channels between each TV channel in use. Thus in a location where there are already three state TV transmissions (on, say, UHF channels 23, 26 and 33) as well as a Canal Plus transmitter (on, say, UHF channel 29), there would not be room for more than two or perhaps three TV stations within the typical bandwidth range of domestic TV antennae, which at the lower range might cover only from channel 21 up to about 40.

President Mitterand suggested that there might be a total of about 80 or 85 private stations across France.

In France, all microwave trunks and TV transmitters are owned and operated by Télédiffusion de France (TDF) on behalf of the four main channels. Private TV stations, if they are going to be received on the same domestic UHF TV antennae as the other programmes, will have to site themselves in the same direction as the local TDF-run transmitters. Private French TV stations are unlikely to want to share transmitter facilities with TDF, even though in practice, with existing towers and vantage points, these would probably provide the best signals.

Before French private TV becomes a reality, a solution has to be found to the frequency allocation problem; if it is not going to follow down the same slippery and unregulated path as private FM radio into spectral chaos and general disorder, it needs to be carefully planned. A general free-for-all in the UHF TV bands is not to be recommended. The effects would be much worse than those experienced with the FM band free-for-all that followed the 'liberation' of the French airwaves!



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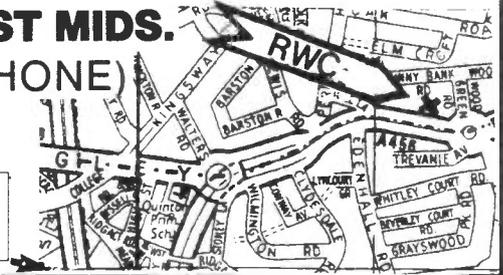


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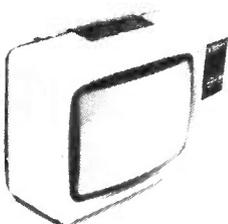
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 - DLV11-E Serial. Modem support £200.00
 - DUP11 Sych Serial data i/o £650.00
 - DQ200 Dilog - multi RK controller £495.00
 - DZ11-B 8 line RS232 mux board £650.00
 - KDF11-B M8189 PDP 1123+ £1100.00
 - LA36 Decwriter EIA or 20 ma loop £270.00
 - LAX34-AL LA34 tractor feed £85.00
 - MS11-JP Unibus 32 kb Ram £80.00
 - MS11-LB Unibus 128 kb Ram £450.00
 - MS11-LD Unibus 256 kb Ram £850.00
 - MSC4804 Qbus (Equip MSV11-L) 256 kb £499.00
 - PDP11/05 Cpu, Ram, i/o, etc. £450.00
 - PDP11/40 Cpu, 124k MMU £1850.00
 - RT11 ver. 3B documentation kit £70.00
 - RK05-J 2.5 Mb disk drives £650.00
 - KL8JA PDP 8 async i/o £175.00
 - M8E PDP 8 Bootstrp option £75.00
 - VT50 VDU and Keyboard - current loop £175.00
 - VT52 VDU with RS232 interface £250.00

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

DISPLAY ELECTRONICS

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

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NEW THIS MONTH

"SENSING & CONTROL PROJECTS FOR THE BBC MICRO"

Have you wondered what all those plugs and sockets on the back of the BBC micro are for? This book assumes no previous electronic knowledge and no soldering is required, but guides the reader (pupil or teacher) from basic connections of the user sockets, to quite complex projects. The author, an experienced teacher in this field, has provided lots of practical experiments, with ideas on how to follow up the basic principles. A complete kit of parts for all the experiments is also available. Book, 245 x 185mm **£5.95**. Kit **£29.95**.

LEADS AT SILLY PRICES!

PL116 DC adaptor lead for Walkman, 1.8m long **30p**.
PL528 2 pin DIN line skt to phono plug 0.2m long **20p**.
PL508 5 pin DIN to 3 pin DIN audio lead 1.2m long **40p**.
PL541 Intercom extn lead, 3.5mm line skt to 3.5mm plug, 6m long **40p**.
PL708 Video lead, **PL259 plug to F type plug**, 3m low loss coax **85p**.
FM TUNING MODULE. This neat unit 75 x 40 x 19mm as used in car radios etc. Standard 10.7MHz IF output, 9-12V DC supply. Full connection data supplied. **£2.40**.
Stereo Cassette Head Only **£1.00**.

REC FILTER PLUG

Made by Rendar, integrated chassis mounted plug with mains filter rated 2A. Like RS 238-S14. Only **£3.00**.

7-SEG LEDS

MAN 8910 0.8" red seven segment LED's common anode. **£1.25 for £10**

DIL SOCKETS

Gold plated low profile at unbeatable prices:
 14DIL.....**£7/100**
 16DIL.....**£8/100**
 24DIL.....**£12/100**
 40DIL.....**£20/100**

VOLTAGE REG SCOOP

7924UC 1A 24V 40p
 uA317UC 1/2A variable 50p
 78MGUIC variable 65p

PCB MOUNTING NI-CADS

Much sought after 4.8V 150mA batts with PCB mntg tags on 25mm pitch. Batt size 25 x 160. Ideal for paralleling. 99p ea: 10 + 85p; 25 + 70p; 100 + 60p

FIBRE OPTICS

Scoop purchase of single and twin cable. For use with visible light or infra-red. Core 1mm dia, overall 2.25mm dia. Single 50p/m; 20m coil **£6.30**. Twin 90p/m; 20m coil **£11.00**

MINIATURE RELAYS

PCB mounting, DPCO size 20x15x15mm. Available in 3.9 or 12V. **£1** each

1W AMPLIFIER

Z914 Audio amp panel 95x65mm with TBA820 chip. Gives 1W output with 9V supply. Switch and vol control. Just connect batt and speaker. Full details supplied. Only **£1.50** 10 for **£12**; 25 for **£25**; 100 for **£75**.

Z915 Stereo version of above 115x65mm featuring 2 x TBA820M and dual vol control. **£3.50** 10 for **£30**; 25 for **£85**; 100 **£200**

AM TUNER PANEL

Z916 For use with mono amp above. Neat panel 60x45mm. Only **£1.50**; 10 for **£12**.

NI-CAD CHARGER SCOOP!!

Ever-Ready model CH4, this charger will take up to 4 AA, C or D cells plus 2 PP3 if required. Smart tone dore grey case 212x97x60mm. Only **£7.95**.

STEREO AMP PANEL

Z908 Panel 147 x 38mm with 2 x TDA 1004 6W audio amp IC's not soldered in! so they can easily be removed. Also 1000/16, 1000/10 x 2, 470/16 elcs, ceramic discs, R's also choke (All easily removed) Only **£3.00** (IC's cost £4 ea) Circuit Supplied.

SEAT BELT ALARM

Originally for sale at **£8.95**, these well made units 70x50x25mm provide both audible and visual alarms. Uses 2 IC's, PB2720 transducer, etc. Available ready built, with circuit and instructions for just **£3.95**. Also available as a kit, PCB + all components, box, wire, etc, together with instructions. Only **£2.95**.

POWERVU METER

Nest unit 40x40mm scaled 0-25 200µA movement. Only **£1.00**; 10 for **£8**; 25 **£17**; 100 **£85**.

STEREO AMP

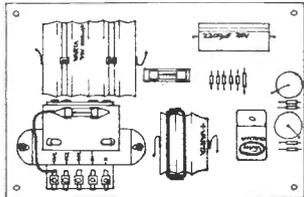
Z908 - Panel 147x38mm with 2 x TDA1004 6W audio amp. IC's not soldered in! so they can easily be removed. Also 1000/16, 1000/10 x 2, 470/16 elcs, ceramic discs, R's, also choke. (All easily removed). Stereo Amp? Only **£3.00** (IC's worth **£8**).

GREENWELD

Min Access order value **£5** No min CWO value. Official orders from schools etc. welcome - min invoice charge **£10**. Our shop has enormous stocks of components and is open from 9-5.30 Mon-Sat. Come and see us!!

1984/5 CATALOGUE

84 page A4 size - Bigger Brighter, Better - more components than ever before! With each copy there's discount vouchers, Bargain List, Wholesale Discount List, Bulk Buyers List, Order Form and Reply Paid Envelope. All for just **£1.00!** Winter Supplement out now! - Send large SAE for your free copy.



NI-CAD CHARGER PANEL

177 x 114mm PCB with one massive Varta Deac 57 x 50mm Ø rated 7.2V 1000MAH and another smaller Deac 32 x 35mm Ø rated 3.6V 600mA. The price of these Ni-Cad stacks new is over **£20**. Also on the panel is a mains input charger transformer with two separate secondaries wired via bridge rectifiers, smoothing capacitors and a relay to the output tags. The panel weighs 1kgm. All this for just **£3.00**.

GREENWELD - The Pack People!

K524 OPTO PACK - a variety of single point and seven segment LEDS (incl. dual types) of various colours and sizes, opto isolators, numicators, multi digit gas discharge displays, photo transistors, infra red emitters and receivers. 25 assorted **£3.95** 100 **£14.95** 250 **£35**

K528 ELECTROLYTIC PACK - All ready cropped for PCB mounting, this pack offers excellent value for money. Good range of values and voltages from 0.47µF to 1000µ, 6v to 100v. 100 **£3.95** 250 **£8.95** 1000 **£32**

K531 PRECISION RESISTOR PACK - High quality, close tolerance R's with an extremely varied selection of values mostly 1/4 and 1/2w tolerances from 0.1% to 2% - ideal for meters, test gear etc. 250 **£3** 1000 **£10**

K532 RELAYS - wide selection of styles voltages and contacts 4V - 240V, AC/DC, SP to 4PCO 20 for **£6** 100 **£25**

K525 PRESET PACK - Big, Big variety of types and sizes - submin, min and std, MP, slider, multiturn and cermet are all included. Wide range of values from 20R to 5M. 100 assorted **£6.75** 250 **£12.95** 1000 **£48**

K517 TRANSISTOR PACK - 50 assorted full spec marked plastic devices PNP NPN RF AF. Type numbers include BC114 117 172 182 183 198 239 251 214 255 320 BF 198 255 394 2N3904 etc etc Retail cost **£7** + Special low price **£2.75**

K520 SWITCH PACK - 20 different assorted switches - rocker, slide, push, rotary, toggle, micro etc. Amazing value at only **£2**.

TORUS!

Computer controlled Robot built around the gearbox described below. Complete kit of parts inc PCB, program listings for BBC (other micros soon) **£44.85** 20W ribbon cable (min 3m recommended - 5m better) **£130/m** SAE for illustrated leaflet.



MOTORISED GEARBOX

These units are as used in a computerised tank, and offer the experimenter in robotics the opportunity to buy the electro-mechanical parts required in building remote controlled vehicles. The unit has 2 x 3V motors, linked by a magnetic clutch, thus enabling turning of the vehicle, and a gearbox contained within the black ABS housing, reducing the final drive speed to approx 50rpm. Data is supplied with the unit showing various options on driving the motors.

Two new types of wheels can be supplied (the aluminium discs and smaller plastic wheels are now sold out). Type A has 7 spokes with a round black tyre and is 100mm dia. Type B is a solid heavy duty wheel 107mm dia with a flat rigid tyre 17mm wide.

PRICES:

Gearbox with data sheets: **£5.95** ea
 Wheel Type A: **£0.70** ea
 Wheel Type B: **£0.90** ea

WOOD & DOUGLAS

VHF/UHF COMMUNICATION PRODUCTS

A NEW RALLY SEASON BEGINS!

During the next months you can meet our happy smiling staff at events up and down the country. Our new illustrated catalogue will be released at the NEC in April along with the new high quality products we have been devising in our winter hibernation!

See you there!

Package Prices

	KiR
1. 500mW TV Transmit	(70FM05T4 + TVM1 + BPF433) 35.00
2. 500mW TV Transceiver	(As 1 above plus TVUP2 + PSI433) 60.00
3. 10W TV Transmit	(As 1 above plus 70FM10 + BD335) 65.00
4. 10W TV Transceiver	(As 2 above plus 70FM10 + BD335) 90.00
5. 70cms 500mW FM Transceiver	(70T4 + 70R5 + SSR1 + BPF) 75.00
6. 70cms 10W FM Transceiver	(As 5 above plus 70FM10) 105.00
7. 2M Linear/Pre-amp 10W	(144PA/S + 144LIN10B) 40.00
8. 2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25B) 42.00
9. 70cms Synthesised 10W Transceiver	(R5 + SY + AX + MOD + SSR + 70FM10) 150.00
10. 2M Synthesised 10W Transceiver	(R5 + SY + SY2T + SSR + 144FM10A) 120.00
11. 2M Crystal Controlled 10W Transceiver	(R5 + T3 + BPF + 144FM10 + SSR) 85.00
12. 70cms Linear/Pre-amp	(70LIN10 + 70PA2/S) 45.00

70cms EQUIPMENT

Transceiver Kits and Accessories	CODE	ASSEMBLED	KIT
FM Transmitter (0.5W)	70FM05T4	48.00	28.75
FM Receiver (with PIN RF c/o)	70FM05R5	65.40	45.80
Transmitter 6 Channel Adaptor	70MC06T	21.30	14.25
Receiver 6 Channel Adaptor	70MC06R	25.20	17.90
Synthesiser (2 PCBs)	70SY25B	88.00	62.25
Synthesiser Transmit Amp	A-X3U-06F	34.15	22.10
Synthesiser Modulator	MOD 1	8.95	5.50
Bandpass Filter	BPF 433	6.50	3.30
PIN RF Switch	PSI 433	7.55	5.35
Converter (2M or 10M f.)	70RX2/2	27.10	20.10
TV Products			
Receiver Converter (Ch 36 Output)	TVUP2	27.50	22.80
Pattern Generator (Mains PSU)	TVPG1	42.25	36.50
TV Modulator (For Transmission)	TVM1	9.85	5.75
Ch 36 Modulator (For TV Injection)	TVMOD1	9.80	5.50

Power Amplifiers (FM/CW Use)

50mW to 300mW	70FM1	18.45	12.80
500mW to 5W	70FM3	23.45	17.80
500mW to 10W	70FM10	41.45	33.45
3W to 10W	70FM3/10	23.95	18.30
10W to 40W	70FM40	65.10	52.35
Combined Power Amp/Pre-Amp (Auto Changeover)	70PA/FM10	56.60	40.15
Linears			
500mW to 3W (Straight amp, no changeover)	70LIN3/LT	27.90	19.90
3W to 10W (Auto Changeover)	70LIN3/10E	41.05	30.15
1W to 7W (Auto Changeover)	70LIN10	44.25	32.50

Pre-Amplifiers

Bipolar Miniature (13dB)	70PA2	8.10	6.50
MOSFET Miniature (14dB)	70PA3	9.65	7.50
RF Switched (30W)	70PA2/S	24.25	15.25
GaAs FET (16dB)	70PA5	20.10	12.80

2M EQUIPMENT

Transceiver Kits and Accessories			
FM Transmitter (1.5W)	144FM2T3	39.35	26.30
FM Receiver (with PIN RF Changeover)	144FM2R5	65.50	47.20
Synthesiser (2 PCBs)	144SY25B	78.75	60.05
Synthesiser Multi/Amp (1.5W O/P)	SY2T	27.90	20.65
Bandpass Filter	BPF 144	6.50	3.30
PIN RF Switch	PSI 144	7.55	5.35

Power Amplifiers (FM/CW Use)

1.5W to 10W (No Changeover)	144FM10A	24.15	18.50
1.5W to 10W (Auto Changeover)	144FM10B	36.11	26.25
Linears			
1.5W to 10W (SSB/FM) (Auto Changeover)	144LIN10B	38.40	28.50
2.5W to 25W (SSB/FM) (Auto Changeover)	144LIN25B	40.25	29.95
1.0W to 25W (SSB/FM) (Auto Changeover)	144LIN25C	44.25	32.95

Pre-Amplifiers

Low Noise, Miniature	144PA3	8.60	7.40
Low Noise, Improved Performance	144PA4	12.85	8.40
Low Noise, RF Switched, Full Changeover	144PA4/S	24.30	15.30

GENERAL ACCESSORIES

Toneburst	TB2	6.70	4.25
Piptone	PT3	7.50	4.45
Kaytone	PTK3	8.75	6.05
Relayed Kaytone	PTK4R	12.70	8.20
Regulator (12V, low differential)	REG1	6.95	4.40
Solid State Supply Switch	SSR1	5.85	3.70
Microphone Pre-Amplifier	MPA2	6.10	3.50
Reflectometer	SWR1	6.35	5.35
CW Filter	CWF1	5.55	5.80
TVI Filter (Boxed)	HPF1	8.95	-
FM TV MODULES			
50mW 420MHz Source (Video Input)	UFM01	26.95	19.80
50MHz i.f. Processor	VIDIF	54.25	38.95
Varactor Multiplier (Boxed)	WDV400/1200	63.95	-
1250MHz Downconverter	1250DC50	69.95	-

Further details on our product range will gladly be forwarded on receipt of an A5 size SAE. Technical help is available by phone (NEW NUMBER) during normal office hours. Kits are usually available by return of post but please allow 28 days for unforeseen delays. Please add 75 pence to your total order for postage and handling. Credit card orders are gladly accepted, please give us a call.

ANYONE CAN SELL A KIT . . . REPUTATION SELLS OURS



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BI-PAK BARGAINS

HIGH QUALITY MODULES FOR STEREO, MONO & OTHER AUDIO EQUIPMENT

Audio Amplifiers			
O/No.	PDWER D/P	MAX SUP VOLTAGE	PRICE
AL 30A	10 Watts	30V	£4.95
AL 60	25 Watts	30-50V	£5.92
AL 80	35 Watts	40-60V	£8.75
AL 120	50 Watts	50-70V	£15.22
AL 250	125 Watts	50-80V	£20.60

Stabilised Power Supplies			
O/No.	Output current 2.5 Amps	AC Input	Price
SPM 120/45		40-48V	£8.05
SPM 120/55		50-55V	£8.05
SPM 120/65		60-65V	£8.05

Mono Pre-Amplifiers - Operating Vtg. 40-65V		Price
O/No.		
MM 100	Suitable for Disco Mixer	£14.75
MM 100G	Suitable for Guitar Pre-Amp Mixer	£14.75

Magnetic Cartridge Pre-Amplifier		Price
O/No.	MPA30 Sup Vtg. 20-30V.	£4.29

Monographic Equaliser		Price
O/No.	GE 100 MK11 10 Channel OUR PRICE ONLY	£20.00

Full Specifications and Data available on request. Please send self-addressed envelope.

OPTO 7-Segment Displays

Brand new 1st Quality
LITRONIX DL 707R 14-pin

Red 0.3" Common Anode Display 0-9 with right hand decimal point. TTL compatible. 5V DC Supply. Data supplied.

5 pieces	£3	(60p each)
10 pieces	£5	(50p each)
50 pieces	£20	(40p each)
100 pieces	£35	(35p each)
1,000 pieces	£300	(30p each)

THE MORE YOU BUY THE LESS YOU PAY

BI-PAK'S OPTO SPECIAL

A selection of large and small sized LED's in various shapes, sizes & colours, together with 7 Segment Displays both anode & cathode plus photo transistors emitters and detectors. Cadmium Cell ORP12 and Germ. photo transistor OCP71 included. In all a total of 25 Opto pieces valued over £12 Normal Price

Order No. VP57
Our Super Value Price Just **£5.00**

DIGITAL VOLT METER MODULE

3 x 7 segment displays Bass Circuit. 0-2v± instructions provided to extend voltage & current ranges. Operating voltage 9/12v. Typ Power Consumption 50mA.

O/No. VP99 Once only price **£9.95**

SINGLE SIDED FIBREGLASS BOARD

Order No	Pieces	Size	Sq. Ins.	Price
FB1	4	9 x 2 1/2"	100	£1.50
FB2	3	11 x 3"	100	£1.50
FB3	4	13 x 3"	156	£2.00

DOUBLE SIDED FIBREGLASS BOARD

FB4	2	14 x 4"	110	£2.00
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EDGE CONNECTORS

50-way x 2.1 pitch Edge Connector (Gold) (O/No. AMP16379 2) £1.20 each. £50 per 50 off

PICK-UP COIL

Large telephone pick-up coil for high sensitivity. Suction pad to stick to telephone. 90cm lead to 3.5 jack plug. Connects direct to cassette recorder. Dims: 32mm(dia) x 17mm(body) 36mm(dia) sucker. O/No. YP87 **£1.00**

VALUE PACKS

Pak No	Qty	Description	Price
VP1	300	Assorted Resistors Mixed Types	£1.00
VP2	300	Carbon Resistors 1/4-1/2 Watt Pre-Formed	£1.00
VP3	200	1/8 Watt Min Carbon Resistors Mixed	£1.00
VP4	150	1/2 Watt Resistors 100 ohm-1M Mixed	£1.00
VP5	200	Assorted Capacitors All Types	£1.00
VP6	200	Ceramic Caps Miniature - Mixed	£1.00
VP7	100	Mixed Ceramics Disc. 1pf - 96pf	£1.00
VP8	100	Mixed Ceramic Disc. 68pf - .015pf	£1.00
VP9	100	Assorted Polyester/Polystyrene Caps	£1.00
VP10	60	C200 Type Caps Metal Foil Mixed	£1.00
VP11	50	Electrolytics - All Sorts	£1.00
VP12	60	Bead Type Polystyrene Min Caps	£1.00
VP13	50	Silver Mica Caps Ass. 5.6pf - 150pf	£1.00
VP14	50	Silver Mica Caps Ass. 180pf - 470pf	£1.00
VP15	50	.01uF 250V Min. layer metallised Polyester Capacitors	£1.00
VP16	50	Wirewound Res 9W (avg) Ass. 1 ohm - 12K	£1.00
VP17	50	Metres PVC Covered Single Strand Wire Mixed Colours	£1.00
VP18	30	Metres PVC Covered Multi Strand Wire Mixed Colours	£1.00
VP19	40	Metres PVC Single/Multi Strand Hook-Up Wire Mixed	£1.00
VP20	6	Rocker Switches 5 Amp 240V	£1.00
VP21	15	2" High Bright Red LED's in plastic encapsulation large area light source	£1.00
VP22	200	Sq. Inches Total, Copper Clad Board Mixed Sizes	£1.00
VP23	20	Assorted Slider Pots. Mixed Values	£1.00
VP24	10	Slider Pots. 40 mm 22K 5 x Log. 5 x Lin	£1.00
VP25	10	Slider Pots. 40 mm 47K 5 x Log. 5 x Lin	£1.00
VP26	15	Small .125" Red LED's	£1.00
VP27	15	Large 2" Red LED's	£1.00
VP28	10	Rectangular 2" Red LED's	£1.00
VP29	30	Ass. Zener Diodes 250mW - 2W Mixed Vtts. Coded	£1.00
VP30	10	Ass. 10W Zener Diodes Mixed Vtts. Coded	£1.00
VP31	10	5 Amp SCR's TO-66 50-400V Coded	£1.00
VP32	20	3 Amp SCR's TO-66 Up To 400V Uncoded	£1.00
VP33	200	Sil. Diodes Switching Like IN4148 DO-35	£1.00
VP34	200	Sil. Diodes Gen. Purpose Like DA200/BAX13/16	£1.00
VP35	50	1 Amp IN4000 Series Sil. Diodes Uncoded All Good	£1.00
VP37	8	Black Instrument Type Knobs With Pointer 1/4" Std	£1.00
VP42	10	Black Heatsinks To Fit TO-3, TO-220 Ready Drilled	£1.00
VP43	4	Power-Fin Heatsinks 2 x 10-3 2 x TD-66 Size	£1.00
VP45	50	BC107/8 Type NPN Transistors Good Gen. Purpose Uncoded	£1.00
VP46	50	BC177/8 Type PNP Transistors Good Gen. Purpose Uncoded	£1.00
VP47	10	Silicon Power Trans. Similar 2N3055 Uncoded	£1.00
VP140	50	Precision Resistors. 2-1% tol.	£1.00
VP141	40	IN4002 Sil. Rects. 1A 100v preformed pitch	£1.00
VP142	4	40A Power Rectifiers Silicon TO48 300VIF	£1.00
VP143	5	BY187 12KV Sil. Diodes in carriers 2.5mA	£1.00
VP144	4	100K 1in. Multi-turn pots ideal vari cap tuning	£1.00
VP145	10	Assorted pots. inc. Dual & Switched types	£1.00
VP146	25	Solid Tantalum Caps. Mixed Values	£1.00

OPTICALLY COUPLED MODULES

1 pair S01131 Consisting 1 x LS600 Silicon Light Sensor & 1 x Matched Gallium Arsenide Light Source - Only TIL23, on ready mounted fibre glass board. Including Data.
BI-PAK Price Only £0.60 pr.
Ideal Alarm projects etc. O/No. VP147.

LED DISPLAYS

VP130	6	RED 7 Seg. CC 14mm x 7.5mm RDP FND353	£2.00
VP131	4	GREEN 7 Seg. CA 6" LDP XAN6520	£2.00
VP132	5	RED 7 Seg. CC 6" LDP XAN6940	£2.00
VP133	6	RED Over-flow 6" 3 x CA 3 x CC 6630/50	£2.00
VP134	5	GREEN Over-flow 6" CA XAN6530	£2.00
VP135	5	RED 7 Seg. CA 3" XAN3061	£2.00
VP136	3	DUAL RED 7 Seg. 5" CA DL527 DPR	£2.00
VP137	3	DUAL RED 7 Seg. 51" CA DL727 DPR	£2.00
VP138	20	Assorted LED Displays - Our mix with Data	£5.00

RDP = Right Hand Decimal Point CC = Common Cathode
LDP = Left Hand Decimal Point CA = Common Anode

ANTENNA SWITCH 2 and 3 WAY

Co-axial switch for one transceiver to two antennae or one antenna to two transceivers. Dims: 96 x 55 x 32mm (Body). O/No. VP 113 **£4.50**

As above but 3-way. O/No. VP 114 **£4.75**

HIGH PASS FILTER/SUPPRESSOR

CB/TV. High pass filter. Reduces unwanted signals picked up by antenna. Dims: 45 x 25 x 17mm. O/No. VP 115 **45p**

LOW PASS FILTER

Designed to reduce harmonics on the VHS and TV band. Cut-off frequency: 30MHz. V.S.W.R.: Less than 1.2 to 1. Insertion loss: -0.2dB @ 27MHz. Impedance: 50 ohms. Dims: 80 x 55 x 40mm. O/No. VP 116 **£2.75**

IC BARGAINS

40 Assorted TTL CMOS INTEGRATED CIRCUITS 74 Series & CD4000 Series - All new Gates, Flip-Flops - MSI etc. GREAT VALUE Data Book & Sheets included. 40 Pieces (Our Mix) **£4.00** O/No. UP40

TRANSISTOR PACKS

VP150	20	BC183B Sil. Trans. NPN 30v 200mA Hfe240+ TO92	£1.00
VP151	25	BC171B Sil. Trans. NPN 45v 100mA Hfe240+ TO92	£1.00
VP152	15	TIS90 Sil. Trans. NPN 40v 400mA Hfe100+ TO92	£1.00
VP153	15	TIS91 Sil. Trans. PNP 40v 400mA Hfe100+ TO92	£1.00
VP154	15	MPSA56 Sil. Trans. PNP 80v 800mA Hfe50+ TO92	£1.00
VP155	20	BF595 Sil. Trans. NPN eqvt. BF184 H.F. TO92	£1.00
VP156	20	BF495 Sil. Trans. NPN eqvt. BF173 H.F. TO92	£1.00
VP157	15	ZTX500 Series Sil. Trans. PNP Plastic	£1.00
VP158	15	ZTX107 Sil. Trans. NPN eqvt. BC107 Plastic	£1.00
VP159	15	ZTX108 Sil. Trans. NPN eqvt. BC108 Plastic	£1.00
VP160	20	ES024 Sil. Trans. NPN eqvt. BC214L TO92	£1.00
VP161	25	BC183L Sil. Trans. NPN 30v 200mA TO92	£1.00
VP162	5	SJE5451 Sil. Power Trans. NPN 80v 4A Hfe20+	£1.00
VP163	2	NPN/PNP pairs Sil. Power Trans. like SJE5451	£1.00
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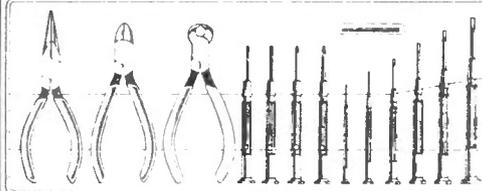
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SYNCHRONOUS RECTIFIERS

In conventional power supplies, one is accustomed to the use of rectifier diodes that turn on and off at times dictated by the ac waveform and the voltage on the energy storage capacitor. If SCRs are employed, then the instant of turn-on (ie the firing angle) is determined by the gate drive circuit in such a way as to control the average power delivered to the load.

... and the like

Dr CJD CATTO

Synchronous detectors

A more general class of circuits includes synchronous rectifiers and phase-sensitive detectors, where the phase of conduction (relative to the fundamental waveform) of a switching device is deliberately set by an auxiliary circuit. This might take one of the forms illustrated in the diagrams in this article.

The power converter shown in *Figure 1* employs MosFETs on both the primary and secondary sides of the transformer T1. A pulse-width modulator drives Tr1 and Tr2 in the conventional manner for a switched-mode power supply, but the normal output rectifiers are replaced by Tr3 and Tr4.

The latter are switched on and off by extra 'gate-drive' windings on T1, and their low on-resistance allows a high efficiency to be achieved. For a 5V rail conventional silicon diodes 'waste' about 0.8V, whereas good DMOS or HEXFET devices can reduce this by half.

In practice extra snubbers etc are needed to ensure that Tr3, Tr4 are not turned on by spurious voltage spikes, but nevertheless this kind of circuit is likely to come into favour as FET prices fall. This is especially true for multi-rail supplies, where Tr1, Tr2 may be run 'flat out' (square wave) but the devices on the secondary side turned on as their respective loads demand.

The circuit shown in *Figure 2*, on the other hand, is used to recover small signals rather than to transfer power. The idea is to produce a dc output proportional to the excursion of the input waveform. This is particularly useful in recovering periodic signals buried in noise; it assumes that the frequency and phase of the required waveform is known, or can be found by synchronising to some clock or 'fly-wheel' oscillator. More about this technique later.

Capacitive converters

It is often the case that an auxiliary supply rail is needed, and if only a small current will be drawn it is possible to avoid the use of inductors by taking advantage of one of the capacitive dc-dc converters now available.

Intersil introduced this kind of device as an IC, the 7660. A more recent part is the Analog Devices AD7560, illustrated in *Figure 3*. This can provide a stable -10V reference, as well as deriving -5V and -15V rails from the +5V

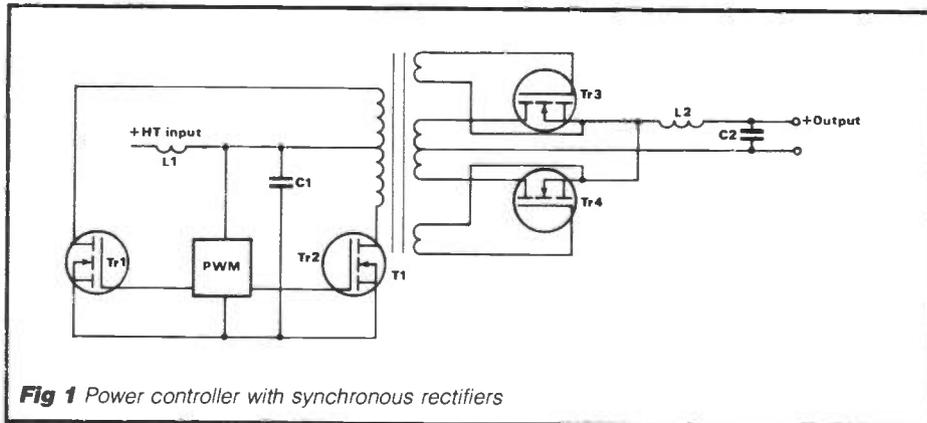


Fig 1 Power controller with synchronous rectifiers

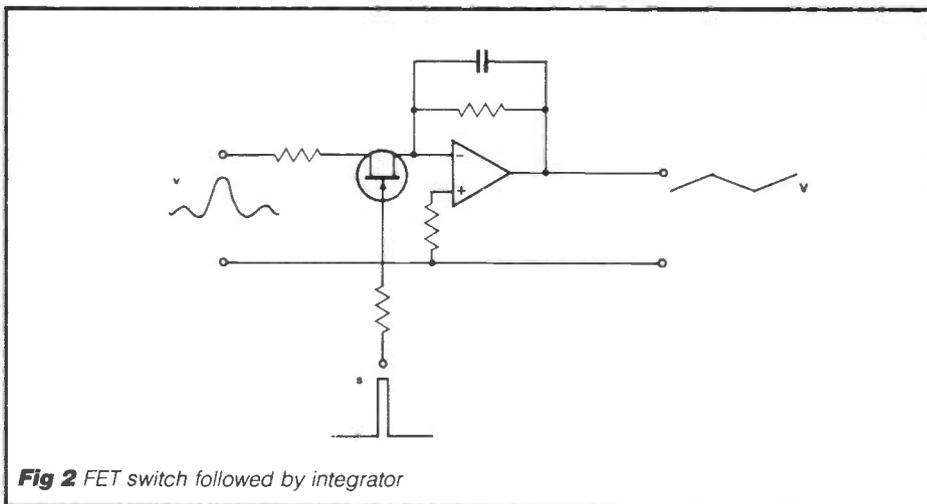


Fig 2 FET switch followed by integrator

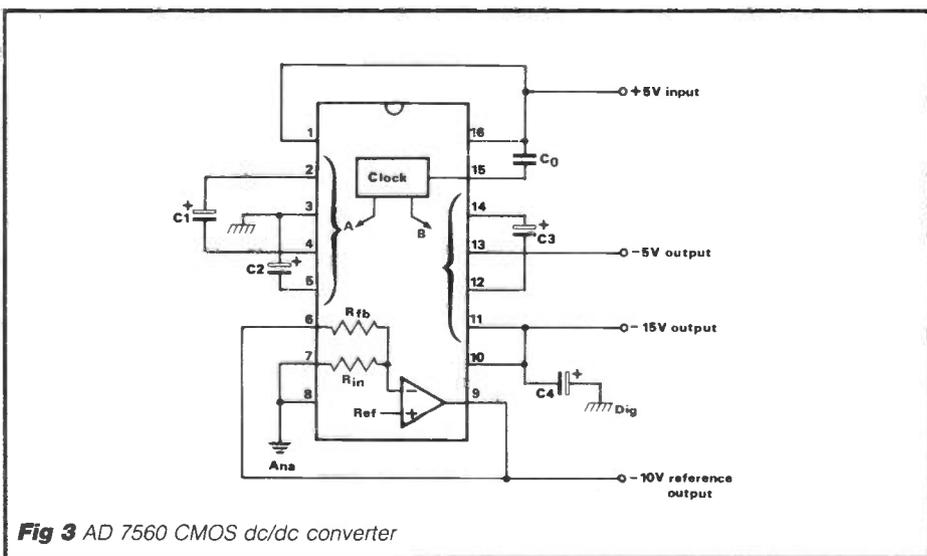


Fig 3 AD 7560 CMOS dc/dc converter

input. Other voltages can be achieved by adding extra diodes and capacitors.

Two converters

The device in fact contains two converters (sections A and B), and these

are cascaded inside the IC. The normal method of operation is shown in *Figure 4*, where initially half the CMOS switches are open and half are closed. Thus C1 charges to +5V.

For the next part of the cycle, all

switches change state. So the charge from C1 is dumped into C2, and after a number of cycles the latter achieves -5V. However, it is connected to section B, and so C3 eventually charges to 10V, with polarity as shown. Consequently the final capacitor C4 is pumped to -15V, by virtue of C2, C3 and the path through the switches S2, S4 in section B. The switching frequency is set by C0 in *Figure 3*: a few KHz is best, since low cost electrolytics can be used for C1 to C4 and switching losses are small.

This kind of circuit is not suitable for more than about a milliamp, since the output falls rapidly as more current is drawn, but it is ideal for CMOS and low power op-amps. It is advisable to keep a separate analogue ground for the reference/op-amp section, since the digital ground can be somewhat noisy.

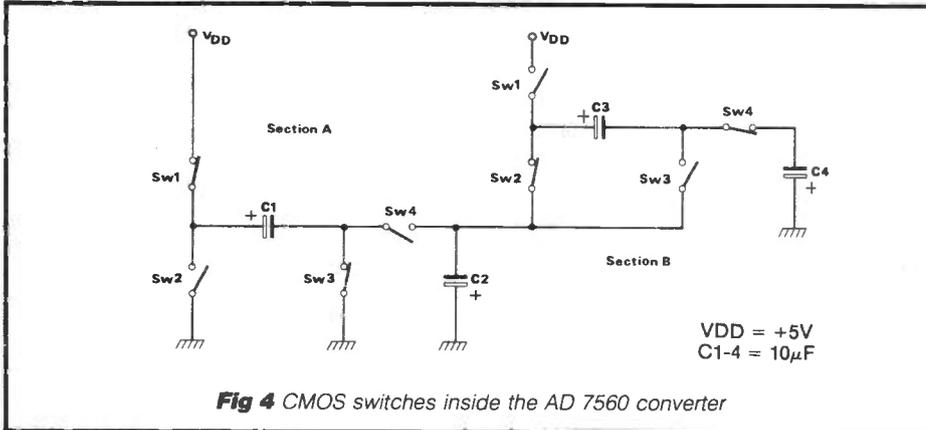


Fig 4 CMOS switches inside the AD 7560 converter

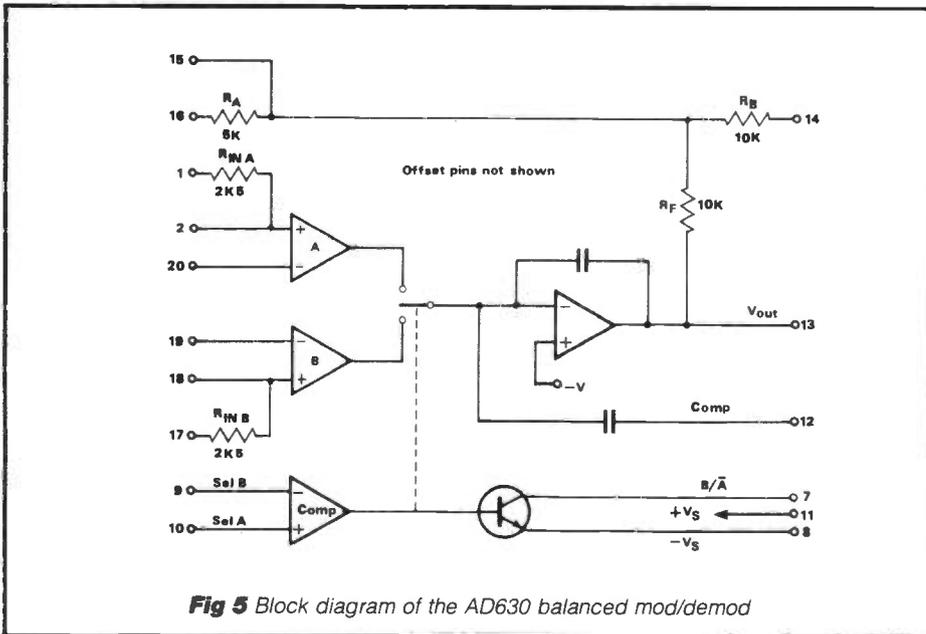


Fig 5 Block diagram of the AD630 balanced mod/demod

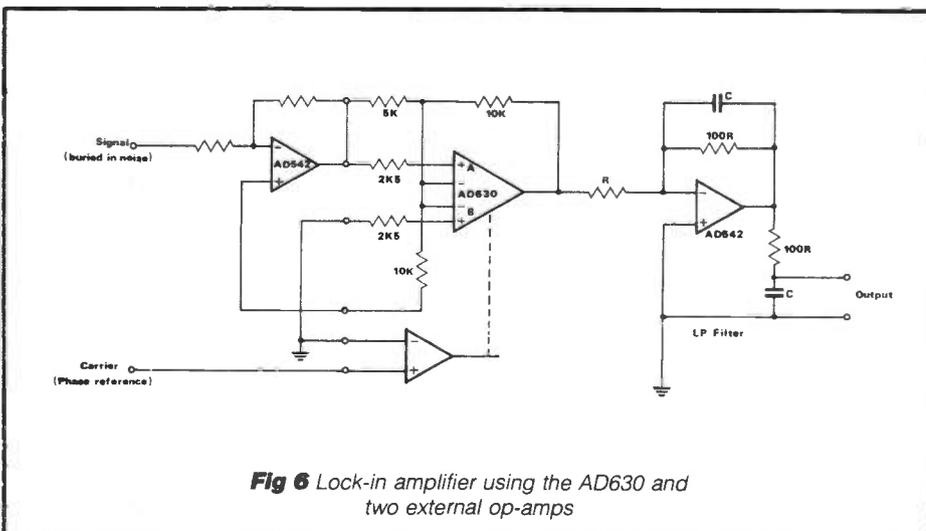


Fig 6 Lock-in amplifier using the AD630 and two external op-amps

Balanced mod/demod

An interesting and ingenious integrated circuit is the Analog Devices balanced modulator/demodulator, the AD630, shown in *Figure 5*. It consists, in effect, of a high performance op-amp preceded by a pair of differential input stages, which are selected by the output of a high speed comparator. A similar part, known as 'SWOP AMP' OPA201, is manufactured by Burr-Brown. The advantage of these ICs is that they enable accurate synchronous detection with a minimum of external parts.

An example illustrating the AD630 in possibly its most effective role is given in *Figure 6*. The object here is to recover a signal buried in noise, assuming that the carrier is available. This could be for, say, an infra-red detector where the radiation is chopped at 400Hz and a low frequency variation needs to be detected, as in a scanning spectrophotometer.

The noise from the detector and other sources can be assumed to be random and therefore not correlated with the modulation. As a result, the synchronous demodulation can extract the genuine signal from the noise. This arrangement is sometimes known as a 'lock-in amplifier', since the useful gain of the amplifier is 'locked in' to the carrier phase reference, and it is possible to recover a signal 100dB weaker than the noise. The low-pass filter is chosen so as to remove carrier and noise components, and allow the signal to be traced on a chart-recorder, for example.

Applications

In fact, the AD630 is a high speed linear device, and can be used with a carrier up to at least 100KHz. It can also be used with ac bridges and LVDT (Linear Variable Differential Transformer) transducers. Other applications include two-channel multiplexing and switchable gain circuits, although the AD630 and OPA201 are somewhat expensive solutions to such mundane problems.

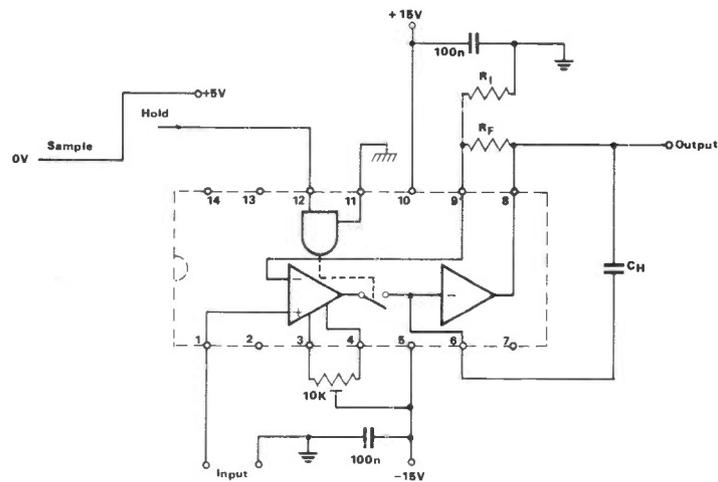


Fig 9 Sample and hold circuit using the AD582

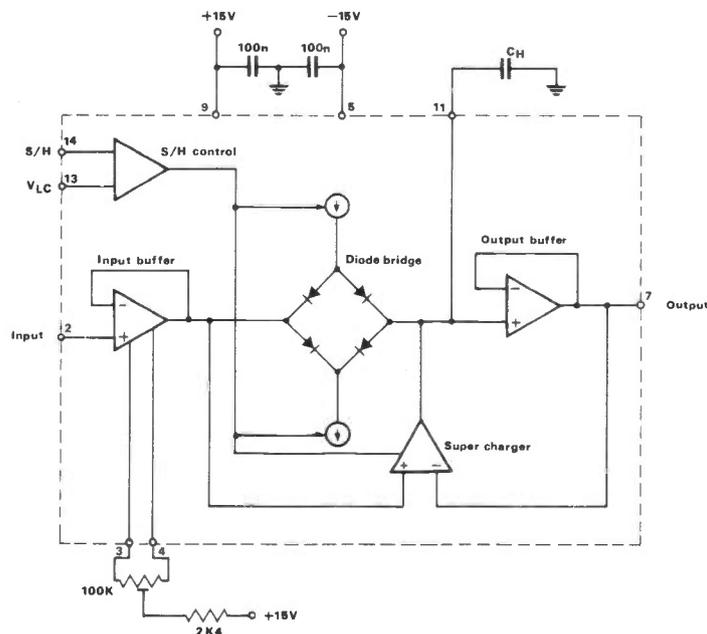


Fig 10 Block diagram of the SMP-10 sample and hold amp

'holds' the last value it had. This continues until the next 'track' command, when it swings to the new input value, and follows it as before.

Limit

In practice there is a limit to how fast a new level can be acquired, and leakage during the 'hold' interval can cause noticeable droop.

The storage capacitor does not necessarily have one end at circuit ground: for instance, with the AD582 manufactured by Analog Devices, shown in *Figure 9*, C_H is in the feedback loop of the output amplifier, making it an integrator, in effect.

During 'sample' (or 'track'), the analogue switch is closed and current is forced into C_H until the output equals the

input multiplied by the gain $(1 + R_F/R_I)$. In the 'hold' mode, on the other hand, the switch is open and so only leakage currents flow: assuming C_H is large enough, the voltage across it does not change significantly.

A somewhat different method is used for the SMP-10 made by Precision Monolithics, shown in *Figure 10*. Here C_H has one end grounded, and is followed by a unity-gain buffer. The analogue switch takes the form of a diode bridge: during 'hold' the diodes are all deliberately reverse-biased, but for 'sample' a controlled current is passed through them. The circuit relies on the diode voltages being equal once equilibrium has been reached.

During the initial part of sampling, however, the 'supercharger' comes

into play, and it can provide up to 50mA so as to charge C_H quickly.

A feature of this IC is that it uses totally bipolar processing, ie no FETs are employed in the buffer amplifiers or the analogue switch.

Isolation amplifiers

In hospitals, while monitoring patients with a heart condition, it is necessary to have a special isolation amplifier for passing the minute electrocardiogram signals to the recorder and display. This isolation is needed for two reasons: firstly, to protect the patient in the event of an electrical fault in the equipment, and secondly, and somewhat paradoxically, to protect the equipment itself. If the patient suffers cardiac arrest it is standard practice to apply a de-fibrilla-

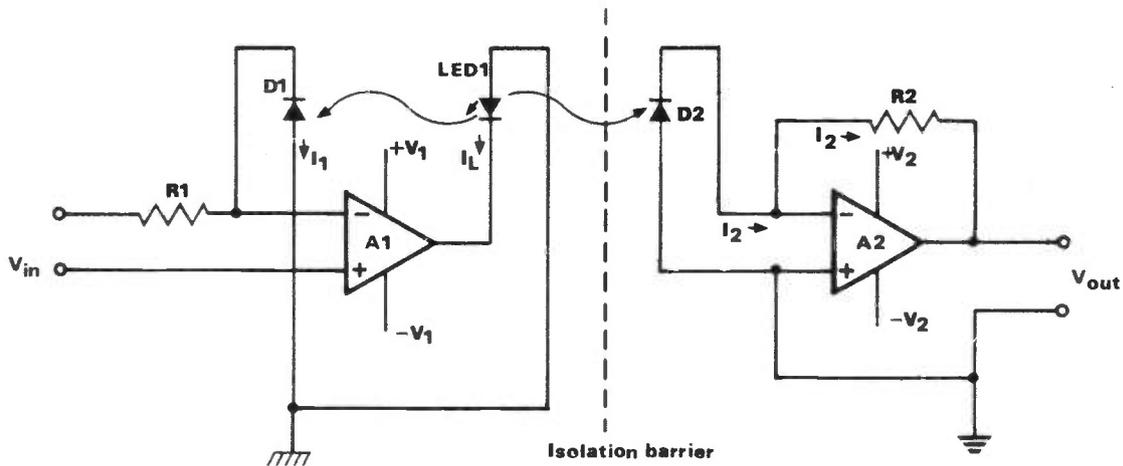


Fig 11 Equivalent circuit of the BB3650 linear isolator

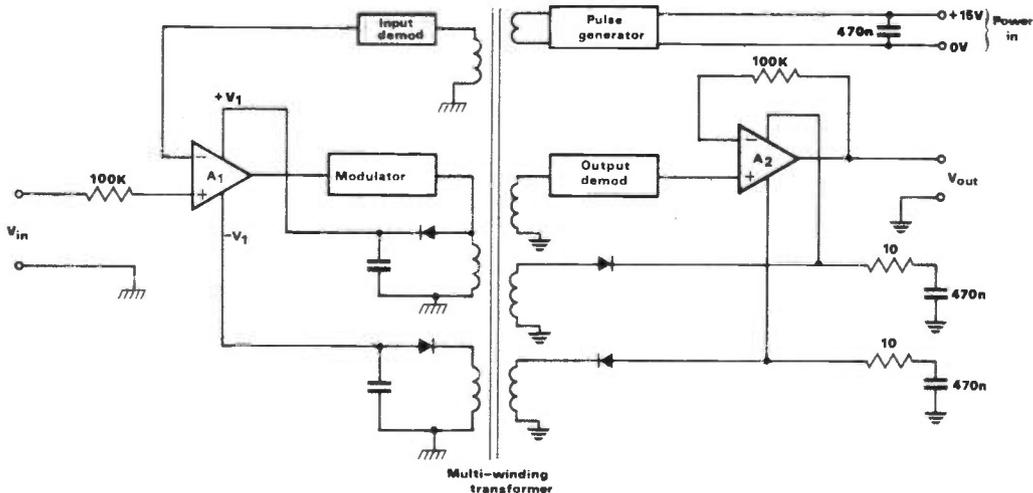


Fig 12 The BB3656 transformer-coupled isolation amplifier

tor, which produces high voltage pulses in order to get the heart working properly again.

One method of electrical isolation is to use opto-couplers, and in the Burr-Brown 3650, shown in Figure 11, this principle is applied in a rather cunning way. The transmitting LED is mounted so that its light reaches not only the receiving photo-diode D2, but also a feedback photo-diode D1.

With proper matching,

$$I_2 = I_1 = V_{in}/R_1.$$

$$\text{Also, } V_{out} = I_2R_2.$$

These equations apply even if the LED degrades with temperature or time, and a linearity of about 0.1% is achieved. Unfortunately, power needs to be supplied to both A1 and A2, which is inconvenient.

An alternative technique is to use a transformer-coupled isolation amplifier, such as the Burr-Brown 3656 illustrated in Figure 12. The advantage of this device is that the internal pulse generator provides power for both A1 and A2; in fact, a pre-amp can be added and run off A1's supply rails.

Strange as it may seem, a single transformer is used for both signal and power transfer. The pulse generator drives the primary winding at 750KHz, and on the forward swing the rectifiers on the secondaries charge their capacitors. However, on the flyback the modulator driven by A1 presents a variable load, so that the flyback voltage is proportional to the input signal.

The two identical de-modulators ensure good linearity: one provides

feedback to A1, while the other feeds A2. The small signal frequency response is 30KHz, and isolation of at least 2KV dc is possible. A key to the achievement of these figures lies in the design of the toroidal transformer, which is only 12mm in diameter and 5mm high.

Conclusion

Although the devices described above are somewhat expensive for the home constructor, similar circuits can often be 'contrived' by judicious use of relatively low cost op-amps, CMOS switches and pulse-transformers. The principles of synchronous rectification/detection are basic to the operation of a wide variety of instrumentation, and can often provide elegant solutions to both small signal and power transfer problems. 

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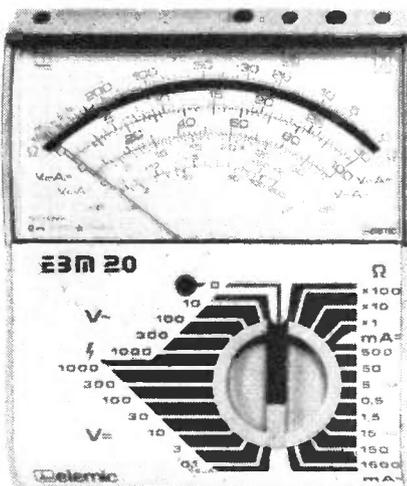
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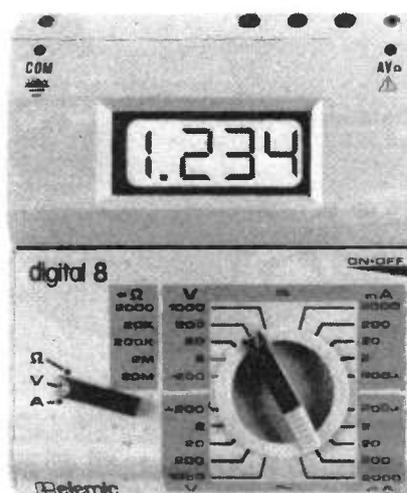
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Another experiment

with packet radio...

AMTEXT ON HF

described by Paul Brown G3WRI
and Alan Wilkinson G3XJI

The original AMTEXT packet system (ref 1) was developed around the BBC microcomputer in order to permit experimentation by the authors in the transmission of packet data on the VHF bands, and in particular the 2m band. A number of articles have recently been published covering the subject of packet radio (ref 2-4) but little experimentation has yet been undertaken with this new mode on the HF bands, to the best of the authors' knowledge.

A new version of the AMTEXT software (ref 5) is currently under development in which it is hoped to incorporate a 300 baud HF packet routine. In order to determine the feasibility of such a system it is proposed to conduct a series of national HF packet transmission tests. By this approach problems noted during earlier HF packet tests, undertaken by members of the Westmorland Radio Society Packet Radio Group, may be better assessed.

```
10REM This is an 'AMTEXT' EXPERIMENTAL 300 baud Rx PROGRAM by Paul A. Brown,  
WRI 29/12/84.  
200NERORRUN  
30MODES:VDU19.0,4.0,0,0:A=&FE08:B=&FE09:CZ=1:DZ=84  
40*TV255  
50*FX151,16,45  
60*FX151,8,18  
70REPEAT UNTIL (C&FE08 AND 1)  
80EZ=(C&FE09 AND 127)  
90IFEZ=126THEN100ELSE70  
100AZ=7A:IFAZANDCZTHEN 120  
110GOTO100  
120REPEAT: BZ=0: BZ="B: IFAZANDDZ THENGOTO170  
130IFBZ<90RBZ>127THEN180  
140IFBZ=124THENPRINT":GOTO70  
160VDUBZ  
170AZ=7A:UNTIL NOT (AZANDCZ):GOTO100  
180*FX15.0  
190PRINT":**** ERROR ****":GOTO70
```

The program listing

Objectives

The objectives may be summarised as follows:

- to examine a prototype HF SSB tuning routine proposed for inclusion in the new issue of AMTEXT software.
- to determine the optimum values of certain protocol parameters for efficient HF working.
- to determine the optimum packet size for HF band working.
- to examine the feasibility of a prototype computer controlled (BBC microcomputer) HF search and tuning routine for use in conjunction with the FT757GX and similar types of transceiver with remote incremental tuning facilities.
- to examine HF 'mailbox' working with a packet system operating at 300 baud.

Methodology

Each Sunday morning on a frequency of 3.655MHz \pm QRM between 10.00 and 11.00hrs GMT and utilising lower side band, one member of the Westmorland Radio Society Packet Radio Group with HF facilities (G3WRI, G3XJI, G3UEC, G4ZBO) will transmit AMTEXT packet data with a composite frame as shown in Figure 1.

Each packet frame is composed of 1 to 2 seconds of pre-tone (2400Hz); AMTEXT data (2400Hz MCW); 5 to 20 small data bursts consisting of a sync character followed by tune, then by an EOT character; a variable length main data burst consisting of a sync character followed by 'TEST de G3WRI' then a variable test message, followed by '73s de G3WRI' and an EOT character; de G3WRI K (2400Hz MCW). A listening

period of 10 to 20 seconds follows each packet frame, and the packet frame is then re-transmitted.

Anyone with a BBC microcomputer and a suitable HF receiver who would like to take part in the tests should either load the program detailed in the listing or load the AMTEXT protocol 1 program (ref 5) and select the 'general Rx mode'. The BBC microcomputer and HF transceiver/receiver should then be interconnected as shown in Figure 2 and the following points noted:

- The strength of the received signal and any type of interference or noise present and its relative strength.
- The ease of tuning the signal for good reception (ie the ease of displaying the 'tune' data bursts after first locating the AMTEXT signals via the MCW identification prefix and suffix). A typical received display is shown in Figure 3.
- the number of error-free packets received, as a percentage of the total detected, during the period of reception of the test messages.
- Any problems encountered with drift or tuning of the signals.
- The type of transceiver or receiver used, together with the method of sampling the Rx audio for the BBC microcomputer cassette interface.

Results

All results with date and time tagged should be forwarded to G3WRI or G3XJI QThr, or G3XJI via Prestel (Micronet) Mailbox No. 919991873.

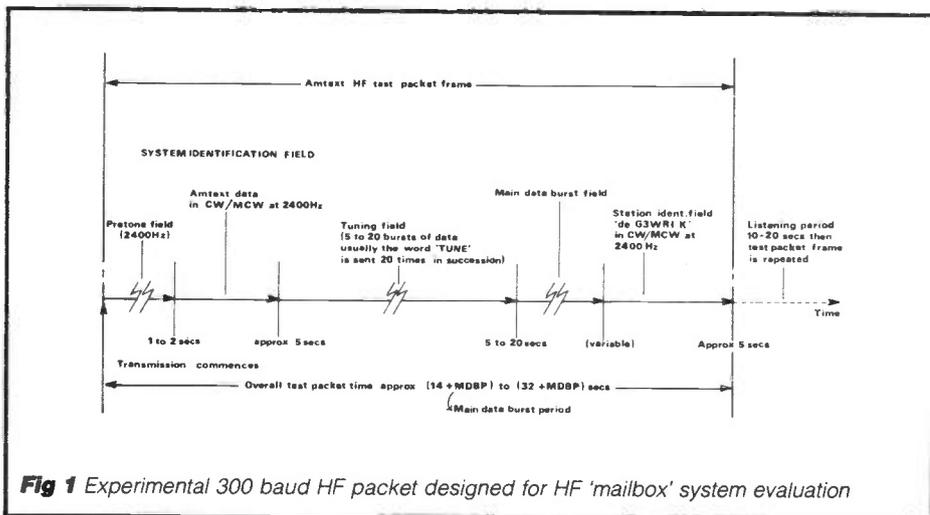


Fig 1 Experimental 300 baud HF packet designed for HF 'mailbox' system evaluation

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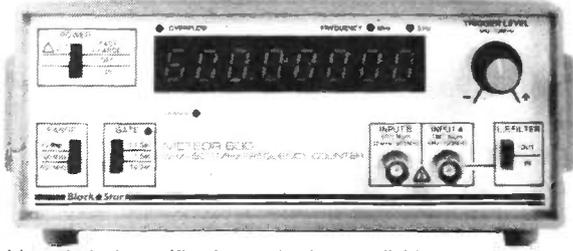
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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Whilst I am not so old as my callsign might suggest, the years are ticking by at the rate of knots. This leads to repeated occasions of sadness when one or another of my amateur radio friends passes on. In this feature last month, I drew attention to the work done by some radio amateurs in the field of community service, in this case special radio communications in the last war. Newcomers to amateur radio may not be aware that particularly in earlier days some very considerable scientific research projects were carried out by radio amateurs, contributing greatly towards our knowledge of radio techniques. This was especially so in the field of radio propagation studies.

'Hiss Phenomenon'

A life-long friend of the writer's, Denis Heightman G6DH, passed away a few months ago. Denis earned a well-deserved reputation as a 'radio researcher' for his work in encouraging communication on the 28MHz band, for developing both transmitting and receiving gear suitable for amateur radio use on VHF and for his propagation studies on the 'Hiss Phenomenon'. This was first described by Denis in 1935.

At the recent London UHF Annual Dinner, held at the Bedford Corner Hotel in London, the guest of honour was Dr R L Smith-Rose. In the course of a speech he spoke of the work of radio amateurs, saying that the science of radio astronomy was partly based on the Hiss Phenomenon, 'first observed in 1935 by a British amateur, Denis Heightman G6DH'. Very little attention had been paid to this, although it had been reported in the RSGB's monthly journal at the time, until the war years when it was noticed that the 'hiss' increased if directional aerials were pointed at the

sun. Dr Smith-Rose suggested that radio astronomy was wide open for future amateur radio investigation.

VHF expertise

Denis put his experience gained in developing VHF gear to good commercial use by starting a firm called Denco, which produced VHF components for the amateur as well as a very nice, tunable VHF receiver. Denco tuning coils, capacitors, chokes and so on were almost universally used by VHF experimenters in the early days.

A keen sailor and glider pilot, he put the same energy and enthusiasm into these interests as he put into his radio activities. Sadly though he developed high blood pressure and suffered a stroke whilst out sailing a dinghy, fell overboard and died.

RFI

Which brings me on to the next topic in this month's contribution, viz, radio interference with gadgets known as 'pacemakers', used extensively these days in the treatment of certain heart disorders.

The heart pacemakers of a couple or so decades ago were simple devices which stimulated an ailing heart at a fixed, regular rate. As they developed, pacemakers which would respond to varying heart requirements became available. These could respond to the patient's electrocardiographic signals and stimulate the heart accordingly. All modern pacemakers are of this type. Unfortunately their sensing systems are very sensitive and will respond to electromagnetic radiation from sources other than those produced by the heart. Further development is taking place to improve the protection from outside influences. As a result, true examples of pacemaker interference are pretty infrequent. However, patients do report 'irregularities' or 'funny feelings', which

have to be investigated to ascertain whether these are from true electromagnetic interference or only the patient's imagination.

The possible causes of interference to pacemakers seem endless, though when properly investigated the majority are found to be improbable. Those resulting from electromagnetic interference include such things as electric motors, solenoids, switches and so on. Electric blankets are frequently blamed. Then there is the large group of sources of electromagnetic radiation such as microwave ovens, diathermy, physiotherapy equipment, anti-theft systems and radio transmitters.

It is with the latter that we are primarily concerned here, and it is interesting to note that complaints about this increased when CB radio took off! Official sources seem to take the view that whilst pacemaker interference is a reality and can be dangerous these dangers are greatly exaggerated, often to the point where patients are caused unnecessary anxiety. What appear to be genuine cases should be investigated, though even so most cases will be found to be groundless after proper investigation.

Russian amateur radio satellites

Some reports have come through recently from Russia about their RS satellites. It seems they have been checking the state of the batteries in the remaining active RS satellites: RS5, RS7 and RS8. RS7 and RS8's batteries are in good shape and these two satellites should continue in operation for some time yet. RS5's batteries however are showing signs of wear and cannot be expected to last much longer, so we may see the end of this one before long.

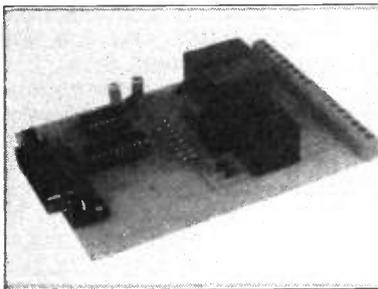
The Russians have also been carrying out tests to try and distinguish between RS1 and RS2, which are reported to be occasionally active. It is one or other of these which is responsible for the '55' telemetry signals on 29.400MHz of '5155' or '55' as it sometimes sends in Morse code. RS2 is ten times larger than RS1 so a distinction between them is possible by radar tracking.

Some interference has been caused lately to EME enthusiasts from a satellite on 2.3GHz. The satellite group at Kettering School have now identified this



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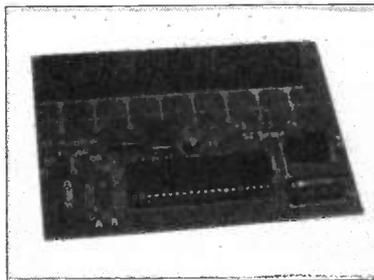
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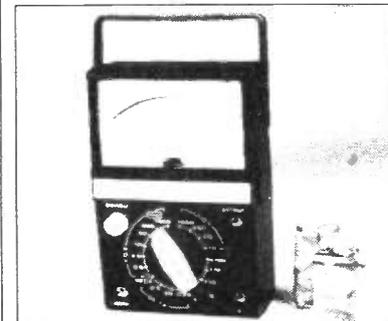
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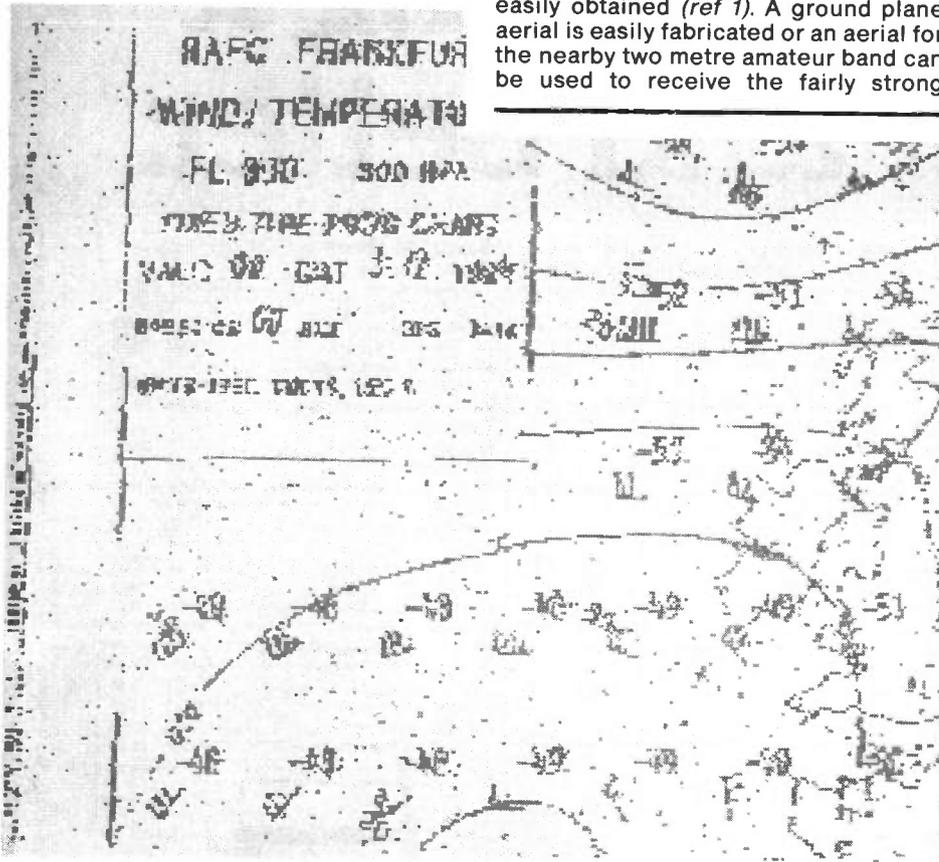
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WEATHER PICTURE

Receiving the signals from the NOAA polar orbiting weather satellites is

not particularly difficult. A converter to enable the FM signals in the 136-138MHz band to be received on an HF receiver is easily obtained (ref 1). A ground plane aerial is easily fabricated or an aerial for the nearby two metre amateur band can be used to receive the fairly strong

Terry Weatherley does the display of weather pictures on the BBC news



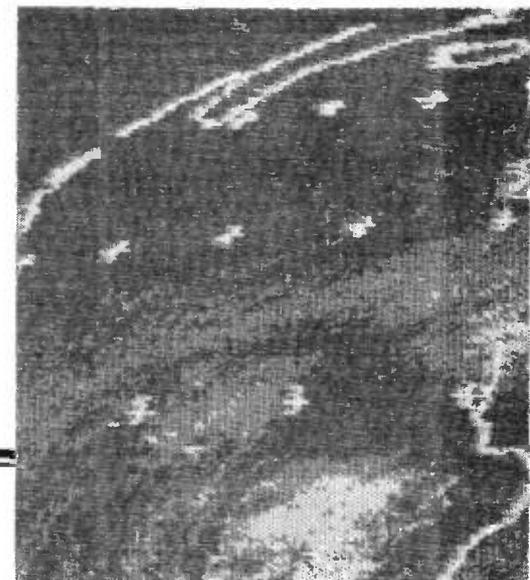
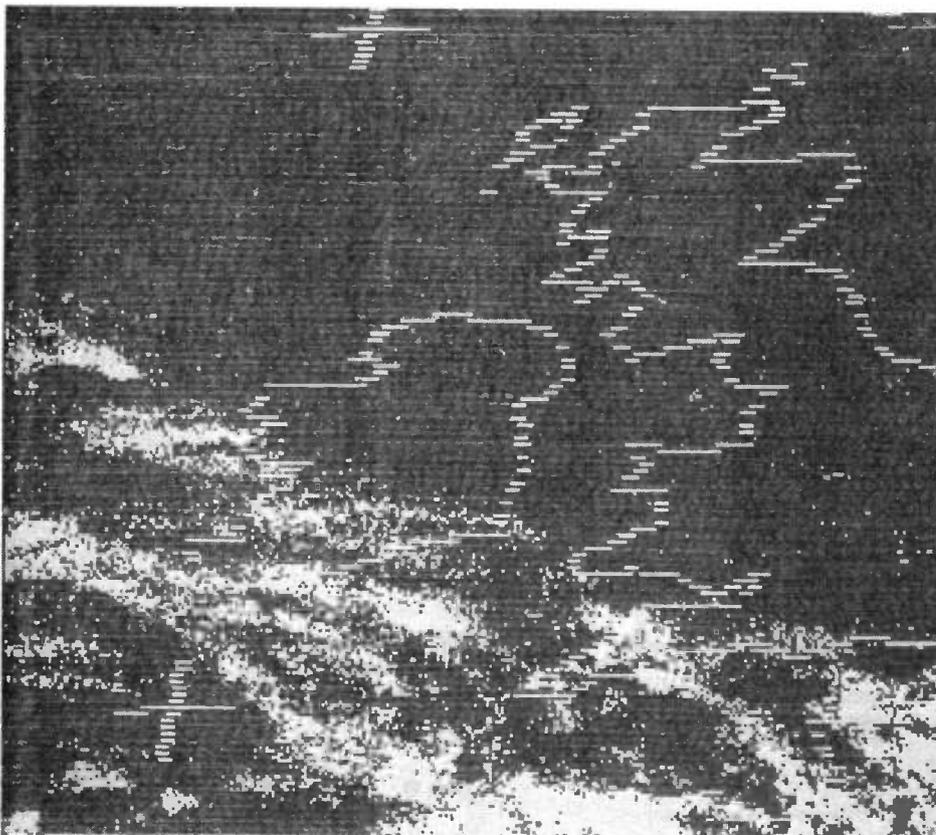
signals from the satellite. Display of the pictures contained within those signals has always been a little more complicated.

It is possible to display the picture on an oscilloscope with a Z input, and there are circuits available (ref 2) to build slow-scan type monitors. Over recent years it has been possible to obtain on the surplus market Muirhead FAX machines - the most popular being the D900/S which with some minor mods can be used to display the pictures from both the polar orbiters and the geostationary satellite Meteosat.

Over recent years enthusiasts have been looking at ways of using the ever-popular home computer to display the pictures. A weather picture from Meteosat is made up of some 800 lines. We can thus assume that each line is made up of 800 pixels. Each pixel can be any one of 64 shades of grey between black at one extreme and white at the other. To store such a picture is quite expensive in RAM at the present time and is outside the memory capacity of the average home machine.

However, if certain reductions in these parameters are accepted then display becomes possible. The BBC model B can offer in mode 1 a graphics capability of 320 by 256 pixels with 4 shades. It is clear that while the resolution is reasonable the grey scale is somewhat restricted. Older readers will recall the TV test card with these steps labelled white, light grey, dark grey and black.

The Beeb also has a user port which can be utilised to get data into the machine. An interface is required to present the data in the correct format. The interface should be able to convert the analogue signal into a digital one and provide a clock for sync purposes. Such an interface was described by Mike Furfinger (ref 3). Software is required to



RES ON THE BEEB

describes a ROM for
her satellite pictures
microcomputer

read the user port, change the digital value into a colour, and plot that colour to the screen.

The SATPIC ROM provides a suite of programs to do this for the different satellite picture transmissions. It is also possible to alter various parameters to tailor the pictures to a particular requirement. When the ROM is first called by '*S' it assumes the parameters for receiving Meteosat. Pressing escape calls up the menu, which offers a number of different options and enables the user to change the colour palette used. The default setting gives black-red-yellow-white.

It is also possible to alter the height ratio of the picture by varying the number of lines received to the number of lines plotted between 1 and 9. This can be combined with a user selected pixel plotting rate up to the execution speed of the program of 325 milliseconds per pixel. This facility is especially useful for selecting the area of a picture showing the UK from a much larger one. Various combinations of these parameters are programmed into the function keys to cover the most popular satellites as well as the 'zoom' facility on Meteosat. Pressing 'break' resets to the default parameters.

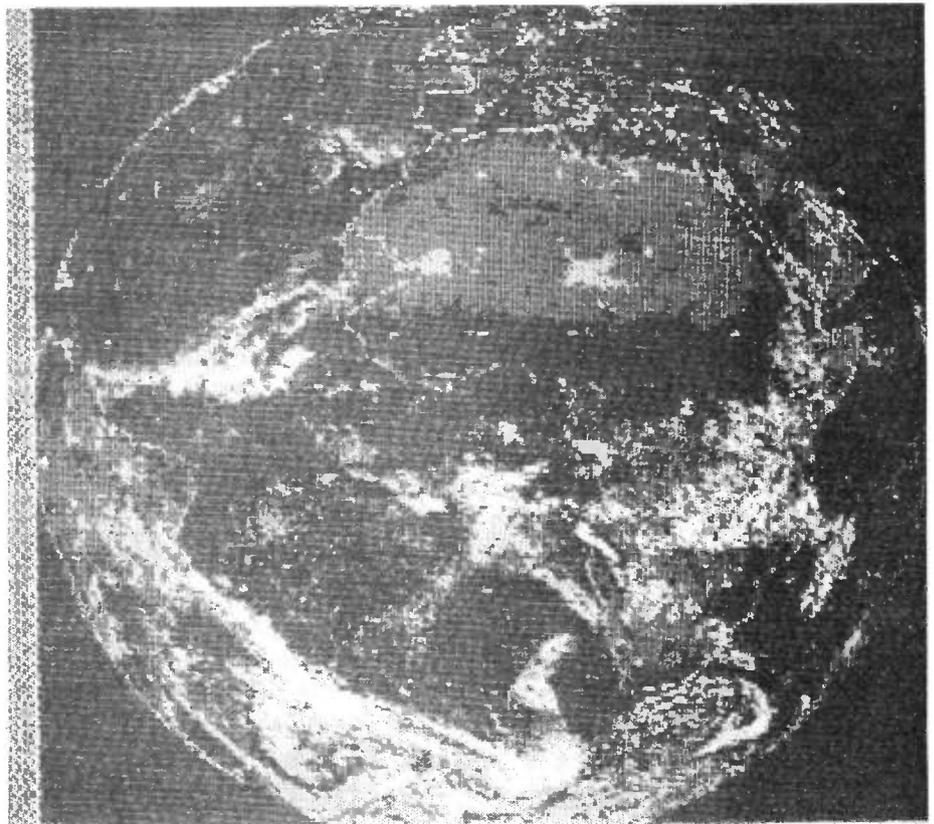
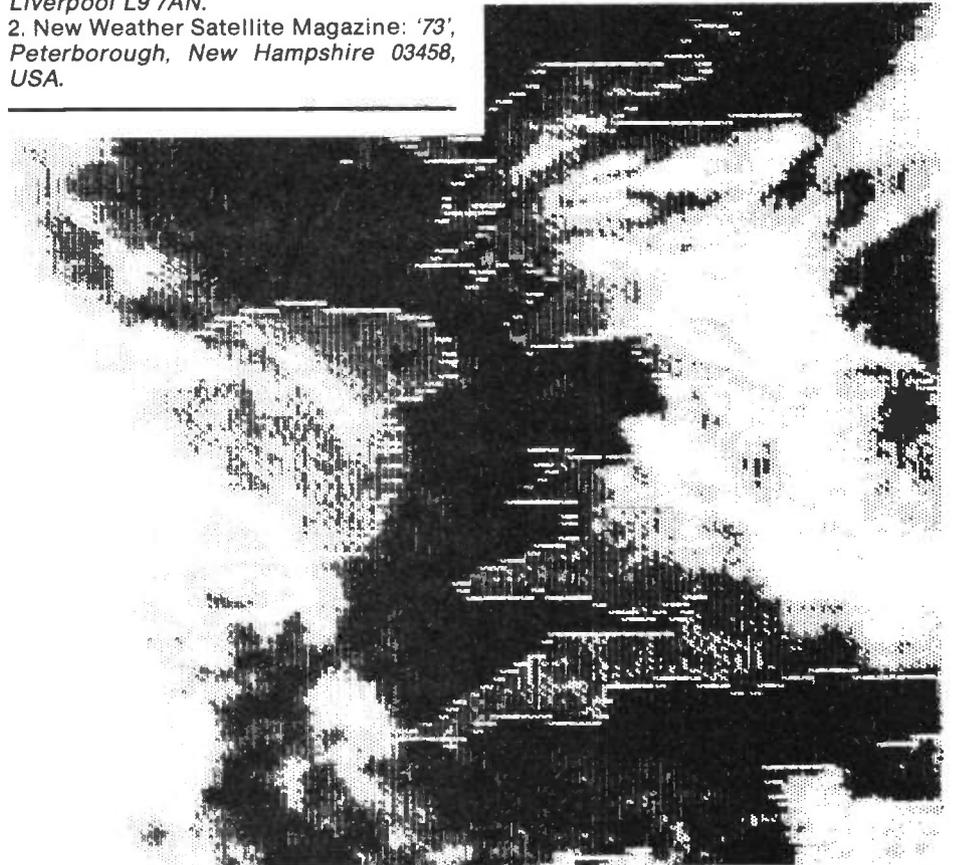
Pictures can be saved by pressing 'f0'. This opens a file and saves the screen to PICA, PICB, etc after first checking that the picture title has not been used on the disc already. This is a useful facility since a 40 track disc can only hold four pictures. The country outlines which appear on Meteosat pictures can be toggled in or out using the 'O' key.

SATPIC is a useful ROM produced to fill a specific need, and the originators Peter Clappison and MJ Atkinson are to be congratulated. The ROM can be obtained for £37.50 including VAT from *Timestep Electronics Ltd, Wickhambrook, Newmarket, Suffolk.*

References

1. 136-138MHz Converter: *Microwave Modules, Brookfield Drive, Aintree, Liverpool L9 7AN.*
2. *New Weather Satellite Magazine: '73', Peterborough, New Hampshire 03458, USA.*

3. BBC Weather Satellite Display: *Electronics & Computing, July 1983.*



WEATHER SATELLITES

As featured in this issue we are able to supply the complete weather satellite reception package. Everything you need has been designed around the superb new ROM from Peter Clappison and Mathew Atkinson. We have commissioned Jaybeam to make a special aerial for us that doesn't need to be moved or turned when it is used with our pre-amp and receiver, it gives good predictable pictures. Our receiver will give 12dB SINAD with only 0.15µV which is considerably better than any of our competitors. The interface unit has several switchable op-amp filters giving enhanced pictures from weak signals and also allows low frequency FAX data to be demodulated. The BBC EPROM has been designed to be used with our interface and will also decode the HF and VLF data from our interface.

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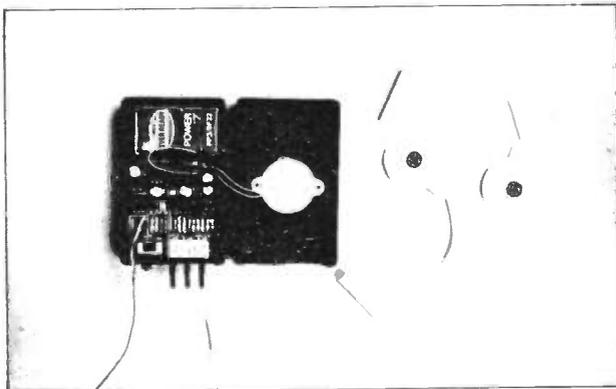
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I feel that one of the basic enjoyments of amateur radio is designing and making your own antenna. There is no way that the average amateur can compete with the antenna manufacturer; the test equipment such manufacturers have at their disposal would frighten us guys to death. Yet good antennae can be produced using just simple equipment, such as an SWR meter, a GDM and a noise bridge. This article is about a piece of equipment that allows the constructor to build and test an antenna in the shack, giving him the ability to move the elements around at will.

Standing joke ratio

There is a sort of standing joke among some of my 2m compatriots about the antennae I build. A QSO usually begins with me being asked what 'wonder' I am working on at the moment and so on; all taken in good part.

Of course I am known for doing strange things, like loading up the wire frame of a lamp shade and having a very good contact with a station in London. The station gave me a 5-9 and asked what antenna I was using. I said a lamp shade; he asked me to 'say again', but before I could another station broke in and a surprised voice called, 'He said he's using a lamp shade!!!'

I have also had very good results on 2m using my XYL's extending clothes pole.

The favourite giggle is about the 2m delta-quad I built. I had it set up in the shack and was happily chatting away, when it suddenly fell apart! I had to do a very quick change-over but you can imagine the laughter when I explained that my antenna had disintegrated before my very eyes!

It was then that I realised that paper clips and PVC tape were not the ideal scientific paraphernalia for such an exercise. What I did need was a simple piece of apparatus on which I could construct an antenna, rigid yet flexible enough for the elements to be moved around for testing. So, being as I am a 'careful' Scot and having no wish to throw the bawbees to the wind, I built a

little gadget to do the job; and here, laddie, is how I did it.

This article is not meant as a technical thesis on the building of antennae. It is a simple description of a piece of equipment which is cheap to build, easy to use and practical for home-brew design work: ideal for those builders with few resources. The equipment should be capable of dealing with quad, delta and yagi configurations, and all elements should be movable on a fixed boom. The equipment should break down for storing and be re-usable.

A simple aid to basic UHF/SHF antenna experiments described by JM Stevenson

My approach is to draw on graph paper any idea that comes to mind, and from the drawing I build the structure on the apparatus. If it works so be it, if it does not there is always another sheet of graph paper. I use 20-22swg enamelled copper wire for quad or delta elements and .25 inch aluminium rod for yagi elements.

For the boom I use a common old broom handle which gives me a boom length of approximately 48 inches. This can be extended if need be. The handle is clamped at its centre to a short pole which in turn is taped to a chair to keep it upright; I use an old music stand for that job.

The element supports are made from 0.25 inch diameter wood dowel, the length being determined by the demands of the project.

The movable wooden blocks that will support the elements involve a bit of drilling, and this should be as exact as possible. The centre hole is drilled out to

suit the boom diameter. The support holes are drilled to .25 inch diameter and support fixing holes are drilled to suit whichever panel pin is to be used. The overall size of the blocks is shown in *Figure 1*.

Important points

The wood blocks are the critical part of the unit and the holes must be drilled correctly so that the arms will line up properly. If the block is clamped in a vice for drilling this job should not prove too difficult.

The blocks must be able to slide along the boom, but take care not to have them too slack, while the holes for the dowel should be drilled to grip-fit. Break all .25in holes through to the centre hole.

Figure 2 displays a three element quad set-up, and *Figure 3* gives settings for the different antenna configurations.

To build a wire element, measure and cut the wire to the calculated length. Then secure it to the supports using drawing pins and twist the loose ends of the wire together. Pull the arms outwards to tighten the wire on the supports, then tap panel pins into the holes in the block to secure the supports in position. Leave the pins raised enough for easy removal. The element is now ready to slip onto the boom.

To temporarily lock the blocks to the boom, tap a small wedge made from a matchstick into the centre hole.

Although this equipment is meant as an aid to experimental work, the fixtures can be used in a practical antenna.

To use the equipment in this manner all the wood parts need to be waterproofed. Two coats of any good outdoor varnish will do admirably, and a long life can be expected if the wood is treated with care.

To put the antenna up in the air some other changes are needed. Instead of the drawing pins, small holes are drilled in the supports and the wire drawn through. Pull the arms outwards as before and tap home the panel pins. Touch with varnish. Where the wire element meets, clean off some of the coating and solder the two ends together. In place of the wedges

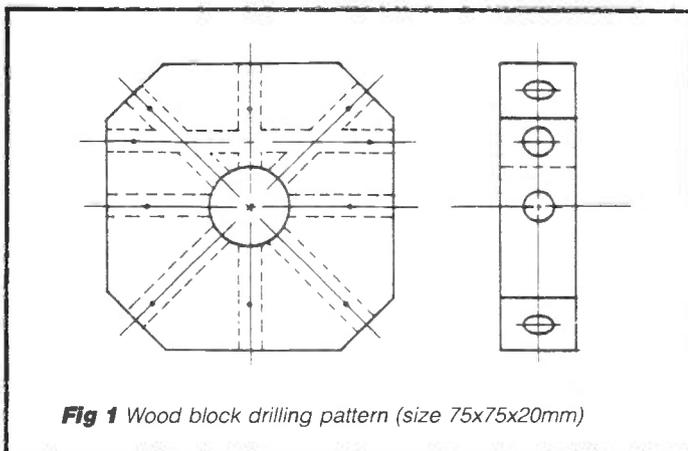


Fig 1 Wood block drilling pattern (size 75x75x20mm)

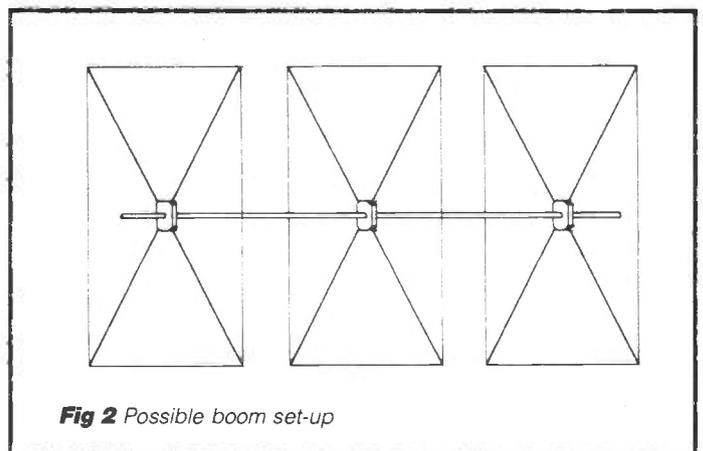


Fig 2 Possible boom set-up

UP IN THE AIR

another hole needs to be drilled in the block, which can then be locked to the boom with a screw.

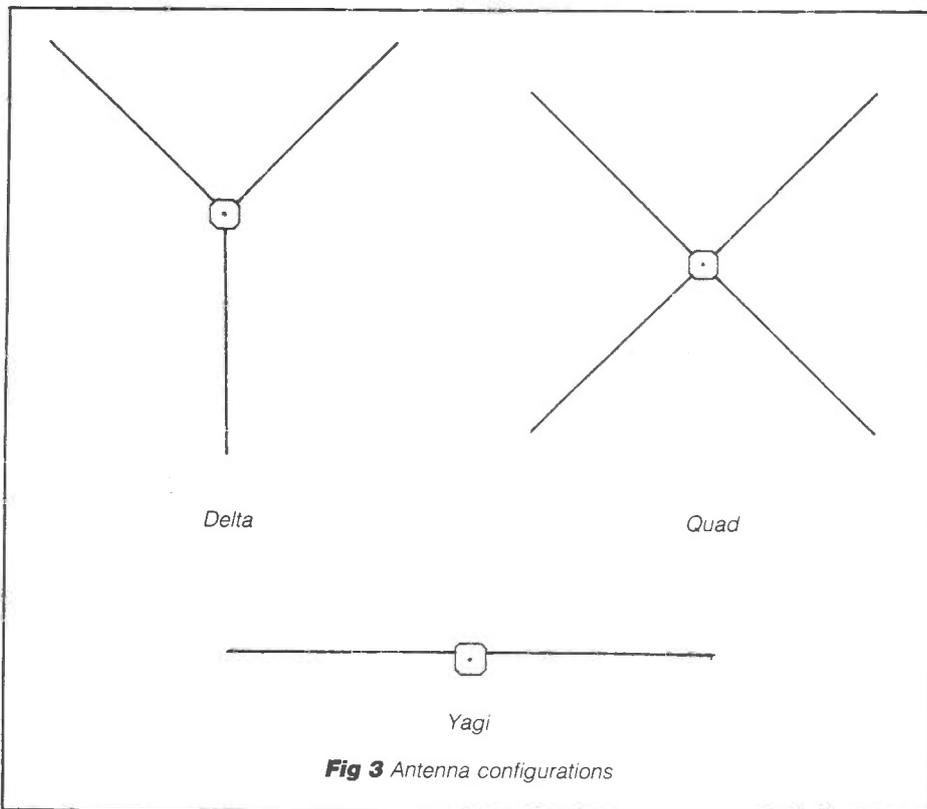
I use chocolate block to connect the wire ends of the driven element to the feed line, then plug the screw holes and give the lot a good coat of varnish. The antenna is now ready to be hoisted. For yagi antennae all that needs to be done is to pressure a piece of dowel down on the element and glue in position.

Footnote

Using this equipment I made a permanent five element quad. It stood on the end of a pole for over two years, until a really nasty storm broke one of the elements. Not bad for a very good antenna that cost less than £2.00.

When I build an experimental antenna in the shack, I transfer it to the garden to do the testing. Again I acquire the XYL's extending clothes pole, lash the boom support pole to it and extend it fully. This gives me a lift of over 12 feet. I hammer a piece of pipe into the ground to support the clothes pole.

As I have already stated, this equipment is easy to build and very practical. It allows complete mobility of elements, and in a test situation that is most important. So, laddie, have fun!



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The DcRx is available for 20, 30, 80 or 160 Meters. It requires a 12 to 14V DC supply and will produce upto a watt of audio into a speaker or 'phones. Modes: SSB and CW. A case and two tuning capacitors are the only major parts to add to finish your receiver. We have suitable capacitors for all but the 160M version at £1.50 each.

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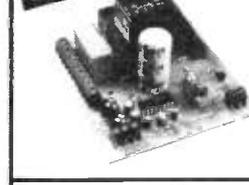
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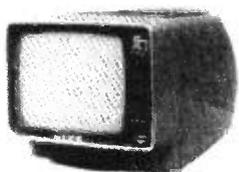
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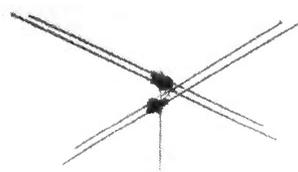
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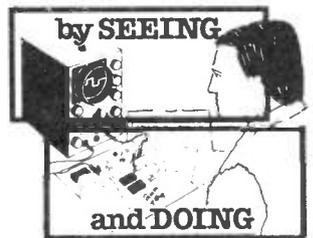
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LC7120	3.25	SN7603N	1.95	TA7611AP	2.95
LC7130	3.50	SN7603N	1.95	TA7611AP	2.95
LC7131	5.50	SN7603N	1.95	TA7611AP	2.95
LC7137	5.50	SN7603N	1.95	TA7611AP	2.95
LM1011	3.15	SN76110N	0.95	TA7611AP	2.95
LM324N	1.80	SN76110N	0.95	TA7611AP	2.95
LM338N	0.45	SN76110N	0.95	TA7611AP	2.95
LM3808N	1.75	SN76225N	1.00	TA7611AP	2.95
LM3837	2.95	SN76227N	1.05	TA7611AP	2.95
LM390N	3.50	SN76533N	1.65	TA7611AP	2.95
ML5153L	2.50	SN76539N	2.65	TA7611AP	2.95
ML515L	2.95	SN76570N	1.90	TA7611AP	2.95
ML5152L	1.50	SN76560N	0.90	TA7611AP	2.95
MB3712	2.00	SN76600N	0.90	TA7611AP	2.95
MB3756	2.50	STK014	7.95	TA7611AP	2.95
MC1307P	1.80	STK015	5.95	TA7611AP	2.95
MC1310P	1.95	STK043	9.50	TA7611AP	2.95
MC1327	0.95	STK044	7.95	TA7611AP	2.95
MC1327Q	0.95	STK435	5.95	TA7611AP	2.95
MC1349P	1.20	STK435	7.95	TA7611AP	2.95

SEMICONDUCTORS

AA126	0.45	BC182LB	0.10	BD238	0.40	BFX98	0.25	TP123C	0.42
AC127	0.20	BC183	0.10	BD242	0.65	BFY50	0.21	TP133B	0.95
AC128	0.20	BC184	0.09	BD246	0.75	BFY52	0.25	TP134B	0.95
AC128K	0.32	BC184LB	0.09	BD276	0.32	BFY90	0.77	TP141C	0.45
AC141	0.24	BC204	0.10	BD434	0.65	BLY48	1.75	TP142C	0.47
AC141K	0.34	BC207B	0.13	BD437	0.75	BR100	0.28	TP147	0.65
AC142K	0.30	BC208B	0.13	BD438	0.75	BR101	0.45	TP120	0.90
AC176	0.22	BC212	0.09	BD520	0.65	BR103	0.69	TP125	0.95
AC176K	0.31	BC212L	0.09	BD538	0.65	BR303	0.95	TP142	1.75
AC187	0.25	BC212LA	0.09	BD597	0.95	BRC443	1.15	TP148	2.75
AC187K	0.35	BC213	0.09	BD701	1.25	BRC399	0.45	TP195	0.55
AC188	0.27	BC213L	0.09	BD707	1.25	BT100A/020.85		TP3055	0.85
AC188K	0.37	BC214	0.09	BD707	1.25	BT106	1.49	TS191	2.50
AD142	0.75	BC214C	0.09	BDK32	1.50	BT116	1.10	TS191	2.50
AD143	0.82	BC214L	0.09	BF115	0.35	BT119	3.15	TV106/2	1.50
AD149	0.70	BC237B	0.09	BF127	0.39	BU105	1.65	ZR0111	6.50
AD161	0.39	BC238	0.09	BF127	0.39	BU108	1.69	2N1100	1.80
AD162	0.39	BC239	0.12	BF154	0.20	BU112	1.25	2N1308	1.55
AD161/2	0.90	BC251A	0.12	BF158	0.22	BU125	1.25	2N1309	1.55
AF106	0.80	BC252A	0.15	BF167	0.27	BU126	1.60	2N219	0.28
AF114	1.95	BC258	0.25	BF173	0.27	BU204	1.50	2N2905	0.40
AF121	0.60	BC258A	0.39	BF173	0.27	BU204	1.50	2N3053	0.40
AF124	0.65	BC294	0.30	BF178	0.38	BU208	1.38	2N3054	0.59
AF125	0.35	BC300	0.30	BF178	0.38	BU208A	1.52	2N3055	0.82
AF126	0.35	BC301	0.30	BF178	0.38	BU208D	1.85	2N3702	0.12
AF127	0.35	BC303	0.25	BF180	0.29	BU326	1.20	2N3703	0.12
AF139	0.40	BC307	0.10	BF181	0.29	BU326S	1.50	2N3705	0.12
AF150	0.60	BC327	0.10	BF182	0.29	BU407	1.24	2N3706	0.12
AF178	1.95	BC328	0.10	BF183	0.29	BU500	2.25	2N3706	0.12
AF239	0.42	BC337	0.10	BF184	0.28	BU508A	1.95	2N3733	0.90
AU106	4.50	BC338	0.09	BF185	0.28	BU529	1.90	2N3773	2.75
AU107	3.50	BC347A	0.13	BF194	0.11	BU720	1.95	2N1711	0.90
AU110	3.50	BC481	0.35	BF195	0.11	BUY20	2.15	2N3792	1.35
AY102	2.95	BC478	0.20	BF197	0.11	BUY69B	1.70	2N4280	3.50
BC107A	0.11	BC527	0.20	BF197	0.11	MJ3000	1.95	2N4444	1.15
BC107B	0.11	BC547	0.10	BF198	0.15	MJE340	0.40	2N5294	0.42
BC108	0.10	BC548	0.10	BF199	0.15	MJE350	0.45	2N5296	0.45
BC108A	0.11	BC549A	0.10	BF200	0.40	MJE350	0.45	2N5298	0.80
BC108B	0.12	BC550	0.10	BF241	0.15	MJE295	0.45	2N5485	0.45
BC109	0.10	BC557	0.15	BF245	0.30	MPSA13	0.25	2N5496	0.95
BC109B	0.12	BC557B	0.08	BF257	0.25	MPSA92	0.30	2SA329	0.95
BC109C	0.12	BC558	0.10	BF258	0.25	MPF237	3.45	2SA715	0.95
BC114A	0.09	BC639/10	0.30	BF259	0.25	MRF450A		2SC495	0.80
BC116A	0.15	BCY33A	1.90	BF271	0.35			2SC496	0.80
BC117	0.19	BD115	0.30	BF273	0.18			2SC931D	0.85
BC119	0.24	BD124P	0.50	BF306	0.34			2SC1096	0.80
BC125	0.25	BD131	0.42	BF307	0.29			2SC1106	2.80
BC139	0.20	BD132	0.42	BF308	0.32			2SC1172Y	2.20
BC140	0.31	BD133	0.40	BF308	0.32			2SC1173	1.15
BC141	0.25	BD135	0.30	BF363	0.65			2SC1306	4.00
BC142	0.31	BD136	0.30	BF371	0.25			2SC1364	0.50
BC143	0.34	BD137	0.32	BF374	0.19			2SC1449	0.50
BC147A	0.12	BD138	0.30	BF423	0.25			2SC1678	1.25
BC147B	0.12	BD139	0.32	BF457	0.32			2SC1909	1.45
BC148A	0.09	BD140	0.30	BF458	0.36			2SC1945	2.65
BC148B	0.09	BD144	0.10	BF467	0.65			2SC1953	2.65
BC149	0.09	BD150C	0.25	BF495	0.23			2SC1967	0.90
BC153	0.30	BD159	0.85	BF597	0.23			2SC1969	1.95
BC157	0.30	BD166	1.50	BF597	0.23			2SC2028	1.15
BC158	0.09	BD179	0.72	BF597	0.23			2SC2029	1.95
BC159	0.09	BD182	0.70	BF597	0.23			2SC2077	1.45
BC161	0.25	BD201	0.83	BF597	0.23			2SC2091	2.85
BC170B	0.15	BD201	0.83	BF597	0.23			2SC2098	0.95
BC171	0.10	BD202	0.65	BF597	0.23			2SC2166	1.95
BC171A	0.10	BD203	0.75	BF597	0.23			2SC2314	0.90
BC171B	0.10	BD204	0.75	BF597	0.23			2SC2314	0.90
BC172	0.10	BD204	0.75	BF597	0.23			2SC2314	0.90
BC172C	0.10	BD225	0.45	BF597	0.23			2SC2314	0.90
BC173B	0.10	BD232	0.35	BF597	0.23			2SC2314	0.90
BC174	0.09	BD233	0.35	BF597	0.23			2SC2314	0.90
BC174A	0.09	BD234	0.35	BF597	0.23			2SC2314	0.90
BC177	0.15	BD236	0.40	BF597	0.23			2SC2314	0.90
BC178	0.15	BD237	0.40	BF597	0.23			2SC2314	0.90

TBA651R	2.50	TDA2581	2.25	TDA2582	2.95
TBA720A	2.45	TDA2583	2.95	TDA2583	2.95
TBA750Q	2.65	TDA2600	5.50	TDA2601	2.50
TBA800	0.99	TDA2611A	1.95	TDA2640	2.50
TBA810AS	1.65	TDA2680A	2.75	TDA2690	2.45
TBA820M	0.75	TDA2690	2.45	TDA3310	2.95
TBA820Q	1.45	TDA3500/2X	2.35	TDA4500	2.90
TBA890	2.50	TBA990	1.49	TDA4500	2.90
TBA920	1.65	TBA990Q	1.49	TDA4500	2.90
TBA950/2X	2.35	TC2A270	1.10	TC2A70S/C	2.95
TBA990	1.49	TC2A70S/C	2.95	TC2A70S/C	2.95
TBA990Q	1.49	TC2A70S/C	2.95	TC2A70S/C	2.95
TC2A270	1.10	TC2A70S/C	2.95	TC2A70S/C	2.95
TC2A70S/C	2.95	TC2A70S/C	2.95	TC2A70S/C	2.95
TC2A70S/C	2.95	TC2A70S/C	2.95	TC2A70S/C	2.95
TC2A70S/C	2.95	TC2A70S/C	2.95	TC2A70S/C	2.95
TC2A70S/C	2.95</				

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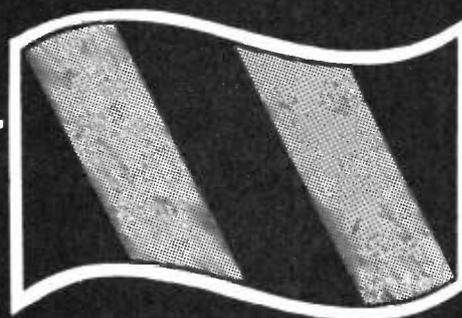
A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714	11.50	E81	6.00	M8099	6.00	QV008-6	19.90	12A16	1.95	92AG	12.80
A1988	11.50	E81	6.00	M8130	7.00	QV008-10	19.90	12A16	1.95	92AV	12.80
A2087	14.95	E153	12.15	M8138	7.00	QV008-15	19.90	12A16	1.95	92AV	12.80
A2134	8.50	EL183E	3.90	M8139	7.00	QV008-20	19.90	12A16	1.95	92AV	12.80
A2283	8.50	EL183P	3.90	M8141	7.00	QV008-25	19.90	12A16	1.95	92AV	12.80
A2356	29.50	EL1380	6.75	M8162	8.50	QV008-30	19.90	12A16	1.95	92AV	12.80
A2366	29.50	EL1380	6.75	M8163	8.50	QV008-35	19.90	12A16	1.95	92AV	12.80
A2372	27.50	EL504	1.40	M8164	8.50	QV008-40	19.90	12A16	1.95	92AV	12.80
A2900	11.50	EL509	6.25	M8166	8.50	QV008-45	19.90	12A16	1.95	92AV	12.80
A2902	24.00	EL519	6.25	M8204	8.50	QV008-50	19.90	12A16	1.95	92AV	12.80
A2923	24.00	EL802	3.95	M8204	8.50	QV008-55	19.90	12A16	1.95	92AV	12.80
A2933	4.00	EL821	3.90	M8224	8.50	QV008-60	19.90	12A16	1.95	92AV	12.80
AC/TH	4.00	EL822	3.90	M8224	8.50	QV008-65	19.90	12A16	1.95	92AV	12.80
AC/SPEN	8.70	EM4	9.00	ME1402	25.50	QV008-70	19.90	12A16	1.95	92AV	12.80
AH21	39.00	EM80	0.70	ME1501	14.00	QV008-75	19.90	12A16	1.95	92AV	12.80
AH28	39.00	EM84	1.65	MH4	4.00	QV008-80	19.90	12A16	1.95	92AV	12.80
AL9	4.00	EM87	2.15	MH4D6	4.00	QV008-85	19.90	12A16	1.95	92AV	12.80
AR12	1.00	EM87	2.15	MISAB	6.00	QV008-90	19.90	12A16	1.95	92AV	12.80
ARP4	1.25	EN91	1.50	MU14	1.80	QV008-95	19.90	12A16	1.95	92AV	12.80
ARP35	2.80	EN92	4.80	N7	12.50	QV008-100	19.90	12A16	1.95	92AV	12.80
ATP4	2.80	EN92	4.80	OA2	4.00	QV008-105	19.90	12A16	1.95	92AV	12.80
BA40	67.00	EC70	1.75	OA2	4.00	QV008-110	19.90	12A16	1.95	92AV	12.80
BS810	67.00	EC70	1.75	OA3	2.50	QV008-115	19.90	12A16	1.95	92AV	12.80
CA1	1.00	EC81	1.00	OB2	1.25	QV008-120	19.90	12A16	1.95	92AV	12.80
CAJA	21.00	EC81	1.15	OB2	1.25	QV008-125	19.90	12A16	1.95	92AV	12.80
CA	9.00	EC81	1.15	OB2	1.25	QV008-130	19.90	12A16	1.95	92AV	12.80
CA112G	70.00	EC81	1.15	OB2	1.25	QV008-135	19.90	12A16	1.95	92AV	12.80
C108	54.95	EC82	0.55	OC2	2.80	QV008-140	19.90	12A16	1.95	92AV	12.80
C1148	115.00	EC82	1.50	OC2	2.80	QV008-145	19.90	12A16	1.95	92AV	12.80
C11491	130.00	EC82	1.50	OC2	2.80	QV008-150	19.90	12A16	1.95	92AV	12.80
C11501	135.00	EC83	0.65	OC3	3.95	QV008-155	19.90	12A16	1.95	92AV	12.80
C154	32.00	EC83	1.35	OC3	3.95	QV008-160	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-165	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-170	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-175	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-180	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-185	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-190	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-195	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-200	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-205	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-210	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-215	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-220	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-225	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-230	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-235	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-240	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-245	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-250	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-255	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-260	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-265	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-270	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-275	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-280	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-285	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-290	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-295	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-300	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-305	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-310	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-315	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-320	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-325	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-330	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-335	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-340	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-345	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-350	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-355	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-360	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-365	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-370	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-375	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-380	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-385	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-390	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-395	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-400	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-405	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-410	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-415	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-420	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-425	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-430	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-435	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-440	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-445	19.90	12A16	1.95	92AV	12.80
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CC3L	3.00	EC83	1.35	OC3	3.95	QV008-470	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-475	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-480	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-485	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-490	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-495	19.90	12A16	1.95	92AV	12.80
CC3L	3.00	EC83	1.35	OC3	3.95	QV008-500	19.90	12A16	1.95	92AV	12.80
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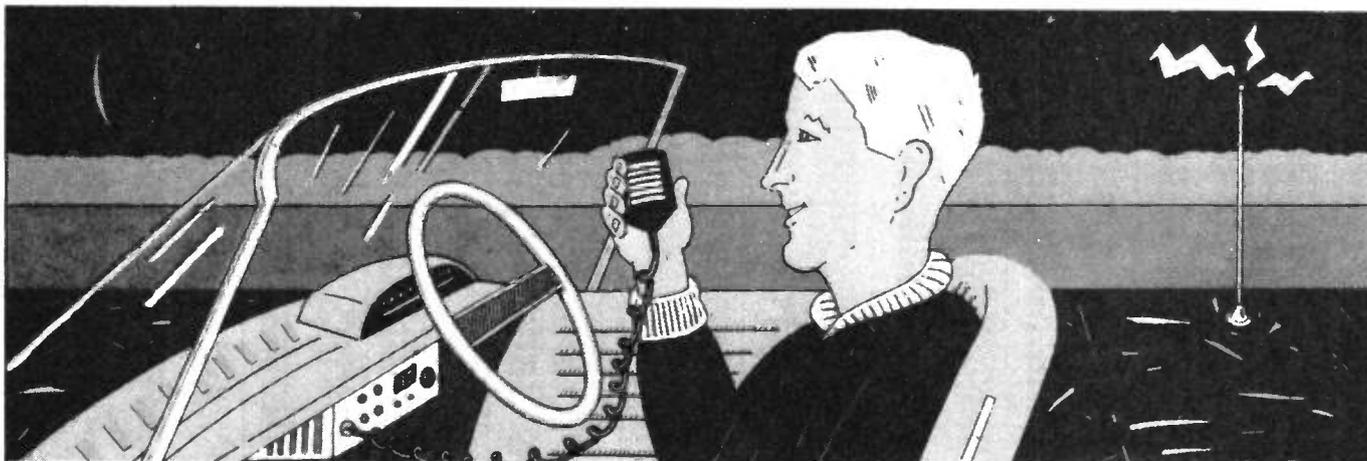


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DATA FILE . . .

Ray Marston deals with light-sensitive devices and their application

In the last four editions of *Data File* we have taken a fairly detailed look at various aspects of the general subject of 'opto-electronics'. We started by giving a basic introduction to the subject, and then went on to take detailed looks at LEDs, LED 'flashers' and 'chasers', LED 'dot-' and 'bar-graph' analogue display circuits, and 7-segment displays and display-driver circuitry.

In the present edition of this opto-electronics mini-series we look at a variety of light-sensitive devices, including LDRs and photo-diodes, and show various ways of using them. In next month's part of the series we will look at opto-couplers and opto-reflectors, etc.

LDR basics

Electronic opto-sensors are devices that alter their electrical characteristics in the presence of visible or invisible light. The best known devices of this type are the LDR (light dependent resistor), the photo-diode and the photo-transistor. Let's start off by concentrating on the LDR and LDR circuitry.

LDR operation relies on the fact that the conductive resistance of a film of cadmium sulphide (CdS) varies with the intensity of light falling on the face of the film. This resistance is very high under dark conditions and low under bright conditions. *Figure 1* illustrates the basic construction of the LDR, and *Figure 2* shows the LDR symbol.

The device consists of a pair of metal film contacts separated by a snake-like track of cadmium sulphide film, designed to provide the maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case to provide free access to external light.

Practical LDRs are available in a variety of sizes and package styles, the most popular size having a face diameter of roughly 10mm. *Figure 3* shows the typical characteristics curve of such a device, which has a resistance of about 900R at a light intensity of 100 lux (typical of a well-lit room) or about 30R at an intensity of 8000 lux (typical of bright sunlight). The resistance rises to several megohms under dark conditions.

LDRs are sensitive, inexpensive, and readily available devices. They have good power and voltage handling capabilities, similar to those of a conventional resistor. Their only significant defect is that they are fairly slow acting, taking tens or hundreds of milliseconds to respond to sudden changes in light level.

Useful practical LDR applications include light- and dark-activated switches and alarms.

LDR light-switches

Figures 4 to *9* show some practical relay-output light-activated 'switch' circuits based on the LDR. Each of these circuits will work with virtually any LDR

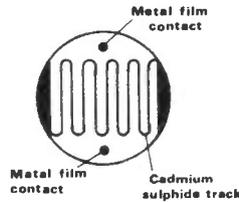


Fig 1 Basic LDR structure



Fig 2 LDR symbol

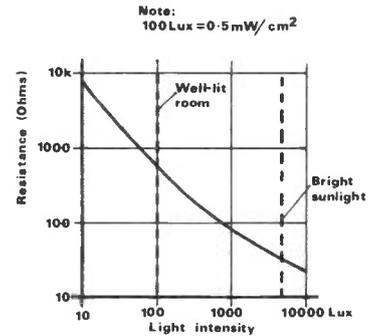


Fig 3 Typical characteristics of a 10mm face diameter LDR

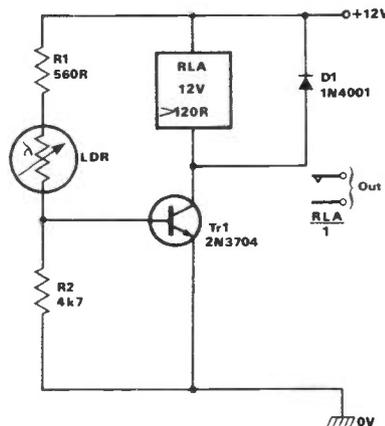


Fig 4 Simple non-latching light-activated relay switch

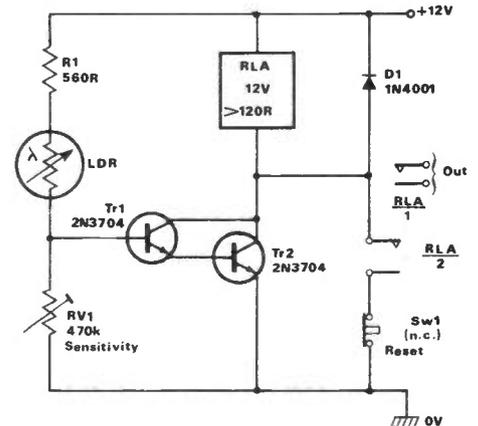


Fig 5 Sensitive self-latching light-activated relay switch

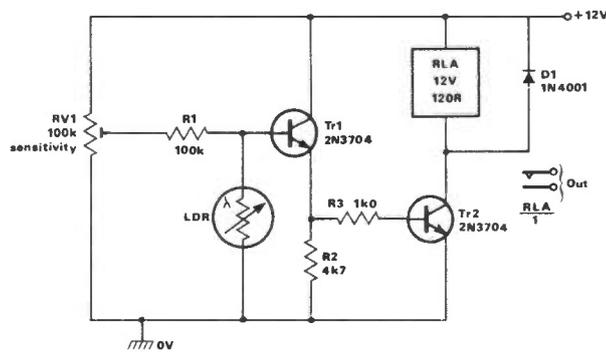


Fig 6 Simple 'dark-activated' relay switch

with a face diameter in the range of 3mm to 12mm. *Figure 4* shows a simple non-latching circuit, designed to activate when light enters a normally-dark area such as the inside of a safe etc.

Here, LDR and R2 form a potential divider that determines the base-bias of Tr1. Under dark conditions the LDR has a very high resistance, so zero base-bias is applied to Tr1, and Tr1 and RLA are off. When a significant amount of light falls on the LDR face, the LDR resistance falls to a fairly low value and base-bias is applied to Tr1, which thus turns on and activates the RLA-1 relay contacts which

can be used to control external circuitry.

The simple *Figure 4* circuit has a fairly low sensitivity, and has no facility for sensitivity adjustment. *Figure 5* shows how these defects can be overcome by using a Darlington-connected pair of transistors in place of Tr1, and by using sensitivity control RV1 in place of R2. The diagram also shows how the circuit can be made to give a self-latching action via relay contacts RLA-2: normally-closed push-button switch SW1 enables the circuit to be reset (unlatched) when required.

Figure 6 shows how an LDR can be

DATA FILE

used to make a simple 'dark-activated' relay switch that turns on when the light level falls below a value preset via RV1. Here, R1 and LDR form a potential divider that generates an output voltage that rises as the light level falls. This voltage is buffered by emitter-follower Tr1 and used to control relay RLA via common-emitter amplifier Tr2 and current-limiting resistor R3.

The light 'trigger points' of the Figures 4 to 6 circuits are susceptible to variations in circuit supply voltage and ambient temperature. Figure 7 shows a very sensitive 'precision' light-activated circuit that is not influenced by such variations.

In this case, LDR-RV1-R1 and R2 are connected in the form of a Wheatstone bridge, and the op-amp and Tr1-RLA act

as a highly sensitive balance-detecting switch. The bridge balance point is quite independent of variations in supply voltage and temperature, and is influenced only by variations in the relative values of the bridge components.

Potential dividers

In Figure 7, the LDR and RV1 form one arm of the bridge, and R1-R2 form the other. These arms can actually be regarded as potential dividers, with the R1-R2 arm applying a fixed half-supply voltage to the non-inverting input of the op-amp, and the LDR-RV1 divider applying a light-dependent variable voltage to the inverting terminal of the op-amp.

In use, RV1 is adjusted so that the LDR-RV1 voltage rises fractionally above that of R1-R2 as the light intensity rises to the desired trigger level; under this condition the op-amp output switches to negative saturation and thus drives the relay on via Tr1 and biasing resistors R3-R4. When the light intensity falls below this level, the op-amp output switches to positive saturation, and under this condition Tr1 and the relay are off.

The Figure 7 circuit is very sensitive, being able to detect light-level changes too small to be seen by the human eye. The circuit can be modified to act as a precision 'dark-activated' switch by either transposing the inverting and non-inverting input terminals of the op-amp, or by transposing the LDR and RV1. Figure 8 shows a circuit using the latter option.

Figure 8 also shows how a small amount of hysteresis can be added to the circuit via feedback resistor R5, so that the relay turns on when the light level falls to a particular value, but does not turn off again until the light intensity rises a substantial amount above this value. The magnitude of hysteresis is inversely proportional to the R5 value, being zero when R5 is open circuit.

Precision

A precision combined light/dark switch that activates a single relay if the light intensity rises above one preset value or falls below another preset value can easily be made by combining an op-amp 'light' switch and an op-amp 'dark' switch in the manner shown in Figure 9.

To set up the Figure 9 circuit first preset RV1 so that approximately half-supply voltage appears on the LDR-RV1 junction when the LDR is illuminated at the 'mean' or normal intensity level. RV2 can then be preset so that RLA turns on when the light intensity falls to the desired 'dark' level, and RV3 can be adjusted so that RLA activates at the desired 'brightness' level.

Note in the Figures 7 to 9 circuits that the adjusted RV1 should equal the LDR resistance value at the 'normal' light level of each circuit.

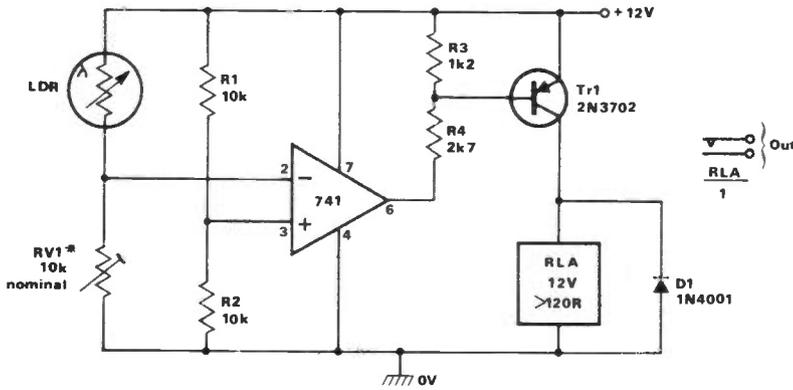


Fig 7 Precision light-sensitive relay switch

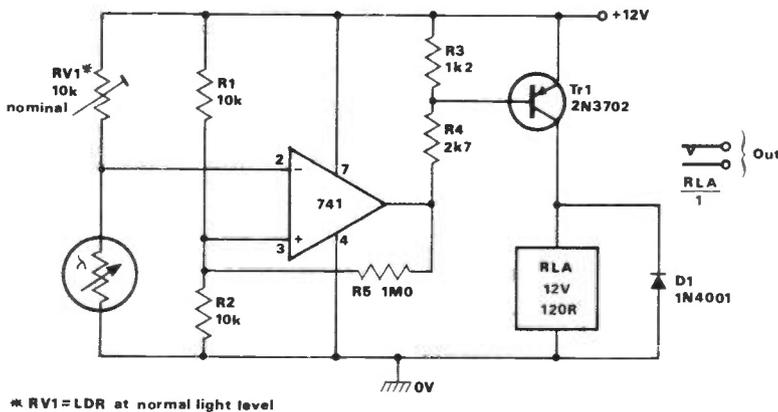


Fig 8 Precision dark-activated switch, with hysteresis

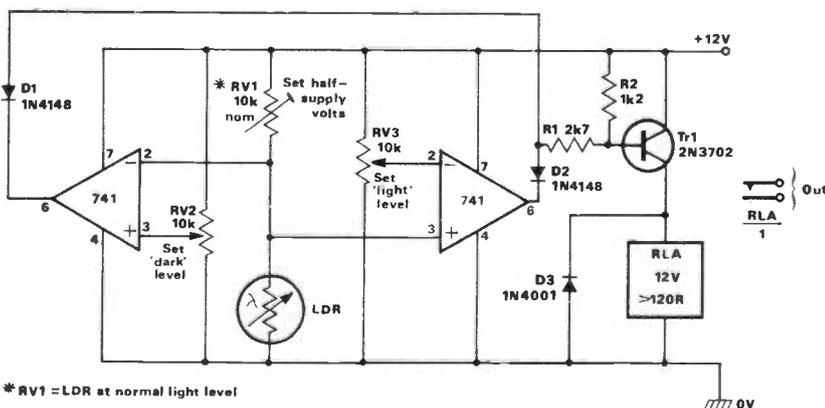


Fig 9 Combined light/dark switch with single relay output

Photo-diodes

If a conventional silicon diode is connected in the 'reverse biased' circuit of *Figure 10*, negligible current will flow through the diode and zero voltage will develop across R1. If the casing is now carefully removed from the same diode so that its semiconductor junction is exposed, and the diode is then exposed to visible light in the same circuit, the diode current will rise possibly to as high as 1mA, producing a significant output across R1. Further investigation will show that the diode current (and output voltage) is directly proportional to light intensity, and that the diode is actually photo-sensitive.

In practice, all silicon junctions are photo-sensitive, and a 'photo-diode' can be regarded as a conventional diode housed in a case that enables external light to reach its photo-sensitive semiconductor junction. *Figure 11* shows the standard photo-diode symbol.

In use, the photo-diode is reverse biased and the output voltage is taken from across a series-connected load resistor. This resistor may be connected between the diode and ground as in *Figure 10*, or between the diode and the positive supply line as in *Figure 12*.

The human eye is sensitive to a range of 'light' radiation, as shown in *Figure 13*. It has a peak spectral response to the colour green, which has a wavelength of about 550nm, but has a relatively low sensitivity to the colours violet (400nm) at one end of the spectrum, and to dark red (700nm) at the other.

Photo-diodes also have spectral response characteristics, and these are determined by the chemistry used in the semiconductor junction material. *Figure 13* shows typical response curves of (b) a general-purpose photo-diode and (c) an infra-red (IR) photo-diode.

Photo-diodes have a far lower light-sensitivity than cadmium sulphide LDRs, but give a far quicker response to changes in light level. Generally, LDRs are ideal for use in slow-acting direct-coupled 'light level' sensing applications, while photo-diodes are ideal for use in fast-acting ac-coupled 'signalling' applications.

Typical photo-diode applications include IR remote-control circuits, IR 'beam' switches and alarm circuits, and photographic 'flash' slave circuits, etc.

Photo-transistors

Figure 14 shows the standard symbol of a photo-transistor, which can be regarded as a conventional transistor housed in a case that enables its semiconductor junctions to be exposed to external light. The device is normally used with its base open-circuit, in either of the configurations shown in *Figure 15*, and functions as follows:

In *Figure 15a*, the base-collector junction of the transistor is effectively

reverse-biased, and thus acts as a photo-diode. The photo-generated currents of the base-collector junction feed directly into the base of the device, and the normal current-amplifying transistor action causes the output current to appear (in greatly amplified form) as 'collector' current. In *Figure 15a* R1 causes this current to generate an output voltage as shown.

In practice, the collector and emitter currents of the transistor are virtually identical, and since the base is open-circuit the device is not subjected to significant negative feedback. Consequently, the alternative *Figure 15b* circuit, in which R1 is connected to Tr1 emitter, gives a virtually identical performance to that of *Figure 15a*.

The sensitivity of a photo-transistor is typically one hundred times greater than that of a photo-diode, but its useful maximum operating frequency (a few hundred KHz) is proportionally lower than that of a photo-diode (tens of MHz). A photo-transistor can be converted into a photo-diode by using only its base and collector terminals and ignoring the emitter, as shown in *Figure 16*.

Alternatively, the sensitivity (and operating speed) of a photo-transistor can be made variable by wiring a variable resistor between the base and emitter, as shown in *Figure 17*. With RV1 open-circuit, photo-transistor operation is obtained; with RV1 short-circuit, photo-diode operation occurs.

Note in the *Figures 10 to 17* circuits

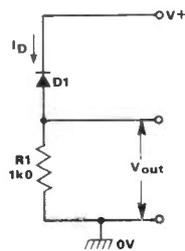


Fig 10 Reverse biased diode circuit

Fig 11 Photo-diode symbol

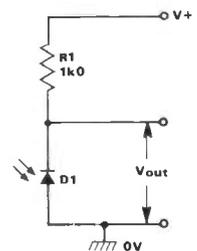


Fig 12 Circuit with D1 to V+ load

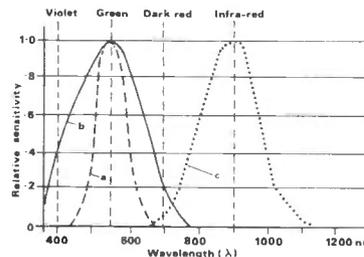


Fig 13 Spectral response curves of (a) the human eye, (b) a general purpose photo-diode, (c) an IR photo-diode



Fig 14 Photo-transistor symbol

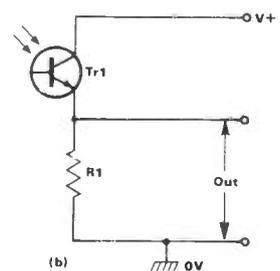
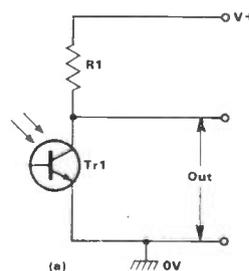


Fig 15 Alternative photo-transistor circuit configurations

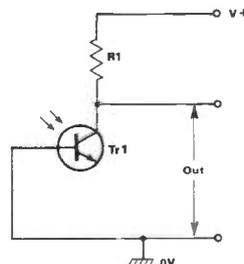


Fig 16 Photo-transistor used as a photo-diode

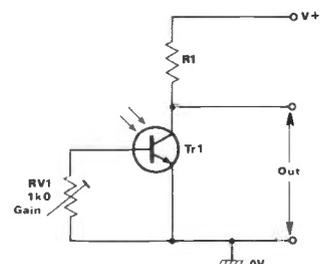


Fig 17 Variable sensitivity photo-transistor circuit

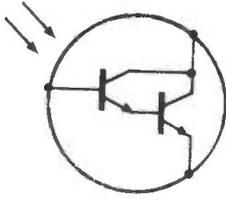


Fig 18 Darlington photo-transistor symbol

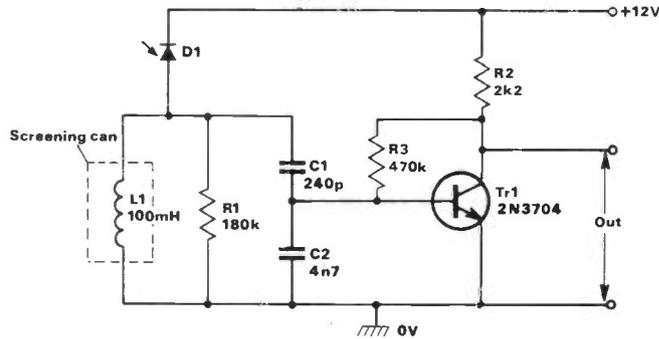


Fig 19 Selective IR pre-amp designed for 30KHz operation

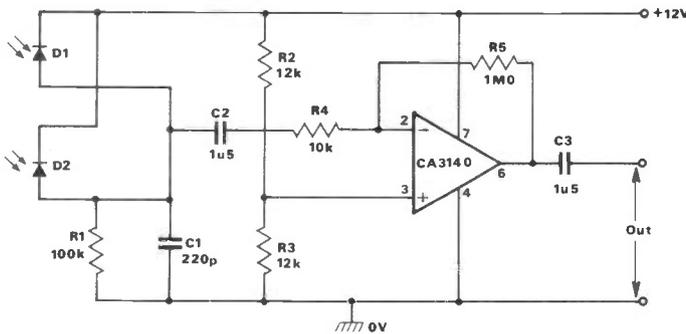


Fig 20 20KHz selective pre-amp for 'beam alarm' applications

that, in practice, the R1 'load' value is usually chosen on a compromise basis, since the circuit voltage gain increases but the useful operating bandwidth decreases as the R1 value is increased. Also, the R1 value must in many applications be chosen to bring the photo-sensitive device into its linear operating region.

Some photo-transistors are constructed in 'Darlington' form, and use the symbol shown in *Figure 18*. These devices have typical sensitivities some ten times greater than a normal photo-transistor, but have useful maximum operating frequencies of only tens of KHz. Devices are also available with integral amplifiers, and in the form of

photo-sensitive SCRs and triacs, and others.

Pre-amp circuits

Photo-diodes and photo-transistors are most often used as the 'sensing' element at the receiver end of an opto 'data transfer' system, such as a light-beam switch/alarm or a remote control system, in which data is sent to the receiver via an opto 'carrier' wave.

In such applications, the signal reaching the photo-sensor may at some times be very weak, and at other times very strong. Also, the sensor may be subjected to a great deal of 'noise' in the form of unwanted light (visible or invisible) signals, etc.

To help minimise these problems the link is usually operated in the infra-red range, and the opto-sensor output is passed to processing circuitry via a low-noise pre-amplifier with a wide dynamic operating range. *Figures 19 and 20* show typical examples of such circuits, using photo-diode sensors.

The *Figure 19* circuit is designed for use with a 30KHz carrier wave, and tuned circuit L1-C1-C2 is wired in series with D1 and damped by R1 to provide the necessary frequency-selective low-noise action. The output signals are tapped off at the C1-C2 junction and then amplified by Tr1.

Finally, to complete this edition of *Data File*, *Figure 20* shows a 20KHz selective pre-amplifier circuit for use in an IR light-beam alarm application, in which the alarm sounds when it is broken. Here, two IR photo-diodes are wired in parallel, so that beam signals are lost only when *both* diode signals are cut off, and share a common 100K load resistor (R1). This resistor is shunted by C1 to reject unwanted high-frequency signals, and the R1 output signals are fed to the x100 op-amp inverting amplifier via C2, which rejects unwanted low-frequency signals.

Next month

In next month's edition of *Data File* we continue the opto-electronics theme by looking at photo-coupler devices and applications.

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LATEST LITERATURE

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TELEVISION & RADIO 1985

Edited by Eric Croston.

This year's 'Guide to Independent Broadcasting' is now available, offering little more than in previous years that will actually interest the 'broadcast enthusiast'. In fact, it consists of the *TV Times* 'pick of the year' with a few 'facts and figures' tacked on the end. The former is colourfully illustrated and utterly banal; the latter contains nothing that is not already available free of charge direct from the IBA.

Broadcasting technology of today and tomorrow is scantily mentioned and there is certainly no speculation on the future of any of the broadcasting that is *rumoured* to exist outside the confines of the IBA. To be fair you would not expect such a thing, and the book is definitely not intended to be in any way technical.

Whether or not it is in any way *informative* or *interesting* is really not the concern of this review; these words serve only to warn prospective buyers who think it may be something more, and to remind those interested in 'professional' broadcasting that excellent technical information can be

obtained from the IBA.

As an irrelevant thought in passing, it is perhaps a sad reflection on 'popular' TV in its present comic-strip form that its review of the year should resemble nothing more than a *Beano* annual.

An example of what the IBA can produce when not catering for the devotees of 'soaps' and wrestling is the latest edition of their quarterly journal *Airwaves*.

This edition sees a new glossy format to coincide with the 30th anniversary of Independent Television. Inside are articles which *will* be of interest to those who follow the progress of commercial broadcasting. Described as 'a journal that carries discussion of broadcasting policy and research', the new issue says goodbye to 405-line TV, examines the technology behind teletext subtitling, and contains the views of IBA chairman Lord Thomson on DBS (including a gem: 'the regulation of pay-to-view services will almost certainly demand innovative thinking' - a good thing for Lord Thomson who, as designate Chairman of the Satellite Broadcasting Board, will be expected to do much of that thinking!).

The magazine is excellent value, since it is free on request from the IBA (subject to availability). Seriously, it is worth getting if your interest extends into the wider areas of communications and, unlike *Radio & Television 1985* (£3.90 from newsagents and bookshops), *Airwaves* contains words (and ideas) of more than one syllable.

Information office, IBA, 70 Brompton Road, London SW3 1EY. Tel: (01) 584 7011, £3.90. ISBN 0-90-0485-48-5.

THE APRICOT PERSONAL COMPUTER

By Mario de Pace.

This is the latest in the series of Collins' books dealing with specific makes of computer. In dealing with the Apricot, the author provides invaluable information for both the beginner who wants to know what his new machine can do and how it can be made to do it, and the more experienced user who wishes to extend the uses to which he puts this powerful and popular personal computer.

The first chapter outlines reasons for buying the Apricot, which although providing a neat introduction to the book by outlining the machine's capabilities does not act in any way as a comparative or objective buyer's guide. Similarly the second chapter on setting up the Apricot will only be of use to those who have completely failed to understand the *Owners' Handbook* supplied with the machine.

The above criticisms are not meant too harshly as they can generally be applied to all books of this type. In fact, the author's style of writing makes these pages a pleasant and gentle introduction to the rest of the book, wherein is contained its real worth.

The chapters explaining

MS-DOS, BASIC and the utilities and their uses with the Apricot could well be of use to the less experienced user, and again de Pace's style and instructive use of examples is a strong plus factor over the often less straightforward approach of the 'user manual'.

The following chapters describe many of the software options available on the Apricot, including word processing, databases, spreadsheets, graphics and integrated software. The author's observations, although in no way definitive, certainly provide many useful guidelines to help the owner choose the correct software to suit his needs.

At this point the book goes further than many of its type in its examination of the programming languages and operating systems used in the Apricot. Apart from being of general interest to all owners in helping to explain more about how their machine works, this information will be particularly useful to all those wishing to realise the full potential of their Apricot.

The final chapters give more details of the Apricot's hardware and the use of printers etc, and a glossary of computer terminology, common in these books but always useful to the beginner, is also included.

The book is thus highly recommended to any owner of the Apricot machine, bar those who are actively engaged in writing books on the subject themselves! Without doubt it provides the required information for any owner who feels he is not making full use of the capabilities which this powerful machine offers. In other words, if you can afford the Apricot - save up for the book!!!

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BC547/8/9	- 8p	BD135,136	- 25p	BSX20	- 15p
BC557/8/9	- 8p	BD137,138,139	- 25p	2N2926	- 7p
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10/16, 10/25, 22/6 - 20P, 15/25, 22/16, 33/10	30p
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22/16, 22/25, 22/50, 47/16, 47/25, 47/50, 33/10 - 6p, 100/16, 100/25	7p
100/50 - 12p, 100/100 - 14p, 220/16 - 8p, 220/25, 220/50	10p
470/16, 470/25 - 11p, 470/35 - 12p, 470/40 - 15p, 1000/16	15p
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LATEST LITERATURE

NINETY NINE NIGHTS ON MEDIUM WAVE

By Wilhelm Herbst.

This slim volume, originally written in German, provides a useful introduction for the beginner to medium wave DXing. The book gets its title from a survey carried out by the author of the results obtained by regular late night (prime time for transatlantic MW DX) listening over three months. The precise tabulation and subsequent analysis of his results are both interesting and impressive, but the usefulness of the book goes far beyond 'one man's experience'.

The author lists the strongest and most regularly heard MW DX stations by frequency, stations which often give an indication of reception conditions on a particular night from a particular area. The accompanying notes regarding the reception of these stations make fascinating reading.

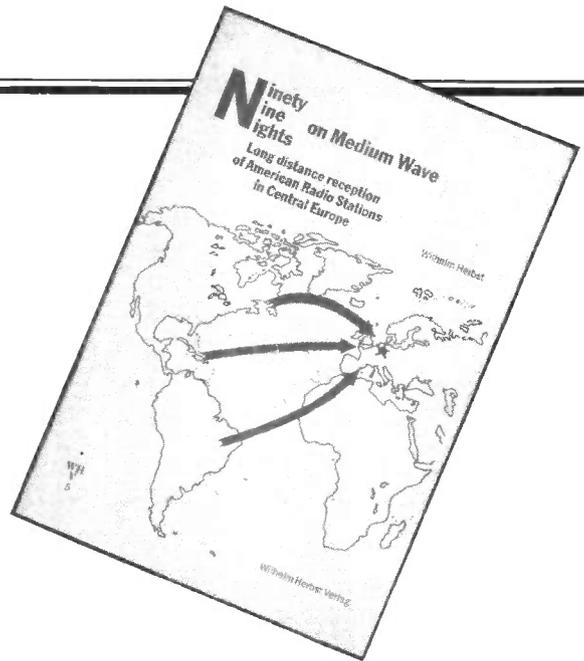
Most usefully, the address-

ses of over 100 stations heard in the survey are also given, and this information will be invaluable to anyone starting off in this area of DXing.

Also for the beginner are comments regarding aeri-als, receivers and additional equipment used by the medium wave listener, and an outline of the particular problems of local QRM, etc encountered.

The book includes a list of some of the major MW DX clubs worldwide, and readers may wish to contact the British club *Medium Wave Circle, 7 The Avenue, York YO3 6AS.*

Despite its simple format and printing, *Ninety Nine Nights on Medium Wave* is cleverly illustrated with exotic QSLs in a way which adds to the overall charm of the book. At times the English translation is quaint, but the intent and meaning of the book always shine through. By avoiding the grand flourish, the book seems more



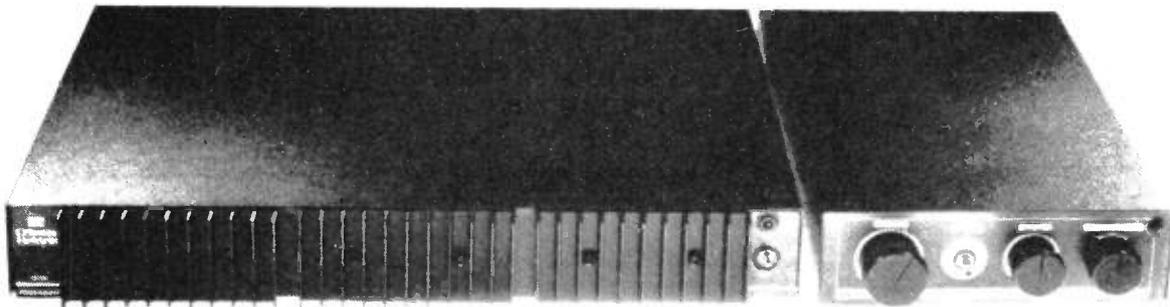
able to bring over the day-to-day aspects of this area of the hobby that a glossy publication might find difficult to present in a suitably cosmetic form.

This book comes firmly recommended to those wanting to get started in medium

wave DXing, as it certainly conveys both the information and the enthusiasm needed in the early days.

Wilhelm Herbst Verlag, PO Box 450506, D-5000 Köln 41, West Germany, £3.50 (DM 16,80). ISBN 3-923 925-04-2.

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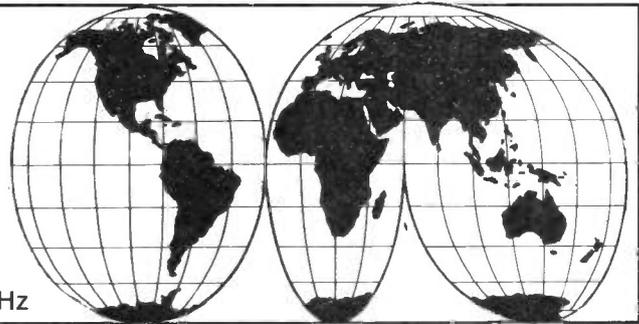
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SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

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



Over the past few years many Chinese regional stations have been reported in these columns, and now that it is possible for DXers here in the UK to log some of them, the season being in full swing, a list of a few now operating on the 60 and 90 metre bands is provided for those interested.

I must confess however that this subject was brought to mind by a letter from old-timer DXer Bob Iball of Costhorpe, near Workop. Bob is a long time correspondent of mine who is a dedicated 'China watcher' on these and other bands, having been so for many years.

In this review of some Chinese regionals the names of both the towns and provinces used are those of the Pinyin or Chinese Phonetic Alphabet (CPA) which was declared by the Chinese government to be the official romanisation system used within the People's Republic of China. The CPA system more closely resembles pronunciations in standard Chinese than the formerly used IPA system. Thus Peking is transliterated as Beijing, Urumchi as Urumqi and Fukien as Fujian etc.

90 metre band (3200-3400KHz)

This is not the easiest LF band on which to receive Chinese regional transmitters, although it is not impossible. Indeed, they are reported by UK based DXers from time to time.

At the low end of the band there is PLA (People's Liberation Army) Fuzhou, Fujian on **3200** where it operates in Chinese and Amoy from 1447 to 1730 with a power of 10KW. It is seldom reported, but as Tripoli does not sign on until 1745 co-channel there is always the possibility that some DXer may be lucky.

On **3235** is the sometimes reported Xinjiang PBS (People's Broadcasting Station)

presenting programmes in Uigher from 2230 to 0730 and from 1030 to 1730.

On **3260** you may be fortunate enough to log Guizhou PBS, Guiyang, a 10KW transmitter which operates the Home Service in Chinese and local dialects from 2130 to 0030, from 0150 to 0600 and from 0850 to 1605.

There are English language lessons from 2200 to 2230, from 0230 to 0300 and from 1300 to 1330.

English language lessons are a feature of most of the

Chinese regionals, as you will note from the content of this and succeeding reviews.

Higher up the band on **3300** is the PLA station at Fuzhou, Fujian in Chinese and Amoy, being scheduled from 1345 to 1800.

On **3310** is one that I have logged on two occasions. Jilin PBS at Changchun is on the air from 2050 to 0535 and from 0850 to 1510 with an English language lesson from 1340 to 1410. The power is variable 10 to 50KW.

Failing to log any of the

foregoing – a not uncommon occurrence for most of us it should be noted – you can always tune to the **3360** channel and listen for CPBS Beijing featuring the Taiwan Service in Chinese and Hakka from 2050 to 0102, from 0815 to 1045 and from 1200 to 1802. Not a regional as such, but reception of this one will probably compensate in some manner for the lack of success lower down the band.

I have managed to log this CPBS on several occasions – but then it is rated at 50KW!

AROUND THE DIAL

Make yourself comfortable, switch on the receiver, adjust the dial or digits to the frequencies at the times listed here and you may log the following

AFRICA

Botswana

Gaborone on **4820** at 0350, interval signal which is the sound of cow bells and cows lowing. At 0400 OM with identification in English and Setswana then choral rendition of the National Anthem on this new frequency with, it is thought, one of the three new 50KW transmitters recently installed at Sebele.

Cameroon

Radio Douala on **4795** at 2110, OM with local and world news in English until 2118 then YL with the news in French. This 100KW transmitter is on the air from 0430 to 0800 (Saturday and Sunday until 2230) and from 1630 to 2300.

Egypt

Cairo on **17670** at 1412, Arabic music then YL with announcements in the Domestic Service which may be heard on this channel from 1300 to 2345.

Kenya

Nairobi on **4915** at 0405, OM with a newscast in Swahili. This is the National Service of

the Voice of Kenya and is scheduled on this frequency from 0255 (Sunday from 0330) to 0630 and from 1330 to 2010 (Saturday until 2110). The power is 100KW.

Libya

Tripoli on **3200** at 0202, OM with a talk in Arabic. The Voice of the Greater Arab Homeland is timed here from 1745 to 0430.

Mauritania

Nouakchott on **4845** at 0611, quotations from the Holy Quran, OM with announcements then YL with songs in Arabic. The schedule is from 0600 (Saturday from 0800) to 0900 and from 1800 to 2400. The power is 100KW.

Rwanda

Kigali relay of Deutsche-Welle (Cologne) on **17800** at 1408, YL with a talk about German commerce during the French programme scheduled from 1315 to 1415 for African consumption.

South Africa

SABC Johannesburg on **3250** at 0206, recorded pops, OM announcements in Afrikaans. This was a transmission in the All Night Service 'Radio Orion', timed on the air from 2200 to 0300. The 'Radio 5' schedule on this channel is from 0300 to 0545 and from 1530 to 2200.

SABC Johannesburg on **4880** at 2042, OM with a talk in Afrikaans, announcements and then a programme of songs by a male choir. The Home Service in Afrikaans on this channel is scheduled from 0347 (Saturday from 0427, Sunday from 0447) to 0550 and from 1520 to 2200. Market reports are featured Monday to Friday inclusive from 1605 to 1650. The power is 100KW.

Tunisia

Tunis on **17820** at 0634, OM with songs, music in a programme of the National Network Domestic Service which is on this channel from 0600 to 1600. Also logged in parallel on **11730**.

AMERICAS

Brazil

Radio Difusora do Maranhao, Sao Luis on **4755** at 0514, OM with folk songs in Portuguese. RD do Maranhao is on the air around the clock and has a power of 2KW.

A tune around the 25 metre band (**11650** to **12050**) one Saturday evening resulted in the following loggings: Radio Nacional da Amazonia, Brasilia on **11780** at 2028, this programme also logged in parallel on **11805**, OM with a sports commentary in Portuguese, the schedule being from 0800 to 1600 and from 1800 to 0200 with a power of 250KW; Radio Globo, Rio de

SHORT WAVE NEWS

Janeiro on **11805** at 2021 in parallel with the above; Radio Bandeirantes, Sao Paulo on **11925** at 2031, OM with a 'futebol' commentary in Portuguese. R Bandeirantes is scheduled from 0700 to 0500 with a power of 10KW.

Colombia

Radio Bucaramanga on **4845** at 0705, OM with a newscast in Spanish. The schedule is around the clock and the power is 10KW.

La Voz del Cinaruco, Arauca on **4865** at 0320, OM with a folk ballad in Spanish. The schedule is from 0900 to 0400 (Sunday until 0200) but sometimes works around the clock in the Caracol Network. The power is 1KW and the frequency can vary slightly at times.

Ecuador

La Voz de los Caras, Bahia de Carques, on **4795** at 0343, OM with songs in Spanish complete with local-style orchestral backing. This 5KW transmitter, whose frequency is liable to be slightly off-channel at times, is on the air from 1300 to 0400 but the latter time can also vary – it sometimes closes between 0300 and 0400.

Radio Rio Amazonas, Macuma on **4870.5** at 0354, OM with talk in Spanish about the Caribbean. OM with station identification, choral rendition of the National Anthem and off at 0400. This one uses Spanish, Indian and vernacular languages in its programmes and is on the air from 1030 to 1300 and from 1700 to 0400, the latter time varying to 0500. Sunday closing is at 0200. The power is 5KW and the frequency can vary on occasions to **4868**, the upper limit being unknown to the writer.

Another Ecuadorean sometimes off-channel is Emisora Gran Colombia, logged at 0357 when transmitting on a measured **4910.6** and featuring a talk in Spanish all about Colombian (not Ecuadorean) political affairs. Emisora Gran Colombia, Quito is scheduled from 1100 to 0500 but the closing can vary from 0400. However, just to fool us all it sometimes operates a 24 hour schedule.

The frequency varies from **4910** to **4911**.

Netherlands Antilles

Bonaire on **17605** (Radio Nederlands relay) at 2003, OMs with a discussion during a Dutch programme for Central and North West Africa, scheduled from 1930 to 2030.

ASIA

China

Yunnan PBS, Kunming on **4760** at 1507, light orchestral music in Western palm court style, OM announcements in Chinese.

Yunnan 1 is on the air from 2250 to 2400, from 0100 to 0800 and from 0900 to 1600 with a power of 50KW.

Xinjiang PBS, Urumqi on **5060** at 0031, local-style music, YL with songs in Mongolian presumably. This is the Home Service which also relays the Radio Beijing programmes in Mongolian. The schedule is from 0000 to 0515 and from 1130 to 1650. The R Beijing Foreign Service in Russian is relayed from 1800 to 2055 but this is jammed by an overlay of Moscow 2. The power is 50KW.

India

AIR Lucknow on **3205** at 1528, OM with a newscast in vernacular. This is the North Regional Service, the schedule being from 0025 to 0215 and from 1215 to 1740 with a power of 10KW. Newscasts in English are made at 0032, 1530 and at 1730.

AIR Bombay on **4840** at 1550, YL with songs, sitar music. This West Regional Service transmitter operates from 0025 to 0215 and from 1230 (Saturday from 1200) to 1740 with a power of 10KW.

North Korea

Seoul on **7550** at 1909, OM with a talk in the Arabic programme intended for the Middle East and timed from 1900 to 1945.

Kuwait

Kuwait on **7120** at 2140, YL with songs together with Arabic music in the Domestic/External Service which may be heard on this channel from 1800 to 2215. Also logged on **7130** in parallel.

Nepal

Radio Nepal, Kathmandu on **5005** at 1526, YL with songs, OM announcer in Nepali. R

Nepal is on the air from 0020 to 0350, from 0720 to 1020 and from 1150 to 1720 with a power of 100KW. The English Foreign Service to India is timed from 1435 to 1520.

Saudi Arabia

Riyadh on **11855** at 1008, YL with the local and world news in the English programme scheduled from 1000 to 1400.

EUROPE

Belgium

Brussels on **17610** at 1417, YL with a talk about Belgian composers and their music in English.

Czechoslovakia

Prague on **5930** at 1903, YL with a newscast in the English programme for Europe scheduled from 1900 to 1930.

Finland

Helsinki on **9575** at 0639, OM with the news in Swedish in the Finnish/Swedish programme for Europe scheduled from 0630 to 0720 on this channel.

Italy

Rome on **17715** at 1401, YL with repeated station identifications then OM with announcements and a newscast in the Italian programme for Canada timed from 1400 to 1425.

Rumania

Bucharest on **7135** at 2100, OM with the station identification followed by the news in the English programme for Europe, timed from 2100 to 2130.

Spain

Madrid on **7450** at 1855, OM with a song then YL with announcements during the Spanish programme intended for Spaniards in Europe and overseas, scheduled from 1630 to 2230 on this frequency.

Vatican

Vatican City on **9645** at 1958, the Rosary to Africa and Europe, timed from 1940 to 2000 daily.

SOUTH-EAST ASIA

Australia

Melbourne on **11800** at 1404, OM with a newscast in English which is timed from 1400 to 1410 on this channel.

Indonesia

RRI Padang, Sumatra on **4003** at 1528, OM with a song in Indonesian, stringed instrumental accompaniment. Padang is on the air from 2300 to 0100 and from 0945 to 1615 with a power of 10KW.

RRI Jakarta, Java on **4774** at 1515, OM with a talk in Indonesian then YL with a song followed by drum and gongs music in typical local style. Jakarta is scheduled from 2158 to 0100 (Sunday until 0200) and from 0800 to 1300 but sometimes, as in the present logging, until 1610. The power is 50KW.

CLANDESTINE

Radio Camilo Cienfuegos on a measured **6299** at 0213, OM with a tirade in Spanish in a CID programme which was also logged on **7353** in parallel. Transmission times are, or were (they have probably changed yet again) from 0000 to 0300 and from 0330 to 1245, although this latter opening time may be variable.

NOW LOG THIS

RRI Sibolga, Sumatra on **5257** at 1541, YL with songs, local-type musical backing just audible amid the CW QRM at times. This one has a power of 5KW and operates from 2300 to 0100 and from 1000 to 1600 but can vary on occasions to **5259**.

NOW HEAR THIS

Radio Tarma, Tarma, Peru on **4775** at 0320, YL with a folk ballad then OM with noticias in Spanish. R Tarma is scheduled from 1100 to 1400 and from 2000 to 0500 with a power of 1KW.

DOTS AND DASHES

Simply to provide a change of occupation, a couple of early morning and late night sessions on Top Band (1.8 to 2MHz) resulted in the following CW loggings. EA1AXX, I2CZQ, K1MM, K3ZUF, KT3M, KG4W, LZ1KDD, N4SF, OH1XX, PY2IF, RB5WW, UG6GAW, W1CF, W1KM, W2BXA, W8JI and YU4YA.

One early morning foray on 7 megahertz brought forth some CW signals from CO8AF, HH2HA, HK1NUK, HP1AW, LU9LBJ, PT7ZP, ZD8TM and ZS4TX. 

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AUGUST 1984

Projects - High Quality Directional Coupler, a coupler for frequencies above 432 MHz; QV06-40A Linear amplifier, a 100 watt valve linear amplifier; 40ft Tilt-over and extending mast, a home construction project; One night's work, adapting a portable typewriter; BBC Micro volume control; TV and Video interface. **Features** - Twenty Questions; Sporadic-E propagation; Data File - Audio amplifiers; BBC Micro Morse tutor; Improving Resistors; Data - Communication; Computing Transmission Lines



SEPTEMBER 1984

Projects - Low Power Transmitter, an 80m CW design; AM RAD, an experimental signal generator; Spectrum Analyser, further update on this project; Five Station Scanner, an add on unit for the 720 channel airband receiver. **Features** - Computing Inductances, a program for winding coils; Data File, a look at alarm systems; Satellite Update, more information about weather satellites; Noise, a look at this electronic phenomenon; Distance and Bearing Program, an aid for station location; Super-Transmatch, a review of Tau Systems ATU kit.



OCTOBER 1984

Projects - Base Mic, construct this processor controlled accessory; One night's work, build an indoor UHF TV aerial. **Features** - Modems, the link between computers and radio; Non-linear elements, a look at multipliers; Data File, continuing the look at alarm systems; SSTV for the BBC Micro, getting started in this mode; Testing! Testing! how to use your test gear: multimeters.



NOVEMBER 1984

Features - cellular mobile radio; computing attenuators for calculating resistance values; small aeriels, coping with problems of space; 27-29MHz conversions; Data File, concluding the series on security systems; FETs - a beginner's guide; Non-Linear elements, log and anti-log; QSO, interesting contacts from clubs and individuals; ATV on the air, with a look at a range of aeriels for the average pocket.



DECEMBER 1984

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



JANUARY 1985

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



FEBRUARY 1985

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



MARCH 1985

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

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C P I

934 MHz DEAD OR ALIVE?

Andy Emmerson G9BUP

I must be honest – this was just going to be a review of some interesting new products for 934MHz. But when I kicked the idea around with a few colleagues I got a mixed reaction... 'Are you really into CB?!?'... 'The alternative 'open channel' – it never took off, did it?'... 'Oh yes – Reftec's folded, so that's it for 934'... 'Do you enjoy talking to yourself, then?'... 'Does radio really work up at those frequencies?'

Bonus background

The reaction made me realise that not everybody was into 934, so I thought I would preface the review with a bit of background on the 32cm band, which (surprise, surprise) is not just CB. Those of you who already know this can jump straight to the review...

Back in the days before CB was legalised in the UK the Home Office was searching for a frequency band for its 'Open Channel' service. Quite a problem this – it could not be a band already used for broadcasting or private mobile radio (or indeed any other 'protected' radio service). The band's characteristics were such that interference to broadcast reception must be avoided, yet at least short distance communication should be practicable.

Bleak band

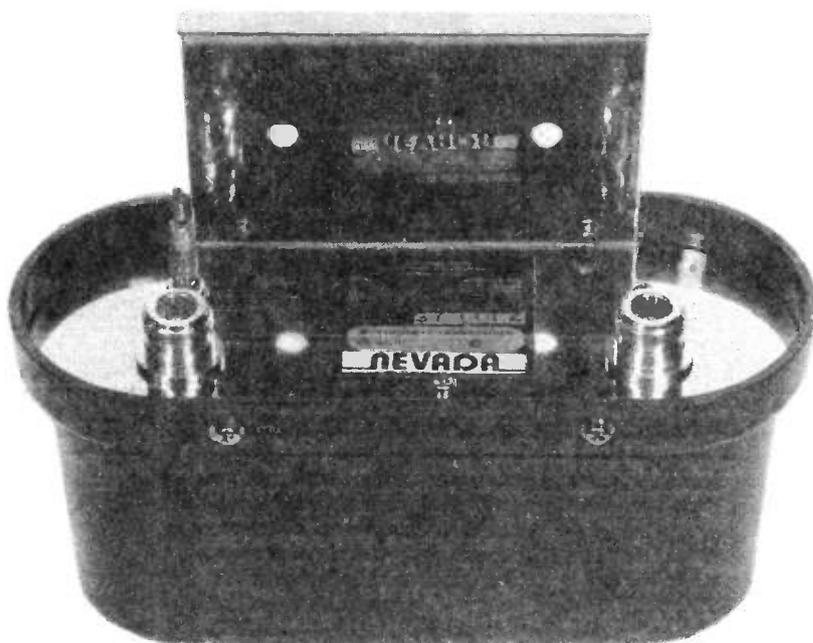
It was probably inevitable that a band satisfying these requirements would be a 'cinderella' or 'green fields' band, and the obvious choice was 900MHz. This was above broadcast radio and TV channels (so no interference) and was by all accounts a genuinely dead area.

Up to now 900MHz had been too expensive to exploit for other purposes (or so it seemed): just below the microwave bands, it was neither fish nor fowl.

RF power generation with transistors was expensive (because the devices had not been developed commercially on a large scale), yet the comparatively long wavelength meant that 'classic' microwave techniques (dishes and specialised tubes) were not practical. No wonder the CB enthusiasts did not welcome the proposals with open arms.

Reality is different

We have come a long way in those few years, and experience has shown most of those fears to be groundless. The choice of the 800 and 900MHz bands for new cellular mobile radio services, first in the USA and subsequently in Japan and Europe, has opened up a large market for



RF amplifiers and provided rig manufacturers with ready-made designs.

Radio amateurs with knowledge of the 70 and 23cm bands knew all along that 900MHz would work fine and experience has indeed borne this out.

We are not alone...

It would be wrong, however, to consider the CB allocation the first use of this fascinating band. It is used in Britain

to a small extent for broadcasters' studio to transmitter links – STLs – and for high-power, over-the-horizon communications in the NATO 'Ace High' system.

The new cellular radio car-phone networks also use 900MHz, as does a radar transmitter in Sweden used for probing the ionosphere. This last uses a 32 metre dish on 933.3MHz: I rather think this would give my Reftec set a fantastic boost! In Japan they have a personal

Channel	Frequency MHz	Channel	Frequency MHz
1	934.01250 (934.03750)	11	934.51250 (934.53750)
2	934.06250 (934.08750)	12	934.56250 (934.58750)
3	934.11250 (934.13750)	13	934.61250 (934.63750)
4	934.16250 (934.18750)	14	934.66250 (934.68750)
5	934.21250 (934.23750)	15	934.71250 (934.73750)
6	934.26250 (934.28750)	16	934.76250 (934.78750)
7	934.31250 (934.33750)	17	934.81250 (934.83750)
8	934.36250 (934.38750)	18	934.86250 (934.88750)
9	934.41250 (934.43750)	19	934.91250 (934.93750)
10	934.46250 (934.48750)	20	934.96250 (934.98750)

radio service with one calling channel and 79 working channels between 903.0125 and 904.9875MHz, while in the USA the band is being allocated for amateur radio use.

European harmony

Reverting to citizens' band – or shall we call it personal radio, too? – our UK system has the blessing of CEPT, the European conference of postal and telecoms administrations. This means that it is likely to be the first (and probably the only) system agreed by all countries in Europe.

The channels and mode (FM) are the same in all countries (see table) and already the Swiss have a service on these frequencies. After a long period of opposition, it looks as if French CBers will accept the 934MHz band as well.

What you get

Transceivers and all the other accessories for 934MHz are not cheap, so what do you get for your money? Simply 20 interference-free channels ready for your personal, social or business chit-chat. Activity is disciplined and not excessive, so you are likely to have a sensible QSO when you want one.

Range is more than line-of-sight but variable; easily one to two miles and between 15 and 35 miles between clear, elevated locations. There is a possibility that in future repeaters will be permitted, which will increase the range and consistency of coverage a lot.

Of course, under abnormal conditions (when the TV broadcasters apologise for foreign interference) the range goes to 200 miles or more and it will be interesting to see who claims the first contact abroad. There is an active users group with 400 members, making up what is believed to be more than half the total



UK users of the band. If you feel like getting in on the ground floor you will need a transceiver, antenna and feeder, all of which you can get from a specialist dealer.

The commercial scene

To begin with there was no commercial equipment for 934MHz, and early users tended to use UHF Westminsters and varactor multipliers (under test and development licences of course – your transceiver must now carry a DTI '934/81' approval mark). There was great rejoicing when the Mildenhall firm of RF Technology (Reftec) brought out their 934 transceiver. Despite a rather average design and performance, over 800 of these sets were sold and it is unfortunate that the firm has now ceased trading. The Japanese now look set to reap the harvest of the UK and other European markets.

Two distributors have made a speciality of the band: Selectronics of Canvey Island and Telecomms of Portsmouth. Both helped with the preparation of this article and the latter firm have sent us a selection of items to test.

The Nevada Professional series

That's what Telecomms call their range

of equipment – though in fact it's also to the highest amateur specifications, which is an equal compliment. Despatched for test were:

- HRA-900: pre-amplifier (£149.95);
 - TC12-L: loop yagi antenna (£39.75);
 - P7-E: mobile magnetic mount antenna (£39.95);
 - P7R-E: mobile gutter mount antenna (£39.95);
 - P714R-E: ditto (£39.95);
 - PA7-E: base collinear antenna (£59).
- These items are also available through dealers.

Telecomms also supply a highly praised Delta 1 transceiver made by Cybernet (£325), a power meter (£89.95) and a catalogue (£1). You might like to start with the latter: it contains a lot of technical info on 934MHz; perhaps we will see the transceiver for review soon.

Boost your signal

A pre-amplifier is not always justified, particularly on the lower frequencies. At 900MHz though, received signals are precious and cannot be wasted. With a sensitive receiver and a short feeder run a pre-amplifier would be wasted: on the other hand, with a longer cable run and a deaf-ish receiver a good low-noise pre-amplifier at the masthead might make all the difference.

Telecomms claim that using the HRA-900 you will hear copies which previously were not there – and it's true! I have a first generation Reftec set with 30 feet of RG-213 co-ax: the instant I switched on the pre-amp I heard a QSO which was totally inaudible before. What's more I could get back to them, indicating that the Reftec had adequate transmit performance but a less sensitive receiver. (In fact it requires 0.6µV signal for 12dB sinad; the new Delta 1 needs just 0.2µV).

The actual pre-amp is well-made in a weatherproof plastic case. It uses the standard Japanese high quality changeover relays to keep switching losses to a minimum and claims a performance of 15dB gain for 0.8dB noise figure (not bad!). The internal construction is well shielded, so well that I was reluctant to pull it to pieces to inspect further.

A set-side on/off switch is provided so you can check the difference which it makes. Actual switchover is RF sensed



since many transceivers do not have an external PTT line, but unfortunately the dc power is fed up a separate wire rather than through the co-ax. At least they supply plenty of wire!

The unit is made by Tokyo Hy-Power Labs and looks similar to their pre-amps sold for 70 centimetres. The price is somewhat higher but obviously a better device has to be used and the 934 mass-market has not yet arrived. I think the dramatic improvement in performance justifies the price.

Aerials In numbers

Two types of base antenna and three mobiles are available. The loop yagi, designed by Mike Walters G3JVL, is a 12 element beam giving 18dBi gain. It is just over 4 feet long, lightweight (1.1Kg) and should give good performance and weather resistance. It is British made, whereas all the others come from Maspro in Japan. The vertical collinear uses stacked $\frac{1}{2}$ wavelength elements in a fibreglass tube to achieve 7.14dBi gain. The whole thing (including feed-point) looks very thoroughly waterproofed.

The choice between beam and collinear is a difficult one, even if you set aside price. I would go for the collinear because despite its lower gain no rotator

is required and you cannot afford to lose calls off the back or side of the beam. I know some enthusiasts use both to gain the best of both worlds!

The mobile antennae are all of the fold-over pattern, which saves time when garaging your vehicle. The 714 uses elements enclosed in a fibreglass whip with a sprung steel base section on a gutter mount. The other pattern of mobile aerial comes with either gutter or magnetic mount and is of open construction. It has a quarter wave stub section which is claimed to be unique and which ensures a uniform radiation pattern regardless of mounting position. All Nevada aerials are fitted with N-type connectors and the mobiles come with waterproofed feeder cables.

I was tempted to give you a pseudo-scientific test of each antenna but without a proper test-range this would be meaningless and unfair to readers as well as the manufacturer. Instead I have spoken to users, who certainly rate the base-station collinear as extremely effective. I have no reports on the loop yagi and in any case I cannot see how it would meet the licensing requirements.

Of the mobiles the enclosed whip is reported to give the best receive angle and all-round performance. It looks less

obtrusive as well as being less exposed to the elements (no pun intended!). Despite the higher price, this would be my choice for a mobile aerial. I must just say that the quality of construction of all of these aerials is first-rate: all fittings are either stainless steel or heavily chrome plated. They really make a change from typical 'CB' quality.

934MHz comes of age

It really does look as if 934MHz is taking off at last: it is amazing that this is the first article on the subject outside the specialist CB magazines. Other suppliers are said to be bringing in transceivers and some other British products are on the market. If you are looking for a 'sensible' alternative to 27MHz or even a band more relaxed than two metres, I can certainly recommend 934.

Names and addresses

Telecomms: 189 London Road, Portsmouth, Hants PO2 9AE. (Tel: 662145).

Selectronics: 203 High Street, Canvey Island, Essex. (Tel: 691481).

The 934 Club: PO Box 424, Althorne, Chelmsford, Essex CM3 6UR. (SAE for details).

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- 5 UR76 50 ohm stranded conductor Coax 23p per m (p 3p pm)
- 6 POPES RG58C/U (UR76) with NC PVC 23p per m (p 3p pm)
- 7 Mini Coax RG174/U 50 ohm 25p per m (p 1p pm)
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SARUG

Paul Newman (?) G4INP has sent us some information about the recent activities of the Sinclair Amateur Radio User Group (SARUG). This group was formed in 1981 to encourage the exchange of information and techniques among radio amateurs and SWLs who wished to make use of their Sinclair computers in the hobby. Since then the group has been successful to the extent that it now has members in over 25 countries.

SARUG now publishes its excellent 16-page newsletter five times each year, and Paul was kind enough to send us a copy of the latest issue. The newsletter contains a variety of news and reviews of hardware and software for the ZX81 and Spectrum with, one presumes, more and more for the QL as time goes on. This information comes from SARUG members themselves, and is more often than not tried and tested by them in amateur radio applications so that one can be confident in their intentions and findings.

The newsletter also features readers' letters in each issue, and this would certainly seem to be a good place to direct any problems or queries concerning the use of Sinclair computers in amateur radio. Readers with items for sale, or specific 'wants', are also catered for in the mag.

The group has recently started placing a heavier emphasis on software. For instance, they now make available free high quality software in the pages of their newsletter, or alternatively at low cost on tape. Proceeds from these tapes go to various amateur radio groups such as the RAIBC, with SARUG itself merely covering its own costs.

Members of the club can often get considerable discounts on commercially available software through the good offices of SARUG. Such software is increasingly being thoroughly and critically reviewed in the club newsletter. These reviews are fast gaining a reputation as reliable and objective.

A good example from the

latest newsletter is G4INP's review of the G1FTU RTTY transceive program for the Spectrum (see *Product News*, February). The review examines the operation of the program and its features and functions and looks at some potential problems of linking the computer with a transceiver to use the program, before going on to recommend the Pearsons Computing product to members. The latter were also offered a special price if they wished to purchase the G1FTU software.

The only comment one might pass on the SARUG newsletter is that it seems to be Paul's one-man-band at the moment; not that there's anything *wrong* with G4INP, but I get the feeling that maybe he could use a hand!

Membership of SARUG costs £5 per annum plus an SAE for each of the year's five newsletters. This should be sent to (yes, you've guessed it!): *Paul Newman G4INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ*. An SAE to the same address will get you further information on the club and its activities. With all the benefits which SARUG has to offer, it certainly seems like a good bet for Sinclair users.

'Datanel'

The British Amateur Radio Teleprinter Group (BARTG) has announced the inauguration of a Sunday morning SSB phone net on 80m called 'Datanel'. The net starts at 1000GMT each Sunday on a nominal frequency of 3.660MHz, and is intended to be an informal meeting point on the air for all people interested in any aspect of data communications, including RTTY, AMTOR and Packet Radio. Where possible, BARTG committee members will participate in the net, so that ordinary members will have the opportunity to discuss group affairs and get up-to-date information on BARTG matters.

The net is open to all licensed amateurs with an interest in data communications. Simply call 'CQ Datanel' on 3.660MHz SSB and join in. Listener reports and comments are also wel-

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

come and may be sent to: *The BARTG Chairman, Stuart Dodson G3PPD, 63 Malvern Avenue, South Harrow, Middlesex HA2 9EU*.

Also on Sundays' BARTG transmits an RTTY news bulletin on 80m, 20m and 2m at various times throughout the day. As well as containing news of interest to BARTG members, the transmissions provide an opportunity to set up receiving equipment. Full details of these transmissions are listed in *Datacom*, the group's magazine. Information on this and other BARTG services is contained in two leaflets entitled *BARTG in the Eighties* and *BARTG and Data Communications*. Free copies of these leaflets may be obtained from: *John Beedie GW6MOK, PO Box 3, Llandeilo, Dyfed, Wales. Tel: (0558) 822286*.

RAIBC news

The latest newsletter from the Radio Amateur Invalid and Blind Club (RAIBC) reports that the present club membership is 1,074, and increasing steadily.

This month's newsletter includes a mini-review of the Trio TS711E multimode base station by Angus McKenzie G3OSS (who writes regularly for our sister magazine *Amateur Radio*), the usual club news, plus information relevant to members with specific disabilities, for example news of a speaking clock/calculator and an RSGB prefix list in cassette form for blind members.

Further information is available from the club HQ at: *9 Rannoch Court, Adelaide Road, Surbiton, Surrey*.

Anglo-Scottish Rally

Following their highly successful inaugural event in 1984, the joint organisers Kelso, Borders and Galashiels amateur radio societies will be hosting the

2nd Anglo-Scottish Rally in Kelso's Tait Hall on Sunday 5 May 1985 from 11am to 5pm.

There will be the usual stalls, talk-in on S22, a CW testing station, a bar, hot and cold snacks, raffles etc.

The entrance fee will be £1.00 except for junior ops, YLs and XYLs who will be very welcome and admitted free. There will be something for everyone to do. Why not spend the holiday weekend in beautiful 'Greystoke' country?

For further information, including details of accommodation, contact *André Saunders GM3VLB, Physics Dept, Kelso High School, or Bruce Cavers GM4UIB QThr, tel: (0573) 24664 and 24654 evenings only*.

BATC news

Amateur TV enthusiasts are asked to note that the British Amateur Television Club (BATC) will be holding their annual rally and exhibition on 5 May at the Post House Hotel in Rugby.

The event will begin with an informal get together in the hotel bar on Saturday evening (wear your club badge or tie!). The Sunday programme includes a wide range of demonstrations, trade stands, and a junk sale, and provides the ideal forum for an exchange of ideas on both fast and slow-scan TV, with an increasing emphasis on 24cm activity.

A lecture programme will include talks such as 'Colour slow-scan TV', 'Interfacing to a Sinclair Spectrum' and 'ATV techniques with Andy G8PTH'.

Half-price accommodation will be provided by the Post House Hotel for visitors to the convention (tel: 0788 822101).

For further information contact:

Mike G8HUA or Norrie GM4BVU, both QThr.

Southgate ARC help charity

The Southgate Amateur Radio Club will be operating a special amateur radio station for 48 hours from 30 to 31 March in support of the Mayor of Enfield's charity appeal, which is in aid of CARE (Community Aid for the Residents of Enfield).

The club will be sponsored for every country they make contact with. The station will be operated from Forty Hall, Forty Hill in Enfield.

Further details are available from: Mr R F Snary G4OBE, 12 Borden Avenue, Enfield EN1 2BZ.

HF engineer wanted

We recently heard from Mr P Jenkins G4ZOW, who is looking for an engineer with an interest in HF solid-state linear design to help him expand his ideas on the subject. He writes:

'Firstly, I must point out that this is not a business venture, I only wish to further a few ideas I have pondered on for a number of years.

'Now, having more free time on my hands as well as the necessary spare cash required for the right project, I decided to seek some help and guidance.

'I have always believed that there is no substitute for RF power, especially in a mobile situation where one is considerably limited by inefficient mobile whip antennae and, of course, power levels are limited by the terms of one's licence.

'Only one American company seems to have ever produced an HF mobile linear amplifier on the same lines as my idea, but this unit is not readily available in the UK, and anyway the dollar exchange rate makes it cost prohibitive - around £800 plus duty, VAT and carriage!

'The basic concept is to design a genuine 1KW PEP, 2-30MHz, 12V, all solid-state mobile amplifier, incorporating four separate push-pull pairs of output devices (total of eight transistors). There are several readily available 100W PEP output devices, such as the MRF421 and SD1487, and these modules would be mated up with suitable power combining transformers on input and

output, together with suitable filtering.

'This amplifier would be driven by a modern 100W HF transceiver, which should cut out the need for heavy driver stages, but some form of over-drive current limiting circuitry would be incorporated.

'I would very much like to contact someone willing to help me further these ideas, and I would cover all costs involved. I already have a supply of suitable devices and ferrite cores, but what I really need is a circuit designer with PCB layout experience at RF.'

Mr Jenkins will answer all letters, which should be sent c/o *Radio and Electronics World*.

Ipswich Radio Club

We recently received a copy of the quarterly magazine of the Ipswich Radio Club (club call G4IRC).

It consists of a collection of articles on various aspects of radio construction, club news, notes from a 1930s edition of *Popular Wireless* and other topics of interest, such as a feature on RTTY operating.

The magazine has an estimated readership of between 1500 and 1700.

The club meets on the second and last Wednesdays of each month at 8pm in the club room of the *Rose and Crown, 77 Norwich Road, Ipswich, Suffolk*.

Amateur radio and computer fair

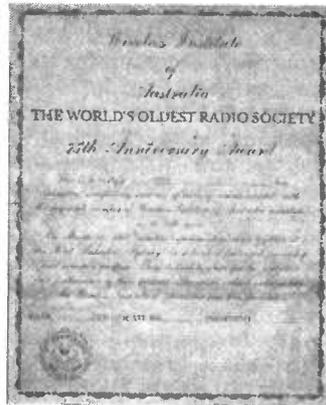
We have received news from the North Wakefield Radio Club of their forthcoming amateur radio and computer fair.

The venue is Bretton Hall College, Bretton, Nr Wakefield, Yorkshire on Monday 8 April.

The doors open at 11am (10.30am for disabled visitors) and admission is free.

Attractions will include radio, computer and electronics stands, a bring-and-buy stall, an amateur radio talk-in on S22 and GB3WU (RB15) and a bar.

For further information contact Steve Thompson G4RCH, 2 Alden Close, Morley, Leeds LS27 0SG. Tel: (0532) 536633.



WIA 75 Award

The world's first and oldest radio society, the Wireless Institute of Australia, celebrates its 75th anniversary during 1985.

One of the many planned

24 hour clock

We have received news from W J Mainwaring G8AWT of his very reliable 24 hour clock:

'While it may be excusable for a 'good buddy' to ask for a 10-36, it is obvious good sense for an SWL (broadcast or specialised) and indeed mandatory for a licensed radio amateur to know the time - and GMT at that (none of your B. Silly T. on QSLs or logs; read the small print in the licence).

'Well, 24 hour clocks are used in submarines, but they are huge, brassy, expensive and scarce, so technology (and XYL 'Santa') to the rescue in the form of a 'Zeon Time Cube' from Hong Kong, at a reasonable price, and using a standard AA cell which is powerful enough to light the bulb when it is really too dark to read the clear 1/2 inch LCD.

'In such a cell there is the possibility of using a nicad and trickle charging it, even intermittently, from available shack supplies to keep it going perpetually. The clock consumes a tiny current with greater demands when the bulb is lit by depressing the button.

'As marketed, it is an AM/PM display, but our local horological technician (whom I know as an SWL) found he could change the display to 24 hour by dint of his involvement with Digitro-

activities is the WIA 75 Award which will be available during the period 1 March to 31 December, 1985. To qualify, radio amateurs (and short wave listeners) need to contact (log) 75 members of the WIA.

A contact will only be valid if the WIA member's individual membership number is logged. No more than 30 WIA members may be logged in any one call sign area.

Claims should include a log extract of the 75 WIA members contacted, \$2 (Australian) to cover the certificate, handling and postage costs, and be sent to: *WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia*.

atics of 126 Park Road, Cowes. By 'operating' on the tiny PCB and following setting and 'regulating', it now keeps time with 'pips' from various broadcasting stations.

'The alarm works too, alerting for sked times or GB2RS. As a delighted customer, I'm pleased to pass this on to your readers.'

Mid-Ulster ARC

We have received news of a mobile rally which will be held on Sunday 19 May at 12.00am by the Mid-Ulster Amateur Radio Club.

The venue will be Parkenham House, Parkenham, near Dungannon, Co Tyrone. The rally will include a bring-and-buy stall, a boot sale and 'something for the XYLs and juniors'.

'Feedback'

The new editor of *Feedback*, the journal of the Bury Radio Society, is appealing for interesting articles and ideas for inclusion in the journal.

Malcolm G3VNZ writes: 'Don't worry if the last article you wrote was a school essay... writing about something you are interested in is much more fun and we will smooth off any rough edges if necessary.'

The club meets every Tuesday at 8.00pm in the Club Room at the Mosses Youth and Community Centre, Cecil St, Bury.

NOTES FROM THE PAST

... comments from the 1950's



Photo call

The group mug shot shows members of the Maltby Amateur Radio Society at their 1984 Christmas junk sale.

Apparently the objects being held by the group were all bought at the sale, although whether or not a bottle of Croft Original constitutes 'junk' is debatable... Oh well, it was Christmas.

The scarf adorning the front row was produced by Bev G1DWY as a sponsored knit, which raised more than £50 for club funds. The item she's holding in the picture is doubtless her out-patient's card from the local hospital, where she's undergoing treatment for knackered fingers...

The Maltby Amateur Radio Society meets at 7.00pm every Friday, the venue being *The Church Building, Church Lane, Maltby*.

Satellite conference

According to the UoSAT Bulletin No.110, a satellite conference which may be of interest to American radio amateurs is to be held in the Washington DC area from 15-19 April. The Second International Satellite Direct Broadcast Service Users Conference will be held at the Holiday Inn, near the Baltimore-Washington International Airport.

The program, sponsored by NOAA/NESDIS, NASA and WMO (World Meteorological Organisation), will include formal amateur participation, an exhibit of commercial equipment, plus a variety of seminars.

The conference provides a forum for designers and managers of the NOAA and GEOS environmental satellites and their users.

Further information is available from: *Mr B Popham, Satellite Program Specialist NOAA/NESDIS, E/ER2, Room 3301, FB4, Mail Stop D, Washington DC 20233, USA.*

Mobile rally

The Maidstone Amateur Radio Society will be holding its bi-annual mobile rally on 26 May at 11am. The venue is the *MCA Sportscentre, Melrose Close, Cripple Street, Maidstone ME15 6BD.*

RSGB news

We have been informed by the RSGB that on the 1 January 1985 the name of the Society's headquarters in Cranbourne Road, Potters Bar, Herts, was changed from 'Alma House' to 'Lambda House'.

This was seen as more in keeping with the society's activities.

The RSGB's newsletter recently included some information on the *Sir Walter Raleigh*, the vessel associated with 'Operation Raleigh', which is a worldwide four year self-training expedition for young people. The operation commenced in January and you can expect to hear the callsign GB2SWR/MM in operation from the vessel as it circumnavigates the world. A number of rare islands should become operational during the voyage, and further information will be given as and when it becomes available.

REW

Holiday exchanges

The account of an ISWL member's holiday in Germany, in last month's *Short Wave News* reminds me that despite the international aspects of our hobby fewer holidays of this sort are arranged than might be expected. I have spent several holidays in this way and I hope to have many more equally enjoyable. My two favourite countries are Holland and Denmark.

Denmark has the most attractive girls, but in radio interest Holland has a good lead. There you will find a tremendous interest in constructional radio, with one of the highest concentrations of transmitting amateurs in the world. The country's biggest industrial concern is centred on radio and electronics, which probably adds to their radio consciousness.

Incidentally, amateur and constructional radio seems more closely allied there than in England. The vast majority of amateur transmitting and receiving equipment in the PA0 stations is home-built - not always from choice, as factory made equipment and communications receivers are dear and scarce. Nowhere else in post-war years have I seen so high a general level of constructional work neatly carried out on clean lines, often with substitute materials. It is quite equal to England in the years prior to the last war, when the home construction of transmitters and short wave receivers was in its heyday. An abundance of ex-WD and mass produced communications receivers has blunted much of the best constructional work here since the War. The keen observer will also be fascinated at the cunningly contrived aerials to be found on the tall narrow houses of the bigger towns - but you have to get up to roof level to see them.

Bitzas

When both countries were occupied by the Germans during the war, most domestic sets were confiscated and many efficient receivers were built behind curtained windows so they might still listen to the BBC. Some of these were still retained for sentimental reasons, and they are made out of all sorts of unlikely things. Bitza everything, so to speak - hence the name I use to describe them. I first heard it applied to mongrel motor-bikes, but it is more truly descriptive of those receivers. The hiding places are equally ingenious; the most popular seemed to be under a loose floor-board in the lavatory.

DX-TV

RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

The main highlight during December was undoubtedly the extremely intense tropospheric opening between the 10th and 14th. This brought welcome relief, especially since the anticipated mid-winter Sporadic-E activity (normally expected around Christmas time) turned out to be something of a damp squib. There were however one or two signals which penetrated the UK. These took the form of late evening openings from Scandinavia and Central Europe around the 21st.

Meteor shower DX showed more promise and thanks to the Geminids every Band I channel was alive with pings of signals, notably on the 13th and 16th. Even channel E5 at the lower end of Band III was affected but to a lesser degree.

Remarkable achievement

Between the 10th and 14th signals arrived from a variety of countries. Reports indicate favourable reception from the Netherlands, Belgium, East and West Germany, Luxembourg and France. Many enthusiasts saw 'entertainment quality' signals in colour, even on relatively simple equipment.

At least two DXers chalked up a couple of 'firsts'. Simon Hamer at his Welsh valley location managed to log several UHF transmitters in the Netherlands and Belgium, while in Band III on channel E10 the Danmarks Radio television transmitter at Vestjylland (Denmark) was noted for the first time. Normally British transmissions hamper reception from the east so Simon was well pleased with the conditions.

Andy Webster of Billinge near Wigan perhaps went one better than most of us on the 13th. While attempting to receive Eire on UHF with his array to the south-west he noted a slow-fading PM5534 test card on channel E35. Further investigation revealed that the signal came from a more southerly direction. As the level of the signal increased, some identification could just be made out. Inside the top black rectangle were the initials 'ETB' while at the bottom there was the inscription '4 KANALA'. This is most certainly the regional television network operating in the Basque region of northern Spain. The abbreviation 'ETB' is short for 'Euskal Telebista'.

As far as we know this is the first time that ETB has been received in the UK.

Andy phoned to say that the signal was present from 1630 but attempts to locate it here in Derby proved unsuccessful. There was far too much cross-modulation present throughout the UHF band when the arrays were turned towards the general direction of Sutton Coldfield.

Quick mystery

On December 7th from 1800GMT, the sound channel of NOS-1 in the Netherlands was heard on channel E23. It was impossible to resolve any vision due to the presence of Central TV from the Wrekin transmitter and Thames Television operating on the same channel. Can anyone solve this mystery?

DX-TV log for December

This month we are featuring the reception noted here in Derby.

7/12/84: CST (Czechoslovakia) on channel R1 with the 'RS-KH' EZO-type test card; TVP (Poland) on R1 with the PM5544 test card which features a darker background than normal; ORF (Austria) E2a radiating the 'ORF FS1' PM5544; DDR:F1 (East Germany) on channel E4 with their electronic test card. Tropes included: NOS-1 (Netherlands) on E4, E5 and E6; BRT (Belgium) E10; mystery NOS-1 sound channel on E23 from 1800GMT.

9/12/84: Unidentified sports report at 1640 on R1/E2a; NOS-1 on E4 with the 'PTT NED 1' PM5544 test card.

10/12/84: Reception via enhanced tropospheric conditions included: NOS-1 on E4 with the test card followed by programmes for much of the evening; TDF Canal Plus (France) on channels F5 and F6 with programmes; TDF F10 with a colour bar pattern from 1750; RTL (Luxembourg) on channel E7 with a news programme; BRT E10 on programmes; RTBF (Belgium, French-language service) on E3, E8 and E11 with evening progs; ARD-1 (West Germany) on E9 from the WDR (Westdeutscher Rundfunk) transmitter at Langenberg.

11/12/84: ARD-1 (SWF-Südwestfunk) on E9 with the 'SWF HGR1' FuBK test card from the outlet at Hornisgrinde; ZDF (the 2nd West German network, Zweites Deutsches Fernsehen) on channels E35 and E37 with the 'ZDF' FuBK test card. During the evening the following stations were noted: RTBF on E3 and E8;

NOS-1 E4; BRT E10; ARD-1 on E6, E9 and E30; RTBF-2 at closedown with their 'TELE 2' PM5544 on channel E49; ARD-1 E2 via meteor shower at 2246GMT carrying the same programme as on E9. **12/12/84:** TVP R1 on test card; SR-1 (Sweden) E2 with the 'TV1 SVERIGE' PM5534 test card. Tropes included: NOS-1 on E4, E5 and E39; DDR:F1 on E11 with their electronic test card at 0750GMT; ARD-1 (NDR-Norddeutscher Rundfunk) on E10 with the 'NDR' FuBK test card; ZDF on E35 and E37 radiating the FuBK and 'DBP' (Deutsches Bundespost) identification; WDR on E9, E40 and E48 with combined ARD-1/WDR-3 schools programmes.

13/12/84: RAI (Italy) on channel IA with programme at 2212. Lots of meteor shower activity noted throughout Band I.

17/12/84: CST R1 on 'RS-KH' EZO-type test card; TVP R1 with 'tp' clock caption.

24/12/84: TVP R1 on PM5544 test card.

26/12/84: SRG-1 (Switzerland) on E2 with weather forecast and map at 2120.

27/12/84: TVE (Spain) E2 on GTE electronic test pattern with 'tve tve' identification; TVP R1 with PM5544.

28/12/84: DDR:F1 E4 on test card; CST R1 with the 'RS-KH' EZO test card.

29/12/84: ARD-1 E4 at closedown with 'ARD 1' logo followed by an FuBK test card.

30/12/84: TVE E2 with GTE test card.

31/12/84: TVE with GTE test card on E4.

Aerials for DX-TV

Our recent article covering Sporadic-E propagation (see **R&EW**, August '84) generated a fair amount of interest among readers and we're pleased to say that one or two are now actively engaged in TV DXing.

The subject of the availability of receiving aerials has cropped up on numerous occasions, especially for systems operating between 45MHz and 100MHz. The demand for Band I and III arrays in the UK diminished rather rapidly following the introduction of BBC 1 and IBA programmes on UHF in November 1969. Consequently, within recent years manufacturers have only produced VHF aerials in small quantities



Test pattern radiated by LS83 TV on channel 9 in Argentina

and most have been intended for the export market.

Aerials for Bands I and III have been increasingly difficult for the DX-TV enthusiast to acquire and thoughts usually turn to DIY construction. Fortunately, for Sporadic-E reception a simple dipole will produce satisfactory results for initial experimentation in Band I, especially since signal strengths frequently attain high levels. However, weaker signals demand something more elaborate than a dipole and this means a multi-element structure.

Making a dipole is one thing but trying to obtain sufficient bits and pieces for a multi-element beam... Ideally for Band I frequencies the elements or rods should be 1/2 inch diameter with a boom diameter of at least 1 inch to ensure mechanical stability.

Ready-built DX aerials

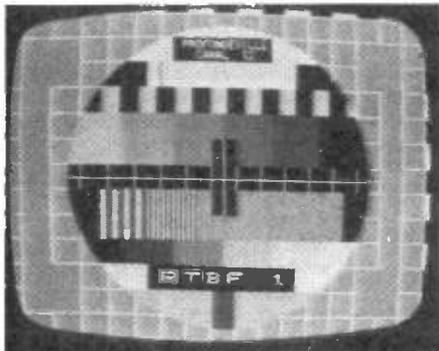
We have recently received literature from a company which specialises in the manufacture of aerials suitable for DX-TV work. It is called 'Weston Developments' and is based at 33 Cherville Street, Romsey, Hampshire SO5 8FB. Various systems are available covering the Band I DX channels. Aerials range from a wideband dipole design to a close-spaced 4-element yagi with a boom length of only 72 inches. An omnidirectional system is available with a crossed reflector system to minimise pick-up from underneath.

Other designs are suitable for the OIRT FM band (64-73MHz), Band II TV (channels R3, R4, R5 and IC) covering 76-100MHz, Airband (117-138MHz) and the Marine Band (156-164MHz). The illegal cordless phone user is also catered for with various combination designs for 46MHz, 49MHz and 71MHz. A free brochure is available from them but a foolscap SAE must be sent.

South West Aerials (11 Parkstone Road, Poole, Dorset) can also supply a range of aerials and accessories for domestic and DX use. A fully illustrated catalogue is available, price 60p.

Reception reports

Sporadic-E reception was around



PM5544 from Belgium with transmitter identification at the top

according to the log sent in by Simon Hamer of Powys. A sustained opening on December 18th brought in Russian signals on channel R2 consisting of a winter-time film showing youngsters sledging by a lake in a forest setting. Tropospheric achievements included Denmark on E10 towards the end of the evening of the 10th and RTL (Luxembourg) on E7 a little earlier with commercials and weather reports. The reception of Denmark on E10 and RTL on E7 were 'firsts' for Simon. The use of a Hitachi portable with 5.5MHz sound facilities made the occasion seem even more dramatic.

Other 'firsts' for Simon included NOS-2 (Netherlands) on channel E27 and RTBF-2 (Belgium) on E42. A flick through the FM band produced Denmark's 2nd programme on 99.9MHz (relaying the 3rd network) and AFN-Frankfurt on 98.7MHz. From the west, RTE (Eire) was noted on 94.9MHz and 95.3MHz.

Although 'Canal Plus' officially commenced at the beginning of last November, there are still a few transmitters on test. Harold Brodribb (St Leonards-on-Sea) noted at least two on December 10th. At midday channel F7 was displaying colour bars at excellent strength while F10 was radiating a form of colour bar pattern with 'FR3' and 'RESEAU SPECIALISE' superimposed. Channel F5 (Lille) on the other hand seems to be competing with the BBC - there isn't a test card to be seen all day!

RTE-2 was resolved at the top end of Band III on channel I by Harold from 1430 onwards on the 10th. He noted the 'RTE 2' PM5544 test card. On the 11th, two British Channel 4 transmitters were received. The first was Crystal Palace on E30. This is rare for his location. The second one was on channel 29. This no doubt came from the Wrekin transmitter near Telford in Shropshire.

RTL (Luxembourg) is a fairly regular visitor to the south coast and on December 13th Harold noted exceptionally clear reception of the PM5534 test card on E7. Finally, a mystery trop signal appeared on channel E2 during the evening of the 10th. The signal emanated from a West German ARD-1



Weather chart used by Norway and received via Sporadic-E

outlet but an NDR (Norddeutscher Rundfunk) logo was seen at the side of the announcer. There aren't any NDR transmitters on E2 nowadays so we can only assume that this was an NDR programme being screened over the whole ARD-1 network.

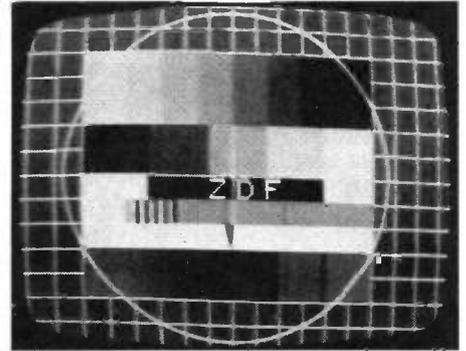
John Bray (St Neots, Cambridgeshire) saw several good quality signals in colour during the recent trop. These were mainly from Dutch and Belgian stations. He queries a PM5544 test card seen on channel E49 with the identification 'TELE 2'. This is in fact the pattern used by the 2nd network of the Belgian French-language service, RTBF.

The situation can be a little confusing at times since the 1st network is aired via the same channels when the 2nd service isn't in operation. The 1st network carries the identification 'RTBF 1' at the bottom of the PM5544 and usually some form of transmitter location details at the top. Typical identifications noted by John during the tropospheric openings included 'CANAL 3' and 'LEGLISE CANAL 11'.

Bob Brooks (South Wirral) reports plenty of activity in Band I and III between the 10th and 14th. Tropospheric reception allowed him to watch Dutch TV on channel E4 from the outlet at Lopik during the entire evening of the 11th. The same opening produced strong signals from the RTE-1 transmitter at Kippure in Eire on the Band III channel 'H'. Reception was positively identified by the clock caption and the PM5544 test card with the inscription 'RTE 1'.

MS pings

Meteor shower DX produced strong and prolonged 'pings' from Sweden and Poland on the 13th. NRK (Norway) appeared on the 14th showing the PM5534 with a variety of transmitter identifications including 'GULEN' and 'KONGSBERG' on channels E2 and E4 respectively. Even the Norwegian clock caption was seen via a 'ping' which coincided with the station opening sequence. From the south the GTE test card was seen on E3 together with a bar pattern carrying the transmitter identification 'GAMONITEIRO'.



West Germany FuBK test card used by the 2nd network, ZDF

DX-TV RECEPTION REPORTS

Bob's elderly Philips N1700 video cassette recorder has finally taped its last! It was useful since its multiband tuner meant he could record DX directly from the aerial in Bands I and III. However, he's back in business having located a source of Grundig Super 2x4 video recorders which are equipped with multiband tuners. They're cheap too, with the monthly rental working out at only £9.95.

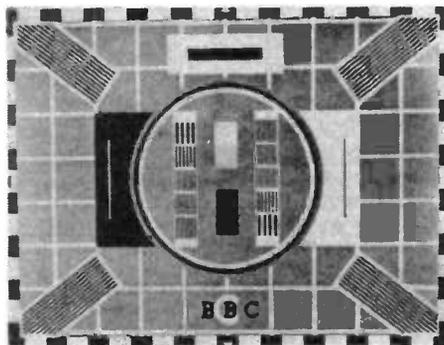
Tony Harris (Fareham, Hampshire) logged the West German ZDF Saarbrücken outlet on channel E45 during the enhanced tropics. From the same direction RTL-Luxembourg was resolved on channel E24, fortunately before the local BBC 2 transmitter switched on in the morning. The Wavre transmitter in central Belgium was noted sufficiently well to record the French language programmes on E8 and the Flemish service on E10.

Speaking of recordings, Tony is able to tape signals from the new French Canal Plus service directly from his Luxor SX9 multi-standard receiver. Canal Plus radiates mainly scrambled video except for a forty-minute period between 1850 and 1930, when a pop music programme is shown. Tony has noticed an advert for 'Perrier Water' at the start and end of the programme and he reckons this may fund the unscrambled slot.

Farewell to 405 lines

January 2nd marked the end of an era in television history which spanned almost fifty years. At nine minutes past midnight the BBC 405-line VHF television system finally closed down. The historic event was only briefly mentioned at the closedown of BBC 1. An extremely early example of a 405-line set had been dusted down and switched on specially for the occasion. Fortunately one of the authors was able to record this final transmission actually on 405 lines via a VCR and a specially modified 405-line receiver.

The channel 1 transmitter at Crystal Palace was officially due to end 405-line transmissions on December 31st 1984,



The BBC test card 'C' as used by the now defunct 405-line service

but obviously things had been delayed. The vision frequency was 45.0MHz while the sound channel was 3.5MHz below at 41.5MHz. Channel 1 was originally allocated to Alexandra Palace, the birthplace of the world's first public high-definition television service which began on November 2nd, 1936. Crystal Palace came into service on March 28th, 1956.

The BBC 405-line channel 4 transmitter at Sutton Coldfield was due to close on January 6th. A special airing of the world-famous test card 'C' had been planned to mark the occasion but, in the end, Sutton Coldfield closed at the same time as Crystal Palace. As far as we know the only BBC transmitter to hold out to the last possible moment was the channel 2 Holme Moss station which served the North. This transmitter (which opened on October 12th, 1951) closed down immediately after the regional news opt-out at about 3.55pm on January 3rd. The remaining IBA VHF transmitters were switched off during the first few days of January. It is interesting to note how many of the VHF transmitters have been lingering on with reduced power complete with a variety of faults ranging from sound-only to 625-405 converter problems. It has been estimated that there are only about 700 405-line sets left in existence.

By the time this column is read Bands I and III will have been completely cleared

of television transmissions for almost three months. Plans to re-open these bands for domestic broadcasting by the IBA (and probably the BBC) were successfully blocked by the many lobbyists clammering for these frequencies.

After the closure of the French 819-line system it was decided to re-open the VHF bands for a scrambled pay-TV service rather than opt for tearing up all the roads in order to lay miles and miles of co-ax for a folly known as cable TV! We now find that cable companies are pulling out of the venture as quickly as possible because the scheme will be far too expensive.

The UK could have fallen in line with the rest of Europe whereby it would have been possible to have had a fifth or even a sixth terrestrial TV service, either on a national or local basis. Unfortunately the powers-that-be have taken the dubious option of releasing the bands for PMR use and general narrowband communications, thus creating a new anomaly for the UK in Bands I and III.

We shall miss you 405-lines. At least you prevented the bands from becoming a hotch-potch for many years! DX-TV enthusiasts in the UK can only look forward to a somewhat uncertain future as far as VHF reception is concerned.

Service Information

Finland: A new transmitter has opened in Posio. YLE-1 is on channel E10 with 10KW ERP and YLE-2 is on E30(500KW).

Sweden: The Sveriges Radio (SR-1) service from the Visby/Hammen transmitter on E27 now has an ERP of 3KW.

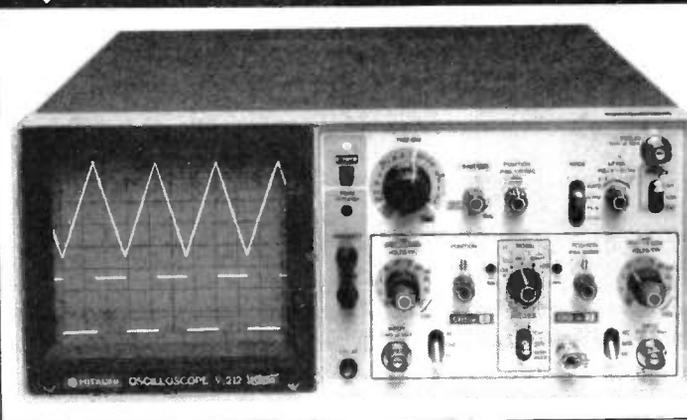
India: A second TV service commenced in New Delhi last September. Programmes consist of local items, imported films and repeats from the 1st network. The transmitter has an ERP of 1KW.

West Germany: From October 1st 1984, Westdeutscher Rundfunk (WDR) have been radiating a 15 minute regional news programme. It is transmitted purely to stop private companies taking over vacant channels. Further regional programmes from WDR are planned to commence next October. NEW



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ATV ON THE AIR

Presented by
Andy Emmerson G8PTH



Keyboard generated captions from Dave G3PTU received in Holland by Ryn Muntjewerff

It's always nice to get feedback from a column, since it proves that someone actually reads it! Letters sent care of the Editor always reach me and they all get a reply, either direct or in this column. Anyway, the recent letters and phone calls have been about the Sony effects generator. To those people asking where they can get one, I must say I don't know.

Certainly the shop where I bought several has now sold out – everyone was asking me to get one for them as well and whilst I could oblige at first, the goose has now *stopped* laying the golden eggs. I dare say there are still dealers with a stock at the reduced price but you will have to do a bit of phoning around to find out where they are. Of course, when you consider the normal price of a camera power supply unit and the extra facilities provided by the HVS-2000, you may well consider it a good bargain at the full price of £69 or so.

Genlock revisited

One or two folk are not sure about genlocking, ie synchronising two cameras or other video sources, so I had better re-cap. Whenever you wish to mix two video sources they *must* be synchronous: in other words, the line lengths must be the same and the line and field synchronising pulses of each source must happen exactly simultaneously. This is because the TV or monitor display uses the sync pulses as a reference to time the start of the beam scanning across and down the screen. If it sees two pulses at different times it gets rather confused and the net result is a scrambled mess of lines on the screen.

This applies to all types of video mixing, and if you see advertisements for miracle devices which allow you to mix between two free-running cameras or VCRs treat them with a pinch of salt – it can't be done! The best that these gadgets can achieve is a quick switch from one source to another: most TVs lock up quickly, so you may achieve this switch without much more than a flicker or jump on the screen. More likely there will be a brief 'frame roll' as the picture jumps up the screen.

Computers too

Many enthusiasts would like to use a computer as a source of graphics in their ATV or closed-circuit home studio, not only for fancy wipes or starburst effects

but (more significantly) for captioning. Computers using the teletext character generators (like the BBC and Oric) seem to offer themselves especially well for this. As you know however life's not like that normally, and this is not an easy task. Because computers are free-running devices it is not easy to incorporate them into video studios and the clever-dick answer is that it cannot be done. However, there are ways and means, so let's look at what's involved.

If you are prepared to forego mixing or inlaid captions there are two possibilities open to you. Either you make a crude switch from one source to another, which will give some disturbance on the screen when you make the switch, or alternatively, if you have a VCR with 'smooth' assembly editing you can include computer effects; the VCR looks after the synchronisation difficulties.

Synchronicity rules, OK?

If this is not good enough for you, then you must arrange the computer to be synchronous with the other video sources. This means locking the computer to the other video or vice versa. Can this be done? Well, it depends... If you have a central SPG (sync pulse generator) with genlock facility you are halfway there: you can try locking up the SPG to the computer video.

The problem is that many computers put out some pretty strange video signals. Monitors and TV can handle non-standard signals, but a genlock SPG may not. Things to look out for are 60Hz field rates, line lengths longer than 64 microseconds or fields with more (or less) than 625 lines! The Sinclair Spec-

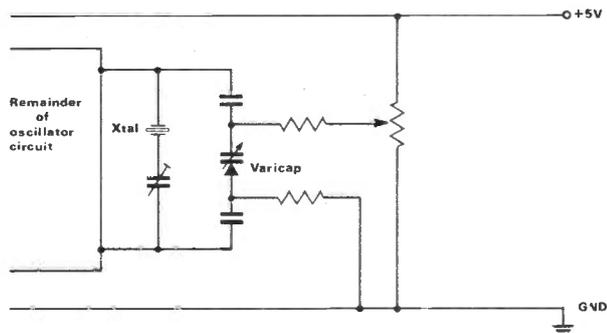
trum is an example with a 'funny' video waveform – you can lock its field (and the line won't match up with standard video) or you can lock it line-wise (and the source video will not lock vertically and slowly rolls through...). Of course a loss of line lock can be an advantage if you want captions scrolling sideways, but not otherwise.

Let us suppose however that our computer's video is fairly standard; how then do we 'take control' and make it synchronous? There are two ways, no, in fact three. Two deal with the master crystal oscillator in the computer. Check out what frequency your computer employs: if you use a crystal-controlled SPG it should be possible to use the computer's oscillator for the SPG as well. If the frequencies are not the same you will have to build a new outboard oscillator operating at a multiple of the two frequencies with appropriate dividers to get back to the frequencies required by the computer and the SPG.

Method number two involves replacing the variable capacitor in the computer's crystal oscillator circuit with a varicap. Then you can adjust the phase of the oscillator and pull it into synchronisation with an external video source. You will also need a double-beam scope or an effects generator and monitor to do this. Obviously it's not a technique for the faint-at-heart but it can be done!

Mainly for Beebers

Method number three applies to those sensible folk who own BBC micros. For



The basic circuit for phasing a crystal oscillator by means of a varicap diode and a variable voltage

ATV ON THE AIR

these lucky people there are two commercial gadgets on the market which will enable you to genlock the micro's video with another source. Neither however is cheap, so here is the

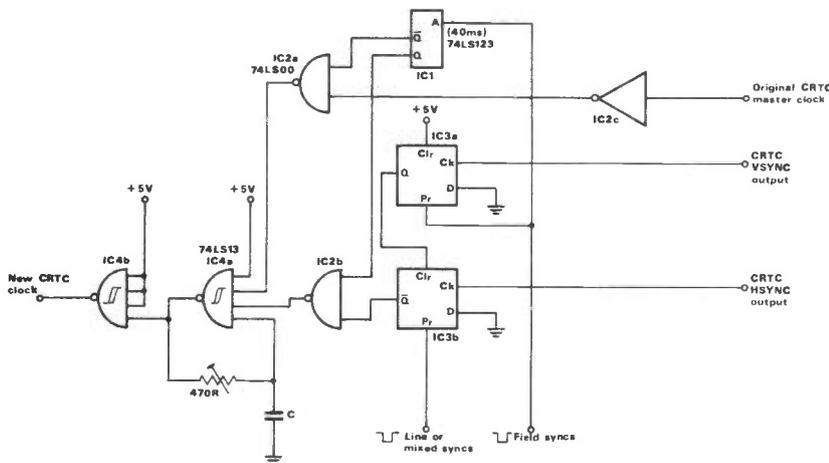
basic circuit, which *is!* You must thank Mr J Wike of Caerphilly who devised and first published it; the circuit will in fact work with any device which uses the Motorola 6845 CRT controller (CRTC)

chip, so there may be some other micros which will benefit from this idea. Write and tell me if so.

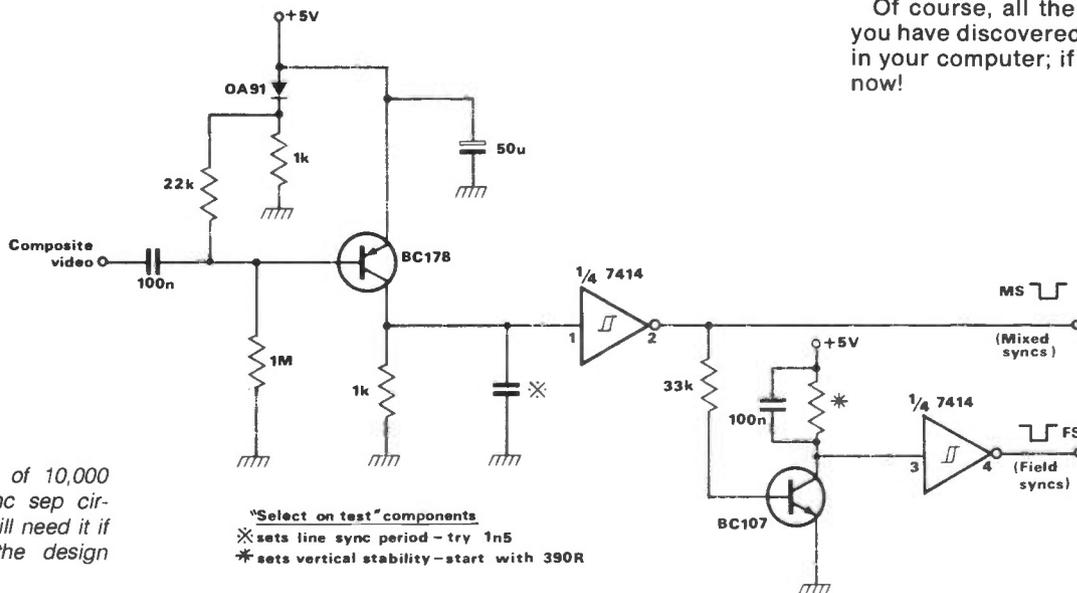
In the modified circuit the main CRTC clock is replaced by an oscillator formed by IC4a, which is running a bit faster than in the original circuit. This oscillator is inhibited, ie halted whenever the CRTC produces a sync pulse, horizontal or vertical. These pulses operate latch IC3 and gate IC2b. When the negative-going horizontal or vertical sync pulses arrive from the external video source, they will reset the latch. The clock is stopped at the end of each line and field, thus achieving full video synchronisation.

The computer can still be used on its own since monostable IC1 and gates IC2a and IC2b ensure that the circuit free-runs without a synchronising signal. IC4a is then driven from the original CRTC clock. The extra chips can be mounted on a scrap of Veroboard or similar and installed neatly inside the computer. This circuit is 'secondhand' and published in good faith. I have not made this modification myself, so it's up to you to decide whether you wish to take the plunge.

Of course, all the foregoing assumes you have discovered a video level signal in your computer; if not, start searching now!



Above - genlocking the Beeb (see text for full details)



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BF181	30	BFR91	2.08	R1038	80
BF184	30	BF142	30	R1039	80
BF185	30	BF143	30	R2008B	1.10
BF186	16	BF236	30	R2010B	1.10
BF195	16	BFY50	30	R2030	70
BF196	16	BFY51	34	R2265	1.30
BF197	15	BFY52	34	R2305	80
BF199	15	BRC116	1.50	R2322	50
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LOW-COST CONVERTER

A kit for a 24cm TV converter is built and tested by Andy Emmerson

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Store and examine data from the UoSAT satellites with the aid of a suite of programs produced by AW Ferneyhough

FRG-7 MOD

Martin Evans fits a narrow-band filter to the Yaesu FRG-7, complete with temperature compensation

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Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space on the order form. We will accept ads not on our order form.

Send to: *Radio & Electronics World*, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements will be inserted in the first available issue on a first come first served basis. We reserve the right to edit and exclude any ad. Trade advertisements are not accepted.

FOR SALE

- Trio TR7800 two metre FM transceiver .25/5KHz steps. 35W high power/5 watts low power. With mobile mounting bracket, mic, £185. Powertran Electronics audio synth. Transcendent 2000. Fully assembled/working from complete kit. Three octave monophonic built but not required £100 on. Buyer inspects/collects or pays carriage. John. Tel: (0908) (Milton Keynes) 542531 after 6pm weekdays or anytime weekends.
- Murphy five-valve baffle radio. Long, medium and short waves. Good condition. £15. Also, a number of radio text books from the valve era. For titles tel: Reading 883799.
- Bargain! Must sell - Commodore Pet 4016, ideal for RTTY logs etc. RTTY software included, also utilities ROM 'power' fitted - very valuable programs aid, would like swap for HF Rx or QRP Tx/Rx or any half decent offers considered, I am open minded! Tel: after 6.00pm (061) 766 2132. G6VQS, not QTHR.
- Yaesu FT77 8 band 100W transceiver, digital readout, as new in box, 18 months guarantee, going fully home brew and need cash for bits and pieces, can deliver 25 miles or so, bargain at £350 saving £100 on new price. Tel: Huddersfield (0484) 643124. G4GMT QTHR.
- Uniden 2030 2m FM transceiver, xtalled, 12 ch. T/burst on mic, good solid worker. £60 or near offer. G4YXB (G1CNE) QTHR. Tel: (0535) 54337, ask for Andy.
- Yaesu FT290R 2m multimode portable, nicads SWR meter quad, 6 element and 15W linear and complete mobile mount, £250 lot. Tel: Seaton (Devon) 23421.
- Yaesu FT480R 2 metre all mode transceiver £240. Icom IC260E 2 metre all mode transceiver £250. Eddystone EC10 receiver £35. Bailey. Tel: Bellshill 747448.
- Yaesu FT290R, including rubber whip, mic, nicads, charger and original packing. Less than six months old, only £210 including p&p. Trio TS130V HF transceiver, 10m to 80m, SSB and CW, 25W output, fitted narrow SSB filter and WARC bands. £330 including p&p. Graeme, G6CSY, tel: Orpington (0689) 29230 evenings.
- Icom IC-260A 2m FM/SSB 143.8-148.2MHz 10W output £250. MM2000 RTTY to TV converter, slight fault hence £100. RTTY TTL level terminal unit with filters £60, similar to ICS RM-1. Wanted TR9130, AMT-2. G6HQK not QTHR. Tel: Wolverhampton 69285 evenings.
- Icom 22A 2m mobile, FM 5/15W, R0-R7 and about 6 Simplex. Pre-amp and toneburst £80. Rascal RA17 receiver 0-30MHz (new valves) £125. Heathkit RF signal generator, vgc £30. Pioneer hi-fi (deck, amp and speakers) 22W, vgc £120. Tel: Simon (01889) 9049 evenings.
- Centronics 306 printer dot matrix 120cps logic seeking, very rugged, as used on mainframe computers. £80 buyer collects. Two new CCS1 conduction cooled tetrodes (similar to 4CX250B) with UHF bases and HS10A heatsink blocks. Ideal for 2m or 70cm linear. £50. Mr Dawson, 10 Seven Acres, Thame, Oxon OX9 3JQ. Tel: (084421) 5857.
- SX400 scanning receiver 26MHz to 520MHz data interface socket for computer control and converter socket for extended coverage 150KHz to 3.7GHz, brand new, boxed £489.00. Mr T Manning, 24 Croftdown Road, London NW5. Tel: 485 4251.
- Mobile in '85? Transit Canterbury Savannah 4 berth motor caravan with sink, cooker, fridge, elevating roof, and tailgate. Ideal base for club mobile or mobile weekends this summer. Good engine (1700V4) and trans. But wings tatty and some welding needed for MOT, 68,000 miles, £170 on. Tel: Rainham (Essex) 56424 anytime.
- Jaybeam antenna 2m 5 el Yagi £5. 6 el Quad £15.

BC453B receiver 190-550KHz offers. Radio Communication May 1966 to December 1980 offers (by volume). G8IEM QTHR. Tel: Hayling Island (0705) 466825 (after 7pm).

- MFJ 901. Versa tuner. Tunes co-ax, wire and balanced lines (4:1 balun built in). Imported. New unused, £50. Trio TR7800 and PSU £150. GM4DHJ. Tel: (041) 889 9010.
- Lowe SRX 30 general coverage receiver with AM, USB, LSB in excellent condition £100. Buyer collects. K Pullen, 210 Hollett Rd, Penfilia Est, Treboeth, Swansea, SA5 9ER.
- Terry Weatherley has for sale his Muirhead D900 FAX machine. This machine produces excellent pics from meteosat and comes complete with extra rollers for the NOAA series, some paper, spare writing edges and manuals. Buyer must collect or arrange carriage (2x19 inch rack units and the writing unit). £150. Tel: (0502) 63216.
- Sanyo RP8880 9 band double conversion + BFO vgc mains or battery £80. R Hubbard, 9 Regency Drive, West Byfleet, Surrey KT14 6EN. Tel: Ashford, Middx 47331.
- Microwave 24GHz: directional coupler and detector with crystal £28, slotted line SWR meter (£700 new) £190, variable attenuator £35, also bends, twists etc. Microwave 10GHz: 75mW Klystron with micrometer tuning and WG mount £18, 25mW Klystron £4, professional micrometer wavemeter £78, variable attenuator and detector with crystal £48, 1-2GHz wavemeter £18. Veroboard 0.1". RS433-8263, brand new, £4. Mann. Tel: Cambridge (0223) 860150.
- Murphy five valve superhet. A122M baffle, long, medium and short waves. Good condition, £15. Also a number of radio text books. 1930s to 1950s. For details tel: Reading 883799
- Black and white TV camera and tripod, little used, £50. 434MHz TV transmitter 1W output in diecast box, £25. 70cm 21 element tonna, £15. New and boxed QQV03-20 valves, £5 each. 15m of LDF450, new, £20. 100W 2m linear with PSU uses QQV07-50 valve, £50. Tel: (0272) 692305
- EHT unit with DY802 for Decca MS2000 television, £3. Transformer mains to 4.5V output at 5A or more, £4. Wanted: altimeter ex-wartime RAF with millibars readout, in good order. Can exchange good wall barometer, also some dismantled. 150B2 voltage regulator valve, new, £2. Five 1/2in dia pointer knobs for AR88D, £4.50. American hole punching set, 3/2in, 1/2in, 3/2in, 3/2in, 7/2in, 1/2in, 3/2in, boxed, £10. Manuals, sheets on following, TT21 (pair). Linear amplifier for HF bands. RCA Tx MI-8167, ET4336H, Codar AT5, National NC-121 Rx type 78 Rx unit, Aiwa AR158/9 Rx, 13cc VHF Tx/Rx type 69, £2 each plus postage. Mains transformer 215-0-215V 100mA, 11V 2.5A, 4V 2.75A, 2V 1A CT 4V 6A twice, £5. Valves 6BL8, 6EW6, 6GM6, boxed, £2 each. 6BW6, £3. Press to talk carbon telephone type microphone, £3. Ex-govt smoothing choke, 10H, 100mA, 200Ω. £3. Alan Edwards G3MBL, 244 Ballards Lane, North Finchley, London N12 0EP. Tel: (01) 445 4321
- Tequipment laboratory oscilloscope type D53 dc to 15MHz twin beam. Time base delay. Little used, immaculate. £150. Marconi LCR bridge 0.25%, type TF1313. £50. Marconi RC oscillator type TF1101 20c/s to 200Kc/s. £40. Heathkit laboratory signal generator type IG42 100Kc/s to 30MHz. Not purchased as kit. £30. All items no repairs, no modifications. Or would exchange for FT200, FP200. G4YKT, Guisborough. Tel: Cleveland 33241
- G2DYM anti-TV1. 2 trap dipole 54ft long with 75ohm twin feeder. £16. 8 Mosley traps for SWL7 with assembly instructions. £15. The above for SW broadcast bands. Mr G Hall, 8 The Glen, Oakland Road, Newton Abbot, Devon TQ12 4EB
- Radio and Electronics World Oct 1961 to Dec

1982. £9, Jan 1983 to Dec 1983. £8, Jan 1984 to Dec 1984 except July and October. £8. Sold complete years only, postage £1. Mr C Jones, Homelea, Marsh Lane, Ellwood, Coleford, Glos GL16 7NA. Tel: (0594) 33363

- 'Igranic' contactor jib in metal box with window. 12 x 10 x 9 1/2in contacts, coil. Connected with welding. Very old. Mains transformer 350-0-350 60mA. 4V 4A, 4V 2.5A CT drop through. £4. Another 300-0-300 100mA plus 6.3V 4A, 5V 3A. £5. Choke 10H 100mA 200Ω. £3. Metal cases, one hinged lid. £10 lot. Wanted: good altimeter, barometric type low readings, can exchange good wall barometer. American hole punch kit No5 JR boxed. £10. Alan Edwards, 244 Ballards Lane, North Finchley, London N12 0EP. Tel: (01) 445 4321
- Bargain! TS280 FM 50W 2 metre mobile, full coverage 144-146MHz in 25KHz steps, auto repeater shift, hi/lo power switching. Excellent condition with original packing, handbook etc. Must sell. £95. Dave Unsworth G8OUU. Tel: (01) 637 8644, ext 264 daytime, (01) 348 4482 evenings and weekends
- Trio TR-2300, high quality 2 metre portable or fixed station. 144-146, 80 channels, complete with nicads, charger, rubber duck, soft leather carry case, manual. Vgc. £130 on. Seaford, Sussex. G0AMF. Tel: (0323) 898515
- KDK2030 2m FM Tx/Rx scanning, memories, priority channel etc. Complete with up/down mic, handbook and mobile mount. In very good condition. £150. Rotator and control unit, plus 7 element commercial ZL special. £40, or £185 the lot. G4ANW. Tel: (0730) 61859
- Mitsuko 2m SSB CW base portable. £80. Sell or swap for 2m, 10m, multimode. Philips TV High Cocks TVDX tuner. £30. Dragon 32 comp plus G4BMK RTTY trcv program. £80. Wanted: CW keyboard or Tono 550, also QRP HF rig. Anything considered but must be in working order. Also 2m beam wanted, will buy, sell or p/x any of above. Tel: Crawley (0293) 515711.
- Forgestone colour TV kit 1973, all PCBs assembled, not wired together, any offers? Also new TV colour tube A56-120X available. £30. Farnell SSF PU 240U 50Hz I/P 0-15V 15A or 15-30V 10A O/PS. £15 on. Newnes' radio TV servicing books, 1946-53, 1948-53, 1953-54, 1955-56, 1956-57, 1957-58, 1958-59, 1959-60, 1960-61, 1961-62, 1962-63, 1963-64, 1964-65, 1965-66, 1966-67, 1967-68, 1968-69. Any offers? Tel: Waggott, Sedgfield (0740) 20668, after 5pm.
- Two (matched pair) Zodiac handheld walkie-talkies three channel crystal AM. £70 for both. No offers. Philip. Tel: (01) 317 1575.
- Microline 80 matrix printer vgc. £140. Kempston printer interface for Sinclair ZX Spectrum. £20. £150 both items. Buyer must collect. Please phone or write to: Andy Brown, 197 Aycliffe Road, Boreham Wood, Herts WD6 4AA. Tel: (01) 953 5294.
- Yaesu FT200 HF Tx/Rx, complete with FP200 power pack and manual. Mint cond, little used, boxed. Prefer buyer collects. £270 on. J M Guest, 6 The Tynning, Widcombe, Bath BA2 6AL. Tel: (0225) 313974
- Jen synth SX1000 mono keyboard, cost over £350 new, exchange for FT290R rig or FT790R rig. Buyer must collect. Tel: Burton-on-Trent (0283) 33526 after 6pm weekdays
- 70cm FM mobile. Yaesu FT730R plus mag mount colinear, and headset. £175. Datong Morse tutor. £35, or £200 the lot. Deliver anywhere within 150 miles of Leeds. Tel: Arthur G1JG on Halifax (0422) 68021 after 8pm, or (061) 962 1214 ext 268 office hours
- PR IAS Midhurst speakers and stands. Akai cassette recorder, auto rev rec, Ham Int jumbo, legal stamped freq counter, 2 boxed set records, all mint, will swap for 160m 71E-70 or Trio 2000

Yaesu FRG7700M or similar. W H Abbey, 21 Moat Close, Bramley, Nr Bstoke RG26 5AD. Tel: 882825

■ SBE opti-scan scanning monitor/receiver, 10 channel model, SBE-125M freq range FM, 30-50, 68-88, 150-170, 450-470MHz mains or 12 volt, complete with UHF/VHF whip aerials, extension speaker, socket, copy of freq allocating charts for scanning cards. £90, or consider swapping for 2 metre scanning receiver. Contact Mr L Soanes, 1 Groomes Close, Hopton-on-Sea, Great Yarmouth, Norfolk NR31 9DG.

■ Straight exchange IBM golf ball Selectric typewriter with spare golf balls and case of ribbons. List price £850, registered red with IBM as new, mint cond, for HF, SSB, Tx coverage, 1.8MHz to 30MHz. Machine is a professional model, must have manual Tx no money either way involved providing set is in good condition. Write or phone R Haines, 24 Loyd Street, First Lane, Anlaby, North Humberside HU10 6UG. Tel: (0482) 658716.

■ KDK2030 2m FM transceiver. Full scanning facilities, 10 memories and priority channel. Complete with mobile mount, scanning mic, handbook and original packing. Also rotator and control unit, plus 7 element commercial ZL special aerial. Rotator and beam only used for short time in roof space. All equipment in very good condition, £185. Terry G4ANW. Tel: (0730) 61859.

■ Bigear 500A 2m FM rig, 25W output, 4 channel scanner plus call/write mode. Covers 144 to 147.9MHz. £95 ono. Tel: Burton-on-Trent 790078 after 8pm.

■ Philips digital multi-meter PM2521, cost £365 accept £250 with manual. Tel: (0704) 31153.

■ RDF Rx Fujion battery portable FM AM LW marine two metres etc. New £65. Or part exchange. Tel: (0274) 676556 after 6pm.

■ Data Dynamics teleprinter with tape punch and stand. £40. Elector Formant synthesiser, full spec with three voices, leads and keyboard, £300. Program note store. £50. All with full data, buyer collects. Wakelam, 5 Haig Lane, Church Crookham, Hants GU13 0UN. Tel: Fleet 28106.

■ RTTY for £50. Creed 7E teleprinter and terminal unit with FSK/AFSK. 4.7V logic terminal for direct connection to microcomputer. Buyer to collect. Tel: Rochdale (0706) 42821.

■ Ham International multimode 11, 120 channels AM, FM, LSB and USB. Complete in box plus The Big Dummy's Guide to CB Radio book, £70. Please write to: Mr M Richards, c/o 'Lesyard', Aughton, Collingbourne, Kingston, nr Marlborough, Wilts.

■ Spectrum 48K antenna design programs. Design 3 element beams or parabolic reflectors. Programs give all measurements with graphic representation and optional copy to printer. Programs only £4.50 each. D A Butler, 'Hillview', Ardattin, Co Carlow, S Ireland.

■ Army set No 31 manpack Rx/Tx not working, £30. Will post, might exchange for working Pye mobile. Tel: (07288) 363.

■ Major M588 multimode CB rig, AM/FM/USB/LSB, complete with service manual. Performs very well, in very good condition. Requires only new crystals to enable use on ten metre band. New car forces sale at £80. Tel: Preston (0772) 863881.

■ Realistic-Tandy DX200 5 band communications receiver 150-400KHz long wave, 520-1600KHz broadcast, 1.6-4.5MHz short wave, 4.5-13MHz ham, 13-30MHz ham and CB. As new, genuine reason for sale. Cost £130, will accept £90 ono. Ayling, 143 Siddely Avenue, Coventry CV3 1GE. Tel: (0203) 457975.

■ Two No 39 Mk2 ex-army transceivers, 7.1-9MHz with handbook and all accessories. Send SAE for details. A Holme, 7 St Paul's Square, York.

■ Wireless World back numbers. 193 from 1944 to 1964. 61 from 1970 to 1975. 21 years complete or near complete. £1 each. Buyer pays postage. A C Hobson, 5 Corchester Walk, Newcastle-upon-Tyne NE7 7SS. Tel: (091) 266 8147.

■ Superstar 360FM, AM, FM, LSB, USB, CW, covers up to 28.3MHz. Ideal for further conversions to cover 10 metres, with some info. £75. Class D wavemeter. £5. Pye 'P' band crystal control

receiver. £8. Burgoyne wireless with 78rpm player. £10. Valve car radio Sears Roebuck & Co. £3. Tandy DTMF encoder in diecast box. £10. 3 soldering irons. £8. McCarthy, tel: Ipswich (0473) 215047.

■ Eumig cine camera super 8. Eumig projector, dual standard. Editor, dual standard, splicer, dual standard, 3ft x 3ft screen, titling set. Spare 7in spools. £100 ono. Buyer to collect. Drae 12 amp PSU, £35 carriage extra. Heathkit 3 amp PSE, £15 carriage extra. Wood and Douglas 2 metre FM receiver, 40 channels, digital readout, scanner. £40. Williams. Tel: (0376) 23604 after 6pm (Essex).

■ Complete station, Swan SSB/CW 80-10 tcvr, 100 watt o/put, Drae 24 amp PSU, SEM transmatch with Ezitune, Osker SWR bridge, junkers key, phones, dummy load, w/meter. £300. Icom IC202 VHF SSB/CW tcvr portable, 3 watts with dummy load and wave meter. £60. Or swap above for good camera outfit or accessories or scanner SX200 type. Wanted: Bronica ETR lens etc. Tel: (0872) 70701, evenings.

■ Eddystone model EC10 com receiver 500KHz-30MHz mint condition collectors piece, bargain £80. Learnakit oscilloscope, ideal beginners first scope complete with manual and test leads, only £20. KT66 output valves British made GEC new in boxes 2 only, £10. Mr Rudman, Tel: (0256) 881444 during office hours.

■ Murphy 27MHz CBH1500 base station CB rig. Modulator 'Saturn' 27MHz base station CB antenna. Unused. Realistic FRC1001 40 channel 4 watt 27MHz handheld CB rig. All as new and boxed £80. Will split or swap for small home computer, eg Spectrum, Vic 20, Dragon 32 etc. Must be in full working order. Graham Johnson, 95A Coventry Road, Nuneaton, Warwicks. Tel: (0203) 341368.

■ 13 Movie Maker magazines, Dec 81-May 82. 35 Hobby Electronics mags, Feb 81-Dec 81, Jan 82-Dec 82, Jan 83-Dec 83. 34 Electronics & Computing 1981 - June, July, August, Oct, Nov, Dec. Jan 82-Dec 82, Jan 83-Dec 83, Jan 84-April 84. 17 ETI Jan 80-Dec 80, Jan 81-Oct 81. 16 Electronics & Music Maker March 81-June 82. 27 The Biker Oct 81-Dec 83. Buyer pays postage half the magazine price each. W D Jeffery, 5 Pipe Hay Lane, Draycott-in-the-Clay, Derby DE6 5BY. Tel: 820760.

■ Small pen recorder £18. Vision stereoramic bench magnifier, new lens fitted and one spare fluorescent tube £32. Hole punching tool Vipers No 5, sizes 3/32, 1/8, 3/32, 1/4, 5/32, £8. Moor-Wright micrometer 25mm £7.50. Jacobs 1/2inch drill chuck £5.50. Mixed screws, nuts, washers, rivets and springs 50p 1lb. Write to Mr Joyce, 110 Charteris Rd, Kilburn, London NW6 7EX.

■ Kingshill stabilised PSU 0V to 6.5V adjustable £7.50. Tinsley resistance box 1 ohm steps to 11110 ohms £10. Variac Zenith V3HU 1A £8. Weller TCP1 £7.50. Kelvo 3s multimeter in ERC £21. Safebloks (4) £3 each. Venner time switches (3) two with solar dial £7 each. Rotaset timer. Bank of 9 adjustable SP/CO micro switches £7. Solid-state controls trans timing unit, 3 secs to 60 secs 240V with relay £5. Mr Joyce, 110 Charteris Rd, Kilburn, London NW6 7EX.

■ 240V in 24V out 10 amps £10. 240V in 110V out 10 amp £10. 16mm projector/camera, rewinder, the lot £40. RCA 16mm opt/mag projector excellent £125. Various projector lamps: 14 240V, 250W prefocus each £4, the lot £40. 10 100V line transformers £15. Cosmica camera lens 'C' mount 25mm F1.4 £30. New valves 13D3 £2.50 each. Micro-switches 50p. Grundig/Pye stereo chassis £5 each. Wanted: manual 16mm photophone sound projector. Exchanges welcome. Wurlitzer 630TA 3 manual cost £3,400 2 1/2 years, offers. J H Williams, 5 Fern Road, St Leonards, E Sussex TN38 0UJ.

■ Trio TS-510 HF Tx/Rx plus PS-510 PSU £190.00. HRO receiver with full set of coilpacks. HRO general coverage and band spread coilpacks. HRO parts, offers wanted. DNT 10m FM Tx/Rx with repeater £30.00. Tel: St Albans 39333.

■ 30ft lattice tower, heavy duty with 18 inch sides, steps to climb up one side, base needs slight attention, offers around £95. Also 2 1/2m fibre glass dish, complete with heavy duty stand, suitable and tested up to 4GHz, sensible offers please. Buyer to

collect or carriage arranged at extra cost. Artlingstall. Tel: Bournemouth (0202) 738253.

■ Sharp P6 dot matrix printer, cable and handbook, tractor and friction feed can be seen working £125. Also 60 floppy disks for MZ80A or MZ80B various software £100. For more details tel: (04867) 2462 (Surrey).

■ Labgear LG50 Tx AM/CW 50W 80-10m VFO - tatty but working £15. Farnell PSU 12V (higher voltages possible) approx 10A good condition £25. Antenna 2m 5 element Jaybeam, vgc, little outdoor use £7. BC221 frequency meter, with power supply and charts, needs attention £10. Will deliver 30 miles around Portsmouth, else buyer collects or arranges carriage. James McIlroy, 15 Dunbar Road, Southsea, Portsmouth PO4 8EX. Tel: (0705) 816176.

■ Sony CRF320 dual conversion receiver first class condition with instruction manual USB/LSB/CW/AM/SW/FM/LW/MW, built in timer, recording facility, cost £850 bargain at £360. Tel: Sunderland 485613.

■ Trio separates TX599 and JR599CS receiver, connecting cable manuals all in excellent condx, £350 ovno. Heavy duty galvanized mast sections 12ft 6in, £20 each, buyer collects. Transformer 14 volts 10 amp sec, £5 each. Numerous variable air spaced capacitors for ATUs from £2 to £3 each. Modified marine band VHF Tx/Rx now working on 2 metre FM, xtal controlled S20, S22, R5, R6, R7 25/1 watt, £25 ovno. Tel: Terry (0789) 294387.

■ Creed 444 telex/RTTY machine would accept SW receiver in exchange. Also to clear class D wavemeter. All with service manuals. Tel: Yoxall (0543) 472054.

■ Creed 444 telex/RTTY machine with additional Boyden soundproof cover: perfect working condition complete with Creed service manual (2 inches thick): also details to use above for computer printer: buyer inspect and I can deliver in Midlands and North/South Wales if required. Tel: (0543) 472 054.

■ Enthusiasts clearout, large hardware packs containing nuts, bolts, washers, screws, solder tags, spacers, studding, etc. All useful sizes, 90% brand new. Minimum 1000 parts for £6.50 post free. Packs of electronic comps, resistors, capacitors, transistors etc. Mostly new, minimum 200 parts £2.50 post free. Multicore cable, 20 way telephone type, 45 pence per metre, postage £1.50 up to 15 metres, £2.50 longer lengths. K Bailey, 40 Seymour Close, Selly Park, Birmingham B29 7JD.

■ Yaesu FRG7700 communications receiver. 150KHz-30MHz. AM SSB (USB, LSB) CW, FM. Variable selectivity, digital frequency readout. Quartz clock, timer. Excellent condition, original packing. Handbook with circuit diagrams, maintenance and alignment instructions, £195. Tel: Malvern (06845) 61478.

■ EH Labs 139B pulse generator, 10Hz to 50MHz and Tektronix 180A time mark generator, offers invited. Please contact Derek Perkins. Tel: (0734) 665489 (evenings - or leave message on answer machine).

■ Akai x4 portable stereo ultra hi-fi tape recorder, about 1965, charger, microphones and leather case. Operators and service manuals. Free for carriage and donation to RNLI or Ethiopia. Duggan, 17 Abbey Drive, Glasgow. Tel: (041) 959 3035.

■ Telequipment D43 double beam oscilloscope, two Y-amps, 15MHz bandwidth, one extra 25MHz Y-amp. Manuals included £100. Advance SG62B RF signal generator 150KHz-220MHz including manual £70. TMK700 20,000 OPU multirange test meter, including real leather case £60. Taylor model 101 100,000 OPU multirange test meter £30. AVO heavy duty multirange test meter £30, Hunts C/R bridge, old but good £10. Assorted 100µA meter movements @ £5 each. Cripps, 18 Bourton Ave, Stratton St Margaret, Swindon, Wilts SN3 4LY. Tel: Swindon 823856.

■ Icom IC255E 2m FM 25W transceiver, mobile mount, scanning mic, boxed £120. Icom IC202S 2m SSB 3W transceiver boxed. £110. Tel: Earis Colne (07875) 3442.

FREE CLASSIFIED ADS

FOR SALE

■ Marconi model T19A superhet receiver with three preselected stations, approx 1953, cord drive tuner, walnut case, in good working condition, complete with makers' instructions, ideal collectors piece. £60. Mr R Levers, 'Haywin', Independent Hill, Alfreton, Derby DE5 7DG.

■ Full Trio HF station TS820S mike ext spkr with audio filters Yaesu LPF only £500. Valve rig SBE 15 to 80 12V dc supply £125. Heavy duty rotor system Diawa DR7600 ready mounted with support bearing and DC7011 control unit £175. Cushcraft PA3 tri band beam vgc £100. FT7B hardly used with YC7B digital unit, very good cond: £275. Mark Brooke, 1 Kenmore Way, Cleck Heaton, West Yorks BD19 3EL. Tel: (0274) 861026.

■ Three ele: tri-band beam Cushcraft A3 £100. Rotor Diawa DR7600 bearing (KS065) control unit DC7011 heavy duty unit ready mounted vgc with 50ft R8B, and control cable £200. SBE HF valve tcxvr 15 through 80m SSB only 12V dc supply, only £100. Also other misc items SWR bridges etc. FT7B, YC7B, never used mobile £300. Trio HF station £500. Mark Brooke, 1 Kenmore Way, Cleck Heaton, West Yorks BD19 3EL. Tel: (0274) 861026.

■ Swap Tandy scanner PRO2008, also Sony ICF2001 for Sony SW with knobs, both sets as new can travel reasonable distance any time, retired. Have also airband radio and 4 band set with air med long beacon direction finder set Sony. L Findley, 27 Keytes Lane, Barford, Warwick CV35 8EP.

■ Eddystone 888A amateur band receiver, Eddystone 680X general coverage receiver, both excellent condition/Hammerlund SP210X and SP600JX rack mount receivers/R107 GC receiver, Hallicrafters SX28A good external condition, needs some work/SCR522 military 100-156MHz transceiver/US Navy 0.5 to 4MHz receiver/RBB-1 0.5 to 30MHz receiver/A510 receiver very compact, modified for 240V, 2 to 10MHz. Please tel: John Baker (01) 794 0823 or write 13 Burrard Road, London NW6-1DA.

■ Oric 4 colour printer, extra paper, pens, excellent condition, hardly used £70, or exchange for Ham multimode 11 FM, USB, LSB, Ham Concorde FM, USB, CSB or similar radio, must be in good working order. H Hume, 171B Langton Road, Edinburgh EH9 3DA.

■ 3 colour & 2 B/W TVs, 8+ ass record players, radiogram, music centre, tape recorders, old vernier potentiometer, old electronic books, burglar alarm and key switch. Varying conditions some items work. Some don't. And a huge heap of electronic junk, ancient and modern. The whole lot £80 ono consider swap for good scope, WHY? Must clear. Divorce imminent. Junction 35 M1. Then second right. S Harper, 8 Birchtree Road, Thorpe Hesley, Rotherham, South Yorks S61 2TH.

■ Yaesu HF tcxvr. 80-10m, +10MHz. 500W CW and SSB exc cond. No room in shack, so first £100 secures. Buyer inspects and collects. Photo and handbook available/SAE. Price includes about 40 spare new valves. This gear will last a lifetime. Elsworth, 27 Balton Way, Harwich, Essex CO12 4UP.

■ WS38 MKIII no mods or bits with circuit and army technical sheet. Set of valves for RF24 unit case and chassis G4EUW, QTHR. Tel: (020630) 3071 Brightlingsea.

■ R1000 communications receiver, 200KHz-30MHz. Includes dc kit. Can deliver/demonstrate south-east England. £215. Tel: (07914) 2823. (Brighton area) evenings/weekends only.

■ HF trans Uniden 2020 150 watt PEP digital/analog readout. CW matching LS, mic. Built-in ac and 12V dc power supply. Excellent condition, and complete with all cables and manual. Sommerkamp HF linear FL1000, needs attention. PA valves ok. Philips BX925 420KHz-30MHz gen coverage receiver. Ex merchant navy model needs attention, CW spares. The lot for quick sale GM5DTA, Gevers, Aberdeen. Tel: (0224) 35760.

■ Simpson digital volt ohm ammeter, built in nicad batt charge facility, auto polarity 1000 volt dc 600 volt ac, zero to 20 meg ohm, six ranges zero to 10 amp ac, dc, £70. Remmer, 11 Blencarn Walk,

Leeds LS14 6SP. Tel: (0532) 735543.

■ Boxed 2m Kenwood TR2400 handheld mains slow charger, car quick charger. Tel: Chelmsford 59298, work Braintree 48330.

■ Heathkit DX100 CW/AM 100W Tx complete with manual in good clean cond. 33 foot fibre glass vertical antenna made in approx 4ft screw in sections complete with base mounting plate, offers invited. Buyer must collect due to size and weight.

Tel: Harry, Castleford (0977) 552862.

■ Trio / Kenwood SM220 station monitor / scope (new) £220 ono. Metallafyre 2 metre 6 ele cross yagi (new) £33 ono. NEC 12in video monitor b/w comp video input (as new) £75 ono. Tel: Paul G4XHF Crawley (0293) 515201.

■ FWO vintage Eddystone 840 HF/MF comms Rx covering MW SW, broadcast bands thru ham 1.8 to 28KHz. AM, ANL for SSB, an efficient and handsome gen cov Rx £80. L Rogers, 156 Franklin Ave, Tadley, Hants RG26 6EV. Tel: Tadley 2476

■ Standard C110A handheld case and two spare Ni-cad packs, plus home brew unit for operation off 13.8 volts or car electrics. 12 months old, new condition in original packing, surplus to requirements £120. Mizhuo SB2M 144.200 144.400 SSB complete with Ni-cads, two spare xtals for 144.100 144.200 £65. G2ATK, 8 Holloway Drive, Pershore, Worcs WR10 1JL. Tel: Pershore 553735.

■ Immaculate Eddystone model 840C. Recently serviced one knob missing but otherwise in fantastic condition. Have got original operation manual only. £280 ono for quick sale. Mr Ali, 469 Oakwood Lane, Leeds LS8 3LG. Tel: Leeds 401500.

■ Global AT1000 ATU as new £25, suitable for any HF receiver. Vertical antenna multiband HF5V, 10-80 metres £20. N G Powell, 732 Hagley Road, West Oldbury, Warley, West Midlands. Tel: (021) 422 7515.

■ FT225RD mint £475 with muTek. FT902DM mint £600, FT707, FP707, FC707, £400, Nag 144XL 2 metre 250W linear, new valve mint £300, Robot 400 SSTV unit £325, FL2100B HF amplifier mint £295, Datong Morse keyboard, ideal for MS £80, standard C8800 2 mtr FM mobile £140, 6 ele quad 2 mtrs £15, Lucas 10FM mobile £25, genuine reason for sale, going QRT for 2 years. GM4TXX Jim Atkinson, Bridge-daff, Main St, Inverkip PA160AS. Tel: (0475) 521661 or (0475) 707604.

■ Army radio sets all complete less batteries in good complete order, 19, 62, 38MK3, 31, B44MK3. Xtal caliB No 10. Remote 31 and 88 set aeralis (new). Might barter but I want Bird 43 (thru-line) watt meter inserts. MJ Buckley, 12 Ranmore Ave, Croydon, Surrey CR0 5QA. Tel: 01-654 2582.

WANTED

■ Help! Pensioner requires 1155 receiver modified or not up to £20. Starting old SWL hobby again can you help? Mr Dawson, 7 Brisbane Court, Croft Pool, Bedworth, Warks. Tel: Coventry 310466

■ Collins KWM380 wanted, cash waiting for first class sample. LRK Gregory, The Well House, The Downs, Herne Bay, Kent CT6 6JP. Tel: (0227) 37 4774

■ Realistic Pro-47 UHF/VHF (Patrolman) receiver, scanner with or without crystals. Also cheap Realistic Pro-2002 or JIL SX200 or 200N. Or Bear Cat equivalent. Letters only please. Mr J Bidgood, 255 Chamberlayne Rd, East Leigh, Hants SO5 5HX

■ Radios: Superstar 360, President AR144, or WKS 1001, or any other SSB radio. Will pay reasonable price, also postage. Must be working and in good condition. Please contact Mr Martin Fuller, 37 Green Field Close, Eccles, Nr Maidstone, Kent ME20 7HU or Tel: Maid 70485

■ Wanted urgently any info on any reel to reel videos, service and circuits plus any spare parts, CCTV camera or any other accessories, such as the RF out converter. Write with full details: Mr G E Ford, 42 Princes St, Normanton, Derby

■ CW keyboard or Tono 550, also QRP HF rig, anything considered but must be in working order. Also 2m beam. Tel: Crawley (0293) 515711, Mr Vickers

■ Old call sign lists, especially international list of coast and ship stations and alphabetical list of call signs. Also Lloyds Register of Shipping. Mr TN Arkell, 'Tyr Eglwys', Baglan, Port Talbot, West Glam, S Wales. Tel: (0639) 812210 anytime

■ Tandy Patrolman-50 transistor portable radio or similar which covers VHF, UHF. Please tel: Stockton on Tees 559651 (STD 0642) after 6.30pm

■ Any VHF/UHF scanner from 68MHz to 174MHz PRO2008 Realistic, or any model that is in good condition. Must have air band. John Dudley-Davies, 'Llysamaeth' Devils Bridge, Aberystwyth SY23 4QY. Dyfed. Tel: (0970) 85 297

■ General coverage HF Rx and WBC hives with/without beesticks in exchange for FT102 with FM used in Rx mode only. Tel: D Jones (0269) 842953

■ Good prices paid for MS4 matching speaker for Drake R4B Rx KW160 Top Band AM/CW Tx. KW160 ATU for same Tx. Prefer good unmodified condition. Also wanted Eddystone 'all world two' Rx with or without coils about 1938 circa. 1920's crystal sets, valves DER, LS5, ARDE, P1, P2, PM22C and any other interesting 1920's valves, components, books, mags, cats, etc for my collection. N Richardson, 2 Edna Road, Ringlestone, Maidstone, Kent ME14 2QJ

■ Practical Wireless, Radio Constructor 1930s, 1960s radio mags, good price paid. Also books by FJ Camm, any old radio books. J Savage, 7 Weyhill Close, Park North, Swindon, Wilts

■ Radio and Electronics Constructor Nov Dec issues 1978. Tel: (0642) 677310 Thornaby, Cleveland

■ Newly licensed amateur requires a cheap 2 metre FM rig, around £70 or less. C Davis, 122A Herbert Avenue, Parkstone, Poole, Dorset BH12 4HU. Tel: (0202) 746803

■ Air band receivers and handheld marine Rx or FDK Rx 40 considered, 141 to 180MHz model. Tel: (0274) 676556 after 6pm

■ Johnsons radio 80 to 180MHz VHF receiver kit. J Anderson, 22 Landau House, Chatsworth Road, London NW2 4BW

■ Copies of Radio and Electronics Constructor, mid 1960s onwards. J Anderson, 22 Landau House, Chatsworth Road, London NW2 4BW

■ Sommerkamp FL200B Tx, non working but must be complete. LRK Gregory, The Well House, The Downs, Herne Bay, Kent CT6 6JP. Tel: (0227) 34774

■ Manual or any info for US Army receiver BC342N 1500KHz to 18000KHz in six bands. Jon. Tel: (07288) 363, any time

■ 16mm Bell and Howell GSAP electric drive cine camera (USA type only), made for USA Navy and Air Corps. Takes 50 foot Kodak mag. Bell and Howell type only required. Also Pioneer turntable PL340, consider whole unit but motor unit only wanted. Tel: Melksham, Wilts (0225) 706795 (evenings)

■ Museum needs German WW2 radio radar equipment or parts, tubes, techn manuals. Also UK sets: WS68, WS53, radio stn No 1 and No 8, various RAF units. Any help appreciated. Will collect in UK. Please write or call Ragnar Otterstad OZ8RO, Vejdammen 5, DK 2840 Holte, Denmark. Tel: (02) 801875 or work (02) 973366

■ Sony ICF.5500M (Captain 55) portable receiver in good condition. Tel: (01) 806 6862

■ Wanted Professional and vintage metal detectors. Industrial, medical, military, security and detectors at least 25 years old. Please write to REW, 34 Nelson Gardens, London E2 7AA

■ British mine detectors mark 3 and/or 6. Cash waiting, or exchange for mark 4A in superb condition and perfect working order. Please write to REW, 34 Nelson Gardens, London E2 7AA

■ Commtron CXX/NATO or similar set required, condition not important but must be cheap and working on Tx at least. I will buy if cheap or exchange for Datong FL2 filter. Matthew. Tel: Basingstoke (0256) 478731

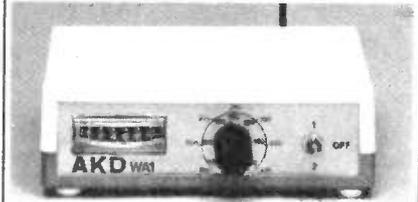
■ Wanted to complete military radios: spare parts box No 39, spare parts box No 46, battery box for WS18, 10 watt generator for WS48, dipole aerial for WS17, control boxes for 19 set. Warner, 45 Entry Close, Ashford, Kent TN23 2RS. Tel: (0233) 36185

Radio & Electronics
For all aspects of practical amateur radio World!

SMALL ADS

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Radio & Electronics World

COUNTY GUIDE

Ensure that radio & electronics enthusiasts in your area know where to find you

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	single	£47.00	£88.00	£158.00
double	double	£94.00	£176.00	£316.00

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TO: Radio & Electronics World · Sovereign House · Brentwood · Essex · CM14 4SE · England · (0277) 219876

print your copy here

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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.

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C P I

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Acorn Electron Computer under £189.95, **Save** £10. Spectrum 48K £120, **Save** £9.95. All hardware and software for Commodore 64, Vic 20, Dragon, BBC etc. Send SAE for list.

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Stratton, Nr Bude, Cornwall.**

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Radio & Electronics
For all aspects of practical amateur radio *World*

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COMPANY

ADDRESS

SIGNATURE **TELEPHONE**.....

C P I

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For all aspects of practical amateur radio *World*

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ABC membership approved pending first audit Jan-Dec 1984

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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
May 85.....	7 Mar 85.....	13 Mar 85.....	15 Mar 85.....	11 Apr 85.....
Jun 85.....	11 Apr 85.....	17 Apr 85.....	19 Apr 85.....	9 May 85.....
Jul 85.....	16 May 85.....	22 May 85.....	24 May 85.....	13 Jun 85.....
Aug 85.....	13 Jun 85.....	19 Jun 85.....	21 Jun 85.....	11 Jul 85.....

CONDITIONS & INFORMATION

SERIES RATES

Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.

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

COPY

Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.

Printed — web-offset.

PAYMENT

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.

Well, I've bought a 2M Rig that has lots of facilities. Now, how many aerials do I need to get the best out of it?

For mobile, the $\frac{1}{4}$ wave worked very well in town on my old FM Rig, and it was no problem getting into multi-storey car parks etc. Still, I will need something better for motorway and open country.

The $\frac{5}{8}$ wave is a good performer — low angle radiation. Not too long and whippy, like some of the long colinears.

What about S.S.B. mobile? I'll need to be horizontal to do any good. Maybe a halo and a gutter mount would be a good idea.

I must try some hill top D.X. this summer. That will need a small beam and some means of rotating it.

Musn't forget Fox Hunting — need a D.F. Loop for that.

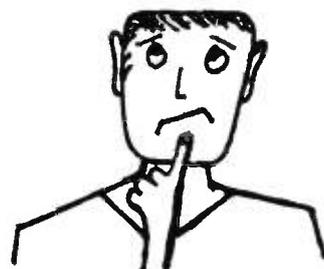
I must think about portable aerials.

Would be good to get one to do it all!



If you are thinking this way, have a look at the first ever aerial to give you the choice of working modes. Built like a brick outhouse (**the Multi P.6**) serves all needs on or off the car 2M (and 70cms)

SEE REVIEW IN THIS ISSUE



R WITHERS COMMUNICATIONS

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B68 OBS (QUINTON, BIRMINGHAM) WEST MIDS.

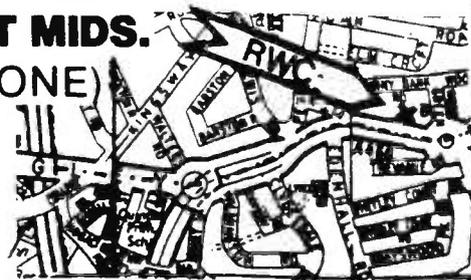
Tel: 021-421 8201/2 (24 HR ANSWERPHONE)



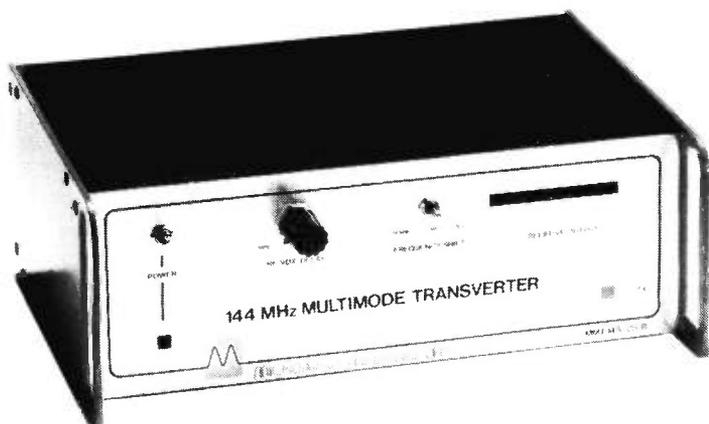
ARM MULTI P6



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SAE FOR FURTHER DETAILS ALLOW 3-7 DAYS DELIVERY



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2 METRE MULTIMODE TRANSVERTER MMT144/28-R

NEW RELEASE

FEATURES

- ★ 25 watts Tx output
- ★ GaAsFET RF stage
- ★ Transmit ALC circuit
- ★ 13.8V DC operated
- ★ Repeater shift (normal, simplex, reverse)
- ★ High level DBM mixer
- ★ LED Bargraph Power Meter
- ★ RF Vox – Adjustable delay & manual override

SPECIFICATION

General

Input freq range	: 28-30MHz
Output freq range	: 144-146MHz
Repeater shift	: Simplex, normal, reverse
DC requirements	: 13.8V DC & 6 Amps

Transmit Section

Output power	: 25 watts +/- 1dB
Input level range	: ¼ to 300mW
ALC range	: 20dB
Modes of operation	: SSB, FM, CW, AM
Spurious outputs	: -65dB or better

Receive Section

Gain	: 20dB min
N.F.	: 2dB or better
3rd order intercept	: +19dBm (output)

DESCRIPTION

This new transverter has been designed to allow users of existing HF band transceivers to establish a first-class transceive facility on the 144MHz band. The MMT144/28-R incorporates many new and exciting features which combine to make this product simply superb.

Receive Section

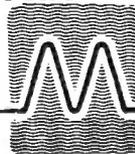
An NEC GaAsFET is employed in a noise-matched configuration feeding a high level double balanced mixer via a bandpass filter. IF gain is achieved by a JFET post amplifier. This combination produces a good signal to noise ratio, excellent immunity to overload and cross modulation, resulting in a rugged receive system having a third order output intercept point of +19dBm.

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The incoming 28MHz signal, in the range ¼ to 300mW, is initially fed to the RF VOX circuit, ALC control circuit and the input level control. This signal is then fed into a pair of MOSFETs in a balanced mixer configuration, together with the local oscillator injection, to produce the wanted signal in the range 144-146MHz. This signal is then amplified by several linear stages up to the specified output power of 25 watts. A visual indication of relative output power is provided by a front panel mounted LED bargraph display. A rear panel mounted level control allows the user to adjust the sensitivity of the transverter to suit the transceiver in use, and a front panel mounted RF VOX delay control allows adjustment to suit SSB/FM modes. The ALC circuit has a 20dB dynamic range and has been incorporated to ensure that a totally clean signal is produced by the transverter. This is a particularly useful feature which will virtually eliminate compressed signals and the resultant problems caused to local stations.

PRICE : £215 inc VAT (p+p £3.50)



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Brookfield Drive, Aintree, Liverpool L9 7AN,
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HOURS:
MONDAY – FRIDAY
9-12.30. 1-5.00
RE



YOU COULD WIN £50.....

Dear Reader

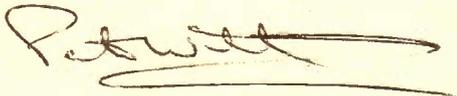
Thank you for buying this issue of Radio & Electronics World. We hope you have found it informative, interesting and enjoyable.

Our intention is to make it the best magazine on the market for radio and electronics enthusiasts. Your help will be invaluable in completing and returning this questionnaire, which is designed to help us plan the content of future issues of Radio & Electronics World.

Your reply will be totally confidential and by using the FREEPOST address, will cost you nothing.

In appreciation of your help the name and address from each completed questionnaire will be put into a free draw. The winner will receive £50. We will be pleased to receive replies without your name and address if you prefer to remain anonymous.

Best wishes



Peter Williams - Publisher

PLEASE TICK APPROPRIATE BOXES

Q1 Can you say how often you buy the following?

	Regularly (10-12 per yr)	Occasionally (1-9 per yr)	Never
Amateur Radio.....	[]	[]	[]
Ham Radio Today	[]	[]	[]
Practical Wireless.....	[]	[]	[]
Radio & Electronics World	[]	[]	[]
Short Wave.....	[]	[]	[]
Wireless World	[]	[]	[]

Q2 Do you feel Radio & Electronics World is good value at 99p?
Very good [] Quite good [] Not very good [] Not at all good []

Q3 Do you have a regular order at your newsagents or are you a subscriber?
Yes [] No [] Subscriber []

Q4 Which of these recent issues of Radio & Electronics World did you buy?
Nov 84[] Dec 84[] Jan 85[] Feb 85[] Mar 85[]

Q5 Are you a licensed amateur? Yes [] No []

Q6 Do you belong to an amateur radio club?
Yes [] No [] I am considering it []
I used to, but decided against continued membership []

Q7 Do you belong to the RSGB?
Yes [] No [] I am considering it []
I used to, but decided against continued membership []

Q8 Are you a member of BARTG?
Yes [] No [] I am considering it []

Q9 Are you interested in computers related to amateur radio? Yes [] No []

What computer and peripherals do you use?.....
.....

For what use? (amateur radio).....

Q10 Of each of the following topics, which would you like given more or less coverage?

	Less	Same	More
Amateur radio world.....	[]	[]	[]
ATV on the air	[]	[]	[]
Computers related to amateur radio	[]	[]	[]
Construction projects - small	[]	[]	[]
- medium.....	[]	[]	[]
- large	[]	[]	[]
Construction techniques.....	[]	[]	[]
Data file	[]	[]	[]
DX-TV reports.....	[]	[]	[]
General communications coverage	[]	[]	[]
General interest features.....	[]	[]	[]
Latest literature	[]	[]	[]
News.....	[]	[]	[]
Product news	[]	[]	[]
Product reviews.....	[]	[]	[]
QSO	[]	[]	[]
Questions & answers.....	[]	[]	[]
Satellites	[]	[]	[]
Short wave news.....	[]	[]	[]

Others (please specify).....
.....

Q11 Please state what subjects you would like to see covered in main features:

.....
.....

Q12 Do you find the Free Readers Small Ads useful?
As an advertiser Yes [] No []: As a buyer Yes [] No []

Q13 What do you most like about Radio & Electronics World?

.....

Q14 What do you most dislike about Radio & Electronics World?

.....

Q15 Can you say what you feel about Radio & Electronics World overall?
Very good [] Quite good [] Not very good [] Not at all good []

Q16 What improvements would you suggest are made to make Radio & Electronics World an even better magazine?

.....
.....

SOME QUESTIONS ABOUT YOURSELF

Sex: Male [] Female []
Age: 15-24 [] 25-34 [] 35-44 [] 45-60 [] 60+ []
Single [] Married [] Number of children.....

Occupation..... Do you own your own home? Yes [] No []

NAME ADDRESS
.....

Post to: Radio & Electronics World
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