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Radio & Electronics

The communications, electronics & computers magazine

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UOSAT-2 AMATEUR RADIO WORLD DISCUSSES THE LAUNCH

RSGB EXHIBITION NEC BIRMINGHAM - PREVIEW

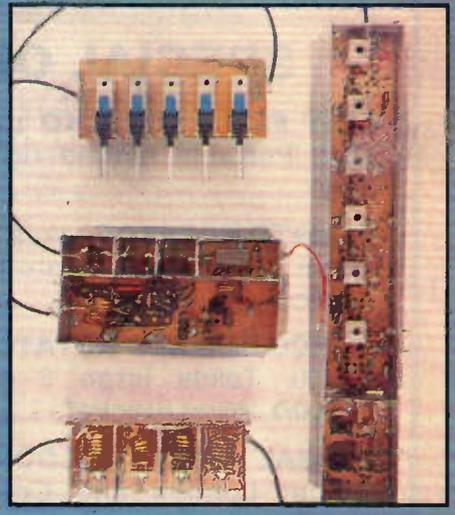
OUR SPECTRUM ANALYSER UPDATE

DATA FILE - VERSATILE 4046B CMOS CHIP

BUILD A LOGIC PROBE GENERATOR

HAMEG OSCILLOSCOPE HM203-4 REVIEWED

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Radio & Electronics

The communications, electronics & computers magazine **World**

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COVER PICTURES

- Top left:** UOSAT 2 logo
- Top right:** Updated Spectrum Analyser boards
- Centre:** 'Levell' TG303 Function Generator
- Lower left:** Front view of the SX-200 Scanning receiver
- Lower right:** 'Meteor' series frequency counters

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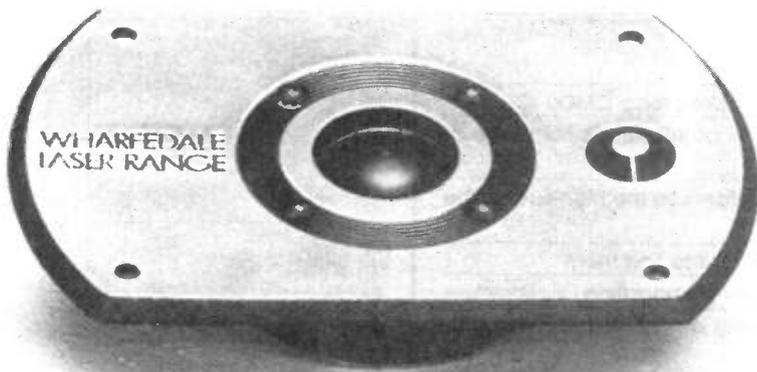
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Radio & Electronics World Magazines

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



DUAL VOICE COIL LOUSPEAKERS

Extending the bass response of such speakers as the LS3/5a by adding a single sub-bass speaker is an idea which is attractive to many users of very compact speaker systems.

Due to the mismatch in sensitivity (low sensitivity for the small speakers, relatively high sensitivity for the bass unit in a large enclosure) the

only satisfactory answer, up to now, has been to balance the relative levels by 'going active'.

Many users would like the extra bass response but are not keen on the extra complication of an active system—another amplifier, active crossover networks etc. Volt Loudspeakers have come up with a simple answer to the problem.

Two new units, the 8"

DVC220DS and the 10" DVC250 have their sensitivities tailored to match such speakers as the LS3/5a and are fitted with dual voice coils so that the bass output of both channels can be fed via 3rd order networks into a single bass unit. Three new models are also announced in the Wharfedale Speakercraft range of designs for the home constructor. They are L50, L90B and L140, two way sys-

tems of 11, 17 and 20 litres respectively. All are of 8 ohms impedance, a break in tradition from the 6 ohms which has been standard for Wharfedale small speaker designs, and maintain the competitive pricing which has been a feature of this range. The new Speakercraft Manual is available free of charge.

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

NEW RADIO RECEIVER

A new radio receiver, the UNIDEN CR2021, utilising the latest in microprocessor control and providing keyboard entry of frequency coupled with LCD digital readout is announced by Lecmar Electronics.

It provides full frequency coverage of FM/LW/MW/Marine Band and the complete short wave bands, giving coverage of 150KHz - 29.99MHz and 76MHz - 108MHz, with reception of either AM, CW or SSB possible. Scanning between any two user-defined frequencies, coupled with a memory for your most popular six frequencies, provides quick access to any station. A sleep

timer facility is incorporated, together with sockets for external aerial, headphones and extension speaker. Operation is from internal batteries, 12VDC or 240VAC, with adaptor.

Compact and lightweight, measuring only 320mm x 155mm x 65mm, coupled with maximum sensitivity, makes it an ideal set for reception of amateur broadcasts, broadcast stations, weather forecasts, SSB shipping information, time signals, BBC World Service, weatherfax information etc.

Lecmar Marine Electronics, Vectis Yard, Cowes, Isle of Wight, PO31 7AY. Tel: (0983) 293996

40GHz DETECTOR FOR ENHANCED ANALYSER

A new Microwave Detector - the 6514 - is introduced by Marconi Instruments. The unit allows the 6500 Automatic Amplitude Analyser to be used over the band 26.5 to 40GHz enabling fast and accurate scalar measurements to be made at both microwave and millimetric frequencies.

The 6514 uses a zero bias silicon Schottky diode. The updated internal software of the 6500 provides power accuracy correction to take account of square law deviation over a wide dynamic range of -45 to +10dBm. In addition, to take account of different detector character-

istics in the 6510 series, selection of the required software correction scale can be simply made from the 6500 front panel keys.

Software enhancements add further capability to the success of the Marconi Instruments 6500. The range of detectors and microwave bridges that can be used with the 6500 is now increased with the improved AUTO ZERO function. This is now three times faster, speeding up the initialisation routine.

Long term power level stability measurements are now possible with the 6500, as a signal monitor function has been added. In addition, scale information is clearly printed, with the trace or measure-

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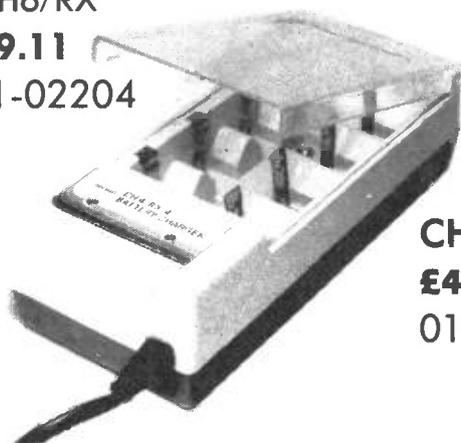
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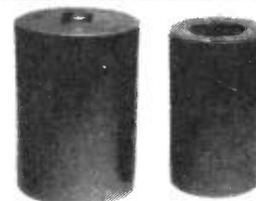
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NEW

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The LEVELL TG302 is the lowest priced 2MHz function generator on sale in the UK.
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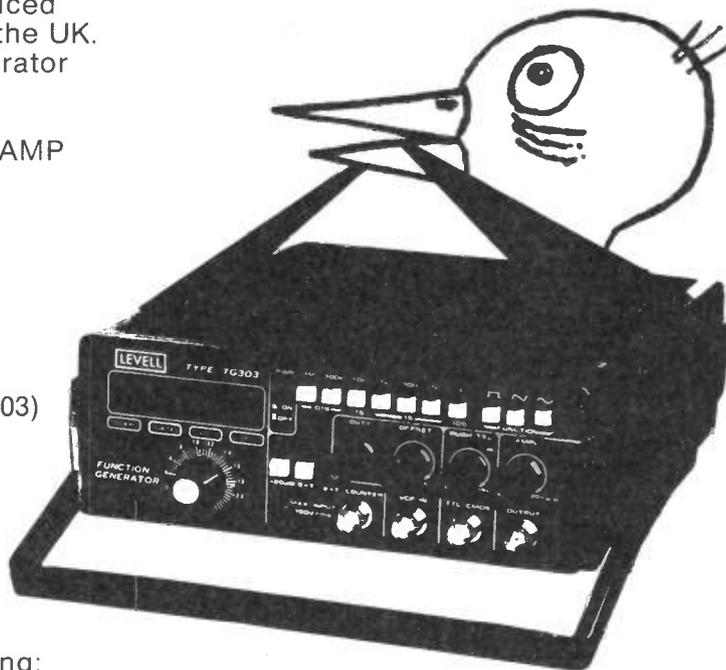
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PRODUCT NEWS

ment details, using any x-y recorder and the unique 6500 PLOT function.

*Marconi Instruments Limited,
Longacres, St. Albans, Herts.
Tel: 0727 59292*

MICROPATCH FOR COMMODORE 64 or VIC-20

Micropatch is a new low-cost, high performance Morse, Baudot and ASCII software/hardware computer interface package. The Micropatch model MP-20 or MP-64 incorporates the complete MBATEXT software ROM for either the VIC-20 or Commodore 64 computers.

All circuitry and software is incorporated on a single, plug-in cartridge module featuring the following: True dual channel mark and space multi-stage 4 pole, Tschebyshev active filters. Automatic threshold correction for good copy when one tone is obliterated by QRM or selective fading. Easy, positive tuning with triple LED indicator. Switch selected 170Hz or wide shift on receive. 800Hz multi-stage active CW filter. Automatic PTT. RTTY anti-space. Demodulator circuitry powered by external 12V D.C. (not supplied) to avoid overloading host computer and for maximum EMI isolation. Exar 2206 sine generator for AFSK output. Shielded transceiver AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK keyed output.

The Micropatch is structured for easy upgrading to the CP-1 Computer Patch advanced interface unit without having to buy a different software package! Simply unplug the external computer interface cable (supplied with the Micropatch) and plug it into the Computer Patch.

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

AERIALS ON THE MOVE

The following new product lines are announced by the Kings Lynn firm of Maxview.

The Cara aerial amplifier: Measuring only 4½ by 2¾ inches, this unit has integral brackets to allow it to be bolted permanently at an appropriate position, eg a caravan television receiver and the incoming aerial lead.

Claimed to have a gain of 12½ times, it covers the whole of the UK television and VHF radio spectrum from 40 to 900 MHz.

There is provision for either 12V or 24V operation to render it suitable for use with the supply voltages generally available on land vehicles and marine craft. This is selected by means of a switch on the top of the unit. A generous length of coaxial cable terminated at each end with a standard TV-type plug to interconnect amplifier with television receiver is supplied and a DC supply is also included in the kit.

Weatherproof TV Aerial Socket: This is designed to be secured as a permanent fitment to the exterior of a

vehicle or marine craft on which a television aerial is installed. The download from the aerial is plugged in to the coaxial socket contained within a small (2in by 2in) plastic box with a weatherproof snap-hinge lid. Extending from the rear of the box is 3 metres of coaxial cable which is passed through an orifice drilled in the side of the vehicle. When the vehicle is ready to move to another site, the external aerial is unplugged from this weatherproof socket and dismantled for safety in transit.

Maxviews Aerials Ltd., Maxview Works, Setchey, King's Lynn, Norfolk PE33 0AT. Tel: (0553) 810376/810591



VDE APPROVAL FOR LOW-COST MULTIMETER

Award of the coveted European VDE safety standard approval plus immediate off-the-shelf delivery, now augment the features of Philips' PM 2502 hand-held 32-range analogue multimeter. The instrument rates very high in the short list of professional multimeters still available for less than £100. It is 1.5 class for DC voltages, 2.5 class for AC voltages and all currents and is based around a robust high-precision tautband moving coil meter movement with 25 μA sensitivity.

Features of the PM 2502 which promote sensitive and accurate measurement include a full-scale deflection of one volt for AC voltages

and 100 μA for AC currents, with a 40 kilohm-per-volt input impedance. The measuring ranges cover DC voltages from 1mV to 1000V, AC voltages from 10mV, to 600V, DC and AC current from 1μA to 10A and resistance from one ohm to 10 megohms.

The meter features include foolproof overload protection, a built-in battery condition monitor, an audible continuity tone for speedy circuit-testing and a wide selection of accessories. The PM 2502 runs from standard 9 and 1.5-volt batteries, a set of batteries having an average lifetime of over a year.

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

ANTENNA TUNER INTRODUCTORY OFFER

Cambridge Kits offer Radio & Electronics World readers £4 off the price of their new Antenna Tuner kit. This band-pass tuner is designed to improve reception from 0.1 to 30MHz. It has switched series and parallel tuning to suit both long and short end-fed antenna and receivers having the usual low impedance input.

It is especially effective with indoor antennas and also includes a detector output for a meter. This adapts it to a sensitive absorption wave-meter or field strength meter, or with headphones, makes a modulation monitor or a general coverage crystal set (useful for emergencies). Although primarily designed for receiving, it will handle transmitter powers up to 10 watts.

The kit contains ready-wound inductors, 4 x 7 x 14cm metal case, instructions, calibration chart and is available at an introductory price of £21.20 including VAT and UK postage if ordered before the end of May 1984. From 1 June 1984 it will be available at £25.20.

*Cambridge Kits, 45(a) Old
School Lane, Milton, Cam-
bridge. Tel: Cambridge (0223)
860150*

CASE SIZES OF ELECTROLYTIC CAPACITORS REDUCED

Electrolytic capacitors with case sizes as much as 60% smaller than conventional types are now available from Panasonic. Known as the SU series, the new capacitor range includes both radial and axial types and offers advanced electrical specifications.

SU capacitors are available with working voltages from 6.3V to 100V DC, and in capacitance values from 0.47μF to 15,000μF (radial) or 22,000μF (axial). Wherever size and weight are important, or where automatic insertion of high capacitance values is required, these advanced components offer considerable advantages to the designer.

*Panasonic Industrial (UK)
Ltd., Electronic Components
Department, 280-290 Bath
Road, Slough, Berkshire, SL1
6JB. Tel: (0753) 34522*

PRODUCT NEWS

18 DIGIT DISPLAY DRIVER

A single 40 Pin device which can directly drive up to 18 digits of 7 segment high voltage vacuum fluorescent display is now available from Campbell Collins Ltd. Available in two versions, the ML 4121 and ML 4221 accept BCD or segment format respectively.

Both the ML 4121 and ML 4221 interface directly with single chip microcomputer and I/O peripheral devices. Using segment format data the ML 4221 can be configured to drive up to 21 segment vacuum fluorescent displays.

Campbell Collins Ltd., 162 High Street, Stevenage, Herts. Tel: Stevenage (0438) 69466

NEW KITS

TAU announce a first in the radio world, by expanding their range of components and kits.

The kits come in two types – the ever popular Super Transmatch design at three power levels (500W, 1KW & 5KW), and the L&C Match (1500W). The kits are TAU's copyright design and the end plates are a unique single composite unit encompassing the capacitors and roller coaster. These ATU's are well engineered but the main attraction is that you've built a quality item yourself at home, in the shack, with the minimum of effort and saved expensive assembly costs. By building our kit the amateur can be proud of his achievement and will, upon completion, have a better idea of how it all works.

The Super Transmatch ATU with split stator capacitor, roller coaster and single capacitor will handle ratios of at least 10 to 1 and take vertical aerials or end-fed aerials. By inserting a balun (also available) it will also take balanced feeder, dipole and beam aerial inputs.

The L & C Match ATU configuration is a truly versatile wide range antenna coupler that is based on the old Marconi design. It will handle impedance ratios of 5 ohm to 5k ohms resistive and 2k ohms capacitive to 2k ohms inductive with no fear of flashover at high impedance levels.

The Capacitor Kit comes in either single stator or split

stator format in 500W pep, 1KW pep and 5KW pep power rating, and has six different capacitors. TAU can make specials to order up to any value and rating at additional cost.

The Roller Coaster Kit covers the frequency range 1 to 30 MHz of 28 micro henries inductance.

All kits are complete with fully detailed step by step instructions with parts lists and drawings for ease of identification.

Tau Systems Ltd (Incorporating G40GP Electronics), Unit 4, Gladden Place, West Gillibrands, Skelmersdale, Lancashire. Tel: 0695-26345



NEW FUNCTION GENERATORS

Two new function generators have been added to Levelle Electronics range of instruments. Prices are £135 and £195 plus VAT.

The TG302 is the lowest priced 2MHz Function Generator in the UK at £135 plus VAT.

The TG303 offers the novel concept of a function generator together with a frequency counter.

The TG302 & 303 produce sine, square, triangle, pulse, sawtooth ramp and asymmetrical sine waveforms over the wide frequency range of 0.02Hz to 2MHz, with a maximum output of 20V p-p from a 50ohm source. $\pm 10V$ DC offset can be superimposed on the output signal. Frequency can be swept

over three decades by an external voltage applied to the VCF input. A duty control changes the triangle waveform into a ramp and the square waveform into a pulse. The invert switch permits choice of ramp and pulse waveforms of either polarity. TTL output of fixed amplitude square or pulse waveform with a fast rise time is available on both instruments.

The TG303 has a CMOS output of 5 to 15V and a 6-digit frequency counter which can be switched to measure the frequency of the generator or an external source up to 10MHz.

Levelle Electronics Ltd., Moxon Street, Barnet, Herts. EN5 5SD. Tel: 01 449 5028 & 01 440 8686

EXTENDED CABLE SERVICES

Custom Cables International, Saffron Walden, has added round cable manufacturing to existing flat ribbon cable services. The company can produce cables for most industries which include Computer, Instrumentation, Equipment and Panel Wires. CCI are also producing cassette leads for every type of home Micro.

Custom Cables International Ltd, Units 2, 3 and 4, Shire Hill Industrial Estate, Saffron

Walden, Essex, CB11 3AQ. Tel: (0799) 25014 Telex 81653

LASER DIODES

Several new Mitsubishi laser diodes are now available from Aspen Electronics and are designed for optical information processing.

The ML 3101 is typical of the range. The ML 3101 is an AlGaAs laser diode emitting light beams around 815nm with a light power of about 3mW. They will operate under CW or pulse conditions and

4 1/2 DIGIT AUTO RANGING DMM

The latest addition to the low cost instrumentation range of Thandar Electronics is the 4 1/2 digit liquid crystal display digital multimeter. It has a basic accuracy of 0.03% and features full auto and manual ranging as standard.

It has full measurement capability of DC and AC voltage, DC and AC current plus resistance and diode check in 21 ranges over 5 modes. A sample hold facility is also provided as is a continuity buzzer which also indicates over-range conditions in a different tone.

The TM451 is powered by a standard 9V PP3 battery, or via a mains adaptor as required. Battery life is considerable due to the CMOS LSI technology incorporated. It is supplied complete with battery and probes.

Thandar Electronics Ltd, London Road, St Ives, Huntingdon, Cambs. PE17 4HJ. Tel: 0480 64646

NEW DIGITAL METER

A new Model 79 digital panel meter, the first with a 1in (25.4mm) 3 1/2 digit (± 1999), high brightness, red LED display, will be shown by Amplicon Electronics at the All Electronics Show in London (1-3 May).

The company will display their complete range of products including digital panel meters, open frame and enclosed switch mode and linear power supplies, DC/DC converters, encapsulated power supplies, digital panel printers, data conversion modules, fibre optic data links, digital cassette recorders, electronic loads and cards for the DEC LSI-11, STD Bus and IEEE 488 Bus.

Amplicon Electronics Ltd, Richmond Road, Brighton, E. Sussex, BN2 3RL. Tel: Brighton (0273) 608331

since they work in fundamental transverse mode they are well suited for optical information processing systems, optical product code readers, laser printers and optical distance meters.

Aspen Electronics Limited, 2 Kildare Close, Eastcote, Ruislip, Middlesex HA4 9UR. Tel: 01-868 1188

PRODUCT NEWS

SIL RESISTOR NETWORKS

What is claimed to be the widest range of types and values of single in-line (SIL) resistors in the UK has been introduced by Lowerdale Limited.

The full range of E24 values is available in a low profile package with either commoned or separate configuration. Stability of individual elements is better than ± 250 ppm and tracking across the array is better than 1%.

The commoned ranges are available in $\frac{1}{8}$ watt rating and separate arrays in $\frac{1}{4}$ watt. Standard tolerance is $\pm 5\%$, with $\pm 2\%$ being available to special order. Single value networks from 22 ohms to 2M ohms are manufactured with the range from 100 ohms to 1M ohm available from stock. Custom networks can be supplied to special order.

The standard package, with from five to fourteen pins, is 6.5mm high by 2.5mm thick with mounting pins at 2.54mm pitch.

Lowerdale Limited, 3 Fleet Road, Fleet, Hants GU13 8QY. Tel: (02514) 20822.

DC/DC CONVERTERS FOR DIL SOCKET MOUNTING

A new family of DC/DC converters, housed in standard 24-pin DIL packages, has been announced by Gresham Powerdyne. Designated the EL Series, the converters are available in 1.5, 3 and 4 Watt ratings.

Designed for developing on-board local voltages from 5V or 12V inputs, the new units operate at efficiencies up to 75%. Typical applications include driving RS232 interfaces, providing power for RAM or microprocessor use, driving op amps, etc.

High reliability, full six-sided RFI shielding and very wide operating temperature ranges make the series useful in particularly demanding applications.

Gresham Powerdyne Ltd. Tel: (025672) 4246/7/8

TWO NEW HF TRANSISTORS

Siemens has introduced two HF transistors for use in antenna amplifiers which meet the most demanding low-noise requirements. Both devices are intended for the output stages of antenna

amplifiers; ratings ensure that, despite the high information density, TV picture quality is not impaired by signal noise.

The BGY 98 double transistor integrates two electrically separate semiconductor chips of equivalent technology in a low-cost SIL 9 package. This component permits the design of wideband series and push-pull circuits for up to 126dBuV at VHF frequencies (40 to 300MHz). Maximum permissible power dissipation is 2W per chip. The double transistor allows output push-pull

circuits to be developed which, on account of their excellent symmetry, produce minimal noise.

The BFR 96 S offers improved linearity characteristics compared with earlier devices. The primary application area for this transistor is wideband antenna amplifiers with extreme low-noise requirements. Maximum power dissipation is 0.7W.

Siemens Limited, Siemens House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HS. Tel: (09327) 85691



4 1/2 DIGIT LCD DPM

A state-of-the-art LCD DPM which employs direct chip bonding techniques to reduce size has been introduced by Lascar Electronics.

The DPM300 features a large 12.5mm digit display, with various symbols to indicate measured units. Auto-polarity, Auto-zero, logic switches 200mV or 2V fsd Digital Hold, crystal clock with temperature compensated display drive, 1mA consumption with 1pA input cur-

rent is combined with true differential inputs and references. The 'over' and 'under' range outputs make auto-ranging circuits very easy to implement.

The new meter sets new standards in accuracy, stability and low-cost and will suit many applications in portable and other measuring instruments.

Lascar Electronics Limited, Module House, Whiteparish, Salisbury, Wiltshire. SP5 2SJ. Tel: (07948) 567

TANTALUM CAPACITORS

Sprague's Type 489D series of miniature dipped-bead tantalum capacitors is now stocked by Axiom Electronics.

The 489D capacitor is a low-cost, miniaturised version of the 499D range, and is ideal for a variety of applications. Supplied with straight legs pre-formed to 5mm pitch, with versions from 6.3 to 35V as standard ratings, the 489D series have performance characteristics which include a temperature range from -55°C to +85°C, and capacitance tolerance of $\pm 20\%$.

Axiom Electronics Ltd, Turnpike Road, Cressex Estate, High Wycombe, Bucks

HP12 3NR. Tel: High Wycombe 442181

SATELLITE COMMUNICATIONS AMPLIFIER

A new class C power amplifier unit, designed primarily for up-link transmission in INMARSAT earth stations is introduced by Microwave Associates. The amplifier is capable of delivering at least 40 watts output over the frequency band 1630 MHz to 1650 MHz, which has been allocated to the maritime communications satellite system.

Identified as type ML-A-12100-16, the new unit employs microwave transistors in a distributed amplifier

configuration based on microstrip technology. Available amplifier gain is at least 26dB, allowing the rated output to be attained with only 100mW input. The gain can be controlled over a 3dB range by adjustment of a DC input voltage. The frequency response characteristic is claimed to be flat within 1dB over the nominal frequency band.

The amplifier is intended for use in 50 ohm coaxial systems and is fitted with SMA input and output connectors. Internal 'forward' and 'reverse' detectors built into the output circuit provide analogue DC output signals, allowing continuous monitoring of forward and reflected power.

Microwave Associates Ltd, Woodside Estate, Dunstable, Beds. LU5 4SX. Tel: (0582) 601441

LIQUID CRYSTAL DISPLAY MODULES

An extensive range of alphanumeric and graphic display modules featuring the latest technology in LCD design are currently available, incorporating the newly developed TN type liquid crystals with high contrast ratio and wide angle display. The alphanumeric displays feature a 5 x 7 dots plus cursor line character composition, internal character generator and data RAM. A wide variety of displays is available from 8-character capacity to 320-character capacity (8 character by one line to 80 characters by four lines). The graphic modules range from 60 x 32 dots to 640 x 240 dots.

All modules are C-MOS and TTL compatible, low powered and can operate from an optional single + 5V supply. These highly reliable LCD modules have over 50,000 hour life and carry a 12 month warranty.

Measurement Control & Displays, Guildford

HOME BUDGET ON THE COMMODORE 64

Kuma Computers have now implemented their well known and proven Home Budget program on the Commodore 64.

Home Budget enables the home manager to keep track

EAST CORNWALL COMPONENTS

TRANSISTORS		DIODES		VOLTAGE REGULATORS		VALVES	
Type	Price (£)	Type	Price (£)	Type	Price (£)	Type	Price (£)
AC125	0.35	BC108	0.10	BD324A	0.32	6X4	0.88
AC127	0.30	Aor B	0.12	BC303	0.32	BD375	0.75
AC128	0.30	BC114	0.14	BC307	0.10	BD410	0.85
AC128K	0.30	BC113	0.12	BC308A	0.10	BD434	0.82
AC132	0.55	BC115	0.12	BC323	0.99	BD436	0.75
AC141	0.16	BC116	0.15	BD327	0.14	BD437	0.82
AC141A	0.22	BC117	0.22	BC328	0.14	BD439	0.82
AC141K	0.40	BC118	0.17	BC337	0.12	BD439	0.82
AC142	0.26	BC119	0.30	BC338	0.12	BD507	0.82
AC142K	0.45	BC120	0.12	BC350	0.14	BD508	0.82
AC151	0.45	BC160	0.28	BC440	0.30	BD509	0.53
AC152	0.45	BC141	0.42	BC441	0.32	BD510	0.48
AC176	0.28	BC142	0.30	BC461	0.32	BD517	0.56
AC176K	0.48	BC143	0.30	BC470	0.12	BD520	0.66
AC187	0.26	BC147	0.08	BC548	0.12	BD699	1.25
AC187K	0.40	Aor B	0.10	BC549	0.12	BD707	0.88
AC188	0.26	BC148	0.08	BC550	0.18	BDX18	2.35
AC188K	0.40	Aor B	0.10	BC550C	0.18	BDX31	2.10
ACY40	0.88	BC149	0.09	BC552	0.12	BF115	0.32
AD142	1.10	BC157	0.10	BC558	0.12	BF117	0.54
AD143	1.10	BC158	0.10	BCX34	0.27	BF119	0.82
AD149	0.96	BC159	0.10	BCY70	0.15	BF120	0.38
AD161	0.96	BC160	0.10	BCY71	0.17	BF123	0.40
AD162	0.42	BC161	0.30	BCY72	0.10	BF131	0.34
AD161/AD162	0.98	BC168B	0.12	BCZ10	1.68	BF127	0.38
AF106	0.48	BC169C	0.10	BCZ11	1.45	BF152	0.16
AF114	2.10	BC170	0.14	BD124P	0.80	BF154	0.23
AF115	2.10	BC170B	0.12	BC130Y	0.88	BF157	0.40
AF116	2.10	BC171	0.14	BD131	0.34	BF158	0.22
AF117	2.10	BC171	0.10	BD132	0.34	BF159	0.32
AF118	0.85	Aor B	0.08	BD131/BD132	0.95	BF160	0.35
AF121	0.62	BC172	0.02	BD135	0.32	BF167	0.30
AF124	0.48	Aor B	0.12	BD136	0.36	BF173	0.25
AF125	0.48	BC177	0.20	BD137	0.36	BF177	0.42
AF127	0.48	BC178A	0.08	BD138	0.38	BF178	0.42
AF139	0.68	BC182	0.08	BD139	0.38	BF179	0.32
AF178	0.68	Aor B	0.09	BD140	0.38	BF180	0.35
AF239	0.68	BC182L	0.09	BD141	1.60	BF181	0.35
AF279S	0.72	Aor B	0.09	BD145	1.82	BF182	0.32
AL103	1.88	Aor B	0.10	BD150A	0.51	BF183	0.32
AL102	1.88	Aor B	0.10	BD150B	0.51	BF184	0.32
AL113	2.20	BC183L	0.06	BD160	1.65	BF185	0.32
AS980	1.75	Aor B	0.12	BD165	0.45	BF194	0.08
AU110	1.40	BC184	0.10	BD175	0.60	BF195	0.10
AY102	4.32	Aor B	0.10	BD182	1.00	BF196	0.10
BA102	0.67	BC208	0.18	BD183	1.10	BF197	0.10
BA121	0.40	BC212	0.09	BD184	1.20	BF198	0.10
BA129	0.38	Aor B	0.10	BD202	0.87	BF200	0.48
BA148	0.16	BC212L	0.08	BD204	0.80	BF222	0.48
BA154	0.08	Aor B	0.10	BD222	0.80	BF224	0.20
BA155	0.08	Aor B	0.10	BD225	0.88	BF224J	0.16
BA156	0.08	Aor B	0.10	BD232	0.45	BF240	0.26
BA157	0.28	BC213L	0.10	BD233	0.60	BF241	0.26
BA164	0.14	Aor B	0.10	BD234	0.62	BF244	0.26
BB104B	0.52	BC237	0.11	BD235	0.63	BF244C	0.26
BB105B	0.48	BC236	0.12	BD236	0.63	BF244C	0.26
BB105G	0.48	BC239	0.11	BD237	0.66	BF245A	0.26
BB110B	0.42	BC251	0.12	BD238	0.56	BF254	0.32
BC107	0.10	Aor B	0.14	BD241	0.60	BF256	0.40
Aor B	0.12	BC301	0.30	BD243A	0.80	BF257	0.32

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1.5W Plastic 3V-200V	15p each 10/£1.40	1/2W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100	1 1/4in Time Delay 100mA	£3.50 150mA £2.25 250 300 500 600 750
1.5W Flange 4.7-47V	£1.26 each	1W 1R0 to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100	Quick Blow 100 125 160 200 250 315 400 500 600 800mA	1.1 2.5 5.0 10 15 2.5 2.5
2.5W Plastic 75-75V	87p each	2W 1R0 to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100	3.5 5.6 3A 400mA 200mA 100 125 150 200mA	£1.80 750 300
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LETTERS to the EDITOR

Do you have an opinion to air? Do you know the answer to something which puzzles, or a tip that might help, fellow enthusiasts? Have you something to add to a feature or review?
Your letters are invaluable in helping us to develop the magazine for you
Write to Letters to the Editor, **Radio & Electronics World**, Sovereign House, Brentwood, Essex CM14 4SE.

HALL EFFECT DEVICES (APRIL '84 ISSUE)

James Dick, in his most interesting article on Hall effect devices, refers to the 'Gauss' as a convenient unit of magnetic flux density. I was brought up with the unit and agree with him, but others do not. Under the SI system of units which are now used in the United Kingdom, the EEC and many other countries, the unit of magnetic flux density is the 'tesla'; symbol T. The tesla is 10,000 gauss which makes the Earth's field rather small but the centre of pulsars more manageable.

I hope that you do not think I am being pedantic but all those taking 'O' and 'A' levels have to use the SI system now as does most of the electronics industry. Problems arise when using literature of United States origin as they are only starting to use SI units.

Incidentally, the Royal Navy still use 'degaussing' coils rather than 'deteslar-ing' coils to protect their ships from magnetically operated mines.

Guy Selby-Lowndes, Billingshurst

WELCOME BACK AM

Having read the write-up about the use of AM on 3.5MHz in the April 84 edition, may I be allowed to throw a small spanner in the works.

After listening to the SSB 'Owners' on 80 metres discussing politics and every other subject, which is contrary to our licensing conditions, I say welcome back AM.

I have just purchased a Japanese transceiver and after studying the circuits etc now have sufficient technical knowledge of its operation to effect repair if this becomes necessary, but it doesn't have an AM mode switch so does this cover the previous argument I wonder?

I must add I use the words relaxation and hobby in the same breath so why do so many keep placing BUZZ saws on our frequencies to communicate at 4000wpm or whatever? I cannot even think at that speed (2wpm they shout) so lets leave such devices to the press agencies etc and carry on with AMATEUR radio.

As a professional telegraphist for 20 odd years I have been drilled with the words 'accuracy before speed' so whats the rush lads?

On behalf of 2000 PO/BT telegraphists

and radio officers (ship) may I be allowed to curse the silicon chip because we are now left with one alternative—unemployment.

As a finale, would the gentleman who plonks his 50 baud (RTTY) spud masher on 7.030 remove it, because that is where the finest amateur radio operators meet. If you don't know who we are ask G3RJV. Whoops sorry, I'm getting as bad as the 80m SSB gum-pounders club 'staking a claim'.

Dave Logan, Hyde

YOUR EXCELLENT JOURNAL

I am now completely addicted to the reading of this publication.

Scores for 'Content' 5.9; 'Technical Merit' 5.9.

I feel that it could be improved however, the meal is 'FB' but where are the condiments, the little light relief. To illustrate what I have in mind, the attached, (all my own work) might provide a topical laugh.

WINTER SPORTS

*It's a terrible time for antennae,
Mine's flat on its back on the floor.
It's a terrible time for antennae,
What with wind-hail-snow and the Law!!
Now I'm flat on my back on the floor of the
Shack and can't QSO anymore.
The doors blown away and what else? I
can't say,
For its dark wet and cold, what a thing!!
I'll hold on till dawn, camp out on the
lawn, and call DX on wet string!!*

R P B Udall, Upper Longden, Staffs

MOVING PICTURES FROM WAX (FEB 84 ISSUE)

I was very interested in the article by Don McLean (G6AWI) on recorded 30-line TV. I used to look in on the BBC transmission from about 1933 till they ended before the 405 line service started in 1936. The 30 line pictures were sent out on London National 261.1 metres, and the sound on Midland Regional 391.1 metres (medium wave).

I used a home built 20" diameter scanning disc receiver with a bee-hive type neon lamp, and a large lens in front of the disc to get the image a bit larger. An old electric fan motor was used to turn the disc at 750rpm. A slider resistance was in series with a rotary

type for fine adjustment.

I did not use any sync gear for most of the time, as I found I could hold the picture quite steady after the motor had warmed up and I set the speed with an 8 bar strobe disc illuminated by the 50c/s AC room light, which I turned off after the transmission started.

A touch on the motor spindle now and again would let the picture drift a line at a time, for framing sideways and the images, though crude, were quite good, and a head and shoulders view of a known person could be recognised.

W E Anson, Gravesend

A SIMPLE RADIO

Housewives and other 'regulars' listen mostly to a single station and only on rare occasions tune to another. Almost never do they seek a third. Their radios tend to 'live' in the kitchen, study or workshop and batteries are forgotten until output becomes inaudible.

For them this should be a very simple but reliable two station mains operated push button receiver able to receive Radio 4 and produce decent quality sound.

Is there such an animal or would someone be prepared to design one?

J M Battenworth, Harrogate

Editors note: Sorry, but we don't know if such a set is available—we suspect that it would not be commercially viable because most users want the set to be portable and the market is well catered for.

WORLD ASSOCIATION OF CHRISTIAN RADIO AMATEURS & LISTENERS (WACRAL)

Just thought I would take the opportunity to congratulate you on the excellent magazine 'Radio & Electronics World'.

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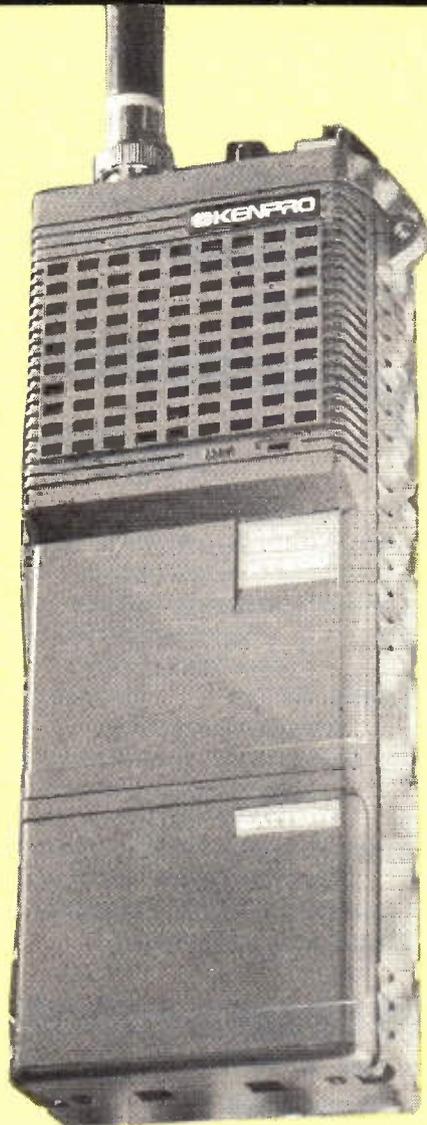
In the radio world, we have had quite a few new mags come out recently—but you beat them all! Keep up the good work!

Len Colley, G3AGX (Secretary WACRAL)

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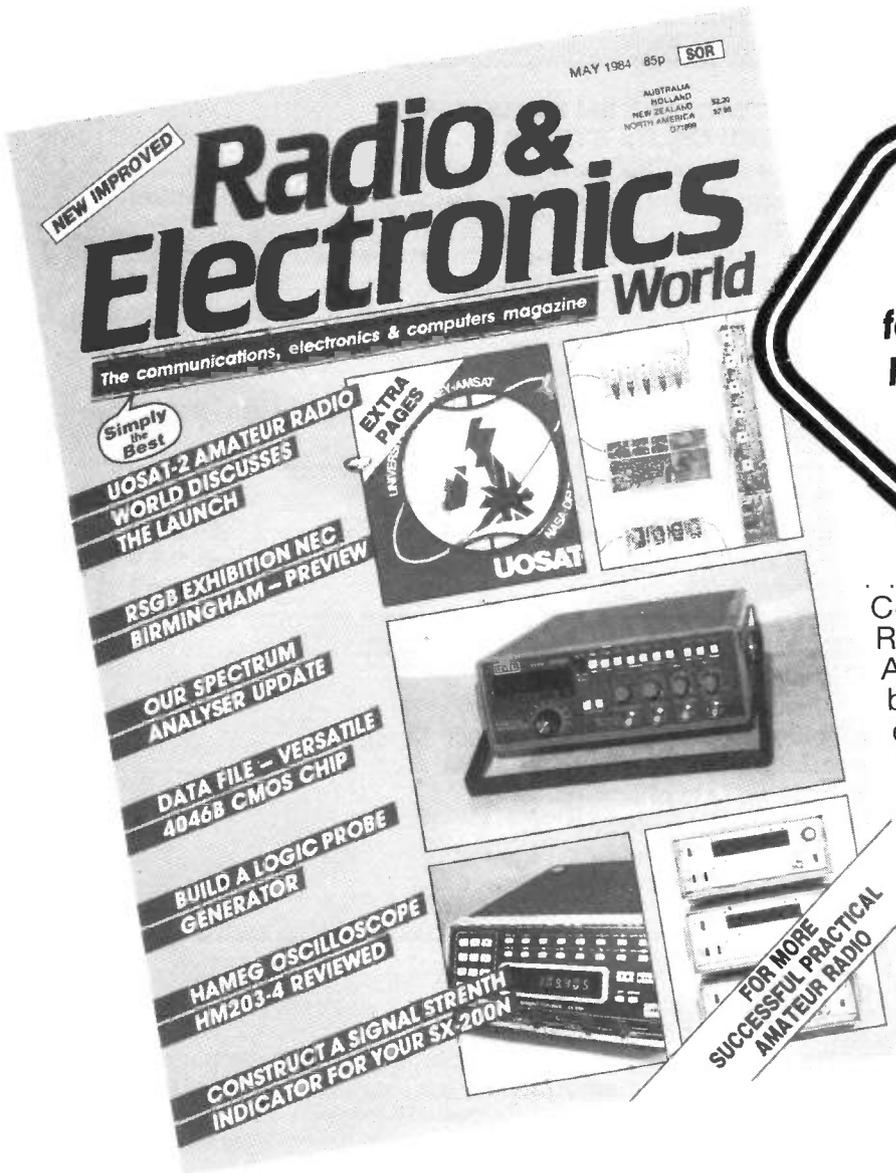
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- Drake TR5 transceiver, noise blanker fitted, as new, boxed £450. FT102, as new, boxed £575. Bob Davis, 88 Goring Rd, Worthing, BN124AB. Tel: 0903 41109
- Hammerlund SP600JX, immaculate, £160. KW77 Ham Band RX £65. SX27 VHF plus Discone £55. 'Persuader' CB speech processor, £15. Racial Diversity Unit £20. Military medals GSM etc. Tel: 0908 314095 after 14.00
- Eddystone 730/4 general coverage receiver nice condition, covers 550KHz to 30MHz, includes manual. Best offer taken. Room wanted. Buyer collects or add carriage. J L Aldersley, 9 Balmoral Cres, Dronfield, Woodhouse, Sheffield, S185ZY. Tel: 0246 410545
- 3/2in gauge 'Juliet' loco. Partly built, including boiler. Not able to finish so will sell. £70 or swop for two metre radio transceiver, or something similar. WHY? Tel: Norwich 662460 evenings or weekend
- Toroidal transformer, potted metal can two secs each, 30V, 0V, 30V, 8 Amp, for 200W stereo amplifier £6. Also smaller version, two 20W channels £2, PP extra, or collect proceeds for Phoenix charity. Brown, 74 Humber Avenue, South Ockendon, Essex. Tel: 0708 852371
- For collector or club, copies Practical Wireless December 1951 to March 1958, one copy missing. Practical Television May 1950 to April 1960, one copy missing. Plus odd copies various mags £45 ONO or swap for ZX81 16K RAM. Mr S J H Whawell, 94 Stony Lane, Burton, Christchurch, Dorset BH23 7LE. Tel: Christchurch 482753
- Realistic Pro 22, six-channel crystal VHF/VHF air. Amateur band scanning receiver, original box with 22 crystals and two antenna, as new £30. Also Harrier 40 CH. CB + Power unit, aerial and SWR meter + mag. Mount aerial, original box, as new £30. Postage extra both items. V Pickard, 20 Portsmouth Avenue, Burnley, Lancashire, BB1020R. Tel: Burnley 58700
- Oscilloscope, Tektronix 545A, 20MHz dual beam, built-in square wave calibrator, dual timebase, full working order, complete with BNC adaptors and instruction book. £150, or swap for 2M transceiver. Could advance DMM7A multimeter, 3 1/2 digit display, complete with leads, mains and battery, works but needs calibrating, £45, or throw in with 545A oscilloscope for 2M rig. Neale Whyatt, Downham House, Downhams Lane, Milton Road, Cambridge CB4 1XG. Tel: Cambridge 356333 (daytime)
- Scope CD1400, Solartron dual beam with manual and leads, excellent condition, calibrated, absolute bargain at £90. Heinz Seitz, 42 Seabrook, Luton, Beds, LU4 0EJ. Tel: 0582 51505
- TS180S DFM new, bands TX/RX complete with mobile leads, YD148 desk mic. SP180, speaker PS30 power supply VFO180, external VFO, workshop manual £525. ATU Daiwa, auto CN1001A £80. FT901DM workshop manual £10. Tel: 0480 53775
- Yaesu FT107M 9-band HF solid state rig. Twelve memory channels, scanning mic., PSU + 100W linear, as new, fantastic base station. £575 ONO. Contact Simon on 0954 50774 (evenings) or write PO Box 142, Hardwick, Cambs CB4 7YA
- Trio JR310 amateur band receiver, good cond., with mods for top band £50. Colley (G3AGX), 13 Ferry Road, Wawne, Nr. Hull, HU7 5XU. Tel: 822276
- RTTY model 28ASR, complete with all manuals and many spares. Swop for VHF/UHF multi-mode XCVR or TRS-80 MODIII disk drives. Also ten new Eimac 4X150 7034 valves, £15 each. A P Szczesniak, 22 Golf Road Park, Brechin, Angus. Scotland DD9 6YF. Tel: 035 62 4911
- Eddystone receiver model 680X. Near mint cond. Offers or part 'ex' for Cobra 148, GTL, DXR or President Grant Trans with or without L/amp. Write to, David Hepplewhite, 19 Miller Close, South Common, Thorne, Doncaster. DN8-5NE
- KW Vanguard, modified for CW/DSB. 160m, 80m, 40m, 20m, 30W input £40, no offers. Collect from Derby. Resolute buyers only please. G3VKR. Tel: (0332) 762684
- Philips PM5525 UHF TV gen £35.00. Sony U-matic VCR VO-1601D, manuals, 16 tapes, excellent cond. £400.00. Shibaden remote control pan tilt unit £20.00. Video camera, eight channel sequencer £15.00. Colour bar generator, korting, £40.00. Ikegami CCTV camera CTC5000 £30.00. Outside

- camera housing new £12.00. Transformers various, SAE list. Mr R Hill, 7 Willowbrook, Greytrees, Ross-on-Wye, HR9-7HN.
- Yaesu FT200 HF TCVR and SP200 speaker power, supply, £220. FC707 ATU, £60. Adonis AM502 mike £15. ZX81 with 2K ram, £25. 10GHz micro wave head, new, £25. D A Johnson, G4DPZ, 32 New Street, Halstead, Essex, CO9 1DD. Tel: 0787 476925 after 7pm
- Azden PCS3000 25W 2mtr. TX/RX, with remote cable kit £140.00 or exchange 70cms TX/RX. G4UKF QTHR. Tel: Somerset 0935 823475 mornings or weekend
- New mains transformers sec. 20.0.20 3amp £3. 12V 2amp £2. 15V 2amp £2.50. 17V 2amp £2.75. 22V 1amp +6V 1/2amp £2. 9.5V 1amp £1.75. 12V 250MA £1. 50+16V 1/2amp+ 11+8V 1/4amp £4. 6V 200MA 50p. P/P. £1 any amount. D70 Morse Tutor £35 P/P inc. E Hawker, 31 Ystad Celyn, Maesteg, Mid-Glam. Tel: (0656) 732919
- Belcom Lincor 2, 2m SSB rig, built in pre amp, PW speech processor, pip tone, £60. Hameg HM412 20MHz oscilloscope, dual channel with trigger delay, vgc, cost £400 new, selling £220. Halbar 5 element 2m Yagi £3. G8ZAG, QTHR. Tel: 062 982 3072
- SX200N scanning receiver plus wide-band RF pre-amp plus Discone, £250. Tel: 08893 3495 (evenings)
- Class 'D' wave meter, one mains, £7, one other £5. Heathkit SWR meter, £9. Storno 'Viscount' 2m. FM mobile radiotelephone, 6 channels, £35. Pye 'Cambridge' 4m. AM radiotelephone, 3 channels, £25, type 10 crystal checker/marker £7, Canadian '58' set, AM transceiver, 6 to 9 MHz, no PSU, £26. Army type '88' VHF transceiver, no PSU, £12, one pair 7MHz traps, £7. Collect or add postage. A W McNeill, 40 Turnpike Road, Newbury, Berks. RG13 3AS. Tel: Newbury 40750
- FT708R portable 1/2 + 1/4 wave, YM 24A speak/mic/FNB-2 Ni-cads (2 sets). PA3 car charge + PSU, QD beam 11 mts H.100 £185 complete. FDK Multi 700EX 2m, VGC, 1 year old, £120. Tono 150R 2m amp, 1 year old, £110. Clive Aldridge, 12 Hensworth Road, Ashford, Middx TW15 3NQ
- Olivetti TE349 computer terminal as used by the TSB, 150 column printer, tape reader/punch, ASC11 character set, 600/1200 bauds. RS232 serial input, some info: sold as seen, since no means of testing - offers, or WHY. Interested in HF receiver, RTTY, home computer. M Levers, 'Waverley', Independent Hill, Alfreton, Derby. DE5 7DG
- Coils, 2 1/2 diam, wound 4 to 6 TPI tapped, some with one or more coupling coils, interior rotating couplers, flexible coupling for standard spindles, 4 types available £3 to £5. Ceramic switch, 6-way, 3 wafer, standard spindle, flexible coupler £2. EX-RAF slow motion drive, with 3ins diam black knob, 4 1/2in diam, white dial, graduated zero to 180 degrees £3.50. All collect or add postage. A W McNeill, 40 Turnpike Road, Newbury, Berks. RG13 3AS. Tel: Newbury 40750
- Testgear, Hewlett Packard 5245L frequency counter £75. Hewlett Packard 606A HF signal generator £50. Advance HI audio generator £10. Tel: Chelmsford 59033
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- Yaesu FT102, £585. FV102DM £185. FC102 +ant. switch FAS14R, £185. SP102 £40. All as new or unused. Prefer sell one lot. £925. FT230R as new £185. Drake R4C. Excellent £225. Quantity WWII radio gear, U.S. Airforce radio altimeters. BC221's, TX tuning units. RAF VHF RX's. MCR1, etc offers. Jim Taylor, Tel: 0202-510400
- FT290R linear preamp, PSU, nicads, charger, case, whip etc £280. JVC Dolby stereo £30 with charger, 8 AA nicads, Sony personal graphic equaliser £15. Drae morse tutor £35. G1 ELN. Tel:

- 06632 2545
- Yaesu 708R handheld 70cm transceiver. Guaranteed as new but now surplus to requirements as gone to HF. Reasonable offers to G4UMC. Tel: Exmouth 039 278181
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- Handheld 2M SSB transceiver excellent condition £45. Morse practice keyboard £30. Contact S Gosling, 25 Willows Road, Walsall WS1 2DR, or telephone Walsall 612451
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- Yaesu 101E Mk3 FM (holdings), spare valves £325. TS120V £250. 600MHz 8 Digit counter £70. Shure 444D £25. Lightweight rotator 3 wire £35. 6 Amp 13-8 Volt PSU £20. 10M 200W Linear, requires attention £30. G4RSY Tel: 01-651-0633 (Croydon)
- Service Manual Philips N1700 series video £12. MW LW car radio £5. FDK multi 11, 2m Fm transceiver, autoscanner, crystallised for: R3, R4, R5, R6, R7, S0, S16, S17, S19, S20, S21, S22, S23, 10W, O/P. £100. 40CH AM CB £15. Crystals. 10M24, 14M91, 15M81, 16M3, 16M9015, 38M0, 20M705, £1.50 each. Pye, PF1. SV8, TX/RX £4. Tel: Mick, Milton Keynes (0908) 316052
- ATV Program for the 48K spectrum as reviewed in Nov 83 R&EW now with 36 features including testcards, maps, large printing, QRA calculator and much much more. The price which includes 16K version and full instructions is only £5.50 inc P&P from R Stephens, Toftwood, Mill Lane, High Salvington, Worthing, Sussex. For list of other programs send sae
- Oscilloscope Tektr 545A 30MHz dual beam, delay, manu. Recond. £99. Spare valves, manual, new probes £20. Collins TC12S HF RX + PSU £20. Pye AM10MC +MIC +CCTS £15. Ever ready Sky Queen portable valve radio, collectors item £15. 39 Hilltop Road, Liverpool L16 7QL. Merseyside. Tel: 051 722 4848
- Tamron TV 200m lens 12.5-50 'C' mount £55.00. 17in solid state monitor metal case, £35.00. 24in Monitor modified TV isolation trans £12.00. Both B/W 22in colour monitor, good CRT £45. 17in Colour monitor receiver, lopt u/s £20.00. TV scan coils, one inch vidicon type, £3.00. Line sender/receiver sends TV pictures over twisted cables £25.00 pair. All ono or swop VHF UHF gear. Ray Hill, (G6TSL), 7 Willowbrook, Greytrees, Ross-on-Wye, HR9 7HN.
- KW 202 receiver £80. Would part exchange for FRG7700 or similar receiver with digital read out. R Elworthy, 64 Jubilee Crescent, Mangots Field, Bristol. Tel: Bristol 563621.
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● IDS RS232 matrix printer, working but stuck on 110 baud! £30. 8 channel paper tape readers, one working + one for spares £15. Pioneer PL12D + Shure M75ED2, classic deck and cartridge combination £40. 24 off MK4027 4k x 1 dynamic RAMS £5. AMBIT high quality FM tuner modules: EF5804 front end, 91225A IF, 44378 stereo decoder, 91072 AM front end. All in a box with digital display, switching etc. got bored before I finished it, over £100 worth of bits. ANY offer considered to clear. Telequipment D53 true dual beam scope 16MHz mostly OK but needs a clean, £50. All items negotiable. Many more bits and pieces from a general clear out, send SAE for list, Harrison, 8 Carlton Mansions, Holmleigh Rd., London N16. Tel: 01-802 5516.

● ATV Program for the 48K Spectrum as reviewed in Nov 83 R & EW, now with 36 features including testcards, maps large printing, QRA calculator and much, much more. The price which includes a 16K version and full instructions is only £5.50 inc P & P from R. Stephens, Toftwood, Mill Lane, High Salvington, Worthing, Sussex. For list of other programs send sae.

● Transformer step-down 240V-120V, 15 amp. Brand new, still in box £30. Tel: 0283 216519.

● Creed 85B/M teleprinter printing reprocessor. Sell or swap W.H.Y.? Tel: Ormskirk (0695) 76212 after 6pm or weekends. M J Lee, 26 Cotton Drive, Ormskirk, Lancashire. L39 3AZ. Tel: 76212.

● Hobbit unit for Nascom plus 6 cassettes, monitor in 2716 Eprom £100. Woodfield. Tel: Coventry 0203 711757 (evenings).

● Yaesu FR6-7 RX, unmodified, with battery box, good condx, £140 ono. Storno CQF13C-14 Commercial TCVR, 160-190 MHz, suitable mod 2m FM. Some data, cheap, offers? Wickstead, G81XB, QTHR. Tel: 0628 26010.

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● Microwave modules transverter 144MHz for 28MHz TCVR, recently serviced, still under guarantee. Also microwave modules transverter 432MHz for 144MHz TCVR. Would part exchange both for 432MHz multimode, or sell at £80 each ono, inclusive of carriage. Peter Lewis G4VFG, 18 Bittaford Wood, Ivybridge, Devon PL210ET. Tel: Ivybridge 4030.

● JVC TV Radio, radio-plus-television, perfect £45. Russian Selena 17+Rams 5SW bands, VHF Medium, Long Wave Bands, 500 MW output, really good £30. Teleton communication receiver SW, PSB, Long Wave, Medium Wave, AFC, Squelch, fine tuning, BFO, good order £50. Vintage 2 Valve mains set, needs mains lead replaced £10. Very old horn speaker, working £10. A.H. Billington, 50 Chipsey Avenue, Bugbrooke, Northants NN7 3QW. Tel: Northampton 830 492.

● Microtan 65, including Tangerine HEX keypad and power supply. Also chunky graphics option. As new with manual and tanbug V2.3 (latest) issue. Cost new £130. Accept offers around £50. Phone Dave Wells (0234) 750993 9am-5pm Mon-Fri or (0908) 613628 after 7pm.

● Over 150 chips. Some SS1, MS1, LS1, VLS1. Few analogue. Over 90% of them unused, £99. 8kx8 350nS Static Ram board, £29. Phone 01 580 6622 ext 533 before 12.30.

● Several hundred electronics magazines,

Practical Electronics, Practical Wireless, Radio Constructor, Wireless World, Electronics Today International. J Fulton, Derrynaseer, Dromore, Co Tyrone, BT78 3BE.

● Rack MR-7 for Yaesu FT707 series. Filing cabinet, desk type in white, ideal for QSL cards. Both items as new, £7 each ono. Buyer collects. Aluminium portable 16ft aerial mast in 4 easy to join sections, never used, £8 ono. Buyer collects. Jane, 83 Cole Valley Road, Hall Green, Birmingham, West Midlands.

● Oscilloscope, Solartron CT316. With manual (photocopy). Single beam, 6MHz (Ranges 1-3, -3 to 0.7MHz on high gain ranges). Timebase with delayed sweep. Switchable signal delay. Calibration Oscillator 10, 100, 1000 KHz. Y shift meter, with large probe. Stored three years - sold as is. £55 (£50 collected). Do not send money until sale agreed. JDR, Westowan, Porthowan, Truro, Cornwall TR4 8AX.

● Rare German TRF (mains) radio by Nordmark (has German swastika and eagle on front of bakelite cabinet (c) 1935?) Set needs attention, £30. Bush VHF 61 (has push-button wave-change) bakelite cabinet, £25. Marconi-phone T9A (wooden cabinet) radio, £20. Howard 1920's TRF radio (not working - has slow dial drive tuning) £25, (wooden cabinet), Bush (bakelite cabinet) DAC10 radio, £25. Ekco U122 radio (plastic cabinet) needs attention, £15. P Titlow, 33 High St, Leiston, Suffolk (0728 881610).

● FT101ZD, MKIII, WARC fan. Yaesu ATU and external speaker. Original packing and manuals. Mint condition, £560 ono or exchange all for FT102, FT757GX or TS4305 or similar. Will separate if enough enquiries. Clive, RS84614. Tel: (0279) 28857, evenings or weekends.

● Eddystone VHF communications receiver type S770R. 19MHz to 165MHz. £50. WW Dolby unit, £25. Martyn, G8HHQ. Tel: Romsey (0794) 515581.

● Kimball Temptation two keyboard electronic organ value £995. Will exchange for Ham HF transceiver and accessories. Tel: Brixham 7988.

● Tektronix oscilloscope, good condition. Plug-ins, manuals, trolley. Nova 820 computer. Texas silent 700 printer. Tel: 01- 868 4221.

● Potentiometer, with light beam galvo. Power output meter, 2.5! to 20K! impedance. 5mW to 50W, large scope EMI WM8, working but needs attention £10. 'Optoelectronics' by R G Seippel. Cost £20 new, asking £10. (Fibre optics mainly). Tel: 994 8001 3-7pm, weekdays, Tony.

● Surplus gear Eddystone GC RX 840C offers. Philips N1700 VCR, complete but faulty £70 ono. Advance audio oscillator, 10Hz-100KHz, handheld dictation unit, mini cassette Philips £15. 300 audio cassette cases, new, C52 blanks 60 off. GM8CJW QTHR. Tel: 031-552 7727 after 6pm or 05783 311.

● Amber 2400 printer CW Vic 20 Interface cable, 4 rolls paper £75.00. Vicfile and Vicwriter £15.00 each. Audiogeni monitor 64 cartridge CW electronics software £10.00. Various cassette games inc. The Valley, Vicmen, Frogger, Victape Backup, Compufax Char Editor, Rabbit Writer, etc. Tel: 0332 556218 (weekends only).

● Sanyo portable stereo cassette recorder with four band radio. Features inc. two two-way built-in speakers and outputs for external speakers, VU meters, AMSS, Dolby, phono output for record deck, 12W per chan output, two built-in mics and two detach mics; price £150 ono. Only two months old, in VGC. NT Ball, 140 Albert Avenue, Prestwich, Manchester. M25 8HE. Tel: 061-798 9269.

● RTTY terminal ZX81 + 16K built into good keyboard scarab board. Good PSU, also high res. graphics board with 6K RAM 2K PROM. Also 3 chnl sound board and 16 user ports. Monitor driver board wired for FT290R - lots of software. Complete £120 or swap 70CMS rig or HF line or Spectrum. Mains filters, stop mains spikes, good for micro or rig uncased £2. G4PEY. Tel: Horsham 0403 69835.

● Transformer for that power supply you always wanted, 110-240V, PRI 28V 10amp. 10V 4amp 15V, 1.5amp 15V 1.5amp SEC. Several large electrolytics, rectifiers, etc. Buyer collects. £5, clearout. Tel: 061-430 2060, Stockport.

● Tristar 747 480 cm LSB, USB, FM, AM. York JCB 863 40 CH CB. Maxcom 20E 40CH CB. ZETAG 200 Watt SSB amp 100W FM. Rama Echo mic. 8 amp

power pack. 300W filter, SWR meter, silver rod 1/2 wave aerial. Plus 2 spare mics and all coax. £150.00. No offers, and will not split. Steve Caswell, 6 Dennis Parade, Southgate, London N14. Tel: 01-886 5897.

● BBC-model B. Sell or swap for HF transceiver - FT101 ZD or similar. All offers considered. Contact Andrew, Cardiff 0222 621576.

● FT101B includes 10MHz transmit, CW filter, fan, spare driver and PA tubes, handbook, transverter, 70MHz homebrew, switchable 3/50W. Obtains HT from FT101B. Both for £330 or will split. CR100 £18. Pascoe, 118 London Road, Wickford, Essex. SS12 OAR. Tel: 03744 3035.

● Yaesu FR101 receiver. 21 500KHz bands, 4M, 2M converters built in. 3 crystal filters FM AM SSB CW 240/12V. very good condition, £260. Tel: 0376 23604 after 6pm.

● 1691/137.5 microwave modules satellite converter, new £80. 6ft aluminium dish aerial on frame eork, excellent condition £100. RG213 low loss coax cable 12ft long with N type connectors £10. Tel: Basingham 231 after 7pm.

● Complete CW station DX40U + VFO, BC348 + upconverter in working order. Bargain £58. J Day, 24 Chestnut Grove, Chesterton, Newcastle, Staffs. ST5 7DD. Tel: Stoke on Trent 564395.

● Several multiband QVQ03-20 valves £6 each incl. postage. Eric Rickett (G3PV), 29 North Road, Berkhamsted, Herts. HP4 3DU. Tel: 044-27 3622.

● Communications receiver realistic DX302. 10KHz to 30MHz coverage. Quartz synthesised, digital frequency display. SSB, AM etc. Absolutely mint condition, complete with manual, 12V lead mains lead, antenna. Cost £289, sell £140 ono. G40AK QTHR. Tel: Storrington 09066 5151 anytime.

● Trio R1000 general coverage receiver with FM module fitted plus Yaesu ATU. All in excellent condition £250 ono. F Roper, 23 Limont Road, Ainsdale, Southport, Merseyside PR8 3NJ. Tel: Southport 77227.

● Sell or swap. Conv: MM2001 RTTY to TV or VF. Unused since bought last month. Will swap TASCOWR 610E conv; or sell £150, or part exch; with cash good Trio R1000 or R2000 or FT77. Tel: Bacup 874928 after 7pm.

● IC 251E, Mutek Board £430. Yaesu FT227R mobil £130, Heathkit S102 TRX £130. Heathkit SB200 linear £180, all FB condition ono plus carriage. SDC Sedgebeer, 50 Minffrwd Road, Pencoed, Mid Glamorgan, CF35 6SD. Tel: 0656 860434.

● Grundig Satellit 2000 communications receiver with SSB adaptor and 12V DC lead, mint condition, 100Hz to 30MHz bandwidth. Plus FM 88 to 108MHz telescopic and long wire antenna facility. With instruction book. £125 ono. Mains, battery or 12V DC operation. D G Bird, 12 Nelson Close, Ettimont, Nr. Stratford-upon-Avon. CV37 7SL. Tel: 0789-740352.

● Eddystone 730/4 receiver. A1 condition. Ex GCHQ. New valves with outboard five digit frequency counter. £130. Buyer collects. Soundair 083. 8-channel marine band scanner with superb FM broadcast receiver. 12V operating modern and compact - scans main calling channels £75. Tristar 848, 26.065 to 28.775. all mode with legal board - brand new and very rare. Looks like a NATO but does more £200. Power reducer with meter 30W. £15. K40 powermike used £10. Voice scramblers in various forms. Tel: Bournemouth 25554 (evenings).

● Rotel CB rig RVC230 compact with volume and squelch controls. New, still boxed. Unwanted gift. £19 + £1.50 Post, for quick sale D Martin, 29 St John's Close, Leatherhead, Surrey.

● Sommerkamp FR100B receiver. 80-10 meters, CW, Upper/lower sidebands and AM crystal calibrator. Handbook. Good condition. £55 ono. Tel: Bexhill 215619

● Trio 9R59 communications receiver, 0.5-30MHz, laboratory aligned. £50. Icom IC22A 2m mobile, 5/15W output. R0-R7, S10, S14-521, ideal for new licensee. £70. Write: Simon Luttrell, 358-360 Camden Road, Islington, London N7 6LT.

● Trio 2300 with case charger Helical Nicads £130. J Beam C5/2M Colinear plus feeder £50. 3/4 W Magmount whip £15. STE AT222 CW/AM/FM 2 meter transmitter £60. Murphy B40 receiver £60. Taylor Scope £25. Spares/repair Eddystone 358X £10. G3RRK receiver £20. Valves, PCBs, spares, wanted Trio 1000 offers to G80YY, QTHR or PM. Tel: 0342 832972.

FREE READERS SMALL ADS

FOR SALE

- Realistic DX300 short wave receiver in as new condition. Covers HAM frequencies, also multiple coverage digital and analogue preselect. 10KHz to 30MHz continuous coverage. Price £140.00 or may haggle a little. Mains, battery or mobile operation. A B Richardson, 5 The Uplands, Mill Hill Lane, Pontefract WF8 4HZ. Telephone: Pontefract 700616.
- Frequency meter BC221 US Army 125KC to 20CM PMO. Ambit GDO working. Needs tidying up. Sell or swap for 2m Cambridge or SW RX. William Doherty, 68 Shelbourne Road, Dublin 4, Rep/of/I. Telephone: 01 686135.
- Commodore 64. Excellent working condition. Asking £145. Sony ICF2001 new £99. Vic 20, excellent working condition, offers. Will consider swap for Atari Disc Drive or Apple Disc Drive on either computers. Tel: (0763) 61222 ext 448 (daytime).
- Icom 240 with scanner, 55-224 manual, mag mounts antenna and power supply included £150. Mint condition Apple II and computer with Hi-Res monitor. Manuals, software, etc £500 ono. Tel: 693 8375.
- Panasonic DR28 six-band receiver, LW/MW/FM, plus 3SW 10 to 90 metres dual conversion. S-meter, BFO, wide/narrow bandwidth, digital readout on all bands, batt/mains, £100 ono. Tel: 01 959 7715.
- Yaesu FR50B receiver transmitter, 50W output, manuals, xtal, HF and 2 metre transverter £135. T Vaughan (G3DQY), 20 The Thatchings, Polegate, East Sussex BN26 5DT. Tel: Polegate 5704.
- R1155A, one modified, other untouched £15 each. Bendix LM-13 heterodyne frequency meter £6. ME-6DU electronic multimeter £5. Disposing of collection of valve equipment, meters, tuners, amplifiers by Armstrong, Rogers, Quad, Leak, Ferragroup tape deck, Series 4 £25. Horn loudspeaker, Cowther PM2 unit O/C £6. Buyers must collect. Phone or write. Jack Heywood, 14 Darling Road, London SE4 1YQ. Tel: 01 692 6977.
- Hoxin GPV-5, 144 MHz co-linear antenna, used briefly only. New cond. Buyer collects. £20. B Jenkinson (G3JHC), 19 Blair Close, Sale, Cheshire M33 4LQ. Tel: 061 962 3089.
- Two VHF SIG gen type TF517. Scope WM8. The lot £5. Come and collect. Tel: Baschurch 260 550.
- Commodore 64 soft wave and add ons. Send SAE for list. M J Seaward, 7 St Olafs Road, Stratton, Nr Bude, Cornwall EX23 9AF. Tel: 0288 4179.
- Liniplex F1 9-channel crystal controlled short-wave broadcast receiver complete with internal Nicad battery pack and mains charger. Crystals for BBC, ABC, Radio Australia, Radio Malaysia, plus tuning tool and tech manual. Marc Robinson, VK2BUA, PO Box 295, Artarmon, NSW 2064, Australia. Tel: Sydney (02) 412 2797.
- Camping trailer, very good condition, 3ft by 3ft 6in by 2ft deep with hinged lid. Lockable. Very strong. Will swap for 2 metre TX/RX or for HF TX/RX, any make, or test equipment. WHY contact Terry, G1FFH, 25 Duke St, Fitzwilliam, Pontefract, West York's WF9 5AF.
- 2in JVC b/w TV/radio, UHF/VHF mains, car batteries charger, service manuals. Useful adaptation mobile DX, little used, guaranteed. £50 ono. Letters only please. H Woodman, Flat 9, 49 Upper Rock Gardens, Brighton BN3 1QT.
- 40 channel 27MHz AM TX/RX good working order. Will swap for VHF wavemeter or WHY? Terry, G1FFH, 25 Duke Street, Fitzwilliam, Pontefract, W Yorks WF9 5AF.
- Oscilloscope, Hameg HM203, dual trace, 20MHz. Unused due to abandoned project, still boxed and absolutely as new £170. Test set (telegraph distortion measuring) by Plessey. Looks like CRO but has circular 'X' trace. In working order ripe for conversion £10. Collection of quality power transformers, few valve types, all going cheap. Phone or SAE for details. T E Tyler, 20 Rochester Way, Croxley Green, Rickmansworth, Herts WD3 3NG. Tel: 0923 776986.
- Spectrum 48K, issue two Fuller Master Unit (comprising of speech synthesiser, 3 chan. sound, joystick port and joystick), carrying case, over £70 software including tapes, magazines, and books (learning machine code book) £180. Not willing to separate. S C Gellion, Mill Farm Cottage,

Lichfield, Staffs WS12 5PG. Tel: Lichfield (05432) 55241 after 5pm.

● ATV converter. Micro wave modules MMC 435/600. UHF output. Never used. £19.00. Jones, 1 Greenway Close, Sale, Cheshire. Tel: 061 905 1040 office hours.

● Receivers Trio R1000 with Lowe UL1000 tunable external Pre-Amp and matching speaker £250. Grundig 2100 Satellit with SSB unit. LW-30MHz plus VHF £110. ICOM IC7308 band, HF transceiver, with SSB/CW/FM £430. 60ft 'Clarbroke' telescopic tower with motor winch, suitable for heavy antennae. Wanted: FT290R and 13.8volt 25amp protected PSU. Offers Mike Jackson, G3TSL, 27 Greenacres, Freckleton, Preston, Lancs PR4 1PS. Tel: (0772) 635560.

● Ken KP202, 2 metre, 6-channel, handheld, 2W O1P plus Ken KCP-2 charger and Ni-Cads, extra xtals manual. Will exchange for short wave receiver or WHY? Tel: 0475 706451.

● Acoustic Research AR94 loud speakers, suitable for use with amplifiers from 10 to 100W output power. Superb bass performance with a good punchy sound. Bargain at £130 for the pair. Tel: 0272 692305 (Bristol).

● SP600JX, 500Kc-30MCs, RX £150. KW77 amateur bands RX £65. SX27, 27-143MCs, RX and Discone antenna £55. Sansui AU-101 stereo amp 2x 40W £25. Howard 450 RX, very rare. C1937, working £100. Kyoritsu 1100 multimeter £12. 12 years bulletins £5. Hacker helmsman portable 3 SW, med long £12. All working and good cond. D C Brightman, 34 Caledonian Road, New Bradwell, Milton Keynes, Bucks. Tel: Milton Keynes 0908 314095 (after 3pm).

● Wartime BG342N. Working order. Offers. Tel: 0734 883418 (after 8pm).

● BBC B Morse reader and morse sender program, plus a tutor course program £5.50. R A Brooks, 'Wayside', South Milton, Kingsbridge, S Devon. Tel: Kingsbridge (0548) 560771.

● HF, 10FM & 70cm gear. Trio TS120V, 5-band, 80m to 10m & stab PSU £295. Trio 8400, 70cm, FM, 10W 430/40 £180. 10FM or HF linear 200W out 10W in. To FM, 25W out 5W in £15. 30 amp switcher 14.5/22V £55. Daiwa rotorator 7500R £85 plus carriage. Ted, G4TBF. Tel: Blackpool 700637.

● Icom IC2E with case and charger and 2 spare packs with new Nicads + 12V pack. £140 ono, or swap for FT290R without mods + cash adjust. or for standard C58 portable multimode + cash adjust. MC 50 desk mic. New unwanted Xmas gift £25 ono. Radial kit for HF5V £25 or swap either for Welz SP15M PWR. Tel: 0248 712763 (QTHR GW6 ITL).

● Shack clear out (enforced by protracted redundancy). Transformers, chokes etc - suitable linears. Parmeko Potted Xformer Primary 230V-440V. Sec. 0-240-250-260-270V @ 210mA. 0-725-750-775-800V @ 300mA £10. Parmeko Primary 230V. Sec 620-550-375-0-375-550-620V @ 250mA. 2 x 5V 3A LT. £10. Thordarson Primary 190-210-230-250V. Sec 700-0-700V @ 175mA £5. Parmeko Potted Primary 115-0-115V (230V). Sec (LT) 2V @ 1.5A. 5V @ 3.0A. 4V @ 1.5A. 4V @ 4.4A. 6.3V @ 0.9A. 6.3V @ 2.2A. 6.3V @ 0.15A. 17.85V @ 1mA. £6. Xformer Primary, 230-240-250V. Sec 610-0-610V @ 185mA £5. Woden Primary, 240V tapped. Sec 650-0-650V @ 200mA. 5V @ 500mA LT £5. Eng. Electric Potted Choke 3H @ 500mA £5. Parmeko Potted Choke, Gresham Potted Choke 10H @ 250mA £4 each. Woden LF Choke (2) 12H @ 250mA £4 each. Potted LF Choke (new boxed) 10H @ 200mA £5. Paper capacitors 2 x 4MFD, 1.5KV, 10 x 4MFD, 1.0KV, 1 x 4MFD, 750V, 4 x 4MFD, 600V. £1.00 each or £14 the lot.

Scores other mains modulation xformers and chokes. Relays, magazines, variable capacitors. Several hundred valves, mostly new. TX/RX/TV. SAE all enquiries please.

R.220 Receiver (4 metres) not working, suitable spares, £4.00. 1 each TU5B/TU9B antenna tuning units in black crackle cases. Contains TX wide-spaced variables, 2in Eddystone style coil formers, ceramic switches, etc. Best offer secures. 1KW. Low pass filter, £6.00.

1 VTVM (Valve Voltmeter No3) Ex military, mains operated precision instrument. Measures AC and RF balanced/unbalanced voltages up to 1,500V, DC voltages up to ±100V. In excellent condition with probes, circuit and instructions. £35.00.

Loudspeakers 1 H/D Fane, 12in Hi/Fi - used, O/K. £5.00. 1 Stentorian (WB), 10in, 12W, Cambric Cone,

Hi/Fi, new boxed unused. Model HF1012 £5.00. 2 R/S, 8in 8 OHM. New boxed unused £4.00 each.

Prefer buyer collects heavy items or pay carriage. Fairclough (G30EI - QTHR), 28 Rimmer Green, Scarisbrick, Southport, Merseyside.

● HRO 5T receiver with mains PSU and complete set of nine general coverage coils 50 KL-30 ML clean working condition with handbook £60. Buyer collects. K G Pullen, 210 Hollett Rd, Penfilia Est, Treboeth, Swansea, SA5 9ER.

● Yaesu FT901DM £440. FV901DM £100. FC901 ATU £80. SP901P exten speaker with patch £30. KW trap dipole Balun 40m cable £30. Rotator, control 8 + Y antenna £50. Office desk with custom built square tube shelves to suit. Yaesu equipment £50. R N Kendrick, 41 Kingsway Avenue, Paignton, Devon. TQ4 7AA. Tel: (0803) 843350.

● Pye Radio Telephones in working order, easily converted to Amateur bands. Hand-held Bantams 1.5W output £15, Cambridge Mobile 5W £10, Vanguard 20W £18, also Avometers Model 7 £15, Model 40 £12, York 863 CB new with guarantee, Fidelity 2000 also new £29 each. Many other spares and bits including valves. Carriage extra. Walker 23 Forest Hill, Yeovil Somerset.

● Two Mullard fast valve testers with cards £35. Avo valve tester and analyser with manual £28. A Mabrouk, 21 Redington House, London N1. Tel: 01-278 4806

● FT290 transceiver, case, Nicads, charger, Alinco 30W linear, whip, SWR meter £260 ono. ZX81, 16K. Offers. Tel: 01-421 1513

● Racal LF converter RA 137A, with manual £55. Postage extra. Robin Filby, 89 Eighth Avenue, Bridlington, East Yorkshire YO15 2NA. Tel: 0262 602278

● 40 x 250B valves. Two brand new boxed valves. Never used. One VHF base in very good condition plus one ceramic chimney. Offers. Tel: 083485 602

● Books and magazines. Large selection dating from 1800 to present day. Dealing with all aspects of electronics, electricity, radio and broadcasting etc. Many collectable items. Also selection of modern books at good prices. Phone for free list. Steve Whitt. Tel: 0473 54405 (evenings) or 0473 644829 (office hours)

● Morse tutor program for BBC Micro only £3.50. Morse RX/TX Program for BBC only £4.00. 747 Flight Program only £3.50. Also other programs available. Circuit diagrams and constructional details for many projects, both valve and transistor. We may have the valve you require, due to clearing out shack lots of old and modern valves. Send SAE for full list. C J Duffy, 105 Cranbrook Street, Oldham, Lancs, OL4 1QH.

● Two Burndept, 3 channel transceivers less X Tals. One UHF, one VHF, 6 Nicads, one mobile VHF adaptor, also Burndept charger for Nicad's, need's attention. The lot £200 or will separate. Two Pye Bantams VHF, low band transceivers complete with cases, Nicad's and battery charger £60. SX 200-N scanner AM/FM all brands. 32,000 channels, 16-memory channels, 26-58, 58-88, 108-180, 380-514 MHz, includes 10M, 6M, 4M, 2M, and 70cm amateur bands. Mint condition £180 or near offer. 8-Element Yagi antenna 'split' with coaxial cables, Rotator and control box, all in good condition. Price £45. Tel: Burnley 0282 59320.

● SX200N scanning RX with PSU. VGC £200 ono. KW2000A complete with PSU/LS also Shure 444 Mike, VGC, £180 ono. Approx 230 RX and TX valves, mostly new, offers. Twin meter SWR bridge new £10. Prefer buyer collects or carriage extra. Letters only please. D Bemister, 69 Woodfield Drive, Gidea Park, Romford, Essex. RM2 5DD.

● ITT Studio 60 tape recorder £15. Microtest 80 20K multimeter £12. Cyldon 12 channel turret tuner £3. 45 used 9BA valves all different £5. 3 VHF loft aerials £3. 3 dual standard table top TV aerials £4. Large box conds, resists, coils, pots £5. C. Paul, 82 Muirshiel Cres, Glasgow G53 6PJ. Tel: 041 881 5099.

● Pye Cambridge High Band 2AM 10' DS and 1AM 10B. No mikes but remote cable and control box for boot mount. Unconverted. Open to offers or WHY. Tel: Tamworth (0827) 51591.

● Realistic DX-160 communication receiver with Digidex frequency counter. Both in very good condition, not used much £150. M Richards, c/o 'Hillview' Aughton, Collingbourne Kingston, Nr Marlborough, Wilts. Tel: 398.

FREE READERS SMALL ADS

WANTED

- ARI 5955 units for 10GC Ham use. WGATC c/o Smith, 381, Carterhatch Lane, Enfield, Middlesex. EN1 4AN. Tel: 363 8910.
- Sweeper, Telonic or Texscan preferred, with Manual and accessories, must cover up to 200 MHz, 1000MHz preferred. Cheap valve. Amateur HF bands transmitter, faulty set OK if cheap enough. GW2 HCJ QTHR, Tel: 0766 770637 (evenings).
- 2M Multimode Kenwood ATZ230 tuner. Tel: 0277 354378 any time (Essex).
- Icom IC 251E VHF XCVR or Sommer Kamp TS 788DX XCVR. Will exchange TEAC X3R stereo reel to reel tape recorder. Auto reverse. cost £400, used half hour only. R M Dotchin, 2 The Crescent, Shorts Town, Bedford MK42 0UJ. Tel: Hitchin 815016. Ext. 2453 Working hours.
- Air band receiver portable or not. Aviation style headset and mic e.g. Airlite 62. Harrison, 01-802 5516.
- Trio model 9R59D communication receiver, in good condition with manual or gen coverage receiver. B40 in working order plus manuals or handbooks, must be reasonably priced as unemployed and new to hobby. K G Pullen, 210 Hollett Rd, Penfilia Est, Treboeth, Swansea SA5 9ER.
- A model car preferably with low voltage DC electric motor, 1 foot to 2 feet long (saloon body preferred). Model tractors, lorries etc are not suitable. Steering if possible, not essential. Will pay fair price for a car in good condition within Yorks, Derbyshire area or will exchange for Pye, Philips, Thorn etc TV spares. A Bouskill, 129 Lymminster Road, Sheffield, South Yorks S6 1HY. Telephone: 0742 311191 after 4.30.
- Yaesu FRG7 or Lone SXR30 receiver. E Whitehouse, 461 Nottingham Road, Derby DE2 6NA. Telephone: Derby 664218.
- KW103 SWR power meter. Have FRG7 for sale £110 or part exchange. Telephone: Herne Bay 02273 3511 (evenings or weekend).
- News from anyone who knows how to make 10m Aerial wire. Think it is tuned to 200kHz 1500m Aerial. Is inverted L type. Ian Millar (5H3AP). Los Arcos 10, La Nucia, Alicante. Spain. Tel: Alicante 873315.
- Would like to hear from anybody with experience of 934MHz CB. Please write to L C Williams, 39 Clockhouse Way, Braintree, Essex CM7 6RD.P
- VFO for Trio 7200G 2m Transceiver. Tel: 0344 882545 (evening), or 01 745 3347 (day).
- Late model TR/RX covering amateur bands with ATU and whip type aerial. Also general coverage communications receiver required, as back up communications for yacht 'Reina Del Pacifico'. Yacht is based in the Aegean and Skipper willing to offer summer cruise to seller, in part payment. Aft cabin sleeps 2. Pick up at Greek island of Samos. Replies and enquiries to: Skipper, 'Reina Del Pacifico', c/o Flat 3, 23 Canada Grove, Bognor Regis, Sussex. Tel: 0243 865715.
- 12MHz Xtals for Seavoice Marine FM. RX, TX for 144 conversions. A E Jeffrey, 42 Dennis Road, Padstow, Cornwall PL28 8DF. Tel: Padstow 532723 (after 6.30pm).
- Trio R2000 and Trio VHF converter, in first class condition. Tel: (Wroxham) 06053 3292.
- Swap Super 8 Camera, projector, editor and splicer for good 2m rig or linear-amp in good condition, 1W input. Toni. Tel: 021 236 1974 ext 268 (leave message, anytime.)
- Heathkit Mohican communications receiver. Please state price and condition. Midland 3001 CB rig, AM or FM, wanted for case and chassis. Please state condition and price required. Mr Barnett, 137 Ringinglow Road, Great Barr, Birmingham B44 9BN. Tel: 021 360 6510.
- Pair of matched Lowther PM6's drive unit loudspeakers, plus cash adjustment for a 2m multimode rig. Condition not too important, but must be 100% working. Also have Emerson stereo FM tuner with LW, MW, VHF stereo. Only 2 months old and has 10 months manufacturer's guarantee left. Also wanted HF receiver. Brian Barwick, 2 Laisteridge Lane, Bradford, West Yorks BD7 1RD. Tel: 0274 727734.
- Exchange Casio-tone MT45 (inc batts, adapter) Plus Seisho small cassette player with headphones. New for 2 mtr Multi-mode TX/RX or 2mtr

- TR/RX (Trio, Yaesu, AoV, Icom, FDK). Must be in good condition. Write Shaheen Aslam, 38 Woodlands Road, Middlesborough, Cleveland, TS1 3BW.
- BC221 freq. meter or equiv good working order with original charts, also diagram/manual of Lafayette RX HE80. Buy or borrow. Please state price. Write J Holmes, 2 Lyneford Gdns, Taunton, TA2 7LJ. Tel: Taunton (0823) 77119.
- Yaesu FT 720 RV 2m 10W FM Mobile purchased 1.3.84. Used on RX 5 mins only. £169. G1FUO. Not QTHR. Tel: South Elmsall 43101.
- Buy or borrow to copy manual and circuit diagrams of Kenwood R-300 Com/Tion receiver. Desperate. Panayides Anastasis (5B4NA), 31 London Street, Ayios Dometios, Nicosia, Cyprus, 109. Tel: 021-72521.
- Data, plug-ins, accessories wanted for Telonic SM 2000 sweeper. Also cheap valve transmitter for amateur bands. Faulty unit with data OK. GW2 HCJ. Tel: 0766 770637 (evenings).
- Toni-Tuner must be in mint condition. G3ZNZ QTHR. R A R Matthews. The Old Post House, Lowthorpe, Driffled, North Humberside, YO25 0AS.
- Cheap VHF receiver. Doesn't matter about the condition but must work, also wanted frequency counter VP to 144MHz. Has any one got 518 X3 colinear or decent vertical for hard up 4th year student. Brian Barwick, 2 Laisteridge Lane, Bradford, BD7 1RD. Tel: 0274 727734.
- Double Beam Oscilloscope. Must be in good condition and able to work at 10MHz. C J Ball, 11 Gordon St, Sutton in Craven, Keighley, West Yorks. BD20 7EU. Tel: 0535-36784.
- 'Senior Citizen' enthusiast wants Linsley Hood cassette recorder (Series 2) by Hart Electronics. Complete working or unbuild kit, with VFL910 deck. Even part kit considered, but must have deck with it. Not too expensive please. Could exchange with camera. Ken Evans, Shelford Cottage, Melbury Abbas, Shaftesbury, Dorset. Tel: Shaftesbury 3515.
- Racial RA63 SSB adaptor, HRO and coils + P/P. Milton Keynes, 0908-314095 (after 3pm).
- Trio R2000 and Trio VHF converter in first class condition. Tel: Wroxham (06053) 3292.
- Help! Has anybody any idea who may have hidden in his shack a VFO 30G or any VFO that will adapt to fit the Kenwood Trio TR-7200G. If you do and it's for sale please contact Terry, G1FFH at 25 Duke Street, Fitzwilliam, Pontefract, WF9 5AF.
- Manuals or circuit for Heathkit oscilloscope 0-12U and electronic switch S3U. Also Philips Scope PM 3201. Buy or borrow. Write C G Tennant, 7 The Maltings, Cranleigh Gardens, South Norwood, London, SE25 6UJ.
- Benkson portable radio model 999. This radio has fourteen transistors and covers five wave bands and is powered by batteries only. Frank T Plan, 215 Dickson Avenue, Dundee, Scotland. DD2 4DD. Tel: Dundee 645325.
- AM CB and plans for all band AM TX. Thomas Williams, 51 Alamein Drive, Winsford, Cheshire. CW7 1DG.
- FT 290B and 13.8V, 25 amp protected PSU. Mike Jackson G3TSL, 27 Greenacres, Freckleton, Preston. Lancs, PR4 1PS. Tel: 0772 635560.
- Manual for Lafayette receiver HE80 or photostat. Will pay. Ray White, 38 Boxted Avenue, Clacton on Sea, Essex.
- Owners Manual/Service manual or telequipment D31R, Taylor valve tester, Windsor 45B/photocopy, buy, borrow. Tony Palmer, 409B Chiswick high Road, London, W4. Tel: 01 994 8001.
- Yaesu FRG 7700 or Trio R2000. Have to swap Ham International Jumbo Homebase CB including Protel stand mike with graphic equaliser, compressor, etc. as new. A Campbell, 24 Elizabeth Rd, Seaton, Devon. EX12 2DS. Tel: Seaton 22115.
- Urgently required, circuit diagram or any information for Metro model U127S AC/12VDC. B/W 12in portable TV, make unknown. Denning, 46 Court Road, Kingswood, Bristol. BS15 2QG. Tel: Bristol 675006.
- RTTY and SSTV programs for the CBM64 wanted on cassette. exchange possible with other programs. D C Cabasson, 25 Rve Epoinay, 94120 Fontenay-Sous-Bois, France.
- Circuit information on how to convert Harvard 410T. Forty Channel 27MHz hand-held NBFM transceiver to work on 29.6MHz amateur band.

- Anthony Stokes G3ZRH, Shenfield Crescent, Brentwood, Essex, CM15 8BW. Tel: 0277 221465.
- Exchange FT708R 70cm Portable TX/RX, NC-9C charger plus Datong D70 Morse Tutor, All as new in original packaging, for FRG7700, FT101, R1000, R600 or WHY? Brian Aspinall G6CJL, 5 Park Fields, Moor End Road, Halifax. Tel: (0422) 54635.
- Manual or circuit diagram for RCA Victor AR77E. Will purchase or photo copy. E Robins, 69 Hart Road, Byfleet, Surrey, KT14 7HL. Tel: Byfleet 40753.
- Data books, ESP Motorola RF manual WHY? G4AIR Tel: 0606 882949. QTHR.
- Trio TS820 Add ons, digital freq. unit, external VFO. C S Fawkes, 130 Chatterly Drive, Kidsgrove, Stoke on Trent, Staffs. Tel: Kidsgrove 72100.
- One FV-101 for Yaesu FT101. Plus SP-101P for same. Good price paid. Tel: Bangor (0248) 354022 or write David Oates, 41 Fford Tegai, Maesgeirchen, Bangor, Gwynedd.
- Ireland Bearcat or similar air band etc. Scanner. Must be working well. Mods accepted. Service manual for Philips PM5508 Pattern Gen. expenses paid, can photocopy. Ray Lyons, 27 High Meadows, Gouldavoher, Limerick, Ireland. Tel: 061/29287.
- Reward £50 for QSL card G2AVI. Also required corsor ganging osc. and CCT for Marconi LCR Bridge TF 868/1. Have CCTs for Airmec 248A and 853 for free loan. Also wanted UK call book, 1946 or 1947, to copy. L.R.K. Gregory, The Well House, The Downs, Herne Bay, Kent. CT6 6JP. Tel: 02273 4774.
- Triband Yagi, FT102 accessories and Shure 444. (Cash waiting). Clive RS84614. Tel: (0279) 28857, evenings or weekends.
- Modification information on PYE PF1 pocket-phones to increase RX sense and TX modulation for purchase or copy. Also wanted circuit diagram of Icom HM10 scanning microphone. T. J. Watkin, 44 Albion Road, Helston, Cornwall.
- Circuit diagrams for CB rigs. AM, FM, SSB or Legal UK diagrams - diagrams returned if address enclosed. Thanks to everyone who has helped so far. Any diagrams or information contact Ian Wiseman, 13 Swift Gardens, St Giles, Lincoln LN2 4NA.
- Sony ICF 7600. State price, year, condition etc. Have Eddystone 730/4 plus cash if of interest. J. L. Aldersley, 9 Balmoral Cres, Dronfield, Woodhouse, Sheffield. S18 5ZY. Tel: (0246) 410545.
- Copy of 'Antennae' by Kraus. Bob Davis, 88 Goring Road, Worthing, BN12 4AB. Tel: 0903 41109.
- EX WD RX's HRO 348 etc: non workers or repairable. Also HRO coils and P/pack. Racial RA63 SSB adaptor. Circuit for Hallicrafters S24 Defiant. Tel: 0908-314095 after 14.00.
- Quad AMII tuner, Long, Med, Short Wave, with Manual. J. E. Ellis, 13 Oakhill Ave, Pinner, Middx. HA5 3DL. Tel: 01 429 0735.
- Vintage wireless books, mags., crystal sets, early wireless RX and catalogues reqd, by private collector. G. A. Chappel (Ex VQ4), Station Road, Arrochar, Dunbartonshire, G83 7DA. Tel: 031 02204.

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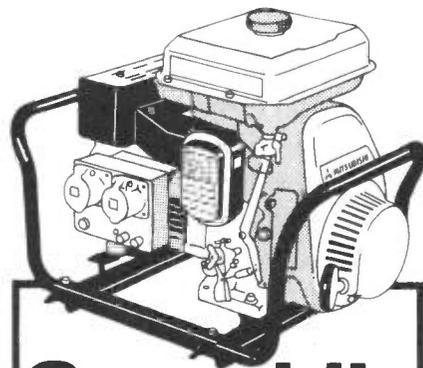
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PRODUCT NEWS

file of incomes and expenditures and using them in 'what if' calculations.

The user can choose the method of operation to suit a particular preference. Income and expenditure (forecast or actual) can be produced in clearly tabulated form, or as a bar chart if desired.

The program can be used with the basic Commodore 64 or in conjunction with a printer if fitted. All data can be logged for date and time and is security coded by the user.

Requests for information are fully prompted with 'Help' pages available from within the program. Up to 12 categories of expenditure and 3 categories of income are defined and these can be modified, under program control if desired.

Home Budget costs £9.95 incl VAT.

Kuma Computers Ltd. 12 Horseshoe Park, Pangbourne, RG6 7JW.

PROGRAMMABLE DIGITAL SOLDERING SYSTEM

A new soldering unit from Litesold combines the special features of the existing ETC-4B (CALPLUG temperature selection) and ETC-4C (digital temperature display) units.

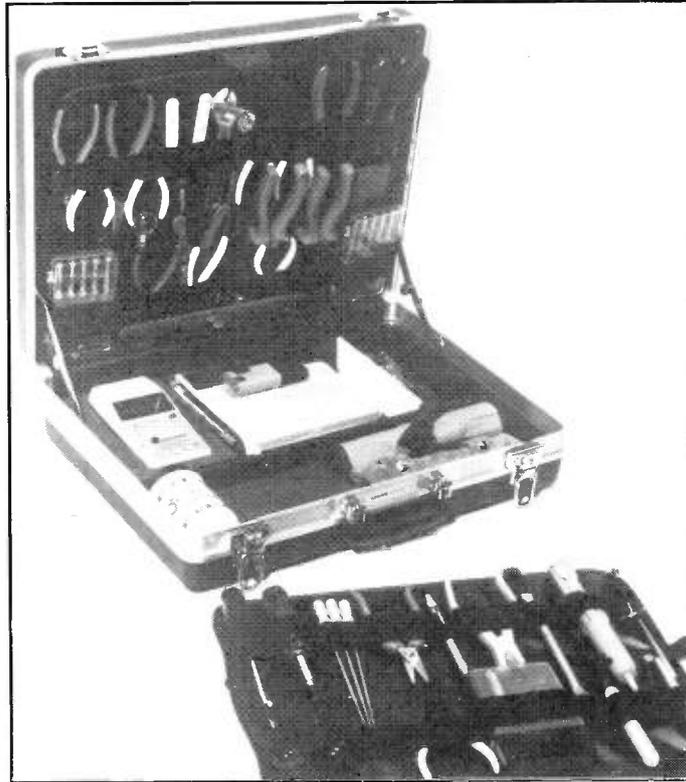
The ETC-4D provides instantly variable, but tamper-proof, temperature selection by means of 7 interchangeable colour-coded Calplugs. The value of the Calplug selected can be read off from the table on the front of the unit, which can only be operated at the selected temperature. Calplugs are available for temperatures from 210° to 400°C.

Using a special 5-transistor and IC circuit (common to all ETC-4 units) the power unit provides a controlled low-voltage dc supply to the lightweight soldering iron, in response to a thermocouple sensor located inside the bit. The output from the sensor also drives the digital LED temperature display on the front of the unit, which indicates the actual operating temperature of the iron, which can therefore be continuously monitored during use. Proportional-band temperature control ensures rapid heating and eliminates

swing. Idling temperatures are held typically within $\pm 1^\circ\text{C}$. Spiking, RFI, static and magnetic effects are totally avoided. The plug-in iron is interchangeable between all ETC-4 units, without re-calibration, and a

range of slip-on bits in 16 shapes/sizes is available.

Light Soldering Developments Ltd. Spencer Place, 97-99 Gloucester Road, Croydon, Surrey CR0 2DN. Tel: 01-689 0574



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It includes electronic pliers, instrument screwdrivers, soldering and desolder-

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Longs Ltd. Hanworth Lane Trading Estate, Chertsey, Surrey KT16 9LZ. Tel: 09328 61241

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user to set precisely the output voltage and current, and $3\frac{1}{2}$ digit, dual-range digital meters clearly display the output voltage and current on the front panel. Pressing the display settings button displays the actual settings of the voltage and current Potentiometers on the Front-Panel digital meters. This feature allows a current limit to be set without shorting the output and a voltage limit to be set without opening the load leads, reducing set-up time and increasing setting accuracy.

Many protective features are included in the HP 6023A to help ensure reliable and efficient operation. The built-

in overvoltage protection is adjustable from the front panel, and its trip point may be observed on the voltmeter by pressing the display OVP button. This allows the trip level to be set accurately without actually activating the OVP circuitry, thus making the OVP simple and practical to use. Low or High ac line or an excessive thermal condition will cause the HP 6023A automatically to reduce its output to zero. In this way damage to the power supply and its load may be avoided. With the use of an advanced 20KHz switching-regulation technique, the unit operates with Uniform Laboratory-Grade Performance at 200W output over its full operating range.

Hewlett-Packard Ltd. Literature Section, Eskdale Road, Winnersh, Wokingham, Berks RG11 5DZ. Tel: (0734) 696622

CMOS ADC GIVES DIRECT LCD INTERFACE

A $3\frac{1}{2}$ digit single chip CMOS analogue-to-digital converter, providing all the necessary functions for control of liquid crystal displays, including seven segment decoders, display drivers, reference and clock, is announced by Altek Microcomponents Ltd. The UM7126 offers direct LCD drive, with differential input and reference and a typical input bias current of 1pA. This is of particular benefit when used with load cells, strain gauges and other transducers based on Wheatstone bridges.

Auto zero is provided to within 10uV and true polarity at zero gives the ability to carry out precise null detection. Zero reading is guaranteed on all scales for 0V input with zero drift of less than 1uV/degree C. Noise level is less than 15uV peak-to-peak and the CMOS fabrication also gives a power supply current of typically 50uA. UM7126 is contained in a 40-pin DIL package and includes sufficient circuitry to enable direct LCD display of data without requiring any external active components.

Altek Microcomponents Ltd, 22 Market Place, Wokingham, Berks RG11 1AP. Tel: (0734) 791579

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ADVERTISING RATES & INFORMATION

ABC membership approved pending first audit Jan-Dec 1984

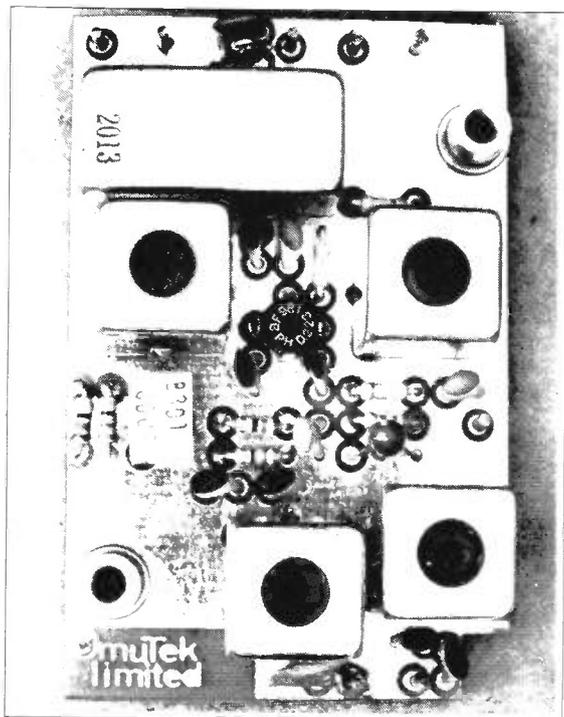
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Jul 84	10 May 84	16 May 84	18 May 84	8 Jun 84	
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<p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p>	<p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.</p> <p>COPY Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.</p>
<p>Printed — web-offset</p> <p>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.</p> <p>FOR FURTHER INFORMATION CONTACT Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE (0277) 219876</p>	<p>Overseas payments by International Money Order Commission to approved advertising agencies is 10%.</p> <p>CONDITIONS A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request.</p>



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THE NEW ANTEX TCSU-D

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ANTEX (Electronics) Ltd.,

Mayflower House, Plymouth, Devon. Telephone: 0752 667377 Telex: 45296



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AC125 30p	BC183C 12p	BF198 14p	TIP29C 45p	2N1304 80p	7417 28p	7447 75p	7486 35p	74119 70p	74160 65p	74190 58p	74LS27 21p	74LS83 51p	74LS138 40p	74LS169 35p	74LS243 81p	74LS293 46p
AC126 30p	BC183L 12p	BF200 35p	TIP30A 40p	2N1305 80p	7420 20p	7448 56p	7489 140p	74121 35p	74162 46p	74191 56p	74LS00 17p	74LS30 21p	74LS86 52p	74LS139 39p	74LS244 86p	74LS363 71p
AC127 30p	BC183BL 12p	BF224B 20p	TIP30C 50p	2N1308 80p	7422 25p	7450 25p	7489 37p	74122 41p	74163 46p	74192 55p	74LS01 17p	74LS32 21p	74LS90 39p	74LS147 121p	74LS245 86p	74LS372 110p
AC128 30p	BC184 12p	BF256 35p	TIP31 38p	2N1613 36p	7401 18p	7426 28p	7451 20p	74123 41p	74164 46p	74193 55p	74LS02 17p	74LS33 21p	74LS96 39p	74LS151 46p	74LS246 86p	74LS380 80p
AC132 30p	BC184L 12p	BF259 35p	TIP31A 40p	2N2222A 36p	7402 18p	7427 28p	7452 21p	74124 41p	74165 46p	74194 52p	74LS03 17p	74LS34 21p	74LS97 39p	74LS152 46p	74LS247 86p	74LS381 80p
AC133 30p	BC184B 12p	BF259 35p	TIP31C 40p	2N2369A 28p	7403 18p	7428 28p	7453 21p	74125 41p	74166 46p	74195 52p	74LS04 17p	74LS35 21p	74LS98 39p	74LS153 46p	74LS248 86p	74LS382 80p
AC141 30p	BC184L 12p	BF259 35p	TIP32A 40p	2N2904A 5A 30p	7404 18p	7429 28p	7454 21p	74126 41p	74167 46p	74196 52p	74LS05 17p	74LS36 21p	74LS99 39p	74LS154 46p	74LS249 86p	74LS383 80p
AC142 30p	BC186 30p	BF594 40p	TIP32C 40p	2N2906A 30p	7405 18p	7430 28p	7455 21p	74127 41p	74168 46p	74197 52p	74LS06 17p	74LS37 21p	74LS100 39p	74LS155 46p	74LS250 86p	74LS384 80p
AC176 30p	BC187 30p	BF595 40p	TIP36 140p	2N2907A 30p	7406 32p	7433 35p	7456 21p	74128 41p	74169 46p	74198 52p	74LS07 17p	74LS38 21p	74LS101 39p	74LS156 46p	74LS251 86p	74LS385 80p
AC187 30p	BC212A 14p	BF639 20p	TIP41B 50p	2N2926R 12p	7408 25p	7438 30p	7457 21p	74129 41p	74170 46p	74199 52p	74LS08 17p	74LS39 21p	74LS102 39p	74LS157 46p	74LS252 86p	74LS386 80p
AC188 30p	BC212L 14p	BF679 20p	TIP41B 50p	2N2926R 12p	7409 25p	7440 23p	7458 21p	74130 41p	74171 46p	74200 58p	74LS09 20p	74LS40 21p	74LS103 39p	74LS158 46p	74LS253 86p	74LS387 80p
AD149 30p	BC213 12p	BF679 20p	TIP42A 60p	2N2926Y 12p	7410 18p	7441 23p	7459 21p	74131 41p	74172 46p	74201 58p	74LS10 20p	74LS41 21p	74LS104 39p	74LS159 46p	74LS254 86p	74LS388 80p
AD161 45p	BC213B 12p	BF679 20p	TIP42B 60p	2N2926Y 12p	7411 25p	7442 40p	7460 21p	74132 41p	74173 46p	74202 58p	74LS11 20p	74LS42 21p	74LS105 39p	74LS160 46p	74LS255 86p	74LS389 80p
AD162 45p	BC213L 12p	BF679 20p	TIP42C 60p	2N2926Y 12p	7412 25p	7443 40p	7461 21p	74133 41p	74174 46p	74203 58p	74LS12 20p	74LS43 21p	74LS106 39p	74LS161 46p	74LS256 86p	74LS390 80p
BC107 12p	BC214 12p	BF679 20p	TIP120 80p	2N3053 30p	7413 26p	7444 95p	7462 21p	74134 41p	74175 46p	74204 58p	74LS13 20p	74LS44 21p	74LS107 39p	74LS162 46p	74LS257 86p	74LS391 80p
BC107A 14p	BC214B 12p	BF679 20p	TIP121 80p	2N3055E 60p	7414 37p	7445 71p	7463 21p	74135 41p	74176 46p	74205 58p	74LS14 20p	74LS45 21p	74LS108 39p	74LS163 46p	74LS258 86p	74LS392 80p
BC107B 14p	BC214L 12p	BF679 20p	TIP122 80p	2N3055E 60p	7415 37p	7446 71p	7464 21p	74136 41p	74177 46p	74206 58p	74LS15 20p	74LS46 21p	74LS109 39p	74LS164 46p	74LS259 86p	74LS393 80p
BC108 14p	BC217 12p	BF679 20p	TIP295 70p	2N3615 20p	7416 28p	7447 71p	7465 21p	74137 41p	74178 46p	74207 58p	74LS16 20p	74LS47 21p	74LS110 39p	74LS165 46p	74LS260 86p	74LS394 80p
BC108A 14p	BC238B 18p	BF679 20p	TIP300 50p	2N3615 20p	7417 28p	7448 71p	7466 21p	74138 41p	74179 46p	74208 58p	74LS17 20p	74LS48 21p	74LS111 39p	74LS166 46p	74LS261 86p	74LS395 80p
BC108B 14p	BC307 18p	BF679 20p	TIP301 50p	2N3615 20p	7418 28p	7449 71p	7467 21p	74139 41p	74180 46p	74209 58p	74LS18 20p	74LS49 21p	74LS112 39p	74LS167 46p	74LS262 86p	74LS396 80p
BC108C 14p	BC308 14p	BF679 20p	TIP302 50p	2N3615 20p	7419 28p	7450 71p	7468 21p	74140 41p	74181 46p	74210 58p	74LS19 20p	74LS50 21p	74LS113 39p	74LS168 46p	74LS263 86p	74LS397 80p
BC109 12p	BC327 18p	BF679 20p	TIP303 50p	2N3615 20p	7420 28p	7451 71p	7469 21p	74141 41p	74182 46p	74211 58p	74LS20 20p	74LS51 21p	74LS114 39p	74LS169 46p	74LS264 86p	74LS398 80p
BC109B 12p	BC328 18p	BF679 20p	TIP304 50p	2N3615 20p	7421 28p	7452 71p	7470 21p	74142 41p	74183 46p	74212 58p	74LS21 20p	74LS52 21p	74LS115 39p	74LS170 46p	74LS265 86p	74LS399 80p
BC109C 12p	BC329 18p	BF679 20p	TIP305 50p	2N3615 20p	7422 28p	7453 71p	7471 21p	74143 41p	74184 46p	74213 58p	74LS22 20p	74LS53 21p	74LS116 39p	74LS171 46p	74LS266 86p	74LS400 80p
BC140 35p	BC338 18p	BF679 20p	TIP306 50p	2N3615 20p	7423 28p	7454 71p	7472 21p	74144 41p	74185 46p	74214 58p	74LS23 20p	74LS54 21p	74LS117 39p	74LS172 46p	74LS267 86p	74LS401 80p
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BC142 35p	BC341 36p	BF679 20p	TIP308 50p	2N3615 20p	7425 28p	7456 71p	7474 21p	74146 41p	74187 46p	74216 58p	74LS25 20p	74LS56 21p	74LS119 39p	74LS174 46p	74LS269 86p	74LS403 80p
BC143 35p	BC347 40p	BF679 20p	TIP309 50p	2N3615 20p	7426 28p	7457 71p	7475 21p	74147 41p	74188 46p	74217 58p	74LS26 20p	74LS57 21p	74LS120 39p	74LS175 46p	74LS270 86p	74LS404 80p
BC147 12p	BC478 45p	BF679 20p	TIP310 50p	2N3615 20p	7427 28p	7458 71p	7476 21p	74148 41p	74189 46p	74218 58p	74LS27 20p	74LS58 21p	74LS121 39p	74LS176 46p	74LS271 86p	74LS405 80p
BC148 12p	BC517 45p	BF679 20p	TIP311 50p	2N3615 20p	7428 28p	7459 71p	7477 21p	74149 41p	74190 46p	74219 58p	74LS28 20p	74LS59 21p	74LS122 39p	74LS177 46p	74LS272 86p	74LS406 80p
BC157 12p	BC547 15p	BF679 20p	TIP312 50p	2N3615 20p	7429 28p	7460 71p	7478 21p	74150 41p	74191 46p	74220 58p	74LS29 20p	74LS60 21p	74LS123 39p	74LS178 46p	74LS273 86p	74LS407 80p
BC158 12p	BC548 15p	BF679 20p	TIP313 50p	2N3615 20p	7430 28p	7461 71p	7479 21p	74151 41p	74192 46p	74221 58p	74LS30 20p	74LS61 21p	74LS124 39p	74LS179 46p	74LS274 86p	74LS408 80p
BC159 12p	BC549 15p	BF679 20p	TIP314 50p	2N3615 20p	7431 28p	7462 71p	7480 21p	74152 41p	74193 46p	74222 58p	74LS31 20p	74LS62 21p	74LS125 39p	74LS180 46p	74LS275 86p	74LS409 80p
BC160 50p	BC556 20p	BF679 20p	TIP315 50p	2N3615 20p	7432 28p	7463 71p	7481 21p	74153 41p	74194 46p	74223 58p	74LS32 20p	74LS63 21p	74LS126 39p	74LS181 46p	74LS276 86p	74LS410 80p
BC161 45p	BC557 20p	BF679 20p	TIP316 50p	2N3615 20p	7433 28p	7464 71p	7482 21p	74154 41p	74195 46p	74224 58p	74LS33 20p	74LS64 21p	74LS127 39p	74LS182 46p	74LS277 86p	74LS411 80p
BC162 15p	BC558 20p	BF679 20p	TIP317 50p	2N3615 20p	7434 28p	7465 71p	7483 21p	74155 41p	74196 46p	74225 58p	74LS34 20p	74LS65 21p	74LS128 39p	74LS183 46p	74LS278 86p	74LS412 80p
BC168 12p	BC559 18p	BF679 20p	TIP318 50p	2N3615 20p	7435 28p	7466 71p	7484 21p	74156 41p	74197 46p	74226 58p	74LS35 20p	74LS66 21p	74LS129 39p	74LS184 46p	74LS279 86p	74LS413 80p
BC169 12p	BC570 20p	BF679 20p	TIP319 50p	2N3615 20p	7436 28p	7467 71p	7485 21p	74157 41p	74198 46p	74227 58p	74LS36 20p	74LS67 21p	74LS130 39p	74LS185 46p	74LS280 86p	74LS414 80p
BC170 20p	BC571 20p	BF679 20p	TIP320 50p	2N3615 20p	7437 28p	7468 71p	7486 21p	74158 41p	74199 46p	74228 58p	74LS37 20p	74LS68 21p	74LS131 39p	74LS186 46p	74LS281 86p	74LS415 80p
BC171 13p	BC572 23p	BF679 20p	TIP321 50p	2N3615 20p	7438 28p	7469 71p	7487 21p	74159 41p	74200 46p	74229 58p	74LS38 20p	74LS69 21p	74LS132 39p	74LS187 46p	74LS282 86p	74LS416 80p
BC172A 12p	BC573 50p	BF679 20p	TIP322 50p	2N3615 20p	7439 28p	7470 71p	7488 21p	74160 41p	74201 46p	74230 58p	74LS39 20p	74LS70 21p	74LS133 39p	74LS188 46p	74LS283 86p	74LS417 80p
BC173 13p	BC574 50p	BF679 20p	TIP323 50p	2N3615 20p	7440 28p	7471 71p	7489 21p	74161 41p	74202 46p	74231 58p	74LS40 20p	74LS71 21p	74LS134 39p	74LS189 46p	74LS284 86p	74LS418 80p
BC177 20p	BC583 50p	BF679 20p	TIP324 50p	2N3615 20p	7441 28p	7472 71p	7490 21p	74162 41p	74203 46p	74232 58p	74LS41 20p	74LS72 21p	74LS135 39p	74LS190 46p	74LS285 86p	74LS419 80p
BC178 20p	BC584 50p	BF679 20p	TIP325 50p	2N3615 20p	7442 28p	7473 71p	7491 21p	74163 41p	74204 46p	74233 58p	74LS42 20p	74LS73 21p	74LS136 39p	74LS191 46p	74LS286 86p	74LS420 80p
BC179 25p	BC585 50p	BF679 20p	TIP326 50p	2N3615 20p	7443 28p	7474 71p	7492 21p	74164 41p	74205 46p	74234 58p	74LS43 20p	74LS74 21p	74LS137 39p	74LS192 46p	74LS287 86p	74LS421 80p
BC181 23p	BC586 50p	BF679 20p	TIP327 50p	2N3615 20p	7444 28p	7475 71p	7493 21p	74165 41p	74206 46p	74235 58p	74LS44 20p	74LS75 21p	74LS138 39p	74LS193 46p	74LS288 86p	74LS422 80p
BC182 12p	BC587 45p	BF679 20p	TIP328 50p	2N3615 20p												

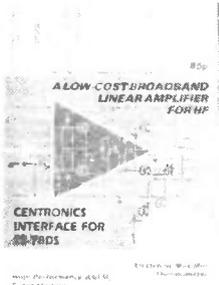
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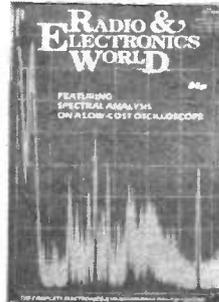
SEPTEMBER 1983

Projects — Max/Min Thermometer, 4 Channel Audio Mixer Morse Key Oscillator; Wideband FM Stereo Tuner Module 1; Rotary Encoder Interface (to Control TTL); Centronics Interface for Z8-TBDS (Parallel printer interface); Linear HF Power Amplifier. **Features** — Weather Facsimile Reception, Zilog Z8000, Data Brief 1-ZN419CE Servo IC



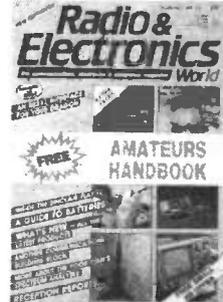
OCTOBER 1983

Designs — Modular Communication Systems Part 1; 4 Channel Audio Mixer Part 2; Tone Bursts; PF70 Conversion. **Features** — Noise Blanking Techniques; The Lambda Diode; A Guide to HF Coils Part 1; The Chromicra (Colour Processing); Timeplex; Data Brief — The NEC PC1037H Double Balanced Modulator; Amateur Radio World. **Reviews** — Tandy VSC-1000 (Variable Speech Control); Yaesu FT-77 (Solid State HF Transceiver)



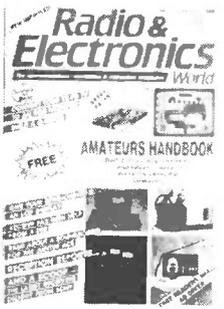
NOVEMBER 1983

Designs — Communications Building Blocks (Front Ends); Poor Man's Spectrum Analyser; Wideband FM Stereo Tuner Module Part 2; 4 Channel Audio Mixer Part 3; Three Digit Timer. **Features** — Squelch Systems; Expansion Bus (First add-on — A light pen); A Guide to HF Coils Part 2; Data Brief — NE584 PLL Tone Decoder. **Reviews** — Meteor 100, 600, 1000 (All-British Frequency Counters); Personal Pearl (For text and information manipulation)



DECEMBER 1983

Designs — Poor Man's Spectrum Analyser Part 2; Communications Building Blocks Part 2; A 4001/4011 Tester; Continuity Tester. **Features** — Inside the Sinclair Flat TV; An in-depth probe; A Circuit Designers Guide to Batteries; Data File on Op-Amps Part 1; Metal Detectors in Warfare; Data Brief 1-LM1821S Video IF PLL Synchronous Detector; Data Brief 2-SL6270 Gain Controlled Audio Amplifier; An RS232C Interface for Your Dragon 32. **Reviews** — ALDEN Weather Chart Recorder Kit; Digithurst MicroSight 1.



JANUARY 1984

Designs — Communication Building Blocks (Active Antennae); FAX Receiver; RGB Interface for the Ferguson TX-90; A Couple of Voltage Detectors; LCD Capacitance Meter; Cymar Q-meter (An aid to winding coils); Zener Diode Checker; A Drinkers Delight; LCD Display Option for the Rewbichron II. **Features** — A Novel Receiver (Sony); Capacitors for Coupling, De-coupling and Filtering; Data File on Op-Amps Part 2; Farewell to Test Card F; A Soundboard for the Jupiter Ace. **Data Brief** — MC1377 Colour Signal Encoder.



FEBRUARY 1984

Designs — Switched Mode Power Supplies; Crowbar Protection Circuit; Switched Step Attenuator; Universal NiCad Charger; Communications Building Blocks (IF Amplifiers); Real Time Calendar Clock. **Features** — Data File on Op-Amps; Six Antennas from Three Wires (Double your directions without doubling your cost); Designers Update (Helical Filters); Moving Pictures from Wax — Phonovision; Computers, Communications and Applications; **Data Brief** — Low cost, wide range varicap diodes.



MARCH 1984

Designs — Modifying the Pye PF1 Pocketfone Receiver; Communications Building Blocks (IF Amplifiers); One Night's Work (Audio-Amp); 200W PEP Transmatch. **Features** — Sony ICF 7600D Receiver; Data File on Op-Amps; UOSAT-B; AKD Absorption Wavemeter; **Data Brief** — Hitachi HA 1197 AM Tuner; Oscar 10 and its Orbit Parameters; Programmable Sound Generator (the AY8910 family); Random Morse Computer Program; ICOM World Clock.



APRIL 1984

Designs — One Night's Work (IF Oscillator); HF Linear Amplifier; The Piano Keyer — only £5 for Perfect Morse; Peak-Reading LED RF Wattmeter; Speech and the Computer — Make the Beep Micro Talk!; 2 Metre Tiger Antenna. **Features** — Hall Effect Devices — Exploiting Magnetism's Effect on Conductors; **Data File** — CMOS Bilateral Switches and Multiplexer/Demultiplexer ICs; **Data Brief**-TD 2002A Linear IC

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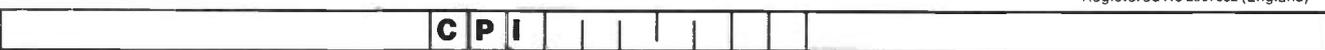
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HF Equipment

IC-751	All band AM FM SSB CW - Gen Cov Rx 32 Memories	1049 00	EX203	CW audio filter	14 50	DC Plugs (flat 4 pin)	30	DC plugs & sockets (flat 4 pin)	30
PS35	Internal switched mode power supply	149 00	EX205	Transverter unit	14 00	DC Sockets (flat 4 pin)	30	Master head pre-amp for 471/451/490	49 00
SM6	Desk microphone	34 50	EX195	Marker unit	17 00	Synthesized hand portable. 1.5 watts	169 00	Synthesized hand portable. 1.5 watts	219 00
HM12	Hand microphone with up/down scanning	16 50	FL44	455KHz SSB filter - 2.4KHz	79 00	Synthesized hand held. keypad entry. LCD display	229 00	Flexi 1/4 wave antenna	7 50
EX310	Voice synthesizer module	39 00	FL45	9MHz CW filter - 500Hz	45 00	10 watt booster unit for 2E	69 00	Accessories same as IC2E/O2E	
RC10	Frequency controller unit	29 95	FM04	FM unit Tx & Rx	49 00	Standard battery pack	25 00	SSB portable - CW. 3 watts output	257 00
CR64	High stability xtal unit	49 95	IC-720A	No longer available. Accs still available		Low volts high capacity (long life)	38 00	DC charger 240v	41 80
FL32	9MHz CW/RTTY narrow filter - 500Hz	39 00	PS20	External power supply 20 amps	119 00	Empty battery pack. takes 6 x AA size cells	7 95	DC charger 13.8v	41 80
FL63	9MHz CW/RTTY narrow filter - 250Hz	39 00	CF1	Cooling fan for PS20	24 00	High volts high capacity (high power)	48 00	DC lead	1 75
FL33	9MHz AM filter - 6KHz	32 50	SM5	Desk microphone	34 50	O2E ONLY	59 00	Carrying case	8 25
FL70	9MHz SSB wide filter - 2.8KHz	35 50	FL32	CW narrow filter	39 00	Low volts high capacity	49 00	1.2 GHz Equipment	
FL52a	455KHz CW/RTTY filter - 500Hz	79 00	FL34	AM xtal filter	34 00	12v regulator pack (2E ONLY)	12 50	FM mobile 1 watt output.	
FL53a	455KHz CW/RTTY narrow filter - 250Hz	79 00	BC10	Memory back up unit	5 95	12v charger lead for c-gar lighter	4 95	40MHz coverage mems	439 00
IC-745	All band SSB CW AM (Rx only). Gen Cov Rx. 16 mems	639 00	FM03	FM unit Tx & Rx	89 00	Helical antenna	7 50	Bit Zero 23e. 1296MHz linear. lw in 7.9w out	179 00
PS35	Internal switched mode power supply	149 00	IC-R70	General Coverage Receiver 0.1 30MHz	549 00	Leatherette case (BP5)	5 00	50 MHz Equipment	
SM6	Desk microphone	34 50	EX257	FM unit	32 50	Leatherette case (BP4)	5 00	IC-551	Multimode base station. supplied
HM12	Hand microphone with up/down scanning	16 50	FL63	CW narrow filter	39 00	Leatherette case (BP3)	5 00	SSB CW only	379 00
EX310	Voice synthesizer unit	39 00	FL44a	455KHz SSB filter	79 00	T L 1	5 00	FM unit	112 00
EX242	FM unit Tx & Rx	32 50	CK70	DC cable kit	5 75	240v wall charger for 2E (all batt packs)	21 27	VOX unit	49 00
EX241	Marker unit	15 95	7072	Interface unit to transceive with IC720A	97 50	240v wall charger for 2E (USA)	6 69	Pass band tune unit	97 50
EX243	Curtis keyer unit	39 00	IC-R71	All mode Gen Cov Rx. k pad entry	649 00	240v wall charger for O2E (BP8 BP7)	6 69	Multimode portable. 3.10watt. supplied	
FL45	9MHz CW filter - 500Hz	45 00	IC-2KL	32 memories		Desk top drop in charger (fast and slow) old packs	9 95	SSB only	382 00
FL44a	455KHz SSB narrow filter - 2.4KHz	79 00	RC11	Remote control unit for above		BC35E	56 35	FM unit	28 50
FL52a	455KHz CW/RTTY filter - 500Hz	79 00	IC-2KL	1KW PEP Linear. auto band switching. complete with		BC25U	56 35	Nicad pack	59 00
FL53a	455KHz CW/RTTY narrow filter - 250Hz	79 00	2KLPS	Power supply to run 2KL linear	1309 33	BC15E	16 50	Charger unit	6 50
FL54	9MHz CW/RTTY narrow filter - 270Hz	39 00	IC-AT100	100Watt Automatic antenna tuner	269 00	BC20	199 00	Carrying case	22 50
IC-740	No longer available. Accs still in stock		IC-AT500	500Watt Automatic antenna tuner	369 00	IC-202S	199 00	Mobile Mounting Brackets	
PS740	Internal switched mode power supply	149 00	IC-PS30	Systems power supply. 25 amps continuous	229 00	HM9	41 80	MMB5	Mount for 251E. 451E. 720A. 730
SM5	Desk microphone	34 50	IC-AH1	Mobile antenna. 3.5MHz 30MHz	199 00	BC15E	41 80	MMB6	Mount for 240
EX241	Marker unit	15 95	VHF Equipment			DC lead	1 75	MMB7	Mount for 245E
EX242	FM unit	39 00	IC-271E	Multimode base station. 25w. 32 memories	629 00	FA1	8 25	MMB8	Mount for 255E 260E
EX243	Curtis keyer	39 00	IC-271HE	High power version of above. 100w	789 00	LC25	8 25	MMB9	Mount for 290E. 490E
FL44	455KHz SSB filter - 2.4KHz	79 00	PS25	Internal switched mode power supply	39 00	FA1	7 50	MMB10	Mount for 25E. 45E. 120
FL45	9MHz filter - 500Hz	45 00	EX310	Speech synthesizer unit	89 00	IC-471E		MMB11	Mount for 22U. 24G
FL52	455KHz CW/RTTY filter - 500Hz	79 00	AG20	Internal receive pre-amp	49 00	IC-471H	699 00	MMB12	Mount for R70. 740. 271E. 471E
FL53	455KHz CW/RTTY narrow filter - 250Hz	79 00	SM6	Desk microphone	34 50	PS25	879 00	MMB16	Mount for 2E. 4E. O2E. O4E
FL54	9MHz CW/RTTY narrow filter - 270Hz	39 00	IC-290D	25W Multimode mobile. 5 memories. scanning mc	469 00	PS15	89 00	MMB18	Mount for 751
IC-730	10-80 Mtrs compact transceiver	659 00	IC-27E	25W FM mobile. 9 memories. multi-function display	299 00	PS20	39 00	SS1	Shoulder strap for handholds
PS15	External power supply - 20amps	119 00	U216	Voice synthesizer unit	299 00	SM6	34 50		
PS20	External power supply with speaker - 20 amps	176 00	IC-25H	45W FM mobile. high power version of old IC25E	359 00	IC-490E	495 00		
SM5	Desk microphone	34 50	BU1	Memory back up unit for mobiles	24 50	IC-490E	329 00		
HM7	Hand microphone with pre amp	14 95		DC leads (flat 4 pin or square 6 pin)	4 50	BU1	24 50		
EX202	LDA unit for use with AT100/500	13 50				Spare DC leads (flat 4 pin or square 6 pin)	4 50		



IC-751, £1049.

The IC-751 now has an interesting and useful addition, a remote push-button frequency selector pad, so you can either twiddle knobs or press buttons.

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-skip options. The 751 is fully compatible with ICOM auto units such as the AT-500 and IC-2KL.

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

compatibility. First IF is 70.045 MHz. XIT and RIT adjustment is displayed. The transmitter features high reliability 2SC2904 transistors in a low IMD (-32dB @ 100W) full 100% duty cycle. Power is restricted to 40W on AM and adjustable from 10W on all modes. FM and the IC-FL44A crystal SSB filter are both fitted as standard.

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

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

ICOM
The World System

Thanet ICOM Thanet ICOM

NEWS DESK

More 50MHz permits to class A radio amateurs

Following the success of last year's issue of 50 MHz permits to 40 Class A radio amateur licensees the Department of Trade and Industry has agreed with the BBC that a further 60 permits be issued later in the year.

The permits authorise Class A amateurs to carry out propagation research in the 50-52MHz band, outside UK broadcasting hours (specifically Band I, Channel 2) on a strict non-interference basis. The agreement is for temporary use of the band and may be withdrawn at any time.

Any Class A Licensee wanting to take part in the experiment will be sent a questionnaire which can be got from the Department of Trade and Industry, Radio Regulatory Division (Amateur Licensing Section), Waterloo Bridge House, Waterloo

Road, London SE1 8UA, or from The Secretary, Radio Society of Great Britain, Alma House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JW. Applicants should write '50 MHz' on the bottom left-hand corner of the envelope and enclose a self-addressed, pre-stamped envelope.

Closing date for completed questionnaires is April 30. Selection of applicants will rest with the Department of Trade and Industry.

International facsimile transmission

A comprehensive guide to UK and international facsimile transmission has been published by British Telecom.

The 1984 UK Facsimile Directory contains more than 7,000 entries covering most sectors of British industry. Each entry includes the customer's name, address, fax machine number and

compatibility and there is a guide on how to make international fax calls and information on bureau services.

The Directory is available from British Telecom's telephone areas sales offices. It costs £4.50 (inc VAT) but is free to customers listed in the publication.

Bristol exhibition

The Micro City '84 exhibition is being staged at the Bristol Exhibition Complex from 15th-17th May. Already over 70 companies have booked to exhibit at the show, including ACT, Logica, DEC, Canon, DRG and IBM.

The exhibition is Bristol's fourth annual showcase of computers, business systems and communication equipment. It is organised by Tomorrow's World Exhibitions Ltd, 9, Park Place, Clifton, Bristol.

Communications for the Falklands

Engineers at Marconi Communication Systems Limited, Chelmsford, are working on a major order from the Ministry of Defence which will provide a fully digital 'line-of-sight', high traffic capacity communication link around the Falkland Islands.

Marconi will provide an all embracing system of communication cabins. These will house the digital microwave radio, multiplex, and microprocessor-based supervisory equipment.

The system is designed to work virtually unmanned in the harsh South Atlantic environment. All supervisory and fault alarm information from the sites will be linked back to the System Control Cabin based near Port Stanley, enabling control of the whole system to be carried out by a two-man team.

The GIOTTO spacecraft

Some details of the GIOTTO spacecraft were published in NEWS Section of the last two issues of *R&EW*. We now give (courtesy of British Aerospace Dynamics Group) details of the scientific payload for this interesting project.

GIOTTO SCIENTIFIC PAYLOAD

Imaging

Halley Multicolour Camera	Multispectral imaging of nucleus and coma.	Max Planck Institute, Lindau
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Coma Chemistry

Neutral Mass Spectrometer	Investigation of neutral, ionised and suprathemal constituents of coma.	Max Planck Institute, Heidelberg
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Ion Mass Spectrometer

	Abundance of Cometary ions, ion formation processes and interaction with solar wind.	Physikalisches Institute, University of Berne
--	--	---

Particle Experiments

Particle Impact Analyser	Mass and composition of dust.	Max Planck Institute, Heidelberg
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Dust Impact Detector

	Physical properties and spatial distribution of particles.	Space Science Laboratory, University of Kent
--	--	--

Halley Optical Probe Experiment

	Change in number density and physical properties of gas and dust through coma.	Service d'Aeronomie due CNRS, Verrieres le Buisson
--	--	--

Plasma Experiments

Reme Plasma Analyser	Composition and dynamics of cometary plasma.	CESR, Toulouse
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Johnstone Plasma Analyser

	Interaction between comet and solar wind; processes in coma and tail.	Mullard Space Science Laboratory, University College London
--	---	---

Magnetometer

	Magnetic and dynamic conditions at comet/solar wind interface.	Institut fur Geophysik und Meteorologie Braunschweig
--	--	--

Energetic Particle Analyser

	Measurements on solar particle background, cometary bowshock and tail.	St. Patrick's College, Maynooth
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Acorn launches BBC Micro 'Add on'

The most powerful expansion of the Acorn BBC micro-computer's capabilities has recently been launched. The new device, called the 6502 Second Processor, converts the standard BBC Micro Model 'B' into a high speed dual processor system, outperforming all other home and personal computers currently available – including 16 bit and 32 bit machines.

The 6502 Second Processor makes possible many sophisticated applications – particularly those requiring complex graphics or fast handling – that have hitherto been impracticable, or impossible on a conventional low cost Micro. The device is also the first use of Acorn's patented 'Tube' interface on the BBC Micro, a high speed data channel designed to enable external processors to 'talk' directly to the BBC Micro's own processor.

This 'dual processor' concept is unique to home computing. With the 6502 Second Processor connected, the host BBC Micro is dedicated entirely to handling input and output, screen display memory and system filing. Meanwhile the Second Processor, with its own 64K of User-Memory and 3MHz 6502 chip (double the memory and 50% faster than the BBC Micro itself) *simultaneously* concentrates on running the application program. To enable users to get maximum benefit from their 6502 Second Processor, Acorn have developed a special 'Hi-BASIC' ROM chip, which frees 44k of User Memory for

BASIC language applications. Up to 60k is available for assembly language programs. In addition, the full character set of the BBC Micro can be redefined without using any program memory. A second ROM is provided to update and replace the user's disk filing and/or Econet filing systems with a single combined chip. Both ROMs plug into the sideways ROM slots within the host BBC Micro.

The 6502 Second Processor also complements the BBC Micro in colour and size. It includes a ribbon connector to the host's 'Tube' port and an integral mains power supply with cable and plug. The unit, complete with two ROMs and User Guide, costs £199 incl VAT. It is available now direct from *Vector Marketing Ltd, Dennington Estate, Welingtonborough, Northamptonshire NN8 2RL* or from authorised Acorn dealers.

Computer-aided design on a home computer

The Acorn BBC Micro-computer can now become a professional drawing tool with the help of a new graphics system from Acorn Computers Ltd. Called 'Acorn Bitstik', the new peripheral uses the increased power and speed of the 6502 Second-Processor – enhanced BBC Micro to provide a versatile, low cost computer-aided drawing facility and for schools and colleges, the professional designer and producer of schematics, plans or business charts, the Bitstik System offers a sophisticated graphics facility 'at an affordable price'.

The Acorn Bitstik System, including joystick, ROM, utility disks and user guide, costs £375 incl VAT, and is also available from *Vector Marketing Ltd*.

The Sinclair story – the official biography

The official biography of Sir Clive Sinclair is being written by Cambridge author Rodney Dale who has known Sir Clive for over 20 years. 'However,' he says 'this is strictly not hagiography. Clive wants a 'warts-and-all' account – failures as well as successes. He will have a say in matters of fact, but not in how they are expressed.' Dale has access to the Sinclair archives, and is interviewing dozens of people who have been associated with Sinclair over the years. The study will look into the future as well as the past, and promises to be a fascinating insight into the world of Britain's best-known technical entrepreneur. Publication is scheduled for October this year.

The RAC Amateur Radio Group Scheme

Membership is open to all amateur radio enthusiasts, and provides membership of the Royal Automobile Club at a discount of £2 below the normal RAC membership

subscription rate. Since 1 June, 1983, the annual subscription for members of the group scheme has been £16.50. The group scheme's subscription renewal date is 17 May (World Telecommunication Day) each year, and all members renew on the same date. Anyone joining the scheme will pay at the pro-rata rate of £1.37 per month until the next group renewal date. In addition, the RAC once-only joining fee of £3 is also payable, regardless of the period remaining in the membership year. Radio amateurs who are already members of the RAC and who wish to transfer to the group scheme will not pay the joining fee. Desirable options are the RAC Recovery Service and the 'At Home' Service, the annual subscriptions for which are £13.50 and £5.50 respectively, annually from date of taking up the option. No additional subscriptions are payable for a member's spouse. The scheme is administered by the Royal Automobile Club's Scottish Western Counties Office, 200 Finnieston Street, Glasgow G3 8NZ. The co-ordinator of the scheme is Mr A W Hutchinson, 88 Broomfield Road, Chelmsford, Essex CM1 1SS, from whom application forms may be obtained.

British Amateur Television Club

The Department of Trade and Industry has granted licences for five amateur television repeater stations to be established in the UK.

This development is destined to have a significant impact on amateur television activities and should serve to establish widespread use of the 1.2/1.3 GHz allocation, helping to preserve the band for the amateur service.

A brief resumé containing the essential elements are given below.

REPEATERS on channel RMT-1 should receive signals on AM or FM and re-radiate them on AM. Those using RMT-2 receive and transmit FM only. These are only

general specifications at present and may vary slightly on different repeaters.

VISION transmissions are 625-line, negative going video/positive going syncs. FM signals are limited to ±6.5MHz deviation with CCIR pre-emphasis.

SOUND frequencies shown are for AM systems although FM transmissions also contain a 6MHz sound subcarrier.

AERIAL polarisation is horizontal.

REPEATER access is by the presence of a valid video signal at the receiver input.

It is expected that GB3GV, GB3TV and GB3VR will be operational almost immediately. Further information will be carried on the BATC news 'Hotline' service.

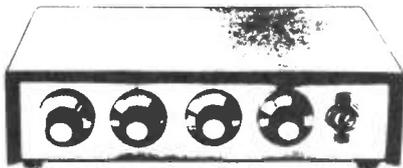
CALLSIGN	LOCATION	CHANNEL	VISION FREQ.		SOUND FREQ.*	
			IN	OUT	IN	OUT
GB3GV	Leicester	RMT-1	1276.5	1311.5	1282.5	1317.5
GB3UT	Bath	RMT-1	1276.5	1311.5	1282.5	1317.5
GB3TV	Luton	RMT-2	1249.0	1318.5	1255.0	1324.5
GB3UD	Stoke-on-Trent	RMT-2	1249.0	1318.5	1255.0	1324.5
GB3VR	Worthing	RMT-2	1249.0	1318.5	1255.0	1324.5

PREVIOUSLY ADVERTISED STILL AVAILABLE

Tape punch and reader	£22.50
Bench isolating transformer 250 watt	£7.75
BOAC in-flight stereo unit	£1.50
Drill assortment 4 each 25 sizes between 25mm & 2.5mm	£11.50
Battery condition tester, less box	£1.75
Nicad chargers, mains	£0.75
Flourescent inventor 13 watt from 12v	£3.50
Ten digit switch pad-pb phone etc	£1.95
Uniselector 2 pole 25 way	£4.60
Water valve mains operated	£2.50
Counter 6 digit mains operated	£1.15
ditto 12v resettable	£3.45
Double glazing clear PVC sheet, 23 1/2" wide-per running ft	£0.15
Locking mechanism with 2 keys	£1.15
Magnetic Clutch	£4.50
Mouth operated suck or blow switch	£2.30
Solenoid with slug 8-12v battery op	£1.82
ditto 230v mains	£2.30
Timer Omron STP NH 110v AC Coil	£6.90
Key switch with 2 keys dp mains	£1.75
Air valve mains operated	£3.75
Latching relay mains operated	£3.50
Dry film lubricant aerosol can	£0.65
Coin op switch, cased with coin tray	£4.60



8 POWERFUL MODEL MOTORS (all different)
for robots, meccanos, drills, remote control planes, boats, etc. £2.95



Complete kit of parts for a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form or £25.00 assembled and tested.

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are series wound and they become more powerful as load increases. Size 3 1/2" long by 3" dia. They have a good length of 1/4" spindle - Price £3.45.
Ditto, but double ended £4.25.
Ditto, but permanent magnet £3.75.



EXTRA POWERFUL 12v MOTOR

Probably develops up to 1/4 h.p. so it could be used to power a go-kart or to drive a compressor, etc. £7.95 + £1.50 post.

THERMOSTAT ASSORTMENT

10 different thermostats. 7 bi-metal types and 3 liquid types. There are the current stats which will open the switch to protect devices against overload, short circuits, etc., or when fitted say in front of the element of a blow heater, the heat would trip the stat if the blower fuses; appliance stats, one for high temperatures, others adjustable over a range of temperatures which could include 0 - 100°C. There is also a thermostatic pod which can be immersed, an oven stat, a calibrated boiler stat, finally an ice stat which, fitted to our waterproof heater element, up in the loft could protect your pipes from freezing. Separately, these thermostats could cost around £15.00 however, you can have the parcel for £2.50.

MINI MONO AMP on p.c.b., size 4" x 2" (app.)

Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of £1.15 each, or 10 for £10.00.



- BARGAIN OF THE YEAR -

The AMSTRAD Stereo Tuner.

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

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

Some of the features are: long wave band 115 - 270 KHz, medium wave band 525 - 1650 KHz, FM band 87 - 108MHz, mono, stereo & AFC switchable, tuning meter to give you spot on stereo tuning, optional LED wave band indicator, fully assembled and fully aligned. Full wiring up data showing you how to connect to amplifier or head-phones and details of suitable FM aerial (note ferrite rod aerial is included for medium and long wave bands. All made up on very compact board.

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

THIS MONTH'S SNIP

Hi Fi sound from your Spectrum 1 watt amp - pm speaker & instructions £2.45

REVERSIBLE MOTOR with control gear Made by the famous Franco Company this robust motor is approx 7 1/2" long, 3 1/2" dia. 3/8" shaft. Very powerful, almost impossible to stop. Ideal for operating stage curtains, doors, ventilators, etc. Even garage doors if properly balanced. Offered complete with control gear as follows:
1 Franco motor with gear box 1 push to start switch
1 manual reversing & on/off switch 2 limit stop switches
1 circuit diag of connections **ONLY £19.50 + postage £2.50.**

FOR SOMEONE SPECIAL

Why not make your greeting card play a tune? It could play 'Happy Birthday', 'Merry Christmas', 'Wedding March', etc. or 'Home Sweet Home', etc. Water thin 3 part assemblies, for making cards musical. Mini microphone speaker and battery with switch that operates as the card is opened. Please state tune when ordering. Complete, ready to work £1.25.

JOYSTICK

WHY PAY £10 OR MORE Make yourself a Joystick. Full details were given in Dec/Jan 'Sindair Projects' We will supply complete kit for £2.30. Although designed for the Spectrum or ZX81 it is equally suitable for any home computer.

TELEPHONE ITEMS

Plug and Wall socket 4 pin or 5 pin	£3.45
Plugs only 4 pin or 5 pin	£1.15
Modern desk telephone	£7.50
Heavy black old type	£5.50
External bell unit	£6.50
Bell ringing power unit	£4.50
Pick up coil	£1.15

STABILISED POWER SUPPLY (Mains Input)

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

PRESTEL UNIT brand new and complete except for 7 plug in IC's

Price: £19.75 + £2.00 p&p

Note: British Telecom may not connect this equipment as there is no manufacturer to guarantee it, however it is well worth buying for its immense breakdown value - sold originally at over £150.



25A ELECTRICAL PROGRAMMER

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



BELLS & ALARMS

Hooter/Siren 6v-12v	69p
Loud, med & soft buzzer	75p
Open buzzer ex G.P.O.	50p
12" Gong cast iron cased ALARM BELL 12v dc	£19.50
6" Gong 12v dc	£7.50
6" Gong mains	£8.50

50 THINGS YOU CAN MAKE

Things you can make include Multi range meter, Low ohms tester, A.C. amp meter, Alarm clock, Soldering iron minder, Two way telephone, Memory jogger, Live line tester, Continuity checker, etc. etc., and you will still have hundreds of parts for future projects. Our 10Kg parcel contains not less than 1,000 items - panel meters, timers, thermal trips, relays, switches, motors, drills, taps, and dies, tools, thermostats, coils, condensers, resistors, neons, earphones/microphones, nicad charger, power unit, multi-turn pots and notes on the 50 projects.

YOURS FOR ONLY £11.50 plus £3.00 post.

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15 conductors colour coded 200mt coil	£59.00
10 conductors colour coded 200mt coil	£39.00
Flex extension lead twin rubber	
5mm ideal gsm cutters etc. 250mtn coil	£25.00
50 meter coil	£6.75

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4 volt 4 amp	£1.75	24 volt 4 amp	£4.85
6 volt 1 amp	£1.15	25 volt 1 amp	£2.25
12 volt 1/2 amp	£1.15	35 volt 2 amp	£3.95
12 volt 3/4 amp	£1.55	38 volt 2 1/2 amp	£4.95
12 volt 1 amp	£1.75	26 volt 10 amp	£9.95
15 volt 2 amp	£3.45	50 volt 2 amp	£5.50
15 volt 4 amp	£4.60	25.0.25 1/2 amp	£3.95
18 volt 1 amp	£1.95	12.0.12 2 amp	£4.95
20 volt 1 amp	£2.30	115v 100w auto	£3.95
24 volt 2 amp	£3.45	115v 250w auto	£5.75

J. BULL (Electrical) Ltd.

(Dept RE), 34 - 36 AMERICA LANE, HAYWARDS HEATH, SUSSEX RH16 3QU. Established 30 YEARS

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £12 add 60p service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted day or night. Haywards Heath (0444) 454563. Bulk orders - phone for quote. Shop open 9.00 - 5.30, mon to Fri, not Saturday.

STORE CLOSING SALE

All stocks must go from one of our big warehouses. 10,000,000 items, everything from AERIALS to ZENER will be cleared at fantastically low prices - if you are a manufacturer you can save yourself a fortune - send for our Sale List, not for small buyers as minimum order £100.

EXTRACTOR FANS - MAINS OPERATED

Woods extractor:
5" - £5.75, Post £1.25
6" - £6.95, Post £1.25
5" Plannair extractor
£6.50 Post £1.25
4" x 4" Muffin 115v
£4.50, Post 75p
4" x 4" Muffin 230v
£5.75 Post 75p
All the above ex-computer, those below are unused.
4" x 4" £8.50 Post 75p
9" American made
£11.50 post £2.00
Tangential Blower 10x3
air outlet, dual speed
£4.60 Post £1.50.



LIGHTING & POWER CABLES

Made by Volex to BRITISH STANDARD SPECIFICATIONS

P.V.C. sheathed outer-copper clad conductors	
1.5mm flat twin 100 metres	£4.50
1.5mm flat 3 core 8E metres	£11.00
6mm flat 3 core metres	£54.00
16mm flat twin 8E metres	£115.00



MINIATURE WAFER SWITCHES

2 pole, 2 way - 4 pole, 2 way - 3 pole, 3 way - 4 pole, 3 way - 2 pole, 4 way - 3 pole, 4 way - 2 pole, 6 way - 1 pole, 12 way.
All at 25p each or 10 for £2.00

OTHER TYPES IN STOCK - PLEASE ENQUIRE

BLEEP TONE

These work off 12v and have an unusual and pleasant bleep 69p each.

CONNECTING WIRE PACK 96 lengths of connecting wire, each 1 metre long and differently colour coded, a must for those difficult interconnecting jobs. 85p the lot.

RED LEDS 10 for 69p. 100 for £5.75. 1000 for £52.

IN LINE SIMMERSTAT Ideal heat controller for soldering iron and many other hand-held appliances. £2.30. 10 for £17.25.



VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95. These are without case but we can supply a plastic case - £1.75 or metal case - £2.95.

Also available is adaptor kit to convert this into a normal 24 hr. time switch but with the added advantage of up to 12 on/off per 24 hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

IONISER KIT

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

OTHER POPULAR PROJECTS

Short Wave Set - covers all the short wave bands using plug-in coils. Kit complete	£14.50
R C Bridge Kit	£9.95
3 Channel Sound to Light - with fully prepared metal case.	£14.95
ditto - made up	£25.00
Big Ear, listen through walls	£9.50
Robot controller - receiver/transmitter	£9.50
Ignition kit - helps starting, saves petrol, improves performance	£13.95
Silent sentinel Ultra Sonic Transmitter and receiver	£9.50
Car Light 'left on' alarm	£3.50
Secret switch - fools friends and enemies alike	£1.95
3 - 30v Variable Power Supply	£13.80
2 Short & Medium wave Crystal Radio	£3.99
3v to 16v Mains Power Supply Kit	£1.95
Light Chaser - three modes	£17.50
Mullard Unilux HiFi stereo amplifier with speakers	£16.75
Radio stethoscope - fault finding aid	£4.80
Mug stop - emits piercing squawk	£2.50
Morse Trainer - complete with key	£2.99
Drill control kit	£3.95
Drill control kit - made up	£6.95
Interrupted beam kit	£2.50
Transmitter surveillance kit	£2.30
Radio Mike	£6.90
FM receiver kit - for surveillance or normal FM	£3.50
Seat Belt reminder	£3.00
Car Starter Charger Kit	£15.50
Soil heater for plants and seeds	£16.50
Insulation Tester - electronic megger	£7.95
Battery shaver or fluorescent from 12v	£6.90
Matchbox Radio - receives Medium Wave	£2.95
Mixer Pre-amp - disco special with case	£16.00
Aerial Rotator - mains operated	£29.50
Aerial direction indicator	£5.50
40 watt amp - hifi 20hz - 20kHz	£9.50
Microvolt multiplier - measure very low currents with ordinary multimeter	£3.95
Pure Sine Wave Generator	£5.75
Linear Power output meter	£11.50
115 Watt Amplifier 5Hz 25kHz	£13.50
Power supply for 115 watt amps	£8.50
Stereo Bass Booster, most items	£8.95

ONE WEEK'S WORK

(APPROXIMATELY!)

Although **R&EW** has published two frequency meter projects (Nov 81 & June 83) which measured up to 600MHz, readers still contact us requesting another design. We asked Stephen if he could produce something new, and after a groan he picked up his soldering iron and produced this little beauty.

VHF/UHF FREQUENCY METER

by S IBBS G4LBW

When talking to local amateurs I have found a need for a frequency meter to measure signals primarily in the 2m and 70cms bands. Not everybody wants to be able to measure HF signals apparently!

The design offered here is a liquid crystal display (LCD) meter and is a development from the June 83 design. The preamp/prescaler is new, using the very versatile SP 8680 from Plessey and all components, apart from the switch, are mounted on one double-sided PCB. This includes the display and obviates the need for a lot of the interwiring that would otherwise be necessary. Construction is not difficult provided care is taken and the finished result should be impressive.

How it works (refer to fig 1)

The ICM 7226A from Intersil is a 0-10 MHz frequency counter that is capable of directly driving an 8 digit multiplexed LED display (see *R & EW, June 83* for the *Data Brief* on this device). Multiplexing means that all the displays receive the same information at the same time (along the segment lines) but only one display is switched on at any time by the data lines.

The speed of switching between the digits is too fast for the human eye to detect and what we see is a stable 8-digit display. The technique enables multi-digit displays to be used with far fewer interconnecting leads (in this example it would be 16 rather than 65). However, for portable use, LED displays consume too much current, particularly if UHF preamps and prescalers are being used, (because these devices draw a *lot* of current!).

Fortunately the 7226 also produced a binary-coded decimal (BCD) multiplexed output, which is the display information coded into a BCD format. This can be decoded by another Intersil device, the ICM 7231A, to drive a triplexed liquid crystal display (LCD). Note this is different from a normal static LCD in that, again, fewer connections are needed, and there isn't a 'backplane'. Instead, the display is controlled by three 'common' lines. However, the 7231 requires a 3-bit code for digit control purposes, so the eight data lines from the 7226 are decoded by the 4532 to give the necessary 3-bit binary code. The final requirement of the 7231 is a low-going pulse on pin 1 to latch the data, and this is

provided by the E pin 15 of the 4532, which needs to be inverted, a job performed by TR1 and its associated components.

Master clock timing

The master clock timing for the meter is provided by the 10 MHz crystal oscillator circuit connected to pins 35 and 36 of the 7226, and the accuracy of the meter is primarily dependant on the tolerance of the crystal. The output from the 7231 controls the display and a decimal point can be activated by connecting pin 31 (7231) to one of the eight data lines.

The chevron beneath each digit can be turned on by connecting pin 30 to one of the data lines. Resistors R6 and R7 hold these two pins normally low, otherwise if left floating, all the decimal points and chevrons would tend to switch on.

The 7226 has 4 gate times ranging from .01secs to 10 secs, the latter giving the full 8-digit resolution. For portable use it was left that the 0.1 and the 1.0 seconds gates were the two most useful, obtained by connecting D₂ or D₃ to the range Input pin 4. As all the ICs run at 5V, the easiest form of regulation was employed, a 7805, with C4 and C5 to aid stability.

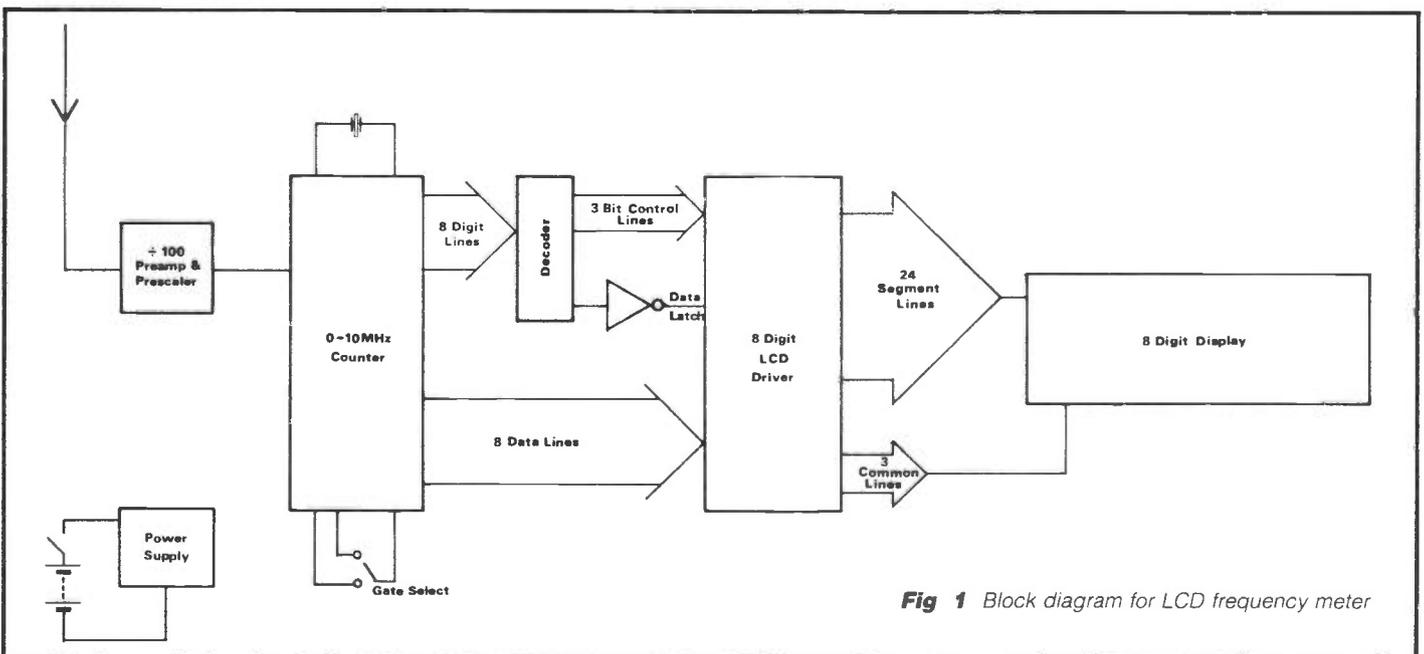


Fig 1 Block diagram for LCD frequency meter

FREQUENCY METER

Preamp/prescaler

The preamp/prescaler departs from the June '83 design by using the SP8680, which not only divides by 10 up to a minimum of 575 MHz, but also gives a TTL output as well as the usual ECL output. This means that the cheaper 74LS196 TTL $\div 10$ IC can be used to further divide the incoming signal and bring it into the 0.10MHz range of the 7226. The preamplifier is again the SL565C, because it is so easy to use. The prototype measured 14mV sensitivity at 10 MHz (I didn't measure below 10 MHz), 7mV at 144 MHz and 440 MHz – a huge range and very sensitive!

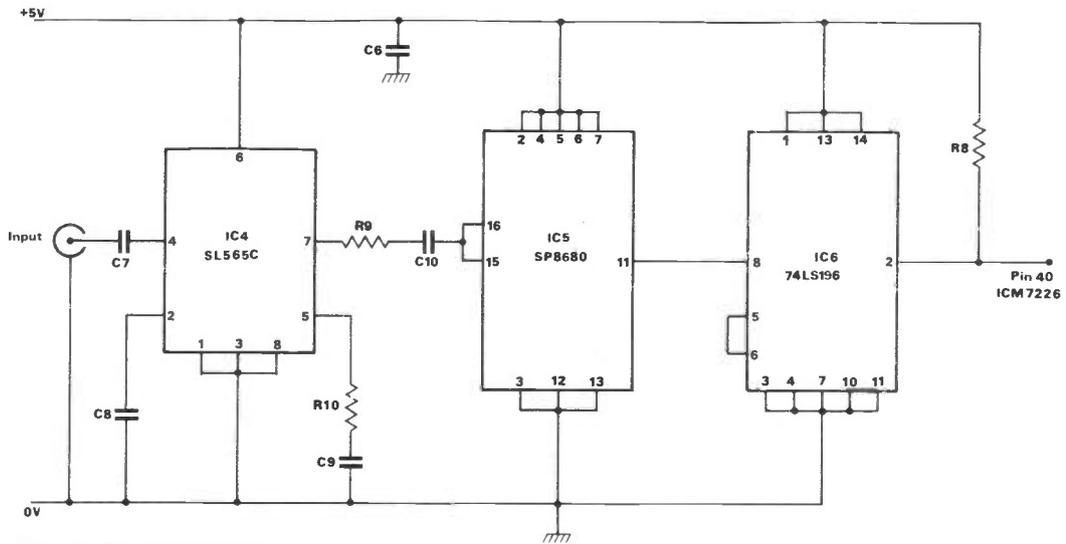


Fig 2 Preamp/prescaler

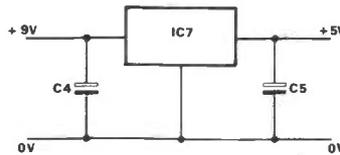


Fig 3 Regulated 5V supply

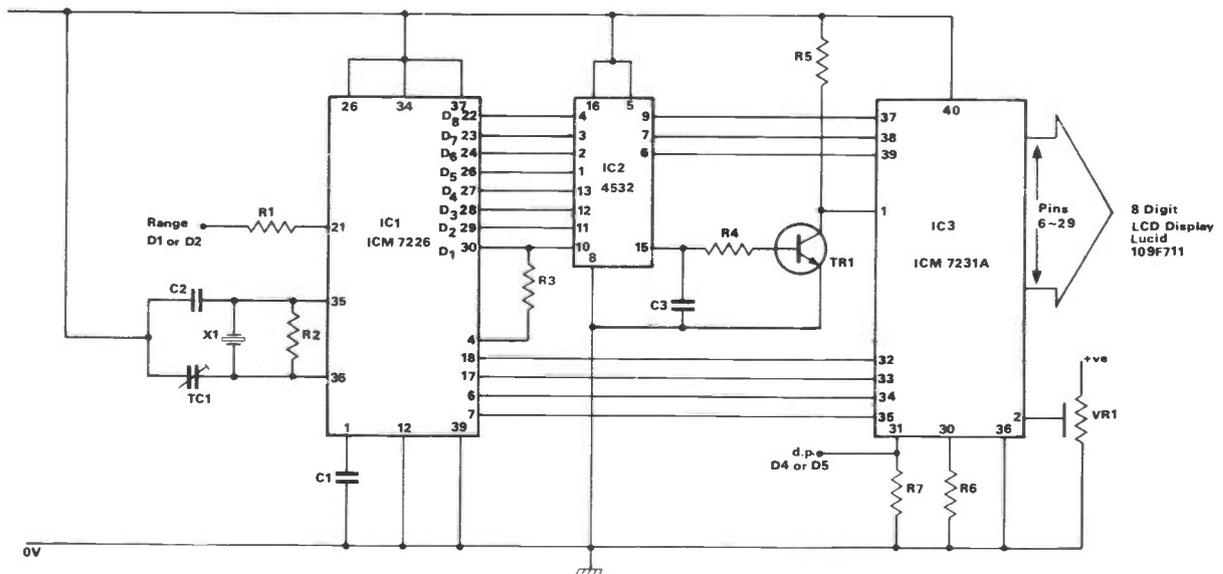


Fig 4 Eight digit LCD display coding and driving circuit

FREQUENCY METER

Construction

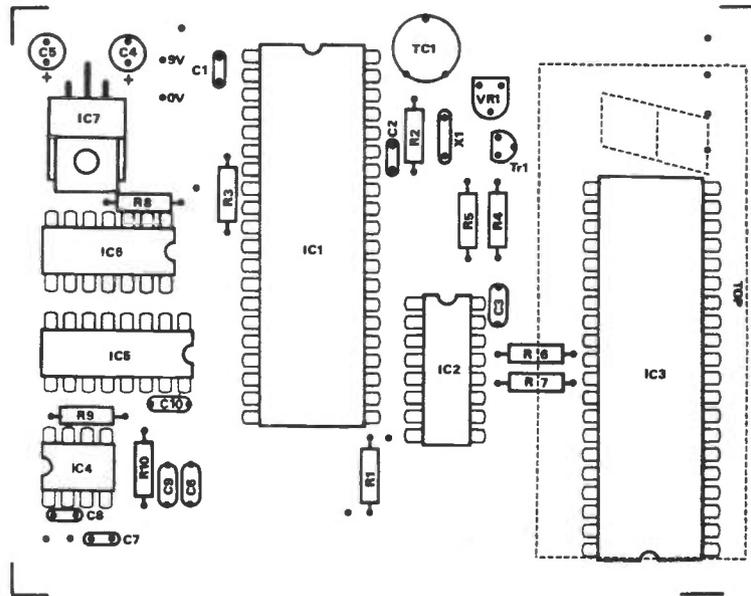
A double sided PCB has been designed and the track and top sides are given in Figure 2.

The LCD driver mounts underneath the display, but if care is taken, construction

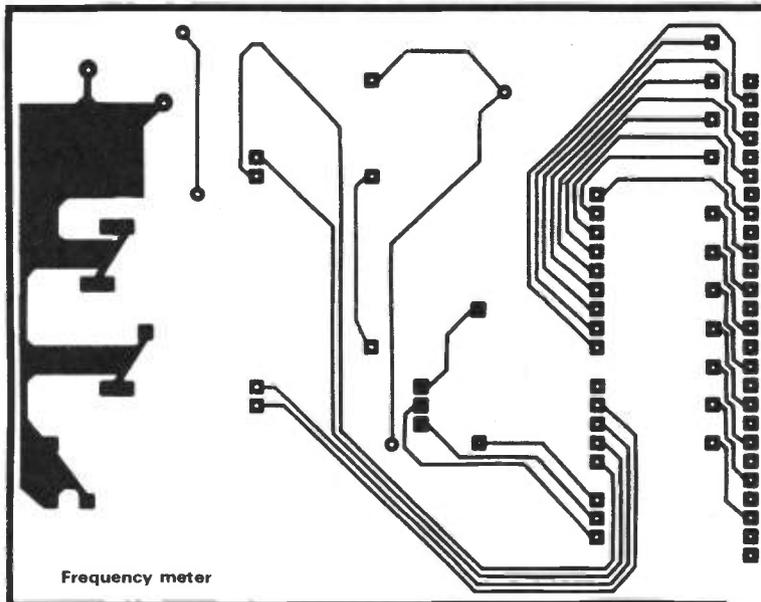
should not be any problem – provided a poker is not pressed into action as the soldering iron. Neither will the chain-wrench be required! Insert the regulator and associated components, first, and check that +5V is appearing at the OUT

terminal before proceeding with the rest of the construction.

Note the common lead is soldered on both sides. The regulator should be bolted down to the PCB.



The component layout



Foil pattern – upper side (actual size)

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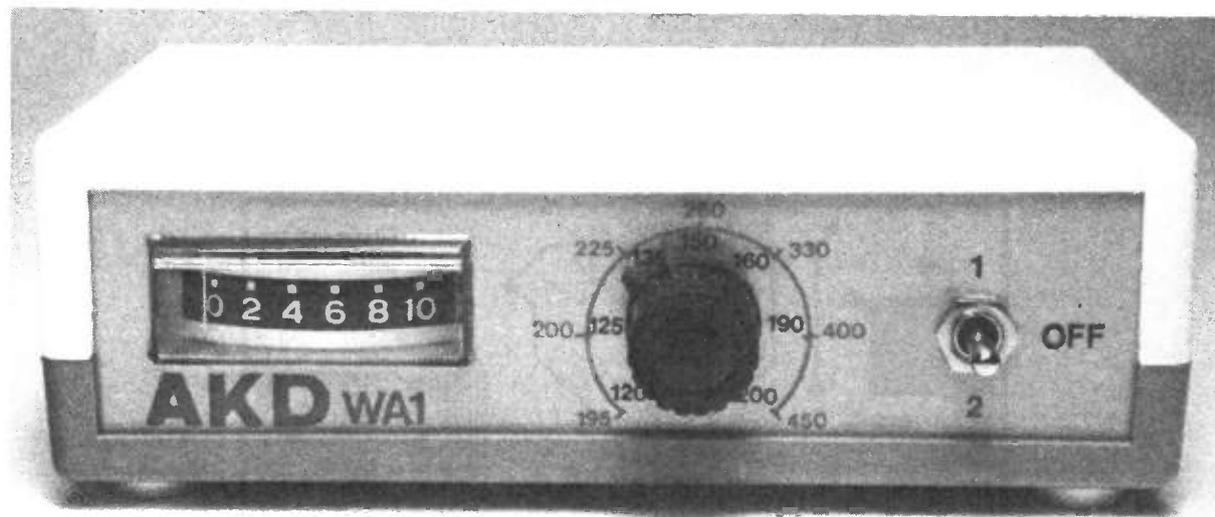


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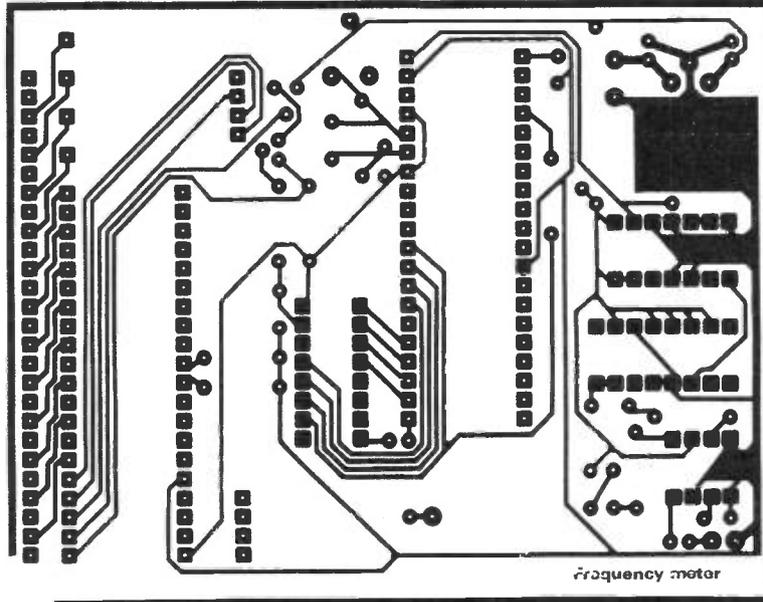
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FREQUENCY METER

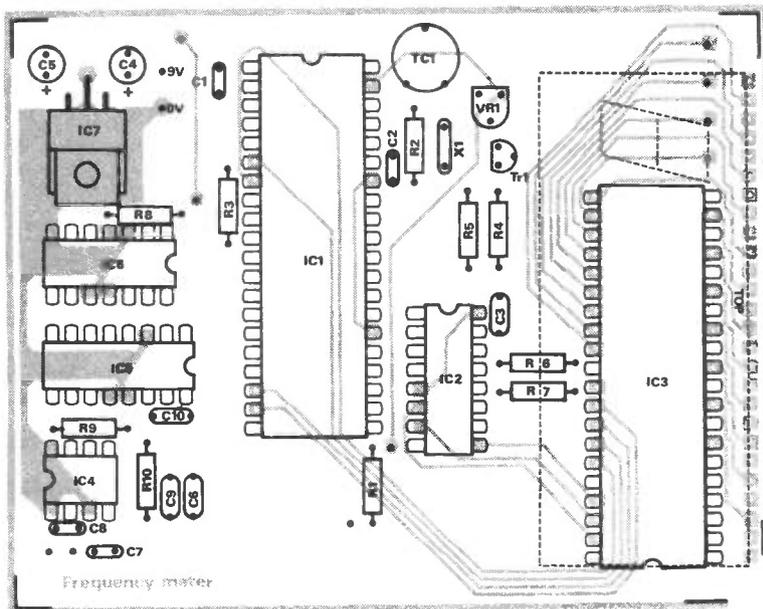
Mount the rest of the components, noting that several solder connections have to be made on the top side, as well as through board links, marked by asterisks. Any component pin or terminal pin that has a track running to it on the

top side should be soldered on *both* sides, and soldercon pins can be used, if readers are unhappy about soldering in the 7226 direct. However the 7231 has very little room under the display and socket pins may not be possible.

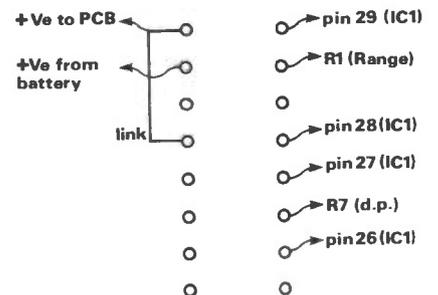
Connect the LUCID edge-strips to the display, inserting it at an angle first, then pushing the strips on very gently so as not to damage the glass. Holding the display to the light, the decimal points



Foil pattern - lower side

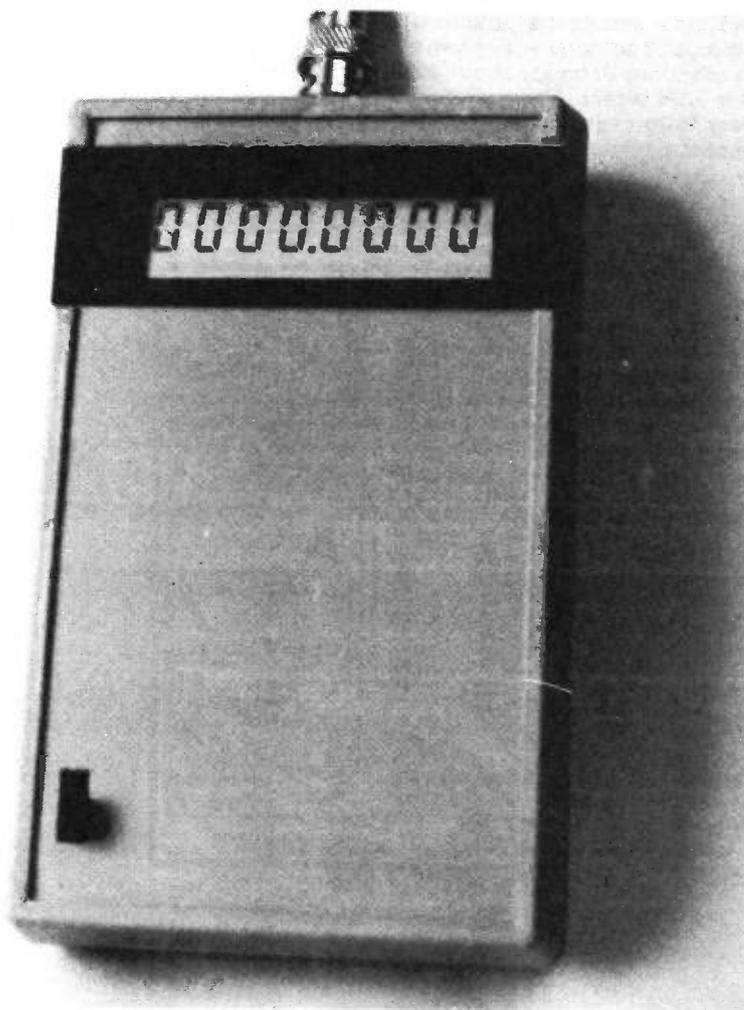


The component overlay



Switch wiring - back view

FREQUENCY METER



The Frequency meter showing the switch position

and chevrons should be at the bottom. Clip off all the bottom row of pins except for 4 at each end. Insert soldercon strips to mount the display and solder on both sides where necessary, taking care that solder doesn't 'creep' up the inside of the pins. The display can now be mounted. This should be folded over the 7226 before being soldered in, otherwise it might foul the underneath of the top panel.

Wire up the switch temporarily according to *Figure 3* and after checking thoroughly, the unit can be switched on, with VR1 and TC1 set to mid point. The display should either register all zeros or a randomly changing set of figures (caused by the prescaler circuitry self oscillating or picking up random RF signals). Adjust VR1 to give a well-contrasted display with no ghosting. Press the PTT on a nearby transmitter and the display should give a stable display, reacting rapidly on the 0.1sec gate, or more slowly but with greater resolution on the 1.0sec gate. Adjust the trimmer to give the correct reading and if all is well the unit can be mounted in the case.

The prototype used on RS 6-digit bezel (587-456) being the right size for this display and this requires a cut out panel 85mm x 23mm. The specified case is a

very handy size, but the side lips have to be filed down to get the bezel seated properly. Measure carefully to ensure the bezel, if used, will be above the display when the latter is mounted, (using spacers and sticky pads in the prototype) to position it properly beneath the bezel.

A slot was cut out for the switch, (as can be seen in the photograph) which should be glued into place and then wired up permanently. The BNC socket was mounted in the lower half of the case at the front taking care not to foul the display connections. Miniature coax links it to the PCB with the earth soldered to the brass mounting nut of the socket. Position all leads carefully and then the case can be finally screwed together.

Conclusion

Finally the 7226 has many facilities such as Reset, Hold, Ext, Osc, In, etc and the data sheet shows how these can be utilised. Only two of the gate times were used, and if readers so wish, connecting D₁ (pin 30) to pin 21 via R1 will give a .01sec gate, and D₄ a 10sec gate, and full 8 digit resolution, but waiting 10secs before obtaining a reading is a very long time and won't do the battery much good.

The actual meter and display consume

very little current, unlike the prescaler and preamp so keep the battery in good condition, and only turn the meter on when it is needed! If the gate times are changed, don't forget to change the decimal point switching (D₃ to R₇ for .01sec gate, D₆ for 10sec gate).

Any other TTL signal can be fed into pin 40 of the 7226, rather than the output from the 74LS196, and the June '83 design gives one example of the logic gate switching to accomplish this. **BEWARE** any signal above 5V fed into the 7226 may cause it to go into a self destructive latch-up – and it is expensive!

The self oscillation of the prescaler circuitry is perfectly normal and nothing to worry about. However if a reading of all zeros is preferred, the inputs to the three ICs can be clamped with resistors to earth – try IC15, but this will reduce the sensitivity of the meter.

PARTS LIST

R1, 3, 4, 6, 7	10k
R2	10M
R5	47k
R9, 10	51Ω
R8	1k
VR100R	7mm min preset (AMBIT)
C1, 3	100pF
C2	39pF
C4	22μ tantalum
C5	2.2μ tantalum
TC1	5-65pf trimmer (RS125-660)
C6, 7, 8, 9	1000pf ceramic
C10	.01μ ceramic
IC1	ICM 7226 A *
IC2	4532
IC3	ICM 7231A *
IC4	SL 565C *
IC5	5P 8680 *
IC6	74LS 196
IC7	7805
TR1	BC109
X1	10MHz crystal

109F711 Display, Lucid (AMBIT) + 2 holders.

Soldercon pins

BNC Socket, single-nut fixing.

Switch, 4 pole 3-way slide (MAPLIN)

Small length miniature RF coax.

Bezel (if used) (RS587-456).

Case HP-BAT-9V (91x146x33.5)

OK Machine Tools Eastleigh.

Unless otherwise specified, Ambit can supply other items.

* Items asterisked can be obtained from Quarndon Elect, Derby. R S Components can be ordered via your local dealer.

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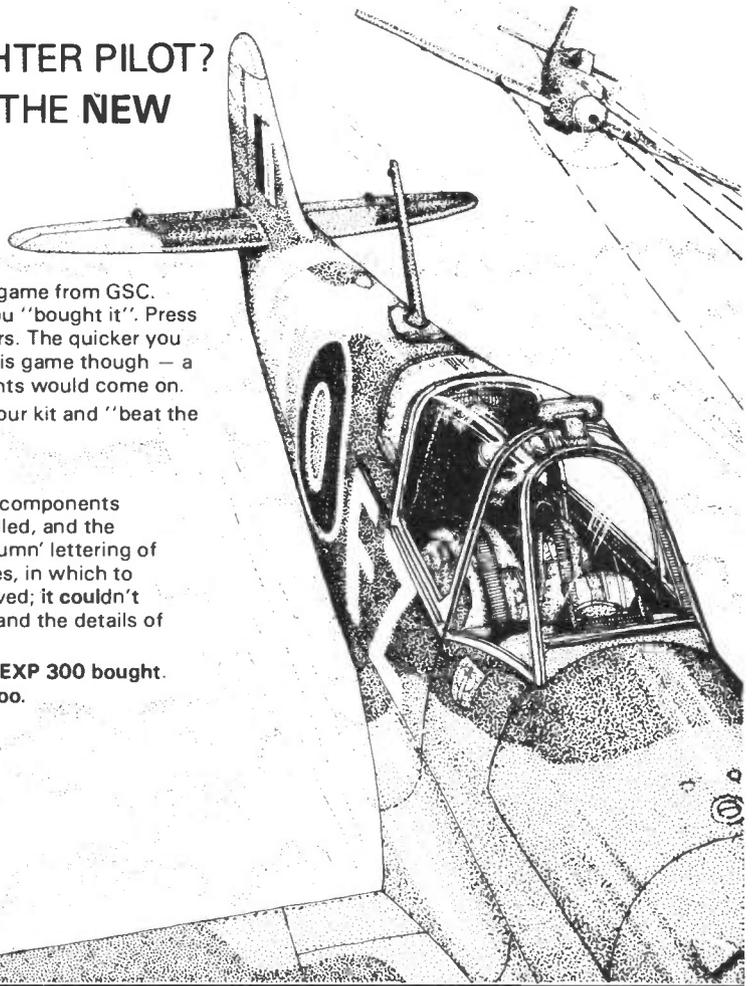
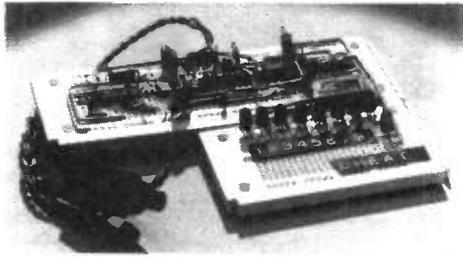
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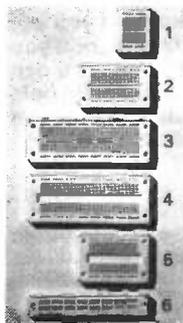
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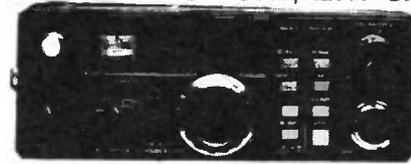
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UPDATE ON THE SPECTRUM ANALYSER

by Ernie Sumption G3DQL

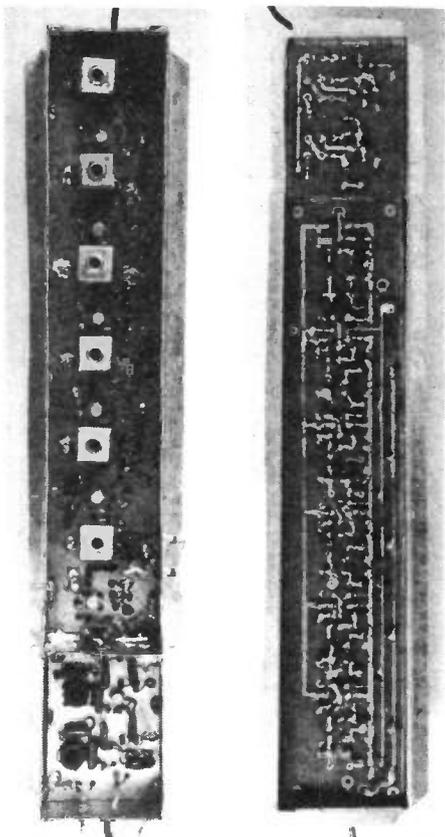
The November/December 83 issues of R & EW described the construction of a spectrum analyser and attracted a vigorous response from our readers. Some of the components required were difficult to obtain in the UK and we now give an update on this project which is modified to use British-supplied alternatives.

This short article is the result of much experimentation with substitute components to replace the more hard-to-get American types.

Preamp & logamp 1 & 2

Starting with the pre-amp and log amplifier, I built both circuits on one double-sided board measuring 11¼in x 1¾in cross screen of PC board being fitted 2¼in from one end for the pre-amp.

Below (left) Top view of the preamp and log amp



Above (right) Underview of the preamp and log amp

The circuit was drawn on the board using a lay-out identical to the theoretical diagram, and proved perfectly stable.

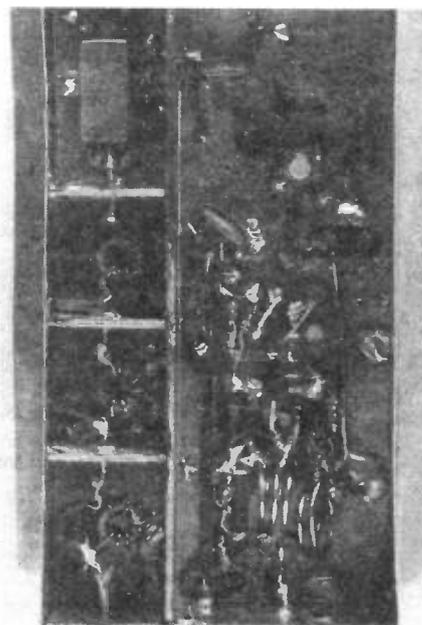
The only components difficult to obtain are the transistors for the pre-amp and the inductors. The FT37-43 ferrites can be replaced by Fairite 26-43006301 from Ambit. They are rather large but work well with the same number of turns as shown on the circuit diagram. The 2N5179 can be obtained from Greatech Ltd. They also supply the MRF 901 for the VCO.

The L43-12 inductors are ordinary RF transformers so any type can be used. I had some ½in square cans with ⅜in formers which worked well. A good source for cores would be from the IF strip of a scrap TV. The constructor new to transformer winding should make sure that the windings are connected in the correct sense, but it is a simple matter to reverse the wires if no signal comes out. Three or four turns should tune correctly and is quite easy to do with the help of a Grid-dip meter. Nail varnish can be used to keep the turns in place. 3SK51 transistors from Ambit work as well if not better than the 40673 type in the log amp. If you have difficulty in obtaining silvered mica capacitors, polystyrene ones work just as well.

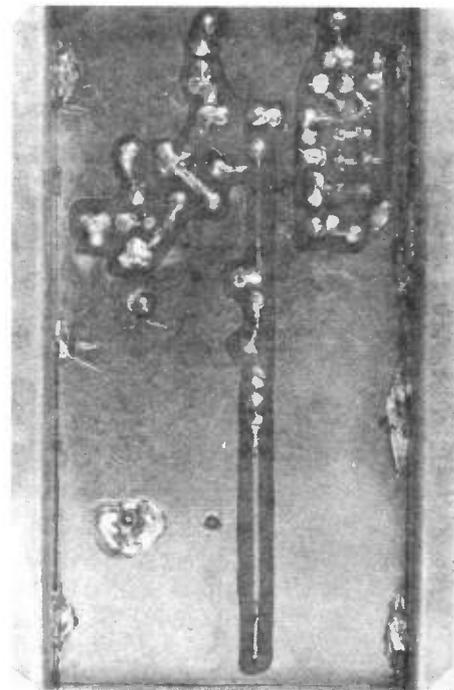
Lowpass filter, mixer, VCO 34

The lowpass filter, mixer and VCO were made on a single board using a piece of double-sided PC board 5¼in x 2⅝in. A piece of PC board was fixed along the board on the long side 1in from the edge to contain the lowpass filter and mixer. The VCO was the main problem. Draw the circuit on the top side of the board soldering the components directly to the copper strips. The varactors should be wired across the ends of the inductor and the coupling capacitors (220pf polystyrene are alright here) and should be kept as close as possible to the inductor, the other end being wired directly onto the MRF 901. The rest of the circuit is not so important regarding lay-out.

If you have difficulty in obtaining the MV 109, the KV1310 from Ambit works satisfactorily. Use two, wiring the centre pin to the inductor and either, but not both ends, to earth. The inductor should be changed to three½in turns, winding length ⅜in. The 100K resistor should be reduced to 33K. The coupling coil needs to be very close to obtain the correct DC voltage at the VCO amp. Also, set the tuning voltage to 2 volts when tuning the VCO to 90MHz.



Top of the lowpass filter, mixer, VCO



Bottom of the lowpass filter, mixer, VCO

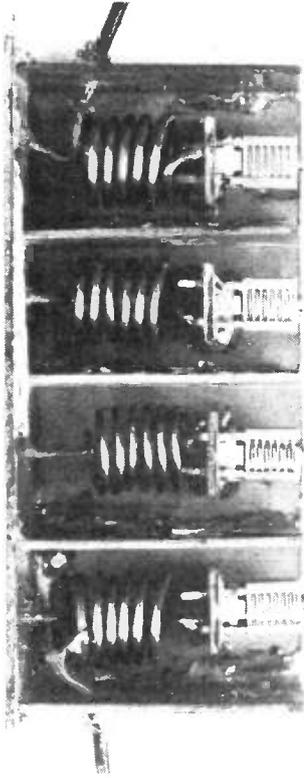
Sweep circuit

The sweep circuit can be built on single board the lay-out not being important. You can use a BC 157 in place of the 2N2907, and also an LM 324 from Ambit in place of the TL084C. However both the TL084 and the VN10KM can be obtained from Cricklewood Electronics.

SPECTRUM ANALYSER

Other circuits

The power supply should give no problems. I have used a 4700 Mfd 16 volt capacitor instead of the 4000 Mfd 35 volt



The bandpass filter

without trouble. For the attenuator, the SLRI lever switches from Ambient mounted upside down below the PC board fit neatly and are satisfactory.

The band-pass capacitors for the filter can be replaced by air-spaced 15pf units from A J H Electronics, and if these are used they can be secured to the filter case by small squares of PC board soldered at right angles to one side of the case at a height which will place the tuning slots flush with the case top. Saw a slot across the middle of both sides of the squares to insulate the stators.

Screening

A good method of screening the circuit boards is to use thin tinplate boxes which 117 is better and cheaper than PC board. A good source for suitable tin-plate is the trays used for toffee. I got two trays free from our local super-market and you can not do it cheaper than that. First make a bottomless four-sided box with flanges bent out at the bottom to fit to a chassis. The box should be about 1/2 in taller than the highest component on the board.

Assembly

The board can then be tack soldered about 3/8 in up from the bottom of the box keeping the circuit away from the chassis. A lid can then be made to suit the box with sides 3/8 in deep. If the sides of the lid are gently pressed inwards a tight fit will result, avoiding having to solder them on and improving access for adjustment or servicing.

The inter-connecting plugs and sockets can be omitted if the coaxial outer is pushed back and soldered to the tin

boxes at entry point. Before connecting the coaxial inner wire, check for short circuit between inner and outer wires because it is easy to damage the cable when soldering to the box.

Testing

One final word – when testing the finished units, if they are not fixed to a metal plate, temporarily bond the metal boxes together otherwise the circuits may go haywire.

The pass-band of a filter can be recorded by sweeping the signal generator manually across the expected bandwidth. A piece of the thin plastic used for drawing PC's can be cut to the size of the oscilloscope screen and a line drawn along the tips to give the pass-band shape. This is much quicker than the laborious graph-paper plotting method, and it is simple to make a carbon copy on to paper for future reference.

The results obtained by my version were exactly as the original, and I was very pleased with this project, particularly with the lack of noise on the scope and its use for adjusting filters. The only disadvantage is the non-linearity of the trace, but this is not too bad when used on narrower bandwidths than the full 60MHz span.

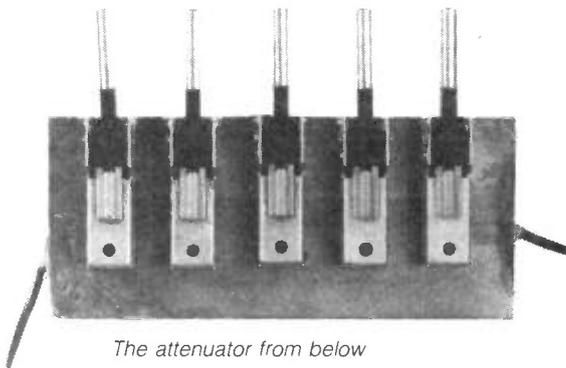
If your scope will not give a full width deflection with the signal from the X output, the analyser will work with the scopes timebase and the X output connected to the external trigger terminal. I shall certainly make a 2N5179 pre-amp for use with small signals such as those from receiver mixers and RF amplifiers.

Log amp transformers

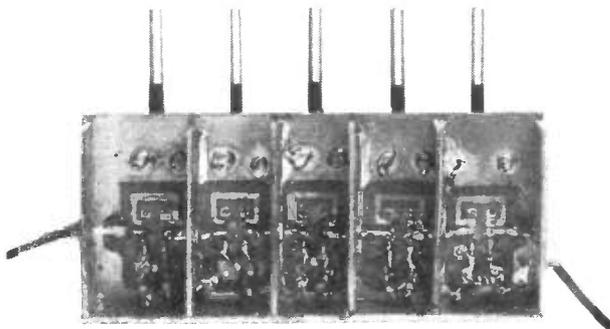
The L43-12 log amp transformers could be replaced by toroid transformers if suitable core type formers cannot be found.

The double sided PC board shown in Figure 1 should be made first, and four 25cm pieces of stiff copper wire pushed into the corner holes. Pieces of earth wire from mains lighting cable are ideal for this purpose. These wires should protrude just enough to allow soldering on both sides. Next a 0.15pf* foil trimmer is pushed through the two centre holes and soldered to the two longer copper strips from underneath. Wind the toroid as shown in Figure 3. The toroid is now placed in the position shown in Figure 2 and soldered to the support wires as in Figure 4. – 15pf foil trimmers can be obtained from A J H Electronics as can the glass bead feed through insulators used (a bargain at 60p per 100!). The more commonly available 0.20pf ceramic would do.

The transformer is now ready to be tuned to 90MHz with the aid of a grid-dip meter. Because a toroid is self-shielding, two or three turns of wire should be wound round the grid-dip meter coil and ends soldered across L2 coil to obtain enough coupling. Tune the transformer to 90MHz with the trimmer at nearly full mesh, opening out the winding if



The attenuator from below



The attenuator from above

SPECTRUM ANALYSER

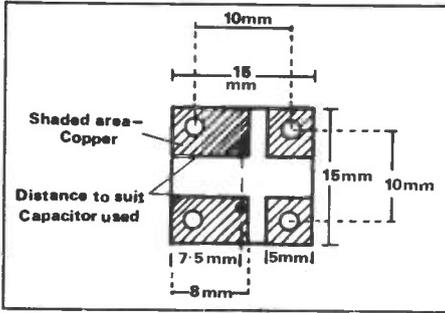


Fig 1 Double-sided PCB

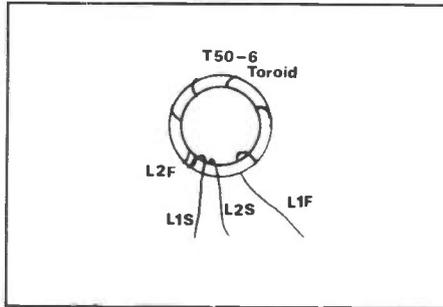


Fig 3 The toroid coil. Winding data — L1, 6 turns, 28SWG enamelled wire. L2, 2 turns, 28SWG enamelled wire

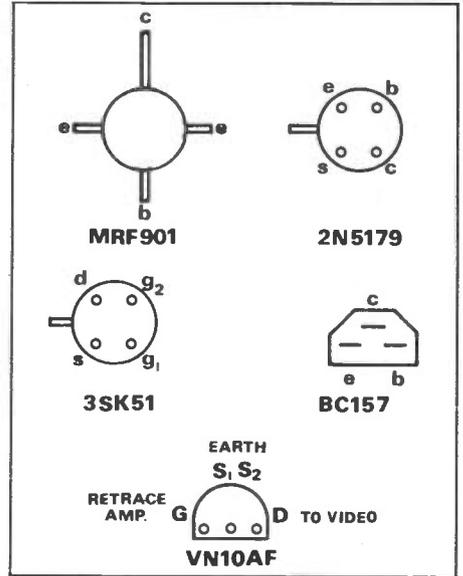


Fig 5 Transistor connections

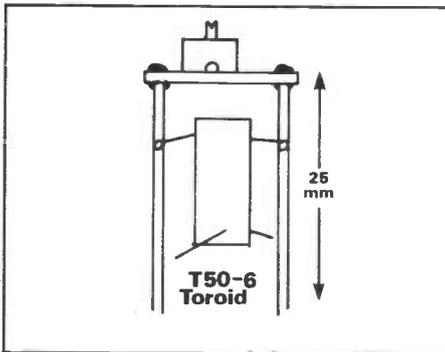


Fig 2 The coil assembly

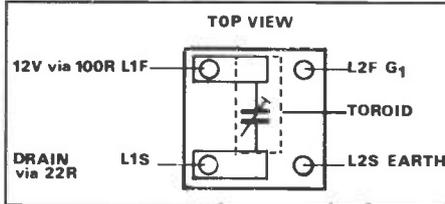


Fig 4 Top view of the coil assembly

necessary. This will allow for stray circuit capacitance when mounted. The finished transformer should be pushed into the circuit board to a height which brings the trimmer just below the lid of the screening box to allow for final trimming with the lid in place. The 27pf across the primary winding is not used with the toroid transformer.

Update on toroids

Since writing this article I have received a catalogue from Maplin and find that it lists core formers and cans which appear to be identical to those described. The details are:- Can No. 10 Order No LB36 P Base Plate Order No. LB44 X Cores Type 4 Order No LB41 U

C M HOWES Communications

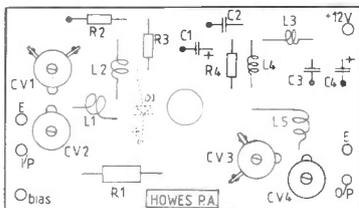
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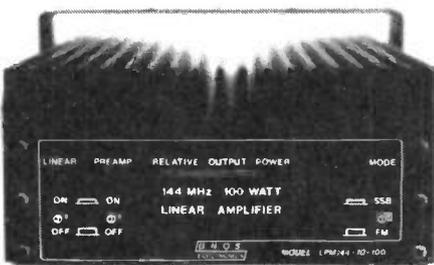
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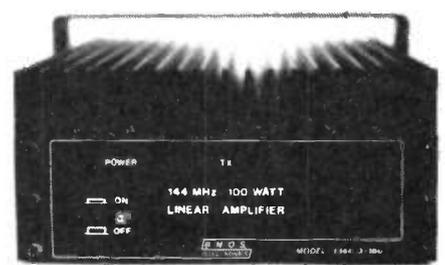
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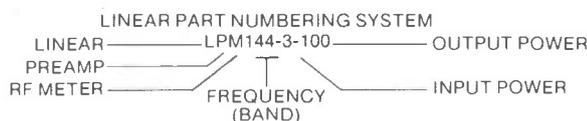


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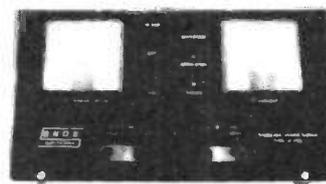


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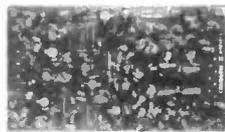
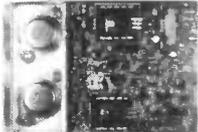
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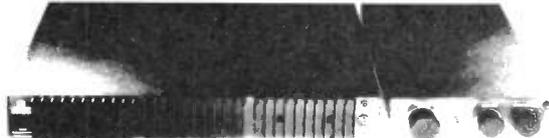
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DATA FILE

Ray Marston takes an in-depth look at a particularly versatile CMOS chip, the 4046B phase-locked loop

The 4046B is probably one of the most versatile but least-used of all ICs in the CMOS range. The device is officially described as a 'micro-power phase-locked loop', or CMOS PLL, and as such it can be used in typical PLL applications such as automatic frequency tracking, frequency multiplication, and frequency synthesis, etc. The most important feature of the 4046B, however, is that it contains a number of exceptionally useful circuit elements, each of which is independently accessible via the IC pins.

The most important of these independently-accessible elements is a pair of phase-comparators and a wide-range, voltage-controlled oscillator (VCO).

This VCO is probably the most versatile and cost-effective voltage-controlled oscillator on the market. It produces a well-shaped symmetrical square-wave output, has a top-end frequency limit in excess of 1 MHz, can be voltage-scanned through a 1,000,000:1 frequency range, can be gated on and off via an INHIBIT terminal, and can (when used in conjunction with one of the 4046B's phase comparators) produce a two-phase output.

We'll look at a stack of practical applications of this VCO later. In the meantime, let's take a closer look at the 4046B IC.

4046B Basics

Figure 1 shows the internal block diagram and the pinouts of the 4046B, which contains two different types of phase comparator, plus a zener diode and the VCO.

Phase comparator 1 is a simple EX-OR type; it has a good noise-rejection performance, but must be driven by square waves on both pins 3 and 14, and has only a narrow capture-frequency range.

Phase comparator 2 is an edge-triggered logic/bistable type with a three-state output; it can be driven by grossly non-symmetrical waveforms on pins 3 and 14, and has a very wide capture-frequency range, but has fairly poor noise rejection.

The VCO section of the IC is a wide-range device with a maximum operating frequency in excess of 1 MHz. Its operating frequency is determined by the voltage on pin 9, by the capacitor value between pins 6 and 7 (50pF minimum), and by the values of R1 and R2. R2 enables the minimum operating frequency to be pre-set, and can be

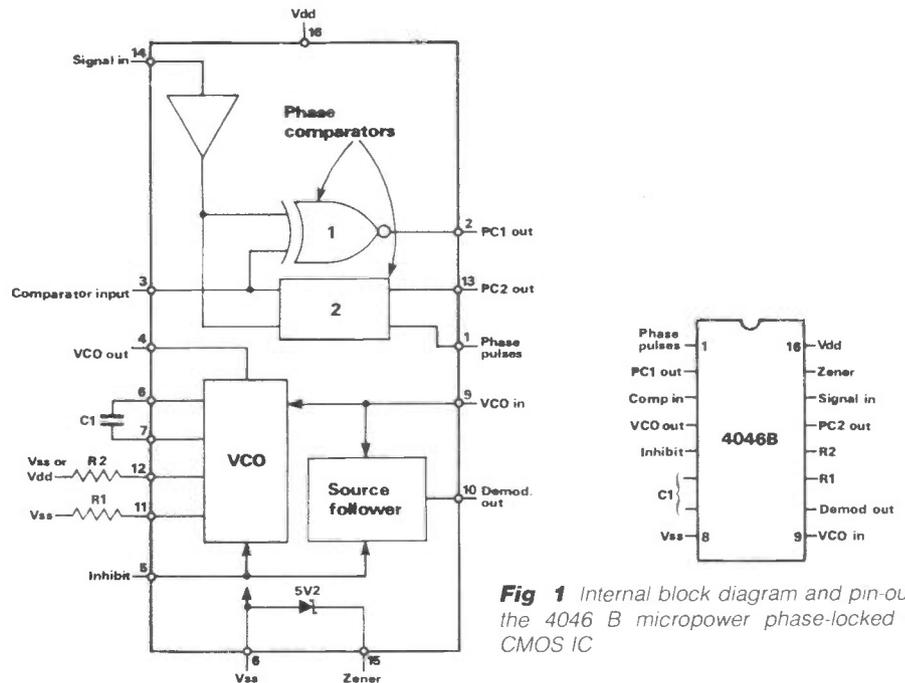


Fig 1 Internal block diagram and pin-outs of the 4046 B micropower phase-locked loop CMOS IC

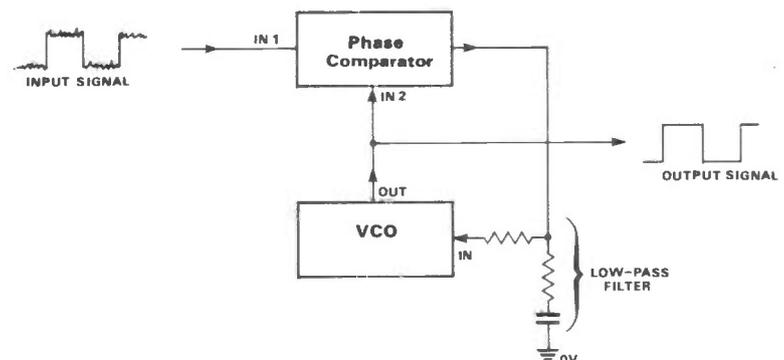


Fig 2 Basic phase-locked loop circuit

eliminated in many applications. The symmetrical square-wave output of the VCO appears on pin 4.

The pin-9 VCO-input terminal of the IC has a near-infinite input impedance and in many applications is driven from a high-impedance source; the internal source-follower stage enables the voltage of pin-9 to be externally monitored without loading this source.

INHIBIT terminal 5 of the IC is normally tied to VSS, to 'enable' both the VCO and the source follower. Both of these devices are disabled when a logic-1 is applied to pin 5. The internal zener diode of the IC (between pins 8 and 15) has a nominal operating value of 5V2, and can

be used to provide supply regulation if required.

PLL Basics

The 4046B is specifically designed for use as a phase-locked loop, and Figure 2 shows the basic way of using the device in this mode. The phase comparator has two input terminals, one fed from an external signal and the other from the output of the VCO. It compares the phase and frequency of the two input signals and generates an output which is proportional to the difference between the two input signals. This output signal is smoothed via the low-pass filter network and fed to the control input

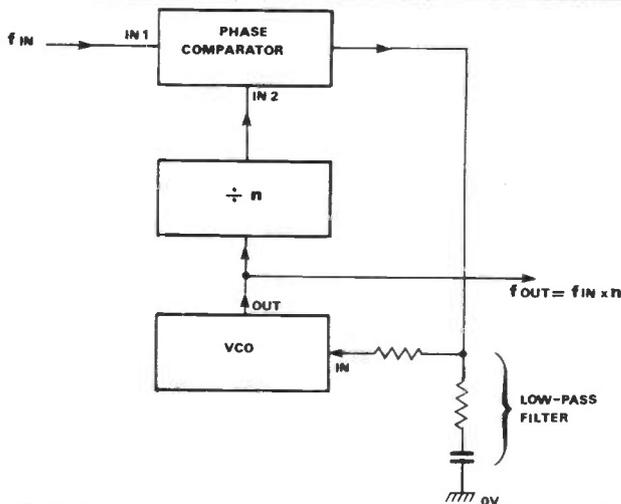


Fig 3 Basic frequency synthesiser or frequency multiplier circuit

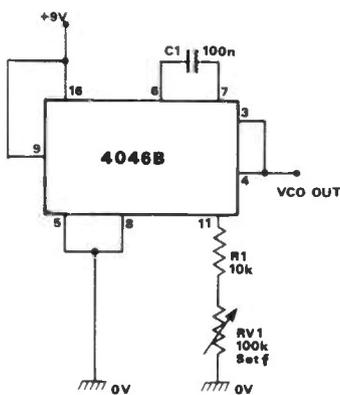


Fig 4 Simple variable-frequency (200 Hz to 2 KHz) square-wave generator

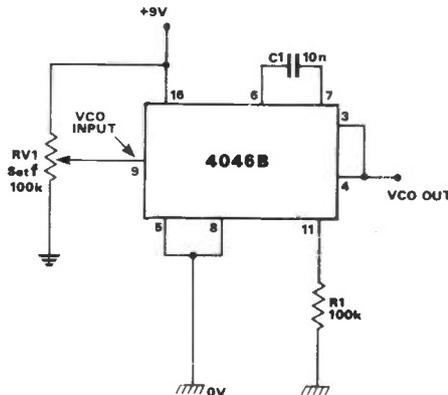


Fig 5 Wide-range VCO, variable from near-zero to 1.4 KHz via the pin-9 voltage

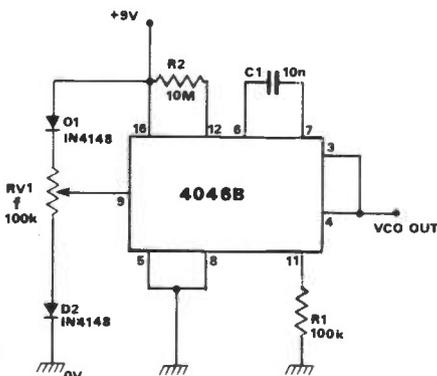


Fig 6 Wide-range VCO, with frequency fully variable to zero

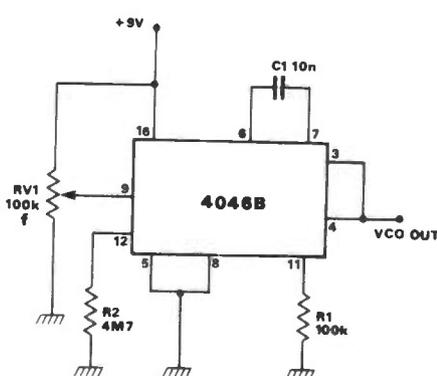


Fig 7 Restricted-range VCO, variable from 60Hz to 1.4 KHz via RV1

terminal of the VCO.

The basic action of the above circuit is such that if the VCO frequency is below that of the external signal, the output of the comparator goes positive, and the resulting filtered voltage then causes the VCO frequency to increase until both its frequency and phase precisely match those of the external signal.

If the VCO frequency rises above that of the external signal, the reverse action takes place and the comparator output decreases, causing the VCO signal to eventually lock to that of the external signal. Thus, the circuit causes the VCO signal to automatically phase-lock to the external input signal.

At first sight, this circuit may not seem very useful. Note, however, that the VCO generates a clean, symmetrical output waveform, even if the external input waveform is noisy and non-symmetrical. Also note that, because the low-pass filter has a finite time constant, the VCO 'tracks' the MEAN phase and frequency of a rapidly varying input signal. The circuit can thus be used to track and 'clean up' slowly-varying input signals, or to track the centre-frequency of an FM signal and provide a demodulated signal at the comparator output.

The most useful application of the phase-locked loop is as a frequency multiplier or frequency synthesiser.

Figure 3 shows the basic circuit, which is identical to that of Figure 2 except for the addition of the 'divide-by-n' counter between the VCO output and the phase comparator input.

The circuit action is such that the VCO frequency automatically adjusts to a value at which the signal frequency at the divider output exactly matches that of the external input signal. Under this condition, therefore, the VCO frequency equals $f_{in} \times 'n'$, and is thus a precise multiple ('n') of the external frequency. If the external input signal is derived from a precision crystal source, output signals of equal precision can be 'synthesised' at any desired 'multiple' frequency by simply using a divider with the appropriate 'n' value.

We'll look at some practical versions of the Figures 2 and 3 PLL circuits later in this edition of 'Data File'. In the meantime, let's look at some applications of the actual VCO.

VCO Circuits

Figure 4 shows the simplest way of using the VCO section of the 4046B. Here, the pin-9 voltage-control input is tied permanently high and the circuit acts as a basic square-wave oscillator, with its frequency variable over a 10:1 range via RV1. Note at this point that the VCO output (pin 4) is tied directly to the pin 3 phase comparator input: if pin 3 is allowed to float, the comparators self-oscillate at about 20 MHz and superimpose an HF signal on the top part of the VCO output waveform.

Figure 5 shows how to connect the 4046B as a wide range VCO. Here, R1-C1 determine the maximum frequency that can be obtained and RV1 controls the actual frequency via the pin 9 voltage. The frequency falls to near zero (a few cycles per minute) with pin 9 at zero volts. The effective control range of pin 9 varies from roughly one volt above zero to one volt below the positive supply value, eg RV1 has a 'dead' control area of several hundred mV at either end of its span.

Figure 6 shows how these 'dead' areas of RV1 can be eliminated by wiring a silicon diode in series with each end of RV1. The circuit also shows how the minimum operating frequency can be reduced to zero by wiring a high-value resistor R2 from pin 12 to VDD. Note that, when the frequency is reduced to zero, the VCO output randomly settles in either the logic-0 or logic-1 state.

Figure 7 shows how the pin 12 resistor can, alternatively, be taken to VSS and used to determine the minimum operating frequency of a restricted-range VCO; f_{min} is determined by R2-C1, and f_{max} by C1 and the parallel resistance of R1-R2.

Figure 8 shows an alternative version of the restricted-range VCO, in which f_{max} is controlled by R1-C1, and f_{min} is determined by C1 and the series combination R1-R2. Note that, by suitable choice of R1 and R2 values, the restricted-range VCO can be made to 'span' any range from 1:1 to near-infinity.

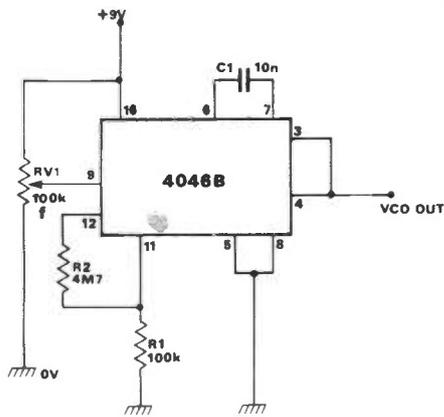


Fig 8 Alternative version of the restricted-range VCO

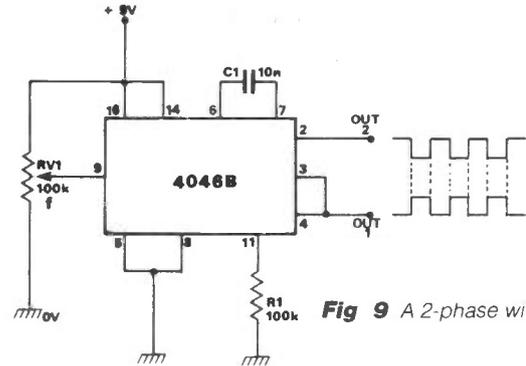


Fig 9 A 2-phase wide-range VCO

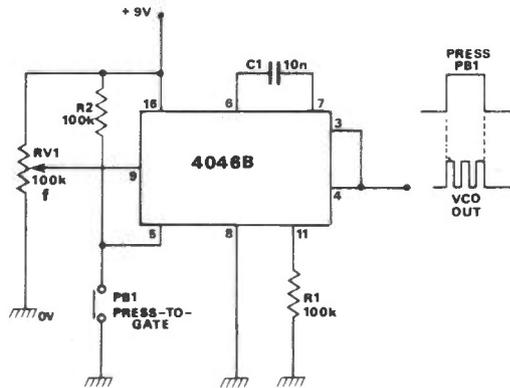


Fig 10 Manually-gated wide-range VCO

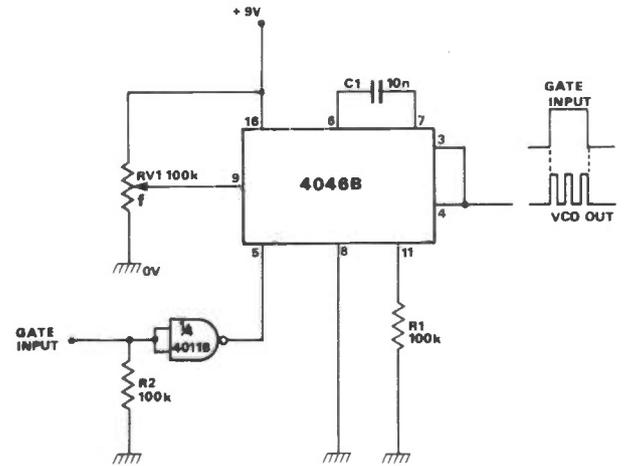


Fig 11 Electronically-gated wide range VCO, using external gate inverter

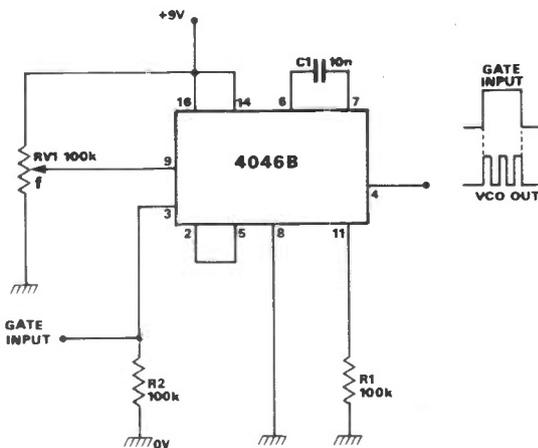


Fig 12 Electronically-gated wide range VCO, using the internal EX-OR phase detector for gate inversion

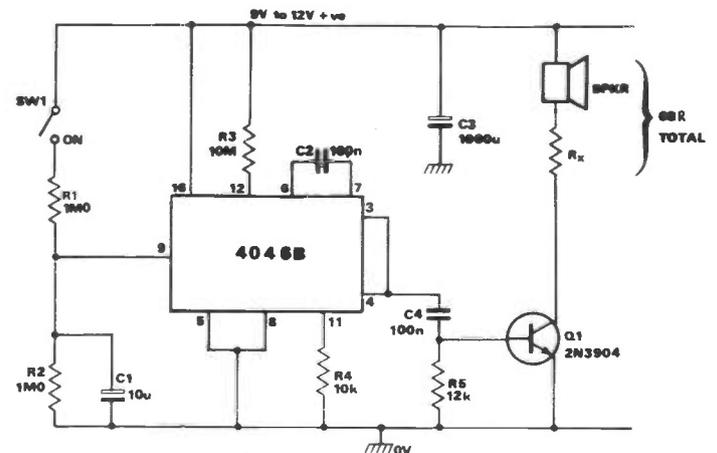


Fig 13 An electronic siren, giving slow rise and slow fall of its frequency

The VCO can be made to generate a pair of anti-phase square wave outputs by connecting the VCO output to the phase-comparator input, taking the signal input (pin 14) high, and taking the anti-phase output from pin 2, as shown in Figure 9. Note that this circuit makes use of the IC's built-in EX-OR gate (phase comparator 1).

The VCO section of the 4046B can be disabled by taking INHIBIT pin 5 high (to logic 1). This feature enables the VCO to be gated on and off via external signals.

Figure 10 shows how the VCO can be manually gated via a push button connected directly to pin 5, and Figure 11 shows how the circuit can be gated electronically via an external inverter (made from a 4011B gate).

Alternatively, if the 2-phase output facility is not needed, Figure 12 shows how the internal EX-OR phase detector can be used to give gate control. Note, in this latter case, that pin 4 is not connected to pin 3.

That completes our look at the basic features of the VCO section of the 4046B. Let's now put some of these features together to make some really interesting practical circuits.

Sirens & sound-effects

Figures 13 to 16 show some practical ways of using the 4046B VCO to make siren and sound-effects generators. Figure 13 acts as a 'conventional' siren circuit; when SW1 is closed, C1 charges exponentially via R1, causing the VCO

frequency to rise slowly from zero to a maximum value. When SW1 is opened again, C1 discharges via R2, and the operating frequency slowly decays to zero. The VCO output is accoupled to the speaker via C4 and Q1.

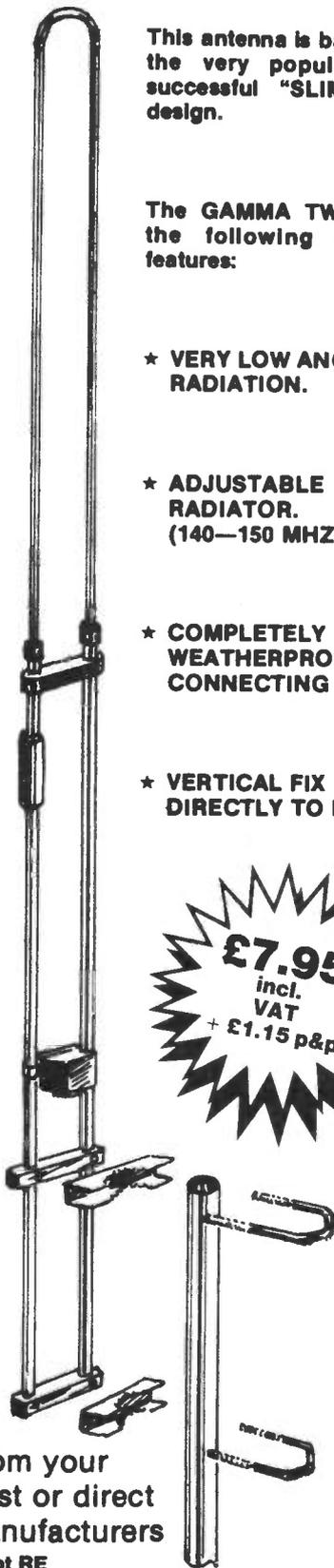
The Figure 14 quick-start siren is similar to the above, except that C1 charges rapidly to half-supply volts via R1-R2 and D1 when SW1 is closed, and discharges slowly via R3 when SW1 is opened.

The Figure 15 circuit generates a 'phasor' sound when PB1 is closed. The 4011B astable is gated via PB1 and produces a chain of 4mS pulses at intervals of 70mS. Each pulse rapidly charges C2 via R3-D2, to produce a high tone that then decays fairly slowly as C2

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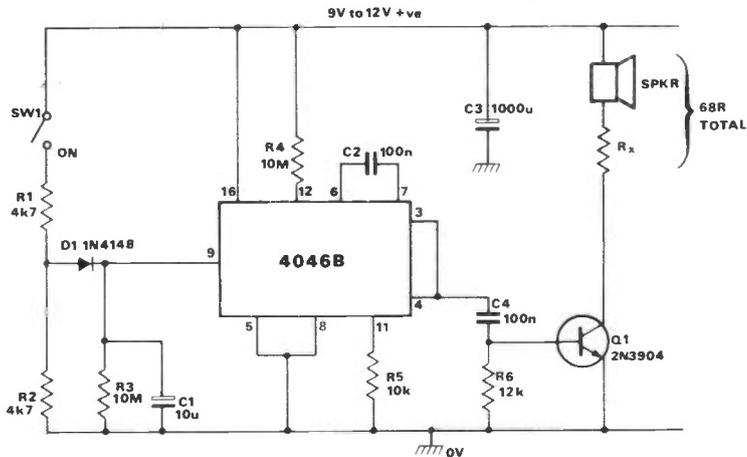


Fig 14 This quick-start siren gives a fast rise and slow fall of its frequency

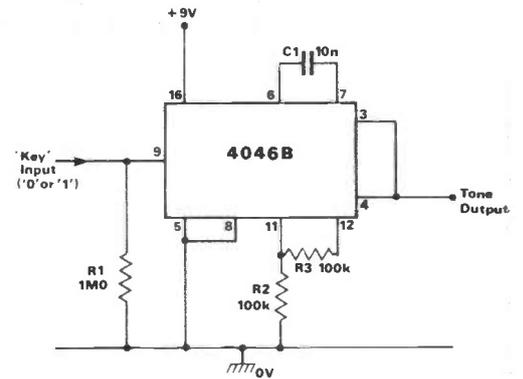


Fig 17 FSK generator. Logic '0' = 1.2KHz, logic '1' = 2.4KHz

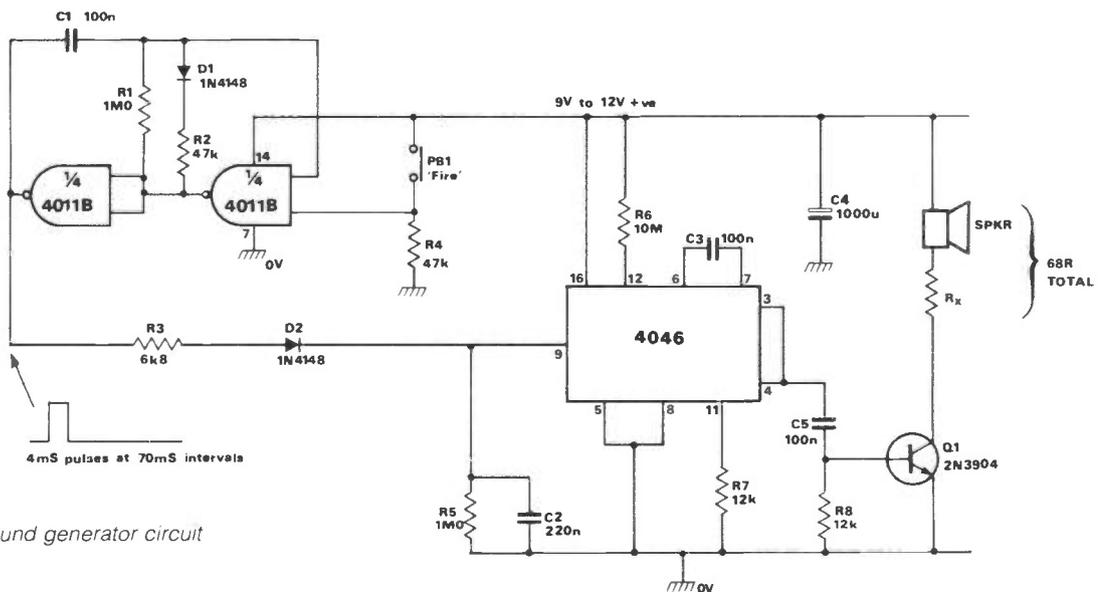


Fig 15 Phasor-sound generator circuit

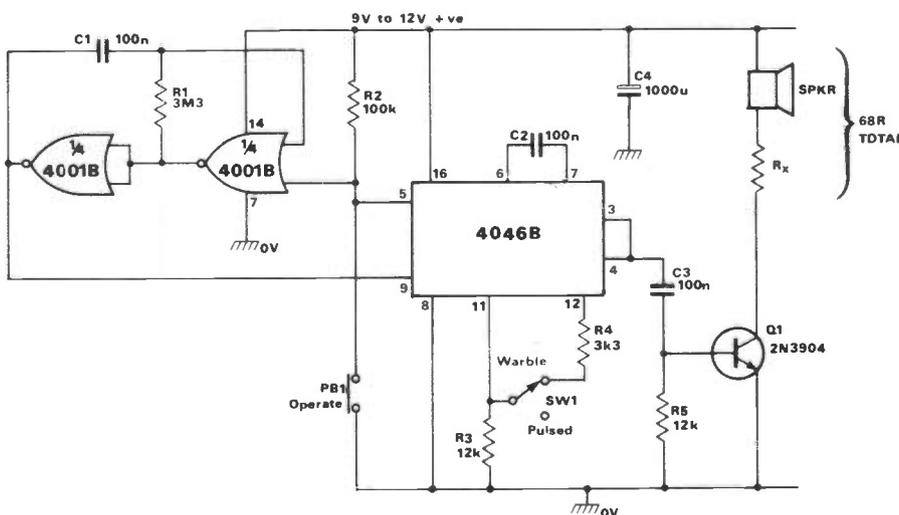


Fig 16 Combined pulsed-tone/warble-tone alarm generator

discharges via R5, only to be repeated again on the arrival of the next pulse.

The Figure 16 circuit generates either a pulsed tone or a warble tone signal (depending on the SW1 setting) when PB1 is closed. PB1 is used to enable pin 5 of the 4046B and to gate-on the 4001B

astable, which then applies a rectangular (alternately fully-high and fully-low) waveform to pin 9. In the 'pulsed' mode, the VCO generates zero frequency when pin 9 is low. In the 'warble' mode, it generates a tone that is 20% down on the high tone when pin 9 is low.

Miscellaneous VCO Circuits

Figures 17 to 21 show a miscellany of 4046B VCO circuits. The simple FSK generator of Figure 17 produces a 2.4kHz tone when a logic-1 signal is applied to pin 9, and a 1.2 kHz tone when a logic-0 signal is applied. The 'high' tone is determined by R2, and the 'low' tone by R2+R3.

Figure 18 is a 220 kHz FM generator. The internal zener (pin 15) of the 4046B is used to provide a stable supply to the 3140 inverting amplifier, which is quiescently biased at about 2V6 via R2-R3; the pin 9 VCO signal thus comprises a mean 2V6 potential that is amplitude modulated with an amplified (x20) version of the AF input signal, thus modulating the frequency of the VCO.

The Figure 19 circuit is that of a 'run-down' clock generator of the type used in dice and roulette games. When PB1 is pressed, C1 charges to a high voltage via D2; simultaneously, Q1 is biased on via D3-R4 and effectively connects R6 between pin 11 and ground. Under this condition, the VCO operates at a high frequency (tens of kHz) and effectively

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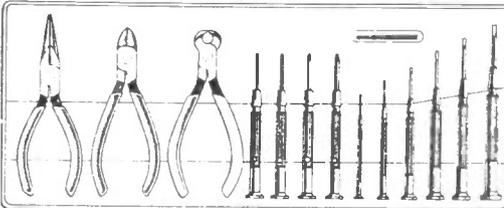


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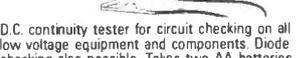
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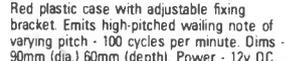
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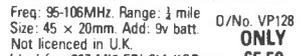
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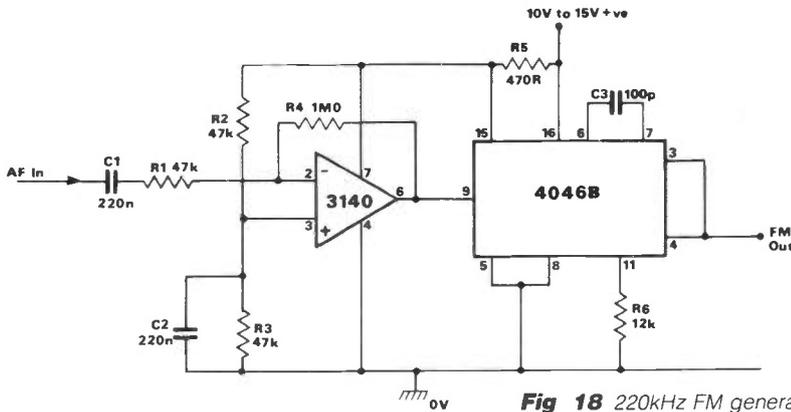


Fig 18 220kHz FM generator

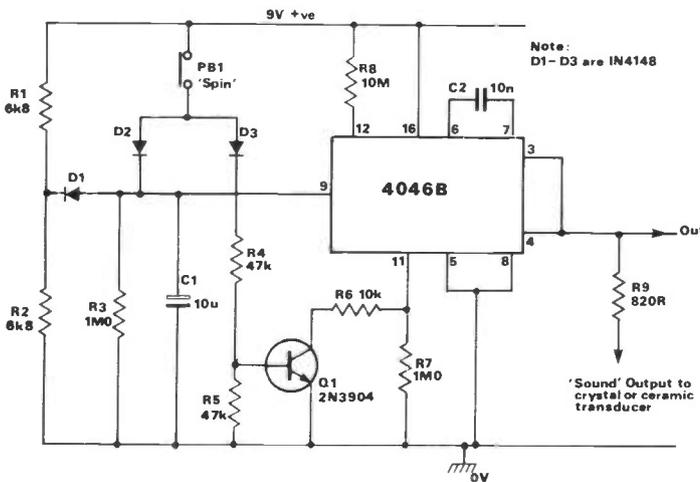


Fig 19 Run-down clock/sound generator, for use in disc/roulette games. The output of this circuit may 'settle' in either ('0' or '1') logic state

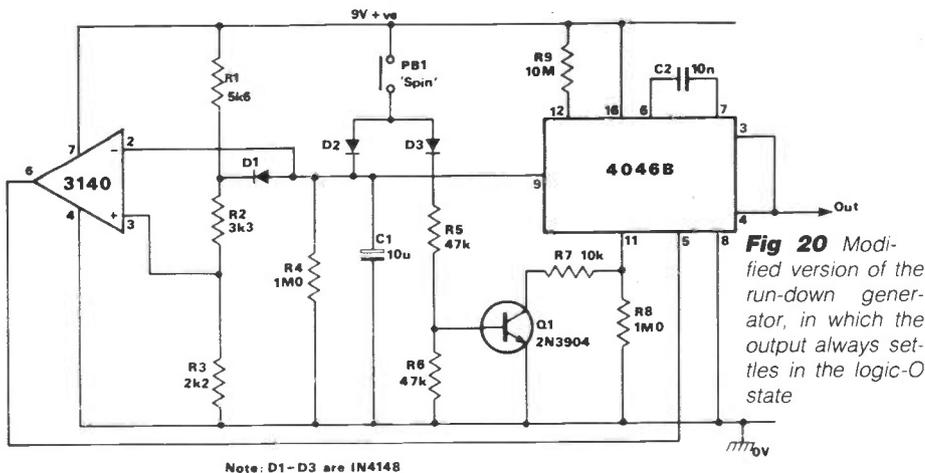


Fig 20 Modified version of the run-down generator, in which the output always settles in the logic-0 state

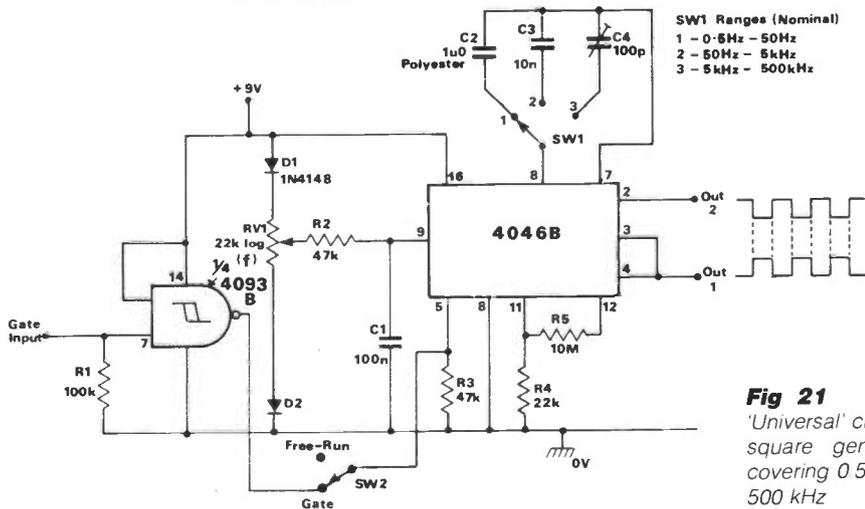


Fig 21 'Universal' clock/square generator covering 0.5 Hz to 500 kHz

generates a random (unpredictable) number of clock pulses. When PB1 is released, Q1 turns off and the VCO timing is governed by R7; simultaneously, C1 rapidly discharges to half-supply volts via R1-R2-D1, causing the VCO to operate at about 100 Hz. C1 then slowly discharges via R3, and the VCO frequency slowly decays to zero over a period of about 15 seconds.

The output of the *Figure 19* circuit can be used to directly clock most types of counter, and can be direct-coupled (via R9) to crystal or ceramic transducers to produce low-level 'run-down' sounds. Note that the output of this circuit may settle in either the logic-0 or logic-1 state when the rundown is complete, so the output should not be direct-coupled to power-amplifier stages, etc.

Figure 20 shows how the above circuit can be modified to ensure that the output always sets to the logic-0 state on completion of the run-down, thus making it safe to direct-couple the output to power-amplifier stages, etc.

Here, the 3140 op-amp is wired as a voltage comparator and is used to automatically turn the VCO off and drive its output low (via pin 5) when the pin 9 voltage falls below a 'reference' value of roughly 2 volts (set on pin 3 of the op-amp).

Finally, *Figure 21* shows how the 4046B VCO can be used as a 'universal' clock or square-wave generator that spans the nominal range 0.5 Hz to 500 kHz in three switch-selected bands. This simple but very useful piece of test gear provides a 2-phase output and can be used in either the free-running or the gated modes.

PLL Circuits

The basic operating principles of the phase-locked loop circuit have already been explained so, in this concluding section of this edition of *'Data File'*, we'll look at some practical ways of using the 4046B in PLL applications.

Figure 22 shows the 4046B used as a wide-range signal tracker, which will capture and track any input signal within the approximate frequency range 100 Hz to 100 kHz, provided that the input signal (to pin 14) switches fully between the '0' and '1' logic levels. Note that this circuit (and all others shown in this section) makes use of wide-range phase-comparator 2, and it can thus lock to any signal within the 'span' range of the VCO; filter R2-R3-C2 is used as a sample-and-hold network in this operating mode, and its component values simply determine the settling and tracking times of signal capture. The operating frequency of the VCO is determined by R1-C1 and the pin-9 voltage; the 'span' range of the VCO (and thus the 'capture' and 'tracking' range of the circuit) can be regarded as ranging from the VCO frequency obtained with pin-9 at zero volts, to the frequency obtained with pin-9 at VDD volts.

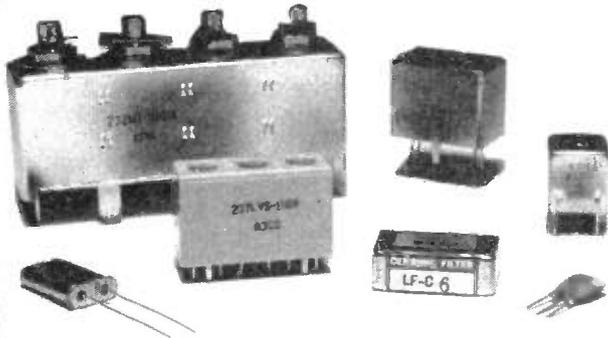
Figure 23 shows a simple but very useful 'lock detector/indicator' circuit that can be used in conjunction with the

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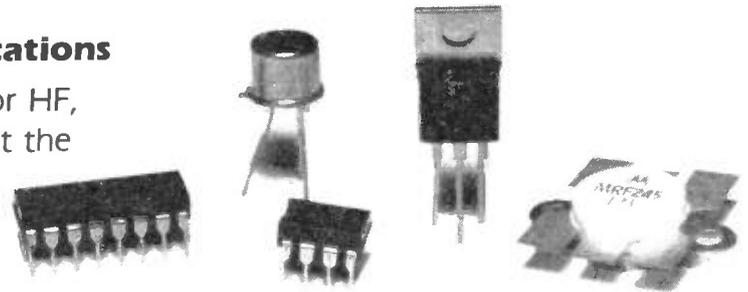
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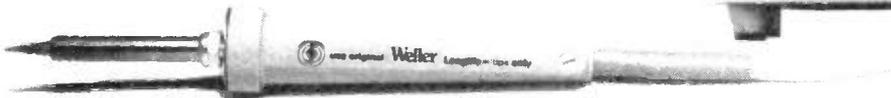
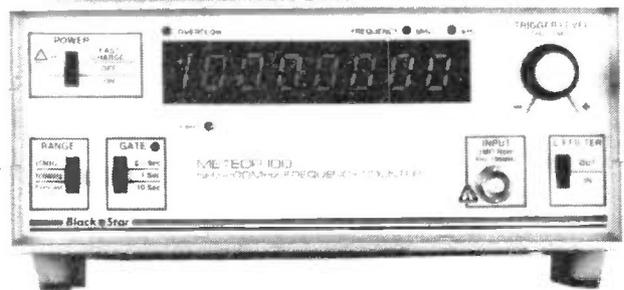
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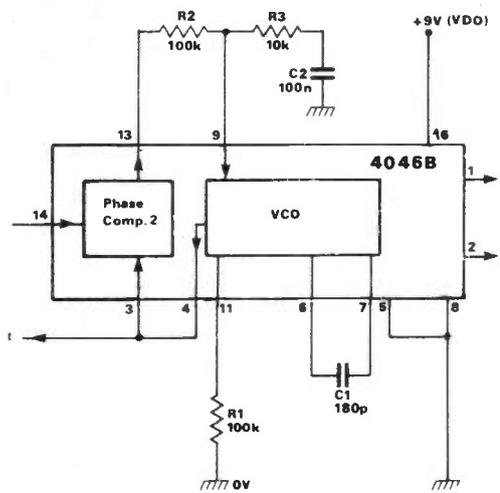


Fig 22 Wide-range PLL signal tracker, showing waveforms obtained when the loop is 'locked'

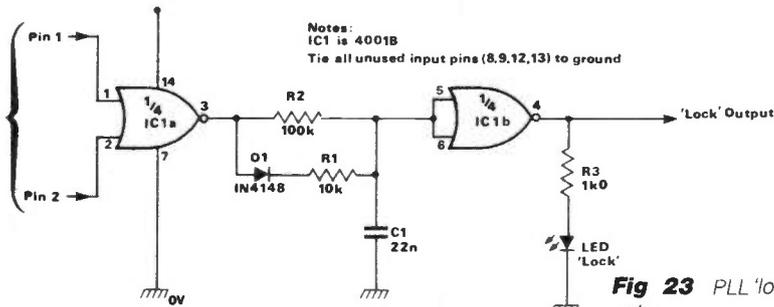
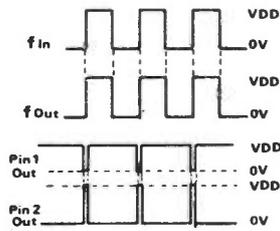


Fig 23 PLL 'lock' detector/indicator

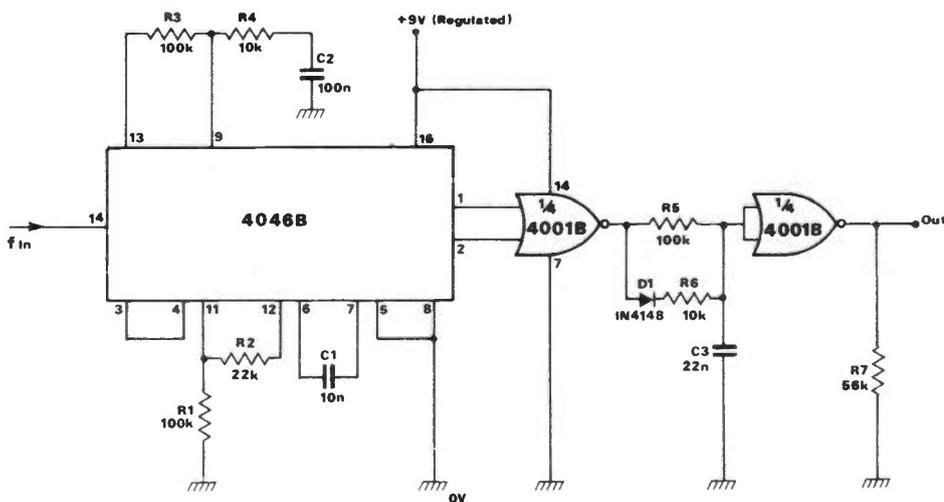


Fig 24 Precision narrow-band (≈ 1.8 KHz to 2.2KHz) tone switch

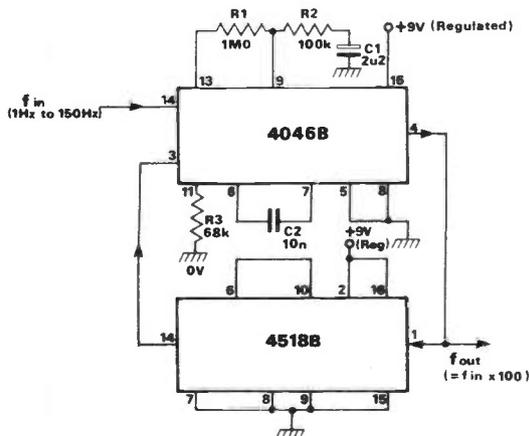


Fig 25 A x100 low-frequency pre-scaler

comprises a series of positive-going pulses, and these rapidly charge C1 via D1-R1, thereby forcing the output of IC1b low and holding LED 1 fully off.

Figure 24 shows how a PLL circuit can be combined with a 'lock' indicator to

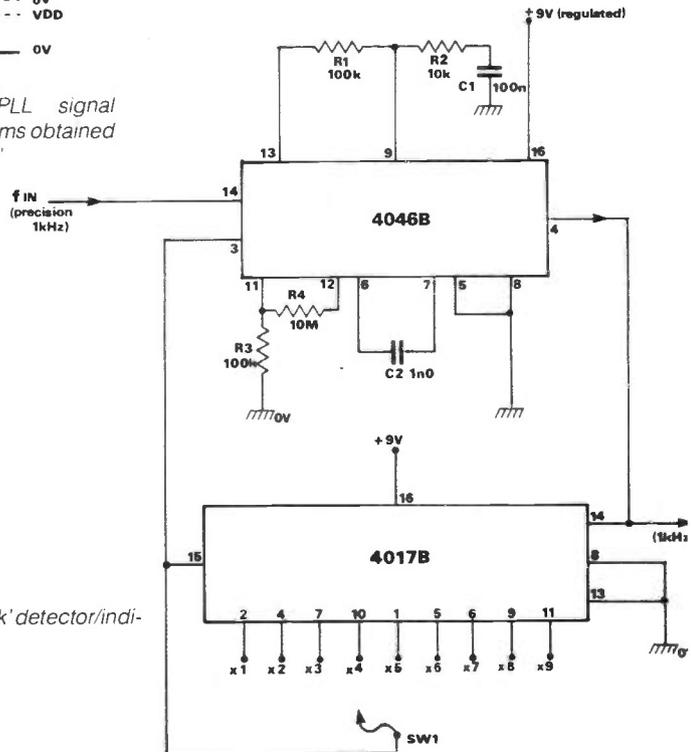


Fig 26 Simple 1KHz - 9KHz frequency synthesiser

make a precision narrowband tone switch. In this case the maximum frequency of the VCO is determined by R1-C1, and the minimum frequency by (R1+R2)-C1; with the component values shown, the frequency is variable from approximately 1.8 kHz to 2.2 kHz, and the circuit can thus only lock to input signals within this frequency range. The output of the circuit is normally low, but switches high in the presence of a suitable input signal.

Finally, Figures 25 and 26 show a couple of practical 'frequency multiplier' circuits. The Figure 25 design acts as a x100 frequency pre-scaler and can be used to change a 1 Hz to 150 Hz input signal into a 150 Hz to 15 kHz output signal that can easily be read on a standard frequency counter. The 4158B IC used in this circuit actually contains a pair of decade counters and in Figure 25 these are cascaded to make a divide-by-100 counter.

The Figure 26 circuit acts as a simple frequency synthesiser. It is fed with a precision (crystal derived) 1 kHz input signal, and provides an output that is a whole-number multiple (in the range x1 to x9 of this signal). The 4017B is used as a programmable divide-by- 'n' counter in this application. The single 4017B can easily be replaced by a string of programmable 'decade' counters, to make a wide-range (10Hz to 1MHz) synthesiser.

above 4046B PLL circuit. In the PLL, the output of each phase comparator comprises a series of pulses with widths proportional to the difference between the two input signals of the comparator. The output of phase comparator 1 is low, and that of phase comparator 2 is high, except for these pulses. When the PLL circuit is locked, (see Figure 22) these two outputs are almost perfect mirror images of each other; when the loop is not locked, the signals are greatly different.

In the lock detector/indicator circuit of Figure 23, the above facts are put to use via 2-input NOR gate IC1a, which is driven from the outputs of the two comparators. The circuit action is such that if the loop is locked the output of IC1a remains permanently low, thus driving the output of IC1b high and illuminating LED 1. If the loop is not locked, however, the output of IC1a

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Well, they managed it! UOSAT 2 got off to a really good launch from the Western Test Range, Vandenberg, California, right on time at 1759 UTC on March 1. Just over an hour later it commenced sending its first telemetry signals which were loud and clear and appeared to be considerably stronger than those from its predecessor, UOSAT 1, at least as far as its 2 metre signals were concerned, on 145.825MHz.

The planning and building of this satellite is a remarkable feat and Dr Martin Sweeting and his team at the University of Surrey, are to be congratulated for the dedication and skill they put into this project.

The launch was described by Richard Limebear, G3RWL, on an 80 metre net, set up by AMSAT-UK for the occasion, and listeners could follow the launch stage by stage. The lift-off; the various stages of rocket separation; the ejection of the Landsat Satellite – the main payload of the launch – and then the successful ejection of UOSAT 2 were all detailed and made very good listening. Our congratulations to Richard for this effort.

The media took a more than usual interest in this launch, it being featured in John Craven's Newsround on BBC 1 and again in the evening's TV News coverage, which showed both the lift-off at Vandenberg and views of the activities in the Control Station at the University of Surrey, from which Dr Sweeting gave a good interview on the project. Altogether, a very good effort indeed.

Details of the orbit are available by ringing Guildford 61202.

Criticisms

When UOSAT 1 was being planned, much criticism came from some quarters that it did not have a transponder, whereby 'amateur radio communications' could take place. This was followed after its launch by further complaints that it was using amateur radio frequencies for purposes which were not 'amateur radio' and should therefore, have been operating elsewhere in the radio spectrum. The same outlook has arisen again over UOSAT 2.

I am strongly against such an outlook. There is much more to amateur radio than just 'communication.' Many radio amateurs get their first taste of the hobby as SWL's and many SWL's find much

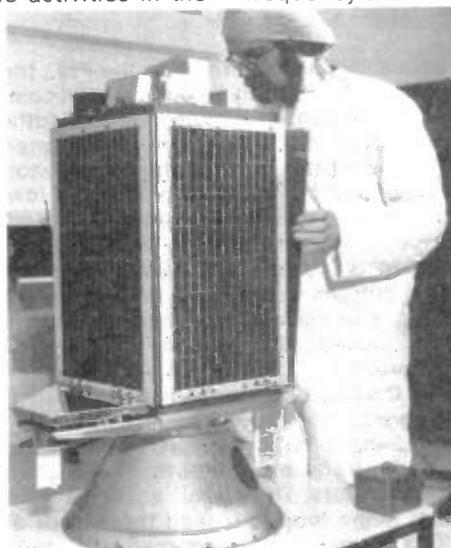


interest in the satellite field. And with the publicity that amateur radio has recently had from space activities with the Shuttle and again now with UOSAT 2, there is no way that projects like UOSAT can be said to have no amateur radio interest.

It was good therefore, to find Bob Phillips, G4IQQ, writing as follows, in his Satellite News and Views feature 'Ephemeris' in the March 1984 'Radio Communications':- 'Another somewhat negative series of comments has been heard recently concerning the objectives of the project (UOSAT) and its relation to amateur radio. Indeed, similar comments were raised around the time of the launch of UOSAT-1. It is argued that the use of radio frequencies allocated to the amateur satellite service should be limited to the usual communication aspects of amateur radio, ie, the reason for

using amateur frequencies is the availability of suitable receiving equipment at a reasonable price.

'My personal view is that it would be a great pity if projects such as UOSAT, were driven to other frequencies. The potential benefit in terms of obtaining a better understanding of some of the non-communication aspects of satellites, surely outweighs the periodic use of a few kilohertz of the amateur frequency allocations.'



Ian Ferebee working on UOSAT-B in the clean room at Surrey University. (Photo by the University's Audio-Visual Aids Unit)

CB changes

The CB licence regulations have recently been amended. In future, CB Licence holders must be 14 years or over in age. CB can be used by those under this age, but only if under the supervision of a licensed person. The new regulations prohibit the retransmission of radio, TV broadcasts and of music. The new licence specifically indicated that Channel 9 should be kept for calling for assistance only, and it will draw licensee's attention to the desirability of following the advice given in the 'CB Code of Practice'.

The number of CB licence holders is dropping. Mr Paul Howell, Norfolk's European MP, in a letter to the Secretary of Trade and Industry, restated his views that a well organised Citizens Band radio service, could play a significant role in time of local or national difficulties and that more channels were needed for it.

The Under Secretary for Corporate

AMATEUR RADIO WORLD

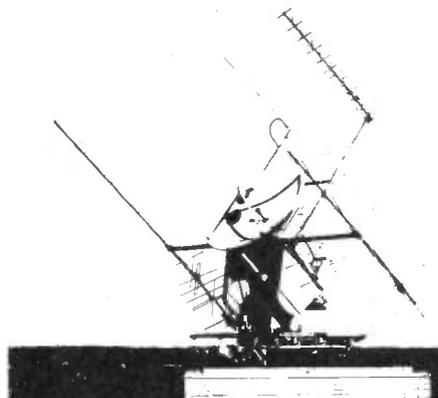
and Consumer Affairs, Mr Alex Fletcher, replying to Mr Howell, pointed out that the use of CB radio in emergencies, was the concern of local authority emergency planning officers. He also said that it was possible that the number of channels for CB use in the 27 MHz band, could be increased to 40 channels once other users had ceased to use that band, and that further channels might be provided in the 934 MHz band. He added that Mr Howell's opinion that CB needed more channels because of its growth did not bear weight, as the number of CB licences was, in fact, decreasing.

Installation of 50th RSGB President

The installation proceedings for the installation of the 50th President of the RSGB took place at Cardiff Castle on 14th January last, when Mr R G Barrett, GW8HEZ, was installed.

One of the objectives planned by the RSGB for 1984, is to survey all aspects of UK Amateur Radio Licensing conditions. Members are being asked for their views on the present licensing conditions and any suggestions they might have for changes.

In view of the views already expressed in some quarters regarding the necessity of retaining the morse code requirement for the amateur radio transmitting licence, it is interesting to note that the FCC, the American amateur radio licen-

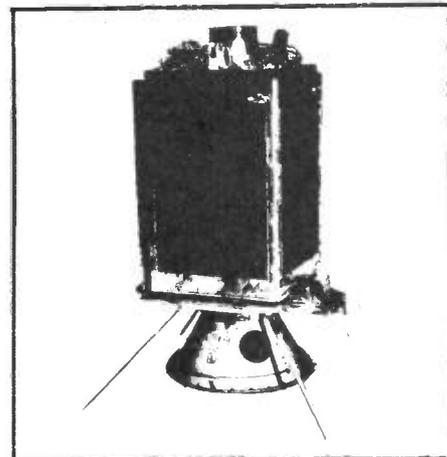


sing authority, recently rejected a proposal for modifying its requirements in this respect, in order to provide an amateur licence similar to the Class B licence in this country. They received comments, 20 to 1 against such a proposal, which included strong opposition from the ARRL - the American National Amateur Radio society. The FCC concluded that a knowledge of morse code by radio amateurs, was always useful and, in some cases, essential for the efficient operation of an amateur radio station; that it was no bar to the physically handicapped and that the amateur radio service in the

USA was healthy and growing, even with a 'no-code' licence.

World Amateur Radio Day

Wednesday, 18th April, has been designated 'World Amateur Radio Day,' by the International Amateur Radio Union (IARU). Activities for this occasion are a bit vague but the general idea is that all radio amateurs should make a special effort to operate on that day and perhaps, try out a mode they do not usually use. It's 'try a new band or try a new mode' day. Material is being distributed by the IARU to the media to encourage publicity for amateur radio.



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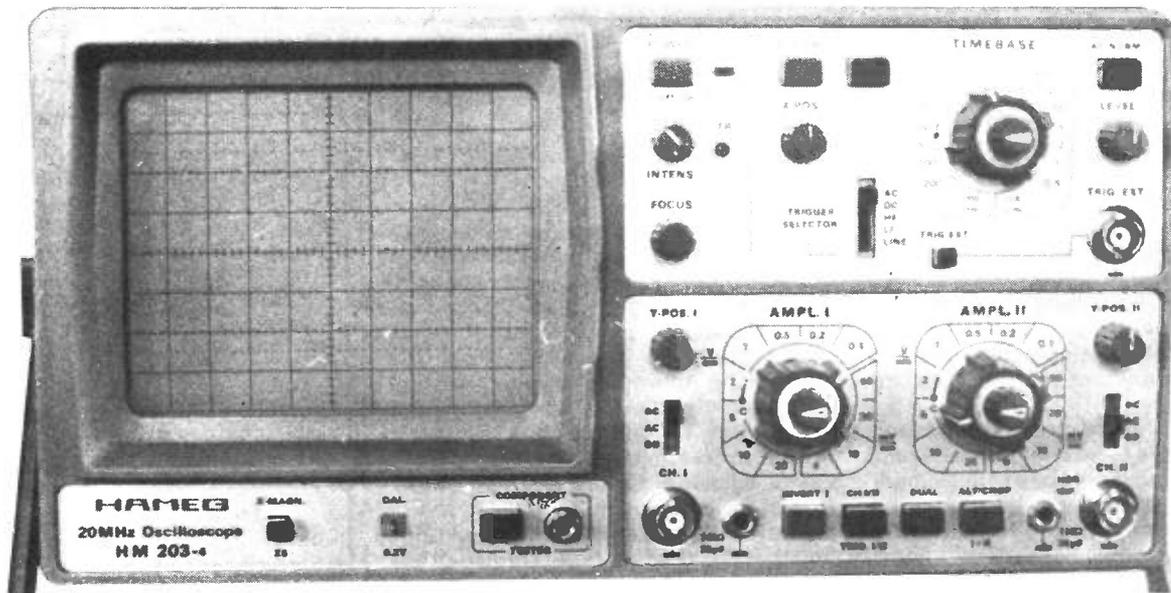
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THE HAMEG HM203-4 OSCILLOSCOPE

This versatile dual-trace model is reviewed by James Dick



There is no doubt that electronics and amateur radio are increasingly popular hobbies. The introduction of citizens' band radio promoted interest and there are now over a quarter of a million CB licenses.

For many, what starts as an interest in using a black box rapidly changes into a desire to understand the techniques in use and the wish to build circuits either from their own designs or from the many that are published every month. This progression is not surprising, considering the excitement of chasing weak signals with a receiver of your own design!

Easy trouble-shooting

The hobbyist frequently has a good set of tools and takes great care when building a circuit. However, what happens when the circuit does not work? A trusty friend is the multimeter – pottering around the board allows voltage to be tested (perhaps the biasing of a transistor) and the current to be measured (...oh, so that's why Tr1 was hot...). If our intrepid hobbyist ventures into the realm of digital circuitry, a logic probe will enable the discrete high/low logic levels to be confirmed – and may even spot the dreaded floating input.

Without dispute, the most useful piece of electronic test gear is the oscilloscope. So simple in concept, yet providing, literally, a view into the workings of any circuit from a home computer to a one transistor amplifier.

The Hameg HM203-4 has had a year's evaluation in the author's shack doing just those sorts of tasks; the simple layout of the controls have made driving the creature very easy (the beam never seems to get lost...) and the wide variety of functions has always been ample to display the necessary features.

Mid-range – but only in price

Hameg make the HM103 – a single trace scope with 15MHz bandwidth and 2mV/cm sensitivity – which retails at £180 (approx), and the MH204 dual beam, 20MHz scope with delayed sweep facility (£420). The MH203-4 represents a mid-range scope. With a price tag of £300 (inc VAT), it holds a competitive position among the rivals manufactured by Hitachi, Crotech Scopex, and Trio. However, the Hameg nearly always beats their specifications with its 20MHz bandwidth.

Features

The vertical deflection system has a DC-to-20MHz response, although this extends to 28MHz with a -6dB penalty. The amplifier risetime is a mere 17 nanoseconds which accounts for the beautifully sharp edges seen with logic signals. The sensitivity is stepped from 5mV/cm to 20V/cm in 12 points in a 1-2-5 sequence with 3% accuracy; a variable gain control with 1:2.5 range allows an ultimate 2mV/cm to be obtained. The inputs, which may be AC or DC coupled or grounded, have a fairly standard 1

Megohm/28pF impedance.

Although it is nominally a dual-trace scope, the HM203-4 has no fewer than six trace modes: selection allows either channel to be displayed separately, dual trace may be obtained by chopping between the two channels or by alternate trace, and the sum or difference of the two inputs may be displayed. This last feature is very useful for examining balanced systems such as the popular MC1496 modulator IC.

The timebase has 18 calibrated steps from 500 nanosec/cm to 200 millisecc/cm in 1-2-5 sequence. A variable setting allows each calibration position to be altered over a 1:2.5 range while a x5 magnification can be used to give 40 nanosec/cm. The timebase trigger is one of the HM203-4's strongest points. The trigger coupling (which may be internal or external and up to 40MHz) is selectable between DC/AC/HF/LF/LINE. The LINE setting triggers the trace synchronously with the mains; the HF/LF options allow the trace to be triggered on high frequency or low frequency components of a signal. This is very useful for displaying video signals: setting to LF allows the video signal to be triggered at frame frequency. 'TV' triggering can be obtained from the AC or HF options; the LF/HF filter point is around 1kHz.

The HORIZONTAL EXTERNAL control causes the CRT's X-deflection voltage to be taken from the channel 2 input, which allows the scope to be used as an X-Y display. Typical applications in this mode

THE HAMEG HM1203-4 OSCILLOSCOPE

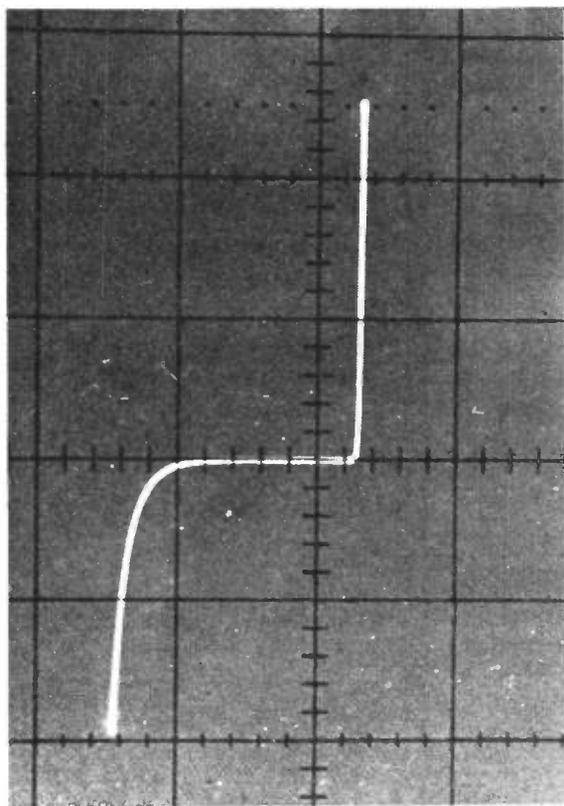


Photo (a) Zener diode display

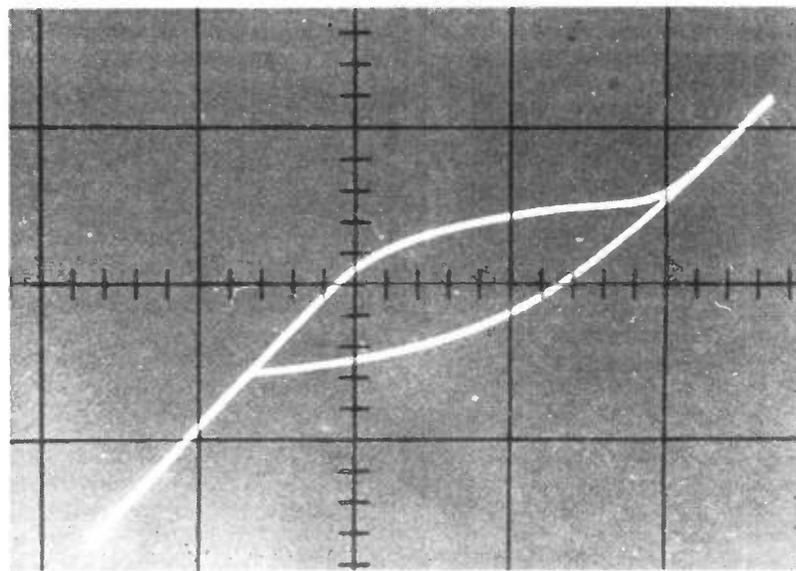


Photo (b) Resistor, capacitor, zener combination

are frequency comparison using Lissajous figures, amplitude/phase comparison, or simple vector graphics when linked to a (home) computer.

Component Tester

When the author potters around in his shack, gathering together bits for a new project, the HM203-4's built-in component tester is always appreciated. Resistors (from 20Ω to $4k7\Omega$), capacitors (up to $1000\mu\text{F}$), and semiconductors may be tested in or out of circuit. Depressing the COMPONENT TESTER button and connecting the suspect component between ground and the component tester output

causes a small voltage to be applied across the device. The scope display then shows the amplitude/phase relationship of the resulting voltage and current – in essence, the display shows the voltage/current 'characteristics' of the device under test. Although devices can be tested in circuit (with the circuit's power off, please!), the display is modified by the effects of the surrounding components which can make the trace hard to interpret.

The above photographs show traces produced by the component tester. The display in photograph (a) is produced when testing a 5V1 zener diode

– note the sharp normal diode knee and the softer zener turnover (to the left of the picture). Photograph (b) shows a resistor, capacitor, zener diode tested in combination; the resistor gives shape, capacitor ellipse and the zener gives an 'off-centre' display.

Ergonomic

The author remembers, a few years ago, being confronted, and totally baffled, by, one of the large Tektronix oscilloscopes – although well equipped the instrument took a lot of time to set up. The Hameg compares well with its rivals for front panel simplicity. Each set of controls is clearly delineated and discretely colour coded. All controls are the correct size for the average human hand (some manufacturers seem to forget this point...) and, while easy to move, have their calibrated positions defined by click stops.

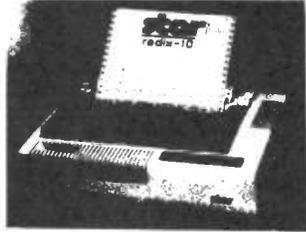
The instruction manual accompanying the scope is particularly lucid – the text, highlighted to ease location of details, is punctuated with examples; four pages are devoted to a detailed treatment of the component tester with lots of example traces obtained from the more common components. When purchased (shortly after product release), no circuit diagram was available – but Hameg supplied this and other schematics within one month. If the need ever arises, all the vital service information is there. The circuit diagrams show the true solid-state nature of the scope – the only valve the author can spot is the CRT.

The display, which uses a medium persistence phosphor (green) is very sharp at all beam intensities. This is important because excellent detail can be seen in complex waveforms which would otherwise be blurred. The lack of an illuminated graticule will not be noticed by most users although it is useful for photographic purposes. The HM203-4 is intended to be a general purpose instrument – a sturdy metal case ensures that it will survive most onslaughts. The carrying handle can be set to alter the scope attitude to 0° , 10° , or 20° to ease viewing when mounted on the bench. At a mere 7kg (it weighs less than the author's portable television) it is easily carried around – contrasting remarkably with the older instruments which may be seen bending the floor in secondhand shops. This reduction in weight is caused by the modern circuitry which goes away with the heavy transformers used in valve instruments – and leaves the Hameg sipping power from the mains at only 36 Watts.

Conclusion

The frequency range of the Hameg HM203-4 is ideal for the amateur or professional; its good sensitivity and accuracy outrun some rivals. The low price and ease-of-use make it an ideal instrument for the home, while the low power consumption and weight would make it an ideal companion for a dx-pedition or field day.

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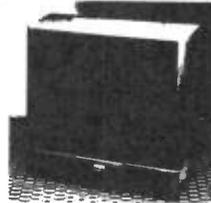
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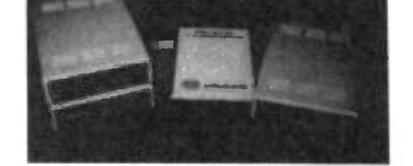
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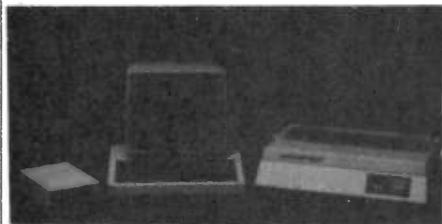
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MOST IMPORTANT — include a **telephone number** — if you have a particularly interesting contact so that we can contact you for details for publication.

G4LNA:

Usually available Mondays to Fridays between 06.30 and 07.15 and before 12.00 during weekends on 1.8, 3.5, 7, 10 and 14MHz. Uses CW mainly but sometimes phone on RNARS nets nr 2069. Equipment includes Redifon marine TCVR with H/B synthesiser and his special interest is Homebrew. Most interesting contact was QSO and CARU from the Magnus oil platform.

5B4NA:

Usually available daily except Mondays and Tuesdays between 13.30 and 16.30 GMT on 10, 15 and 20 metres. Uses phone and CW. Equipment includes FT-902DM and his special interests are DX stations and contacts with USA stations. Most interesting contact to date was QSO-A3J with 5W1DZ in Apia (Western Samoa) on 21.243.

G4VFG:

Usually available between 22.00 and 24.00 Monday to Friday on 80m and at various times during the weekends on 10 metres and 2 metres SSB. Uses mostly phone but occasionally CW. Equipment includes Yaesu FT77, Eddystone EC10RCVR, Trio 2300 FM 2m, Belcom liner 2SSB. His special interests are QRP portable work on VHF, construction and simple antennae. Most interesting contact was VP8ALD on S Orkney on 28MHz.

G4NNJ:

Usually available daily on 20, 40 and 80 metres. Uses CW only.

Equipment includes Homebrew QRP on 80m and Heath HW7 40/20/15. His special interests include ragchew around the UK on 80m.

GU6NAE:

Usually available daily after 18.00 on 144MHz. Phone only at present. Equipment includes IC290H, IC2E, Belcom Liner 2, R1000, Vic 20 with MPTU-1 terminal unit (RTTY). His special interests are /P operation, RTTY, amateur satellites and FSTV (receive only).

G3VMR:

Usually available Sundays on 2m, CH14 (145/35) and 10m (28.4). Nets 11.00 (social), 19.30 (data). Uses phone, FM preferred. Equipment includes Multi 2000 & Atlas 210. Special interests are high speed data and news bulletins using CCITT tones at 300 and 1200 baud, text and programs.

G3IFM:

Usually available daily between 08.00 and 20.00 on 160 through 10 metres (local chats on 2m). Uses RTTY and AMTOR. Equipment includes FT1012D, VIC-20, AMTOR AMT-1, 5 band vertical ant. His special interests are RTTY and AMTOR mainly 20m. Auto-mode available on 14075 MHz daily. Most interesting contact was FP8 in 1950s, 10Watts CW on 7MHz.

G1ESG:

Usually available on Wednesdays, Fridays and Sundays between 08.30 and 21.00 on 144 MHz. Uses phone, F3E and sometimes J3E. Equipment includes Icom IC2E and FT290R. His special interest is DX. Most interesting contact was Lebanon during lift, RST (5-0-3).

G3ZNZ:

Usually available most days on 144 and 432MHz. Uses J3E and FM mainly horizontal. Equipment includes FT221R

Mutex Board, FT780R and 19ELE 'Cushcraft' Boomer. Special interests are radio computing with Dragon 32, diplomas especially DLD1000 on VHF and PA1000 2 metres VHF. Most interesting contact made to date was QSO with King Hussein (JY1) and his then wife Princess Muna (JY2). Both confirmed. Last QSO to complete 'WAB' gold (13) and 'Mary Rose'.

G3NRW:

Usually available on Sundays between 0900 and 1300 on 2, 4 and 20 metres. Equipment includes FT200, MM transverters, Nascom for RTTY and AMTOR. He is editor of 'Datacom' and of the BARTG quarterly magazine. His special interests are RTTY, AMTOR, Packet radio, computers, QRPp (50mW on 20m) and transmitting RTTY news on 2m on Sundays at 10.30.

G3YLR:

Usually available most days on 3.5MHz through 30MHz and 144-146MHz. Uses mainly phone. Equipment includes HF bands, Ten Tec Argosy II, 144-Trio 2300 and 40w amp. Special interests are RNARS, AMSAT, G-QRP, mobile, Technical interest: antennae transmission lines, methods of matching. Has upwards of 1000 QSL cards and has had one interesting QSO with Jan Mayen Island and another with St Kilda.

G1DCD:

Usually available daily between 1800 and 0100 on 2 metres. Uses phone and RTTY. Equipment includes KDK FM 2030, Belcom LS102 and MM transverter. Special interests are AMTOR, satellite work and European DX.

Most interesting contact was made with F6BY (France).

G8YOX:

Usually available early evenings on most days on 2m, 23cm and above.

Uses phone, RTTY with computer, SSB, ATV. Equipment includes, Trio TR1010 SSB Txcvr, H/brew linear, H/brew FM Synth Rig, 9ELE Tonna, 24 ELE Quad (23cms) and his special interests include VHF/UHF DX, Meteor scatter microwave propagation, homebrew equipment and computer-aided communication. Most interesting contact to date was made with Karl OK1KH/P. Czech 2m SSB.

G2DHV:

Usually available most days during the afternoons on 160-80 (A3E/A1A), 20/15/10 (A1A), 10 (F3E) and 4/2 (A1A/T3E) and can be contacted mostly by CW and, occasionally, phone. Equipment is mostly home converted gear plus MX4-MX2-TR2100M, and his special interests include DX, AMSAT, VHF/UHF, Microwaves, ATV/SSTV propagation, aerials, construction, mobile, satellites and contests (VHF). Most interesting contact to date: QTH AL41F-JOO1F.

G2VF:

Usually available most afternoons and evenings on 40, 15, 20 and 10m (CW only). Equipment includes Heathkit HX1681 and DX100 transmitters, HF loop antenna.

Special interests include loop antennae for HF bands, RSGB QSL awards, Bureau Sub Manager. Had an interesting contact with OR4VN during the Antarctic expedition of 1964/65.

POINTS OF CONTACT

G2VF:

Usually available most afternoons and evenings on 40, 15, 20 and 10m (CW only). Equipment includes Heathkit HX1681 and DX100 transmitters, HF loop antenna. Special interests include loop antennae for HF bands. RSGB QSL awards. Bureau Sub Manager.

Had an interesting contact with OR4VN during the Antarctic expedition of 1964/65.

G3AKG:

Usually available Monday to Friday: 08.00-09.00, 09.30-10.30, 15.00-17.00 on 10, 15 and 80 metres. Uses CW and SSB.

Equipment includes FT101E (modified), Standard C8500 and Datong downconverter. Special interests are various nets, 80m, KSG, BTI, RNARS and RAOTA.

G4ASR:

Usually available daily from 16.00 on 70, 144, 432, 1296 and

5760 MHz. Uses SSB, CW, FSTV, RTTY. Has various equipment and his special interests include EME on 144/432 MHz, MS on 144 (432), Auroral, Sporadic-E and DX Tropo. Most interesting contacts made to date: 584AZ on 70 MHz, LA6HL/TF Iceland, three QSO's on 144 MHz.

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Type of Licence A..... B.....

Bands usually preferred.....

Operating days M T W T F S S Times.....

Equipment.....

Phone/CW.....

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YAESU FT980	1265.00	(—)
ICOM IC751	1049.00	(—)
ICOM IC745	839.00	(—)
TRIO TS430S	752.00	(—)
TRIO TS830S	731.00	(—)
YAESU FT102	685.00	(—)
YAESU FT757GX	685.00	(—)
TRIO TS530S	638.00	(—)
TRIO TS130S	555.00	(—)
YAESU FT77	459.00	(—)

ANTENNA TUNER UNITS

ICOM IC-AT500 Auto	369.00	(—)
ICOM IC-AT100 auto	269.00	(—)
TRIO AT250 auto	273.00	(—)
YAESU FC757 auto	231.00	(—)
YAESU FC102 High Power	179.00	(—)
TRIO AT230	138.00	(2.00)
TRIO AT130	95.45	(1.50)
YAESU FC700	98.90	(1.50)
WELZ AC38	69.00	(1.50)
YAESU FRT7700 Short Wave Listening	46.00	(1.00)

HF RECEIVERS

ICOM R70	549.00	(—)
TRIO R2000	421.00	(—)
TRIO VC10 VHF Converter for R2000	113.00	(—)
YAESU FRG7700M with memory	435.00	(—)
YAESU FRG7700 without memory	369.00	(—)
YAESU FRT7700 antenna tuner for FRG7700	46.00	(—)
YAESU FRA7700 active antenna for FRG7700	41.80	(—)
TRIO R600	263.00	(—)

VHF RECEIVERS

JIL SX200N	299.00	(—)
AOR AR2001 25—500MHz	325.00	(—)
FDK ATC720 Handheld Airband	159.00	(—)
FDK RX40 Handheld 141-179 MHz	132.00	(—)

2M FM TRANSCEIVERS

TRIO TM201A 25W Mobile	269.00	(—)
ICOM IC27E 25W Mobile	299.00	(—)
YAESU FT230R 25W Mobile	259.00	(—)
TRIO TR2500 Handheld	237.00	(—)
FDK Multi 725X 25W Mobile	215.00	(—)
YAESU FT208R Handheld	199.00	(—)
ICOM IC2E Handheld	169.00	(—)
ICOM IC02E Handheld	229.00	(—)

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TRIO TS780 2M and 70cm base	795.00	(—)
YAESU FT726R 2m fitted (70cm optional) base	739.00	(—)
ICOM IC271E 25W base	629.00	(—)
ICOM IC290D 25W Mobile	469.00	(—)
TRIO TR9130 25W Mobile	442.00	(—)
YAESU FT480R 15W Mobile	399.00	(—)
FDK Multi 750XX 20W mobile	315.00	(—)
YAESU FT290R Portable	269.00	(—)

70 TRANSCEIVERS

TRIO TW4000A Mobile 2M/70cm	469.00	(—)
TRIO TM401A 12W Mobile	299.00	(—)
TRIO TR3500 Handheld	256.00	(—)
YAESU FT790R Multimode portable	249.00	(—)
ICOM IC4E Handheld	219.00	(—)
YAESU FT708R Handheld	179.00	(—)

POWER SUPPLIES

YAESU FP7579X	149.00	(1.50)
YAESU FP700	125.00	(2.50)
TRIO PS430S	115.00	(2.50)
TRIO PS20	59.95	(2.00)
ICOM PS15	119.00	(2.50)
ICOM PS20	176.00	(2.50)
DRAE 4 amp	34.00 (—)	12 amp 79.50 (—)
6 amp	53.50 (—)	24 amp 110.00 (—)
BNOS 6 amp	48.30 (—)	24 amp 125.00 (—)
12 amp	£86.40 (—)	40 amp 225.00 (—)

NEW AKD WAVEMETER (VHF) £27.50

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TRIO SP230 (TS830, 530)	42.00	(1.50)
TRIO SP430 (TS430)	29.90	(1.50)
TRIO SP120 (TS130, 120)	27.14	(1.50)
YAESU SP102 (FT102)	52.50	(1.50)
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YAESU FSP 1 Mobile speaker	12.65	(0.75)

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TRIO HC10 Digital	67.62	(2.00)
ICOM Globe Clock — LCD readout	55.00	(2.00)
YAESU QTR 24D — Analogue quartz	34.50	(2.00)

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HI-Q Balun 1.1 5kW pep	9.95	(0.75)
W2AU Unadilla 4:1 Balun	18.99	(1.20)
7:1 14/21/28 MHz Unadilla Traps — pair	18.99	(1.20)
7:1 MHz RAL TRAPS — Epoxy — pair	8.95	(1.50)
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T-piece polyprop Dipole centre	1.50	(0.30)
Polyprop Strain Insulators	0.50	(0.10)
Small ceramic Egg insulators	0.50	(0.10)
Large ceramic Egg insulators	0.75	(0.10)
75 ohm Twin Feeder light duty	per metre 0.16	(0.40)
300 ohm Twin Feeder	per metre 0.14	(0.04)
UR67 Low loss coax — 50ohm	per metre 0.60	(0.20)
UR76 50 ohm coax — dia 5mm	per metre 0.25	(0.05)
UR70 70 ohm coax	per metre 0.30	(0.05)
4mm Polyester Guy Rope. strength 400kg	per metre 0.16	(0.04)

WELZ SWR-POWER METER

SP15M SWR-Power HF/2M 200W	39.00	(1.00)
SP45M SWR-Power 2M/70cm 100W	55.00	(1.00)
SP250M SWR-Power HF/2kw	55.00	(1.00)
SP350M SWR-Pwr HF/2M/70cm 200W	65.00	(1.00)

COAXIAL SWITCHES

SA450 2 Way Diecast SO239 (500MHz)	10.00	(0.75)
SA450 2 Way Diecast N plug (500 MHz)	12.95	(0.75)
CH20A 2 Way Welz SO239 (900 MHz)	19.50	(1.00)
CH20N 2 Way Welz N plugs (900MHz)	34.50	(1.00)

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LM317 Metal.....	£2.00
7812 Metal.....	£1.00
L036 TO3 Metal 12v L037 15v.....	ea 50p
7805/12/15/24 plastic.....	40p
7905/12/15/24 plastic.....	50p
CA3085 TO99.....	50p
LM723 14 dil or TO99.....	50p

EPROMS/MEMORIES

2732A-4.....	£2.50
2716 Ex eqpt.....	£2.00 10/£17
2102 500ns AMD.....	80p 10/£6.00
MC6810P.....	£1.05 10/£8.50

POWER TRANSISTORS

2N3055 Motorola.....	50p 5/£2.00
2N3055 Ex eqpt tested.....	5/£1.00
MJE3055.....	50p
MJE2955 equiv.....	50p

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FLT-02-8.....	£1.50
Futaba 8 digit calculator fluorescent display 9CT-01-3L.....	£1.50
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A1/216 24v 150w.....	£2.25
H1 12v 55w (car spot).....	£1.25

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with adjusted unused	
RM7 LA4245.....	3/£1.00
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ideal for car/home alarms £3... 100+ £2.00	
12v 1.2w small wire ended lamps	
fit AUDI/VW TR7 VOLVO.....	10/£1.00

14v 0.75w MES lamps.....	8/£1.00
Heat shrink sleeving pack.....	£1.00
PTFE sleeving pack asstd colours.....	£1.00
250 mixed res diodes, zeners.....	£1.00
Convergence pots asstd.....	10/£1.00
Mixed electrolytic caps.....	100/£2.00
ITT CASS RECORD/PLAY AMP+cct	
.....	£2.00

Stereo cassette deck.....	£5.00
Stereo cass R/P head.....	£2.50
Mono head £1 Erase head.....	50p
Thermal cut-out 50°C, 77°C or 85°C.....	50p
Thermal fuse 121°C 240v 15A.....	5/£1.00
sim RS 413-563	
Vero pins fit 0.1" Vero.....	100/50p
Double sided PCB pins.....	100/50p
TO220 Micas + bushes 10/50p.....	100/£2.00
TO3 Micas + bushes.....	10/50p

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2 pole changeover.....	£1.00
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TDK MAINS RFI FILTER 115v 15A.....	£1.00
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BELLING-LEE 12 way block L1469. 4/£1.00	
POTENTIOMETERS short spindle 2k5 10k 2m5 Lin.....	5/£1.00
500k lin 500k log long spindle.....	4/£1.00
555 Timers.....	5/£1.00
40KHZ ULTRASONIC TRANSDUCERS EX-EQPT.NO DATA.....	PAIR/£1.00

RECTIFIERS

120v 35A stud.....	40p
12FR400 12A 400v small stud.....	4/£1.50
BY127 1200V 1.2A.....	10/£1.00
1N5401 100v 3A.....	10/£1.00
BY254 800v 3A.....	8/£1.00
BY255 1300v 3A.....	6/£1.00
1A 800v bridge rectifier.....	4/£1.00
6A 100v bridge.....	50p
10A 100v bridge.....	£1.25
15A 100v bridge.....	£1.25
25A 200V bridge.....	£2.00 ea 10/£18
25A 400v bridge.....	£2.50

SCRs

2N6399A 10A 600v.....	£1.00
BTX95 800v 15A.....	£1.20
35A 800v stud.....	£2.00
70A 500v large stud.....	£3.00
MCR106 equiv 4A 400v 40p ea.....	100/£20.00
2N5061 8A 60V TO92 4/£1.00.....	100/£10.00
TICV10D 8A 400v TO92 3/£1.00.....	100/£15.00

TRIACS

TXAL 228 8A 400 visoltab.....	2/£1.00
25A 800v ex eqpt tested.....	£1.50
20A 500v isolated ex eqpt. tested.....	£1.50

CONNECTORS

'D' 9 way £1.00 15 way £1.25 25 way £2.00	
37 way £2.00 50 way £2.50	
(EX EQPT price perpair) covers 50p ea	
AMPHENOL (Centronics) 36 way plug + skt ex eqpt.....	£2.50
0.1" double sided edge connector 32 way ideal ZX81/SPECTRUM.....	£1.50
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2 pole sub min connectors ideal radio control RS 466/472/488/343 5 pairs.....	£2.00

IDC CONNECTORS

25 WAY 'D' SOCKET.....	£2.00
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34 WAY SOCKET (BBC DISC DRIVE).....	£2.00

40 WAY SOCKET.....	£2.00
IDC EDGE CONNECTORS D/S EX-EQPT	
34 WAY (FITS DISC DRIVE PCB).....	£3.00
40 WAY (FITS CENTRONICS 739 PCB).....	£3.00

50 WAY.....	£3.50
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WIRE WOUND RESISTORS 2.5W (W21 or sim)	
R10, 1R0, 2R0, 2R7, 3R9, 5R0, 4R7, 10R, 12R, 15R, 18R, 20R, 27R, 33R, 36R 47R 100R 120R 180R 270R 330R 390R 470R 560R 680R 820R 1K 1K2 1K3 1K8 2K7 3K3 10K	
10 FOR £1.00	
W22 or sim 6 watt.....	7 for £1.00

R22 1R5 9R1 10R 12R 20R 33R 51R 56R 62R 120R 180R 270R 390R 560R 620R 1K2 2K2 3K3 3K9 10K	
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W23 or sim 9 watt.....	6 for £1.00
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R22 1R0 3R0 6R8 56R 62R 100R 270R 1K8 10K W24 or sim 12 watt.....	4 for £1.00
10R 68R 75R 200R 270R 400R 620R 1K	

PHOTO DEVICES

Slotted opto-switch OPCOA OPB815.....	£1.30
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2N5777.....	50p 100/£26 1000/£190.00
TIL81 T018 Photo transistor.....	£1.00
TIL38 Infra red LED.....	2/50p
OPI2252 Opto isolator.....	50p
Photo diode 50p.....	6/£2.00
MEL12 (Photo darlington base o/c).....	50p
RPY58 LDR.....	50p
T018 LDR.....	50p
LEDs RED 3mm or 5mm 12/£1.00.....	£5/100
GREEN + YELLOW 3/5mm 10/£1.00.....	£6/100

FLASHING RED 5mm.....	50p
BICOLOUR RED/GREEN 5MM OR RECT 50p.....	5/£2.00

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1N4151 sim 1N4148.....	100/£1.25
1N4148.....	100/£1.50
1S3740 Germanium.....	100/£2.00
1N4004 or SD4 1A 300v.....	100/£3.00
1N5401 3A 100V.....	10/£1.00
BA157 1A 400V Fast Recovery.....	100/£2.50
BA159 1A 1000V Fast Recovery.....	100/£3.50

MULTI TURN PRESETS

10R 20R 100R 200R 500R.....	40p
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IC SOCKETS

8 pin 12/£1.00 14 pin 10/£1.00	
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22/28pin 25p 24pin 25p 100/£20	
1k/£130.00	
40 pin 30p 16pin 12/£1 100/£6.00	

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Grey 1.5-6.4pF GREEN 2-22pF.....	6 for 50p
YELLOW 2-16pF	

SOLID STATE RELAY NEW 10A 250v AC zero voltage switching control voltage 8-28v DC.....	£2.00
VARIAC 0 to 270v 12A new uncased.....	£20.00

VARIAC 0 to 130v 6A new uncased.....	£6.00
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POLYESTER/POLYCARB CAPS

10n ax 100/£2.00 22n radial 100/£2.50	
47n rad 100/£2.50	
1u 250v Polyester C280	
5/£1.00 100/£10.00	
1u5 P/carb 15mm rad.....	100/£5.00
2u2 160v red 28mm.....	100/£10.00
470n 250v AC X rated rad.....	4/£1.00
100N 250V AC X rated rad 20mm.....	4/£1.00
33n 250v AC X rated rad 15mm.....	10/£1.00

BEAD THERMISTORS

GLASS BEAD NTC Res @ 20°C.....	80p
250R 1K2 50K 220K 1M4	
R53 THERMISTOR.....	£1.50

BEAD TANTALUM CAPS

47u 3V 10u 6V3 68u 6V 12/£1.00.....	100/£6.00
2u2 20V.....	8/£1 100/£8.00

SMALL AXIAL CERAMIC CAPS 50V

15p 18p 22p 27p 33p 47p 68p 82p 470p in 10n (25v).....	100/£3.00
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Exhibition '84

The RSGB National Convention at the NEC, Birmingham, 28-29 April, will be the largest and most comprehensive hobby exhibition ever held in the UK.

There will be 58 exhibitors, more than double the figure for 1983. To accommodate this larger number the RSGB has taken over Hall 3a with a total floorspace of just under 6,000sq.m. – an increase in area of 16% over Hall 6 and 6a used last year.

A very wide selection of amateur equipment will, as usual, be on display and all the familiar big names will be present.

Among the major companies exhibiting will be Western Electronics with their comprehensive array of antennae, towers and masts; Wood and Douglas with their complete range of kits; and, we believe, Lowe Electronics have something up their sleeve for display (look for them next to the RSGB stand near the entrance). Thanet and SMC are other big names to look out for.

Another major attraction again this year will be the ever-popular flea market. It too will be bigger, with over 150 tables booked so far.

The RSGB stand will be as busy as ever and all the books, charts and sundry items will be available.

Another stand guaranteed to attract great interest will be the G-QRP Club, who were overwhelmed last year and who this time will have a stand twice as large and many more people to help with enquiries. In addition, the Rev George Dobbs, G3RJV, will be giving a talk on the Saturday afternoon. This, along with the other lectures over the weekend will be well worth attending. Do ensure, though, that you arrive in good time for a particular lecture or talk as space has, in the past, been quickly taken by the crowds who have turned up for the informative and lively talks.

Take a break

The criticism levelled last year of insufficient seating facilities should be rectified this time; together with the restaurant and bar facilities there will be in excess of 400 seats available.

For those members of the family seeking pursuits other than looking at the shining array of Oriental 'black boxes', a frequent train service to Birmingham New Street for around 70p is available and only takes about ten minutes. Mums and tots can thus have a day out shopping while Dad spends the life savings on 'that new rig'.

Facilities

If you will be arriving by car, there is ample parking space and frequent free 'shuttle' buses will transfer you to the entrance and will also convey you and your bargains back to the car park when you are ready to leave.

For those who require it, overnight accommodation is available, prices ranging from £8.00 per night for B & B to around £35.00 for rooms with more facilities. The Metropolitan Hotel on site is the nearest and you should go to the

Information Bureau opposite the Medical Centre on the main piazza for further details.

The exhibition promises to be a great day out for all the family, and from all at R & EW we wish you happy bargain hunting!

HOW TO GET THERE

By rail

Birmingham International railway station was built specifically to serve the NEC, and is linked by covered walkway and escalator to the exhibition buildings. Frequent trains from London (Euston) provide an 80min connection, and there are 10min journeys to Coventry and Birmingham (New Street).

Members of the RSGB who wish to travel by train may take advantage of a special arrangement that has been made with British Rail. This is a package deal, which includes the rail journey from the station nearest your home to Birmingham International – and admission to the exhibition – all included in the price. Since members don't have to leave to go home the same day, the opportunity exists to enjoy the exhibition and also stay overnight in Birmingham and enjoy that too.

The table across shows the inclusive prices from your county, and all that is required is to complete the coupon included in the April edition of 'Radio Communication' and send it with your remittance, and a self-addressed envelope to: The Travel Manager, Kings Cross Station, London NW1 2RT.

By road

Birmingham is located at the centre of the national motorway system, and can be reached quickly from all parts of the UK. A pattern of specially-built roads gives direct access from the M1, M5, M6, M42 and M45, and parking for 15,000 cars and 200 coaches is available; a free shuttle bus brings visitors from the car park to the main entrance. The NEC is also on local bus routes.

By air

Birmingham Airport is adjacent to the NEC; a 5min journey by taxi or bus. Scheduled flights operate between Birmingham and all major European cities, with five flights a day connecting with London Heathrow.

For details of convention programme see April issue R&EW, page 94

Prices shown are return fares

(Children half price)

Avon, Lincolnshire, Greater Manchester, Powys	10.40
Bedfordshire, Berkshire, Merseyside, Sth Yorkshire, Gwent.....	11.90
Buckinghamshire, Oxfordshire .	9.20
Cambridgeshire, Greater London, Surrey.....	15.90
Cheshire, Gloucestershire, Nottinghamshire.....	7.90
Cleveland, Dyfed	21.40
Cornwall, Isle of Wight (v London)....	28.30
Cumbria, Devon, Dorset, Essex (v London) Surrey (v London).....	19.90
Durham, Kent (v London) Sussex (v London).....	22.60
Derbyshire, Leicestershire, Northamptonshire, Shropshire	6.50
Hampshire, Humberside, Gwynedd.....	17.40
Hampshire (v London) Suffolk (v London).....	24.10
Hereford & Worcester, Warwickshire, West Midlands.....	3.70
Hertfordshire, Mid-Glamorgan, Somerset, Wt Yorkshire.....	14.60
Hertfordshire (v London) Norfolk, Nth Yorkshire, Wt Glamorgan.....	18.60
Lancashire, Wiltshire, Clwyd, Glamorgan Sth	13.30
Staffordshire	5.00
Tyne & Wear, Dumfries & Galloway	25.60
Northumberland.....	30.80
Central Scotland, Fife, Lothian, Strathclyde.....	33.80
Tayside	39.20
Grampian	41.70
Highland.....	45.90

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ICOM IC271E
2m base station for the eighties, 25w O/P, 32 memories, scanning, 10/100Hz auto shift tuning rates + (as options) voice frequency synthesiser, internal 12V psu, GaAS FET preamp.

NEC PRICE £629 WITH ICSM6 ELECTRET BASE STATION MIC OR AG20 INTERNAL GaAS FET ICOM PREAMP

HOW LOW CAN WE GO!



YAESU FT790R
Portable microprocessor controlled UHF 70cm multimode. Fast becoming as popular as its 2m brother the FT290R - the FT790R has the same major features. Power output is 1 watt, but includes a speech processor.

NEC PRICE £249
EXTRA-SPECIAL OFFER
YAESU FT790R PLUS 30W 70CM AMPLIFIER ELH 730 G WORTH £114.95 ALL FOR ONLY £299



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PERFECT TIMING



ICOM IC71
The latest superior grade receiver, with keyboard entry, 32 tunable memories, three rates of tuning + (as options) infra red remote, F.M., voice frequency synthesiser, additional filters.

NEC PRICE £649 WITH GLOBAL CLOCK

WORTH £59 FREE AT NEC

REACH FOR THE SKY



YAESU FT726R
Multiband base station transceiver. Just compare the following features:

NEC PRICE £739

PLUS FREE MD IB8 MIC

FEATURES	FT 726R	TS780	FEATURES	FT 726R	TS780
Choice of bands	yes	no	Limited Band Scan	yes	yes
450 MHz capability	yes	no	Mode Memory	yes	no
IF Shift	yes	yes	Memory Backup	lithium	AA cell
IF Width	yes	no	RX Tone Control	yes	no
CW Filter	option	no	RF PWR Control	continuous	Hi/Low
X-band Full Duplex	option	no	Speech Processor	AF	none
Squelch	all modes	FM only	VOX	no	yes
Memory Channels	11	10	CW Semi break-in	yes	yes

EXTRA-SPECIAL OFFER
FT726R WITH 70cm CARD FITTED £989 - WITH DUPLEXER/SATELLITE MODULE WORTH £95!!

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FROM A.R.E. AT NEC



WORLD BEATER



YAESU FT290R
The design team on this one at YAESU definitely deserve full marks—probably the best selling 2m multimode in the world.

**NEC PRICE
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MORE FOR LESS

YAESU FT708R
Compact synthesised 70cm, hand held, minimum 1 Watt O/P, scanning/memories, full 10MHz coverage.



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ON OLD PRICE**

*Yes, of course there are!
You look after the coffee, Brenda—
and I'll look after the Special Offers!*

Invitation

FROM BRENDA G4VXL and BERNIE G4AOG
We've more at NEC than we can show you here.
Make sure you visit us on STAND B35/36.
Compare prices—see us last—then buy!
Your entrance fee refunded with all purchases
over £100.

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National Exhibition Centre, Birmingham

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-  Lectures on Propagation, VHF and Microwaves.
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-  Annual RSGB HF Convention
-  Major Exhibition of Amateur Equipment & Components.

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R1	4 0284	8 0569	12 0854	14 9916	18 1281	44 9750
R2	4 0291	8 0583	12 0875	14 9944	18 1312	44 9833
R3	4 0298	8 0597	12 0895	14 9972	18 1343	44 9916
R4	4 0305	8 0611	12 0916	15 0000	18 1375	45 0000
R5	4 0319	8 0638	12 0958	15 0055	18 1437	45 0166
R7	4 0326	8 0652	12 0979	15 0083	18 1468	45 0250
S8	—	—	12 1000	14 9444	18 1500	44 8333*
S9	—	—	12 1020	14 9472	18 1531	44 8416*
S10	—	—	12 1041	14 9500	18 1562	44 8500*
S11	4 0354	8 0708	12 1062	14 9572	18 1593	44 8583
S12	—	—	12 1083	14 9555	18 1625	44 8666*
S13	—	—	12 1104	14 9583	18 1656	44 8750*
S14	—	—	12 1145	14 9638	18 1718	44 8916*
S15	—	—	12 1145	14 9638	18 1718	44 8916*
S16	—	—	12 1167	14 9667	18 1750	44 9000*
S17	—	—	12 1187	14 9694	18 1781	44 9083*
S18	—	—	12 1208	14 9722	18 1812	44 9166*
S19	—	—	12 1229	14 9750	18 1843	44 9250*
S20	4 0416	8 0833	12 1250	14 9777	18 1875	44 9333
S21	4 0423	8 0847	12 1270	14 9805	18 1906	44 9416
S22	4 0430	8 0851	12 1291	14 9833	18 1937	44 9500
S23	4 0437	8 0875	12 1312	14 9861	18 1968	44 9583

SR = Series resonance *HC25 only

The above list includes crystals for the following equipment R0 to R7 and S8 to S23 for following Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215. Trio Kenwood 2200, 7200, Uniden 2030 and Yaesu FT2FB, FT2 auto, FT224, FT223 and FT202.

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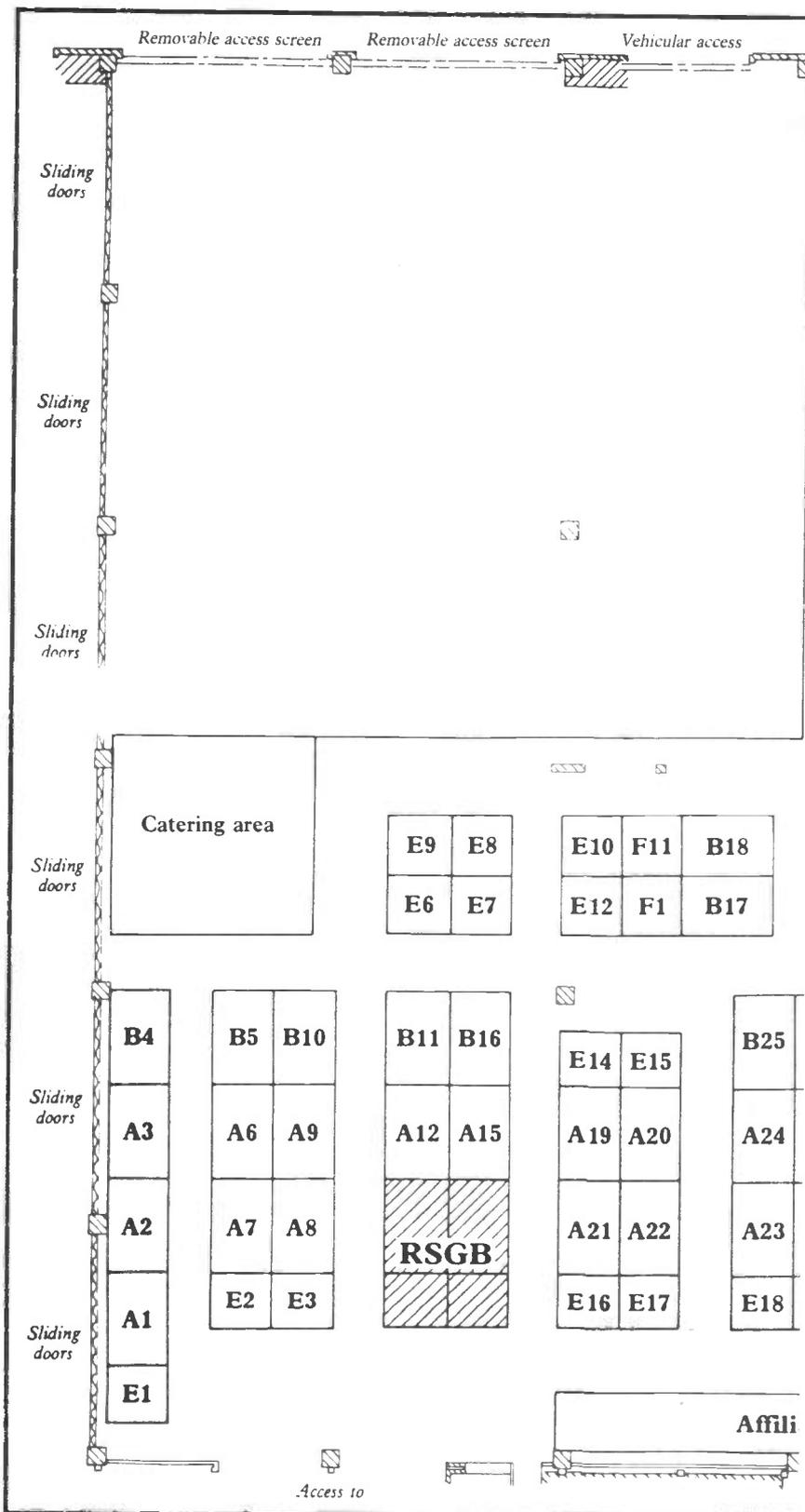


Exhibition '84

RSGB - EXHIBITION 84: FLOOR PLAN

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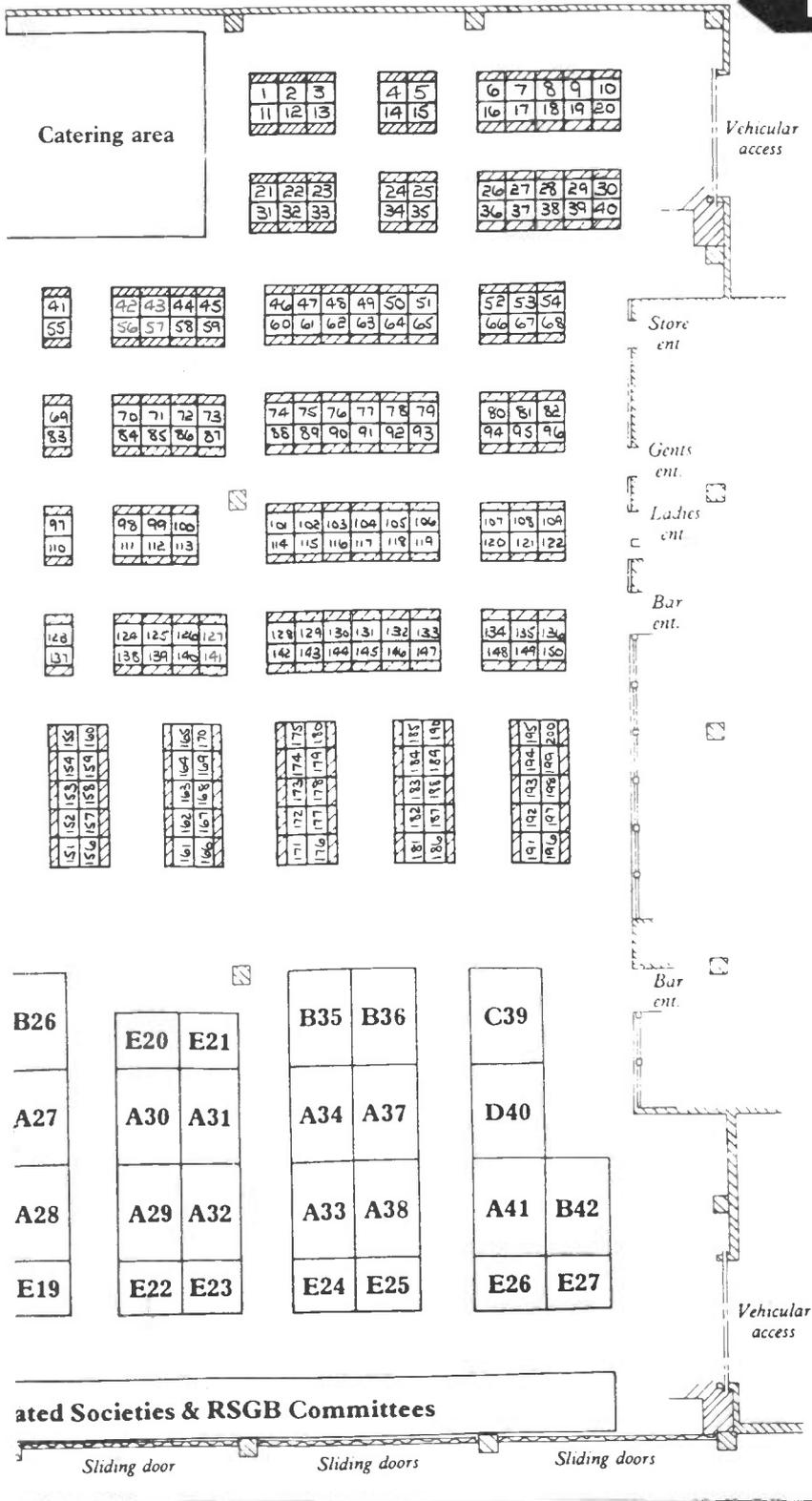
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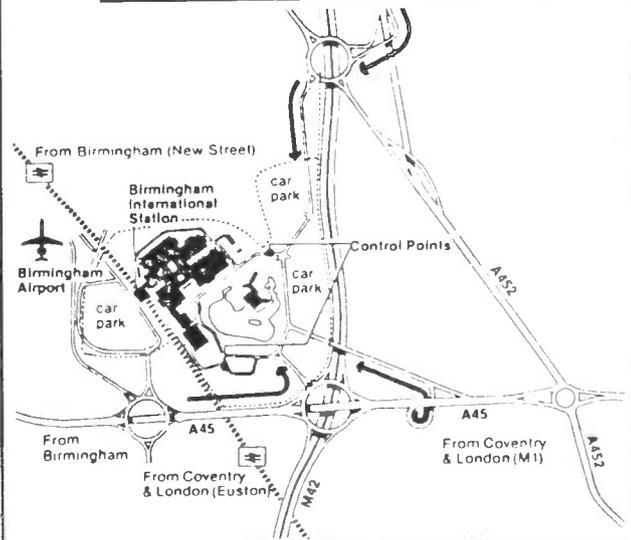
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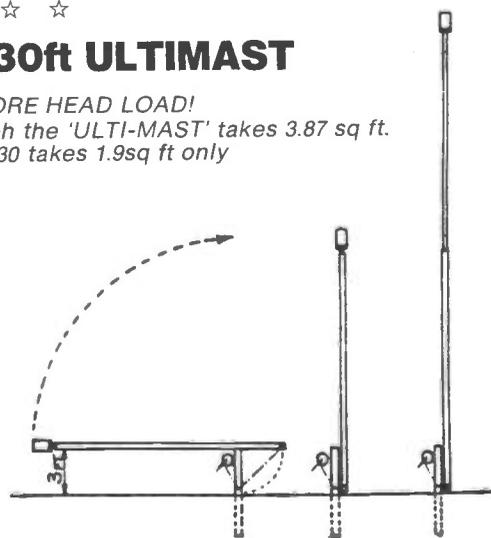
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A beginners guide to Meteor Scatter Propagation and SSB operation

By David Cox

This article is prepared as a guide for the newcomer to meteor-scatter propagation and is based on my own experiences over the last seven years. During this time I have spent many hours operating late at night and in the early hours of morning trying to keep awake, listening to noise and occasionally wondering if my partner is QRV at the other end.

Although I have been operational for 30 hours out of 40 on occasions, the operating times and techniques that are described here should enable the

them. Greater distances are possible, but the chance of success is reduced.

The European record distance is 3099km, made by GW4CQT and UW6MA using high speed CW on 144 MHz. The European record on 432MHz is 1033km made by SK6AB and SM2AID also using high speed CW. Both contacts were made during the Perseids.

and still get as much pleasure as I have derived from an extremely exciting mode of propagation. With the advent of lightweight antennae, competitively-priced linear and low-noise amplifiers, many more amateurs are beginning to participate in this activity.

What is meteor scatter propagation? Simply, when a shooting star enters the earth's atmosphere it leaves behind ionised particles (comet tail). These particles reflect signals up to 432 MHz, ranging from a burst of a few seconds to almost nothing. As far as I know, less than a dozen contacts on 432 MHz have ever been completed (using CW) and -99% of meteor scatter QSO attempts are made on 144 MHz.

Generally, the lower in frequency you go in the VHF spectrum, the longer and stronger is the reflection. It is not easy to make QSO's via this mode of propagation, but don't be put off. If it was as simple as talking to somebody through a local repeater using a black box, would it be worth it?

Usually, it is only possible to make successful single sideband QSO's via this mode about 3-5 days a year on 144 MHz, although some operators have had better success than that and the degree of success varies from year to year.

Distance between stations

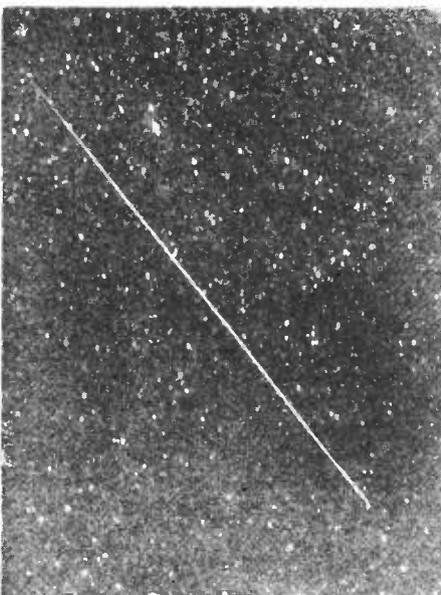
To start with, do not try to make QSO's under 850km and not over 1600km. Working between these distances will increase your chances of a higher success rate, and provide a lot more QRA locator squares should you be chasing

Pointing the antenna

Although you would point the antenna in the direction of the station you are attempting to work I would recommend that an offset of $\pm 10^\circ$ is attempted. This can sometimes make a big difference in received signal and also provide improvement for your partner. I have adjusted my antenna up to 30° off my partner's heading to get a better signal but this offset is unusually large.

Best operating times

To make complete single sideband



Above: Perseid shower with multiple bursts (Photo by Nicholas James)

Above: Long Perseid streak in Andromeda (Photo by J W Mason)

(SSB) QSO's you cannot rely on random meteors but should arrange your schedule around major showers during the year. The best chance of successful completion of single sideband QSO's occurs between each of the following dates, which are associated with the major showers of each period.

January 3-4 - Quadrantids
August 11-13 - Perseids
December 14/15 - Germinids

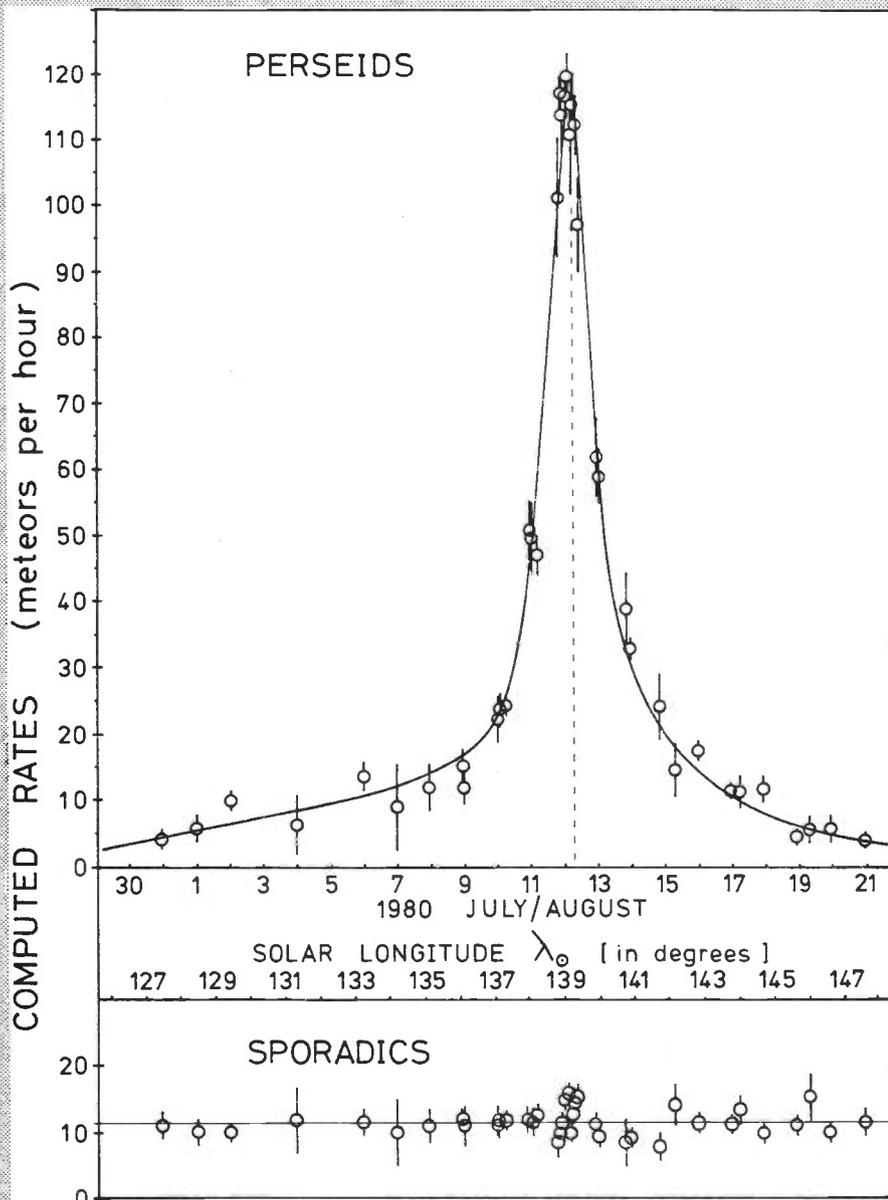
Generally, the Quadrantids and Geminids are referred to as non daytime showers, meaning that the best reflections occur during darkness. The Perseids have both components, although I have completed more contacts during darkness than in daylight.

The Perseids are connected with the periodic comet P/Swift Tuttle, last seen in 1862. The following graph shows the variation in Perseid meteor notes during July and August 1980.

As a general rule, the best times and beam headings for each of these three showers, are:

Quadrantids
Jan 3
2200-2400 GMT NE-SW path
Jan 4
0000-0600 GMT E-W path
0100-0600 GMT NW-SE path

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For example, let's suppose we wish to attempt a contact with i4YNO in 'FE locator square'. For those who don't have a QRA locator map, i4YNO is located about 100km SE of Milan. We would choose a NE-SW path because from the South of England he is SE of us and we are NW of him, so any time between 0100 and 0600 GMT on January 4 would give the best chance of success.

Perseids

August 11,12,13

0400-0700 GMT NE-SW path

0400-0700 GMT NW-SE path

August 12

0000-1000 GMT SE-NW path

0000-1000 GMT E-W path

0000-1000 GMT N-S path

August 13

0400-1000 GMT SE-NW path

0400-1000 GMT E-W path

0400-1000 GMT S-N path

August 14

0000-0700 GMT SE-NW path

0000-0700 GMT E-W path

0000-0700 GMT S-N path

Although many would say this shower is the best; I'm not so sure. In recent years reflections have been poor and inconsistent. I have compared my results with Mike G8LLJ in Romsey and John G8KBQ in Glastonbury and they are dissimilar from each other.

During the Perseids it is difficult even for astronomers to predict when the maximum number of meteors will occur. This shower peaks any time between 11th and 13th August. The times between 0400-0700 GMT on 11, 12, 13 August have been the only consistent times, although good reflections have occurred during all the times given during the past few years.

I would suggest that if you try any of these times; you will almost certainly have some success.

Geminids

December 13

2200-2400 GMT S-N path

2200-2400 GMT NW-SE path

December 14

0000-0600 GMT S-N path

0000-0800 GMT NW-SE path

This shower is more predictable than the Perseids and has given me excellent results. Although the shower is shorter in duration, the reflections are generally longer and some times very strong, 54dB above noise (that's S9).

Equipment for 144MHz operation

It comes as a pleasant surprise to many newcomers that a huge antenna array, masthead GaAs FET preamp and the full permitted output power is not necessary in order to obtain acceptable results. Obviously, a good preamp noise figure and reasonable power output levels will 'enhance your chance', but there is no need to go to extremes.

The Antenna

An antenna giving a gain of 10 dB over a dipole (a 9-element Yagi) would be sufficient.

However I would recommend an antenna with a gain in the region of 14 dBd (16-element Yagi) as the optimum. If

METEOR SCATTER PROPAGATION

you go beyond this figure, your main beamwidth becomes narrower, and will reduce the number of reflections available to you, thus a large array is not desirable.

The output power requirements

You must be able to generate 70W at your antenna feed point. This should be enough to produce acceptable results, but obviously the more you can generate the better they will be. Completed contacts have been made with output levels as low as 10W but not very often, and should not be attempted unless your partner is aware of the situation.

The Receiver/Transmitter

The Receiver/Transmitter must be very stable, and should have an accurate frequency read out to within 100Hz at 144MHz. I cannot stress enough how important these two factors are.

The first stage of pre-amplification in your receiver should have a noise figure not greater than 2dB and have less than a 3dB loss in feeder, between your receiver and antenna. These are minimum requirements to receive reasonable reflections. The ultimate would be a masthead pre-amp GaAs FET which would contribute to excellent signal-to-noise performance and would increase your success even further.

Operation and techniques

The next requirement is a clock which must be accurate to within 3 seconds or you can synchronise your clock or digital watch to British Telecoms speaking clock. You must minimise the chance of over-lapping your receive and transmit periods.

Now, it must be decided how the attempted QSO should be conducted. Consideration must be given to the time which offers the best chance of completing the QSO (as previously discussed).

The frequency period length, who will

transmit the first period and how long the attempt will last (schedule) must be considered. Generally, the QSO will be in the upper side band, but this should be confirmed.

Choice of frequency/period length

A frequency should not be chosen between 144.180-144.420MHz, because there is a chance that local stations could be conducting normal tropo contacts between these frequencies. 144.200 and 144.400MHz are random meteor scatter calling frequencies. During major showers there are many stations operating on these two frequencies. By considering these factors the chances of a QRM free attempt is increased. The period length is the length of time for each transmitting and receiving period. Normally, one minute periods are agreed, although sometimes 30 or 15 seconds are chosen.

Who transmits first?

Normally, stations with their antenna pointing in a south-east, south or south-west direction transmit on the second period. If most people agree on this then everybody locally transmits together and listens together. If two stations are situated within one mile of each other and are each conducting a meteor scatter QSO 10KHz apart, they do not create interference, and there is no reason why they should not both complete their attempts.

Length of attempt

Normally, a sked will last for an hour, although some run for two hours, but if no reflections have been heard by either station after one hour 30 mins, then the schedule should be abandoned.

Signal report

A meteor scatter signal report is different to the normal tropo propagation report using two numbers to make

up the report. The first number represents the length of the burst from the station you are attempting to contact, and the second represents the signal strength of the burst. These two numbers are never the same, so if you think you heard your report as 44 then you have not heard it correctly. Be sure to listen to your report carefully before proceeding further with the QSO.

First Number (burst length)

2 burst length less than 5 secs
3 burst length between 5-10 secs
4 burst length between 20-120 secs
5 burst length greater than 120 secs

Second Number (signal strength)

6 signal strength less S3 or less
7 signal strength S4 or S5
8 signal strength S6 or S7
9 signal strength S8 or S9

A burst contains information, a ping does not. A ping is a short reflection that is not long enough to contain any useful information.

Procedure

The following procedure, made necessary by the short duration periods, was adopted for a QSO between G80PR and I4YNO:-

Date: January 4

Time: 0200-0300 GMT

Period: 1 minute, I4YNO to start

Frequency: 144.437 USB.

The QSO went as in the table seen below

A signal report can only be sent when a positive identification to both call signs has been made. They might not come together in the same burst and it may take two or three bursts to identify both calls, as it did for G80PR in the example.

The fourth transmission (U207) made by G80PR indicates that he has received his report from I4YNO by sending 'Roger'. The Roger is then followed by 26.

I4YNO			G80PR		
0200	TX	G80PR I4YNO, G80PR I4YNO, etc	RX	NOTHING HEARD	
0201	RX	Heard G80P	TX	I4YNO G80PR, I4YNO G80PR, etc	
0202	TX	G80PR I4YNO G80PR I4YNO etc	RX	Heard G80PR I4	
0203	RX	Heard G80PR I4YNO G8	TX	I4YNO G80PR, I4YNO G80PR etc	
0204	TX	G80PR I4YNO 27, 27, G80PR I4YNO 27, 27	RX	Heard 27, 27 G80PR	
0205	RX	Heard I4YNO G80P	TX	I4YNO G80PR, I4YNO G80PR etc	
0206	TX	G80PR I4YNO 27, 27, G80PR I4YNO 27, 27	RX	Heard I4YNO 27	
0207	RX	Heard NO G80P	TX	I4YNO G80PR ROGER 26 ROGER 26 I4YNO G80PR ROGER 26, ROGER 26 Heard 80PR I4YN	
0208	TX	G80PR I4YNO 27, 27, G80PR I4YNO 27, 27	RX	I4YNO G80PR ROGER 26 ROGER 26 etc	
0209	RX	Heard I4YNO ROGER 26, ROGER 26	TX	Heard YNO	
0210	TX	G80PR I4YNO ROGER ROGER ROGER G80PR I4YNO ROGER ROGER ROGER	RX	I4YNO G80PR, ROGER 26 ROGER 26 etc	
0211	RX	Heard I4YNO G8	TX	Heard I4YNO ROGER ROGER	
0212	TX	G80PR I4YNO ROGER ROGER ROGER	RX	I4YNO G80PR ROGER ROGER ROGER I4YNO G80PR ROGER etc	
0213	RX	Heard OPR I4	TX	Heard NO ROGER ROGER	
0214	TX	G80PR I4YNO ROGER ROGER ROGER	RX	I4YNO G80PR ROGER ROGER ROGER etc	
0215	RX	I4YNO G80PR ROGER ROGER	TX		

The first period I4YNO sends both call signs and continues to send this on his transmit periods until he hears both call signs either with or without a report from G80PR.

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This is the signal report for I4YNO.

When this transmission is received at I4YNO (0209), he can see that G80PR has received his report, and the report for I4YNO is 26. I4YNO must now indicate to G80PR that he has copied everything.

He does this by sending what is called 'the final Rogers' (0210). G80PR will keep sending 'I4YNO G80PR Roger 26, Roger 26' until he hears I4YNO's final Rogers. Then G80PR must also send final Rogers to I4YNO. He would normally send this for three transmission periods.

If, for some reason, one or other did not receive the final Rogers, the QSO would still be complete. At 0209 G80PR sent I4YNO G80PR Roger 26, Roger 26, indicating to I4YNO his report had been received. The final Rogers received by G80PR, indicate that I4YNO has everything complete.

Making a schedule

There are many European radio amateurs operational via meteor scatter propagation. Most are only interested in high speed CW because it is easier, but there are many operational on single side band.

On the 20 metre band at a frequency of 14.340MHz is the European VHF net. Many VHF enthusiasts use this frequency to set up Meteor Scatter schedules. The highest activity level is usually at weekends from around 1200

GMT throughout the afternoons, or just before and during any major meteor shower.

Random QSO's (144.200, 144.400MHz)

During the maximum of any of the three major meteor showers it is possible to make meteor scatter contacts without any pre-arrangement. My advice would be to obtain some schedules before you embark on the random calling frequencies.

The operation procedure is the same as before, excepting for starting with a CQ call. For example, you might hear 'CQ MS YU3ES CQ YU3ES.' You should now wait until his transmission period expires, then reply YU3ES G80PR 27, 27 etc.

If you hear somebody calling CQ MS be sure you have his call phonetically correct, otherwise the QSO will obviously be incomplete.

On the random channels you may also hear 'CQ MS YU3ES CQ YU3ES BREAK.' The BREAK means that YU3ES has given somebody the chance to transmit during his transmitting period. A reply should be made as follows, 'YU3ES GULF eight oscar papap Radio 27, 27, 'break,' inviting the transmission back to YU3ES.

The QSO could be completed in as little as 25 seconds, provided the burst is long enough and correct operating

procedure is used. If the burst fades out, you must revert back to normal procedures.

This break technique is generally used during the shower maximum. It can also be used during schedules. Do not try the technique on the Random Frequencies until you have gained experience, as inexperienced operating can give unnecessary interference to other more experienced stations also hearing the same burst.

Hints and tips

1. Always have a tape recorder running, to play back the report or call you were not quite sure of.

2. Get your station operational 10 minutes before the start of your schedule.

3. If you transmit say on 144.4370MHz and you hear your partner calling you on 144.4375MHz, then you should tune him in using your clarifier. Do not adjust your transmit frequency.

Acknowledgements

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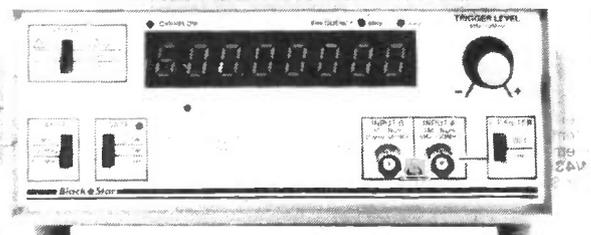
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22/16, 22/25, 22/50, 47/16, 47/25, 47/50, 33/10 - 6p, 100/16, 100/25.....	7p
100/50 - 12p, 100/100 - 14p, 220/16 - 8p, 220/25, 220/50.....	10p
470/16, 470/25 - 11p, 470/35 - 12p, 470/40 - 15p, 1000/16.....	15p
1000/35 - 22p, 1000/40 - 35p, 2200/10 - 8p, 2200/25.....	35p
Carbon Film resistors 1/4W 5% E24 series 0.51R to 10MO.....	1p

100 off per value - 75p, even hundreds per value totalling 1000 £7.00

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Miniature polyester capacitors 250V working for vertical mounting
01, 015, 022, 033, 047, 068 4p, 01 5p, 015, 022 6p, 0.33 & 0.47 8p

Mylar (polyester) capacitors 100V working E12 series vertical mounting
1000p to 8200p - 3p, 01 to 068 mfd - 4p, 0.1 5p, 0.12 & 0.15 6p

Subminiature ceramic plate capacitors 100V wkg vertical mounting, E12 series
2% 1.8 pf to 47 pf - 3p, 2% 56 pf to 330 pf - 4p, 10% 390p - 4700p 4p

Polystyrene capacitors 63V working E12 series long axial wires
10 pf to 820 pf - 3p, 1000 pf to 10,000 pf - 4p, 12,000 pf 5p

DIODES (p.i.v./amps)

75/25mA 1N4148 2p, 800/1A 1N4006 6p, 400/3A 1N5404 14p, 115/15mA OA91.....	6p
100/1A 1N4002 4p, 1000/1A 1N4007 7p, 60/1.5A SIM1 5p, 100/1A bridge.....	25p
400/1A 1N4004 5p, 1250/1A BY127 10p, 30/45mA OA90 6p, 30/15A OA47.....	8p
Zener diodes E24 series 3V3 to 33V 400 mW - 8p, 1 watt.....	12p
L.E.D.'s 3 & 5mm Red 10p, Green, Yellow 14p, Grommets 3mm - 1 1/2p, 5mm.....	2p
20mm fuses 100mA to 5A Q/blow 5p, A/surge 8p, Holders p.c. or chassis.....	5p
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†Denotes 50Ω ONLY - all others 50Ω or 75Ω impedance

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HATELY

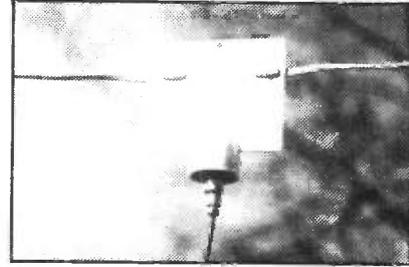
ANTENNA

TECHNOLOGY

GM3HAT



GM3HAT/A



DIPOLE OF DELIGHT

Readers who saw last month's technical description of the amazing new antenna system incorporating a provisionally patented capacitive BALUN will appreciate the Photograph above which shows the centre card of a DD 14/21/28L type Dipole of Delight. The scale of the picture can be judged from the size of the UHF plug on the 5mm 50 ohm feeder coax. Also there is clearly visible the central support hole for use with 'Inverted Vee' arrangements.

TECHNICAL DETAILS IN BRIEF

To those who missed seeing last month's advertisement we remind readers that the Dipole of Delight is:-

- (i) MULTIBAND
- (ii) NO-TUNE
- (iii) QUIET
- (iv) EFFICIENT
- (v) COAX-FED using 50 Ohm cable.

These antennas may be used for Amateur Radio receiving and transmitting and can handle 800 W pk power. They are designated by a coding which gives the frequency bands over which the antenna has less than 1.5 to 1 SWR. There are eight versions available on short delivery. Four of these are multi-band versions, and four are monobanders. All have a UHF socket integral with the capacitor card at the centre to which the purchaser is to fit his own 50 ohm coax. Due to the variability of site layout etc. it was not possible to attach marketable lengths of coax in a simple and comprehensive manner.

SUMMARY OF PRACTICAL SWR VALUES 'S' to 1

DD 7/14/21 f MHz	7.0	7.05	7.1	14.0	14.2	14.35	21.0	21.2	21.45			
Length 21m (69ft) S	1.4	1.2	1.4	1.3	1.2	1.3	1.4	1.15	1.4			
DD 10/18/24 f MHz	10.1	18.1	24.9									
Length 15m (50ft) S	1.2	1.2	1.2									
DD 14/21/28L f MHz	14.0	14.2	14.35	21.0	21.2	21.45	28.0	28.4	28.8			
Length 10.7m (36ft) S	1.4	1.2	1.4	1.4	1.2	1.5	1.5	1.2	1.5			
DD 7/14/21/28L f MHz	7.0	7.05	7.1	14.0	14.2	14.35	21.0	21.2	21.4	28.0	28.4	28.8
Length 21m (69ft) S	1.4	1.2	1.4	1.4	1.2	1.4	1.4	1.2	1.4	1.5	1.2	1.5
DDM 14 f MHz	14.0	14.1	14.2	14.3	14.35	Noise	50 ohm	Galaxy				
Length 10.7m (36ft)	1.12	1.05	1.03	1.05	1.08	EMF μV	0.24	1.23				
DDM 21 f MHz	21.0	21.1	21.2	21.3	21.45	Ditto						
Length 7m (24ft) S	1.08	1.05	1.03	1.05	1.10		0.24	0.92				
DDM 28 f MHz	28.0	28.4	28.8	29.2	29.7	Noise	50ohm	Galaxy				
Length 5.8m (19ft)	1.3	1.13	1.02	1.16	1.45	EMF μV	0.24	0.65				
DDM 27 f MHz	27.0	27.2	27.4	27.6	27.8	27.99						
Length 5.9m (19ft)	1.2	1.1	1.03	1.05	1.08	1.15	0.24	0.65				

For monobanders, as evidence of good reception behaviour the increase in noise noted between a reference 50 ohm dummy source and the Galactic Noise during a winter night on SSB bandwidth using a receiver whose Noise Figure was 8 dB.

PRICES

The UK Price includes Packing Post and VAT. STATE VERSION REQUIRED. The DX Price includes Packing and Post which will be AIR Mail outside Europe. Provided local exchange control allows, the cheque may be written in ANY CURRENCY, equivalent on day of signature of the £ Sterling published exchange rate.

	UK Price	DX Price
DD 7/14/21.....	£56.46	£56.00
DD 10/18/24.....	£56.46	£56.00
DD 14/21/28L.....	£46.75	£46.50
DD 7/14/21/28L.....	£58.50	£58.00
DDM 14.....	£15.98	£15.28
DDM 21.....	£11.64	£11.50
DDM 28.....	£11.64	£11.50
DDM 27.....	£11.64	£11.50

* Introductory Offer Price

GUARANTEE

SWR Data given in good faith but it does not constitute a contract. Money back guarantee if purchaser dissatisfied with the antenna and it is returned undamaged within one month.

Proprietor:- Maurice C Hatley, B Sc (Eng) M Sc C Eng MIEE
Chartered Electrical Engineer (GM3HAT)

HATELY ANTENNA TECHNOLOGY

1 Kenfield Place, ABERDEEN AB1 7UW
SCOTLAND UK

ONE NIGHT'S WORK

THE LOGIC PROBE SIGNAL GENERATOR



This logic probe signal generator, designed and built by D J Hamilton, uses cheap or easily obtainable components and should not take anyone more than an hour to put together.

The 4060B is a 14-stage counter with a built-in oscillator circuit, which, using the 500KHz ceramic resonator provides a cheap, accurate multi-frequency output.

Eleven outputs are available from this chip, ranging from 500KHz down to 30,518Hz.

Eight of these outputs may be selected by means of the DIL switch and fed to an output driver (in this case, 4011B).

This will provide up to 20mA drive capability at up to 15V peak-to-peak, depending upon supply voltage.

A Zener and fuse is included, to protect against over voltage or reversed polarity connection.

The unit shown in the photographs, is the prototype model and has a small wire

Fig 1 The circuit diagram

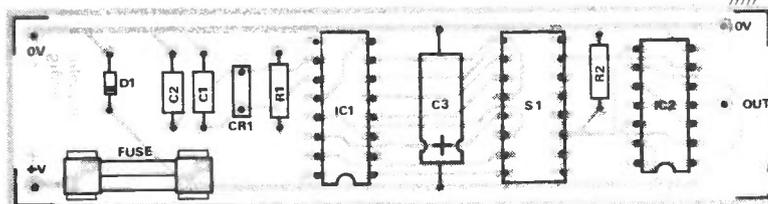
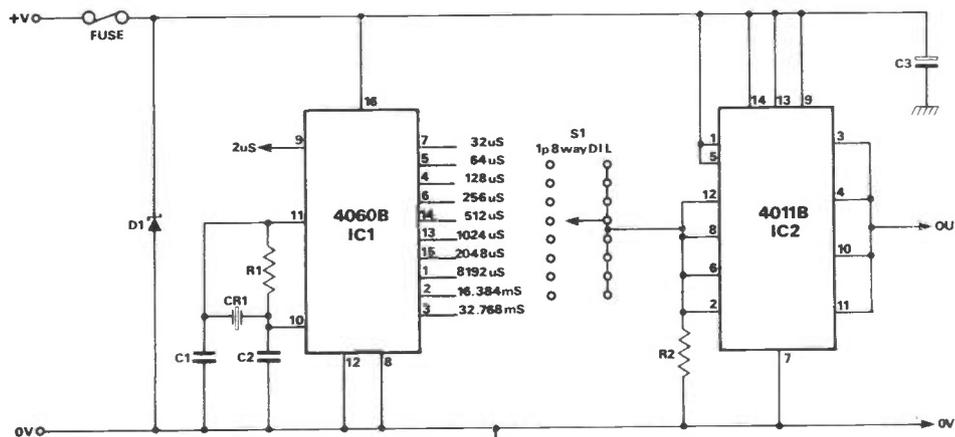


Fig 2 Component overlay

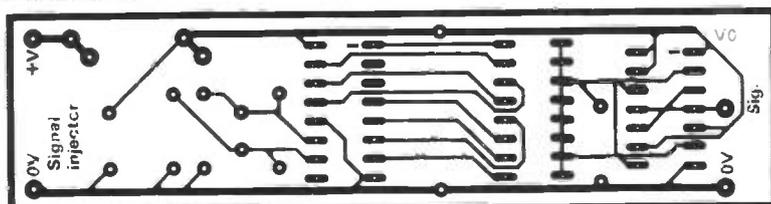
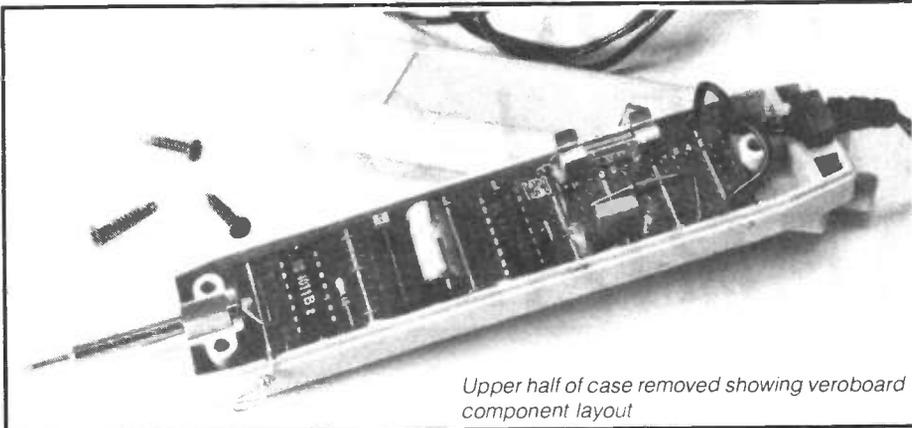
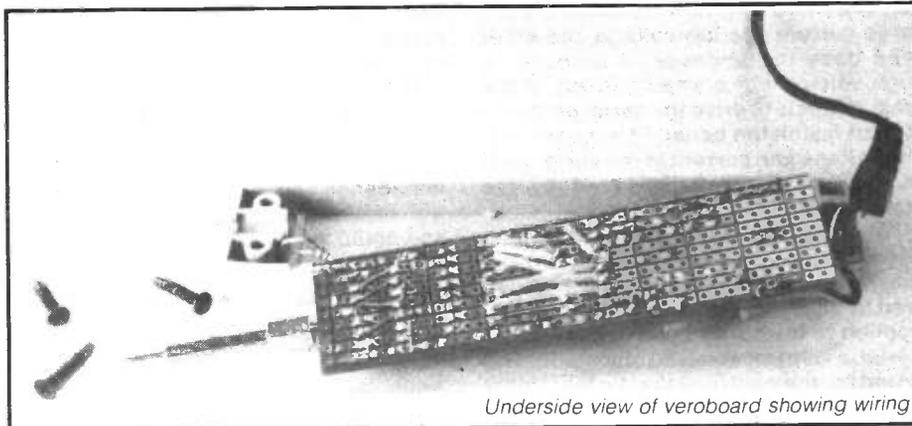


Fig 3 Foil pattern

THE LOGIC PROBE



Upper half of case removed showing veroboard component layout



Underside view of veroboard showing wiring

loop adjacent to the pointed probe. This loop provided the earth connection, but it is recommended that a more convenient connection is made by replacing this with a wire, terminated with a suitable crock clip.

The unit can be used as a precision scope calibrator since the frequency and output voltage can be precisely defined. Or, alternatively, may be used as a cheap signal generator or logic circuit driver.

PARTS LIST

(LOGIC PROBE CASE ONLY)

- IC1 14060B or equiv
- IC2 14011B or equiv
- CR 500KHz ceramic resonator (Ambit) (parallel mode)
- R1 1MR 1/4W HS
- R2 10kR 1/4W Hg
- C1 100pf axial polystyrene
- C2 100µf 25V (or47µ) axial
- D1 BZX61-15V Zener
- F1 20mm x 5mm 100mA quick blow + PC mounted fuse clips
- S1 1 pole 8 way PC switch

Enquiries about a PCB for this project should be addressed to **Edwardschild Ltd, 453a Becontree Avenue, Dagenham, Essex RM8 JUL.**

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12 Volt DC 18 rpm N/L 10 MA

24 Volt DC 36 rpm N/L 18 MA

Total length of motor and gear box 90 M/M Max Dia 42 M/M

Shaft Length 15 M/M

Shaft Dia 6 M/M

Approx. half manufacturers price. £15.00, p&p £2.00 - total inclusive of VAT £19.55

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Approx. 20lb pull at 1.25 in. Ex equip. Tested. Price £7.50 p&p £1.50 (£10.35 incl VAT) R & T



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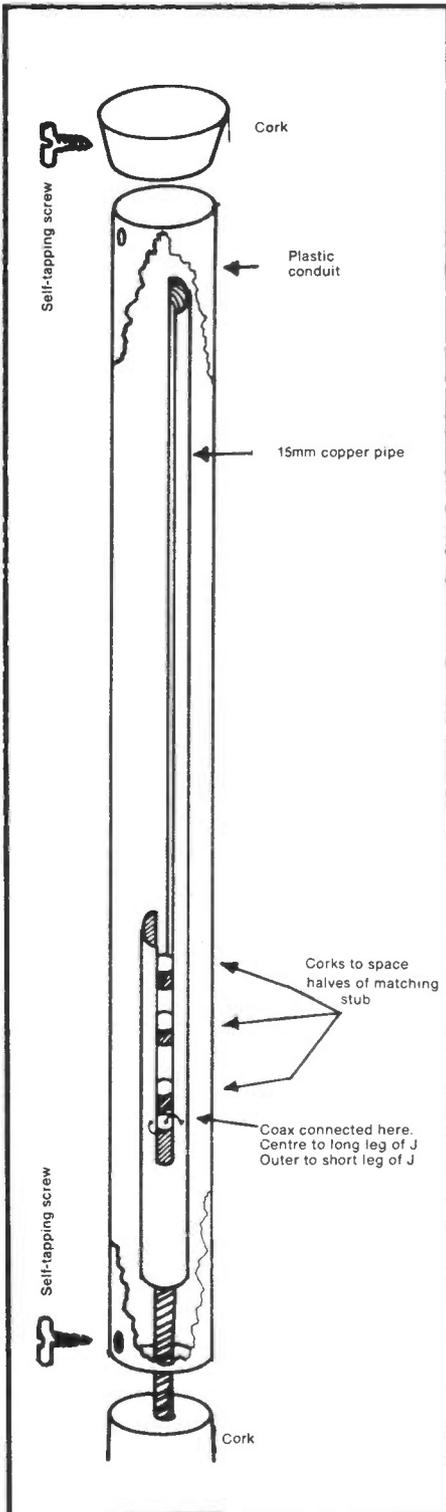
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CONSTRUCTING A 2-METRE J-STICK AERIAL

by C N Bauers



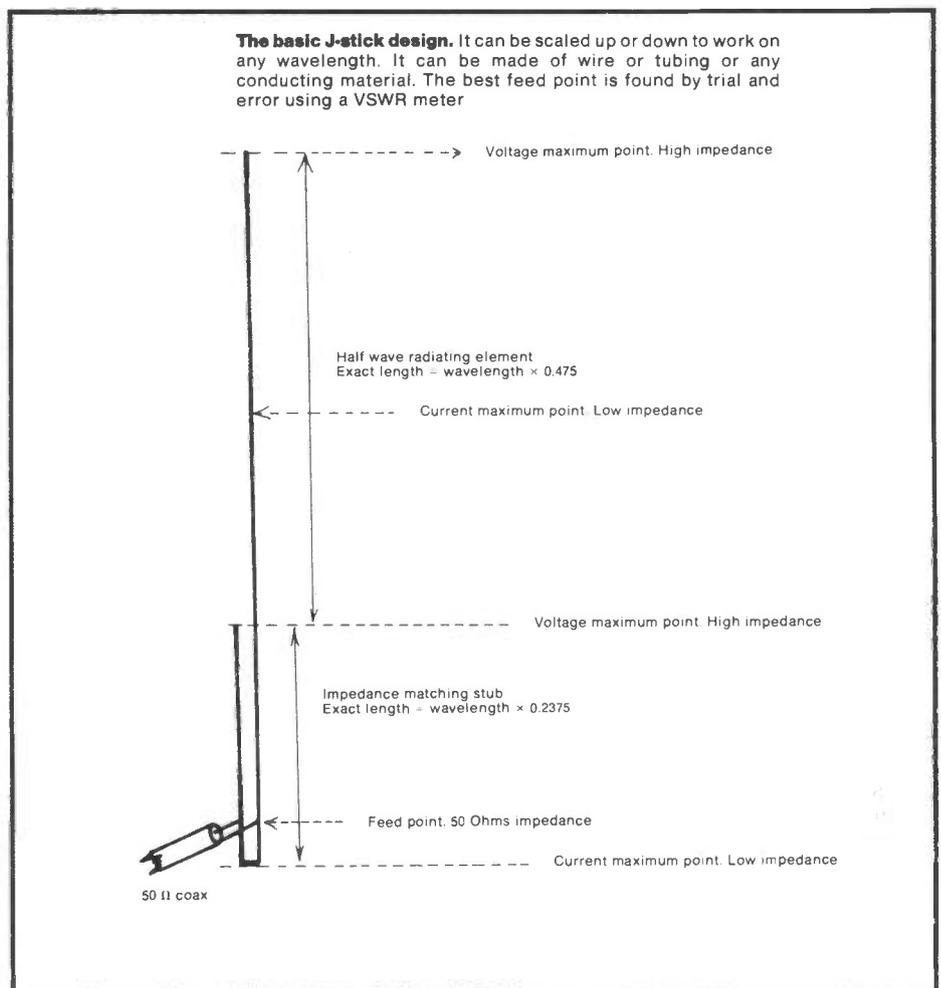
Introduction

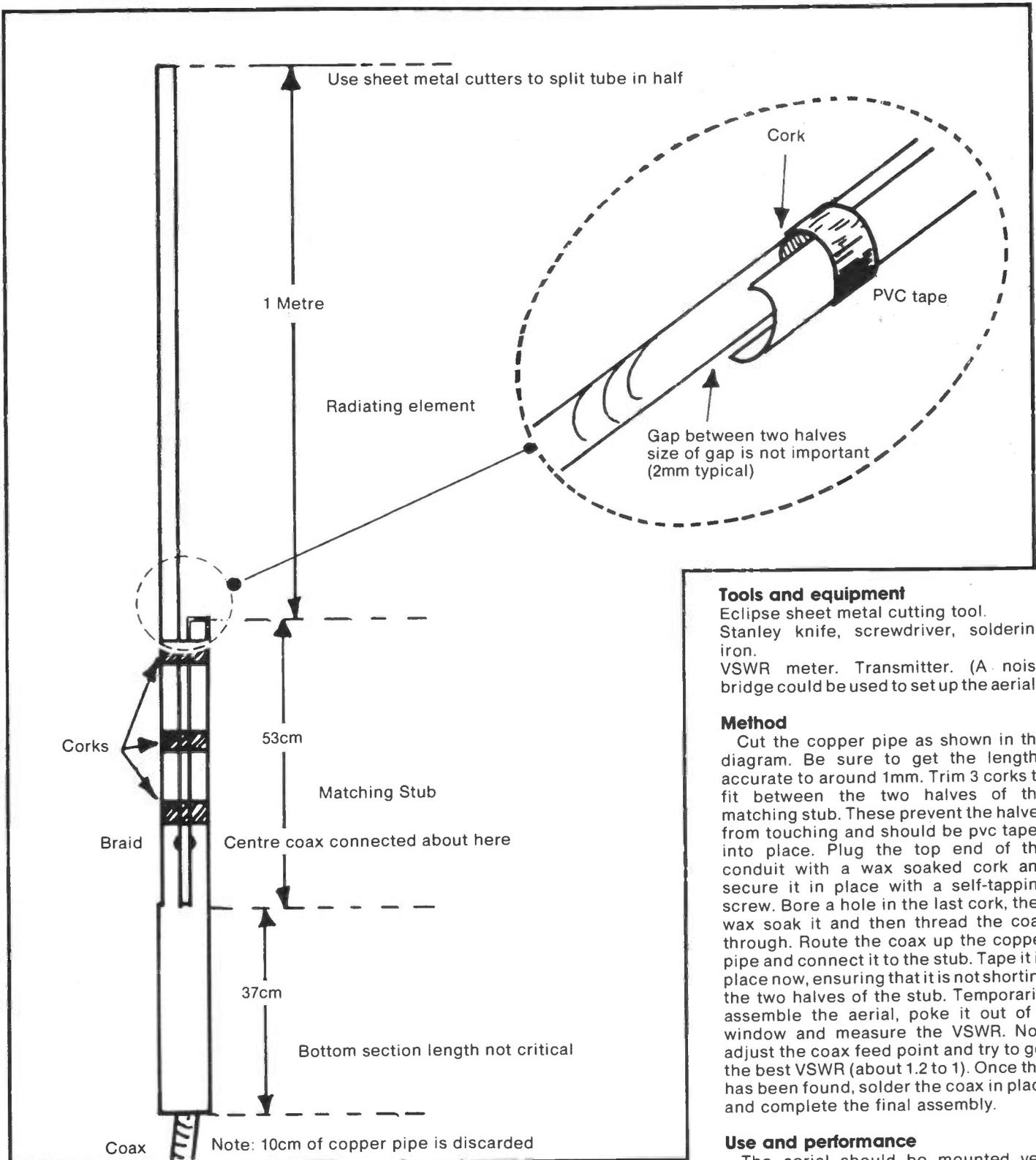
There are two main classes of transmitter. The more common produces quite a large current at a low voltage, the other type does the opposite. It produces a high voltage but a small current. If the transmitter is to drive the aerial properly, it must match the aerial. This means that the voltage and current in the aerial must be similar to those produced by the transmitter.

At the centre of the half wave dipole, there is a low voltage and a large current, most commercial equipment will match well to this type of aerial. If Ohm's Law is applied to the current and voltage in the aerial, a value of about 50 ohms would be found for the centre of the dipole. This is called impedance. Most transmitters

have a 50-ohm output and 50-ohm coaxial cable should be used to connect the aerial. Then everything is *Impedance* matched and maximum efficiency is obtained.

The difficulties start if you try to feed the end of a half wave wire. Here there is a small current and a large voltage. Applying Ohm's Law, this gives a high impedance and if connected to a 50-ohm transmitter would be most inefficient and could even damage the transmitter. There are ways and means however to overcome these problems. The following design employs a common method of impedance matching. This makes the transmitter 'see' 50 ohms and the aerial 'sees' its best impedance so both are happy and the system is efficient.





Tools and equipment

Eclipse sheet metal cutting tool.
Stanley knife, screwdriver, soldering iron.
VSWR meter. Transmitter. (A noise bridge could be used to set up the aerial).

Method

Cut the copper pipe as shown in the diagram. Be sure to get the lengths accurate to around 1mm. Trim 3 corks to fit between the two halves of the matching stub. These prevent the halves from touching and should be pvc taped into place. Plug the top end of the conduit with a wax soaked cork and secure it in place with a self-tapping screw. Bore a hole in the last cork, then wax soak it and then thread the coax through. Route the coax up the copper pipe and connect it to the stub. Tape it in place now, ensuring that it is not shorting the two halves of the stub. Temporarily assemble the aerial, poke it out of a window and measure the VSWR. Now adjust the coax feed point and try to get the best VSWR (about 1.2 to 1). Once this has been found, solder the coax in place and complete the final assembly.

Use and performance

The aerial should be mounted vertically as high as possible, away from obstructions for best performance. It gives results similar to a centre fed half wave vertical dipole but it is much more convenient to mount in position. The design is also similar to the Slim Jim aerial but mechanically simpler to build. It will work better than a quarter wave ground plane but not as well as colinear vertical aeriels. It is weather proof and lightweight making it suitable as a permanent base station aerial or for portable work. Being somewhat flexible it is fairly difficult to break, making the design pretty useful.

The 2-metre J-stick

The aerial consists of a half wavelength conductor. This is the part that radiates the radio waves. The half wave is end fed. This is a high impedance point so a matching stub is used to get a 50-ohm feed point for the transmitter. The matching stub is another half wave length of metal folded in half. Current is distributed around this in the same way as in the radiating part. Near the bottom of the stub there is a point where the impedance is 50 ohms. The coaxial cable is connected here.

CONSTRUCTION

Materials

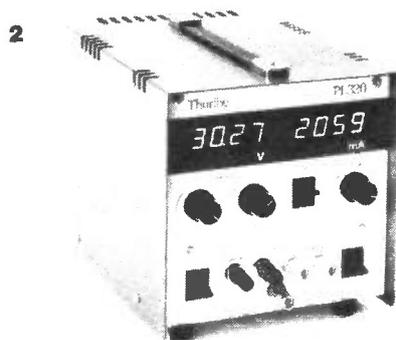
2 metre length of 15mm copper water pipe.
2 metre length of 24mm (approx) white plastic conduit pipe.
5 corks, 50-ohm coax, pvc tape, 2 self tapping screws, candle wax.
Cost should be £2.50 to £4 depending on your local DIY store.



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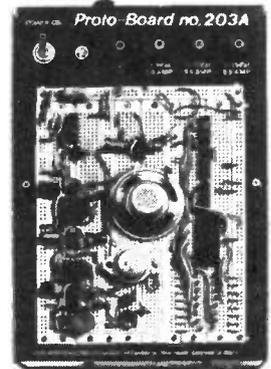
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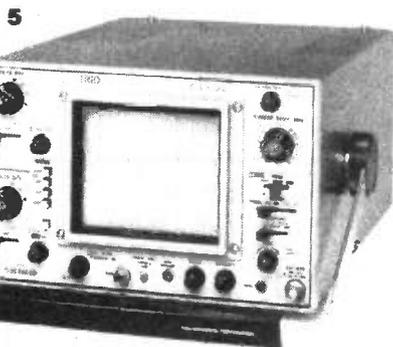
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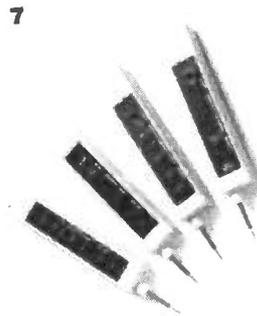
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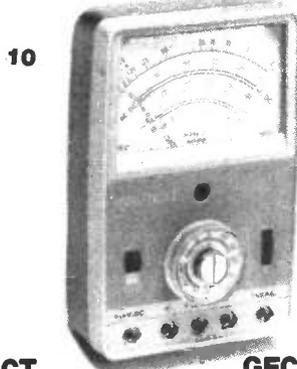
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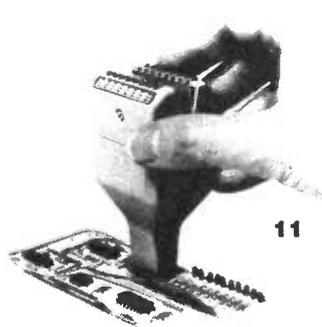
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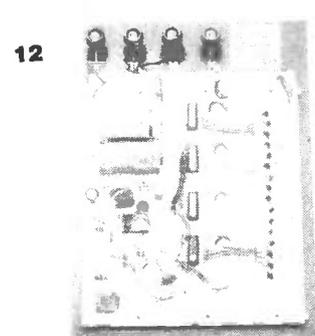
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HIGH AND LOW MEASUREMENTS

Dr C J D Catto describes some economical and practical methods of electrical measurement

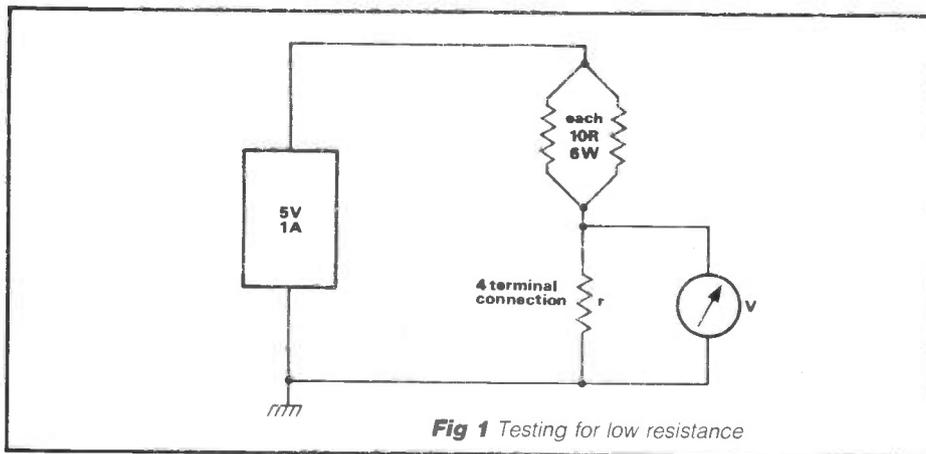


Fig 1 Testing for low resistance

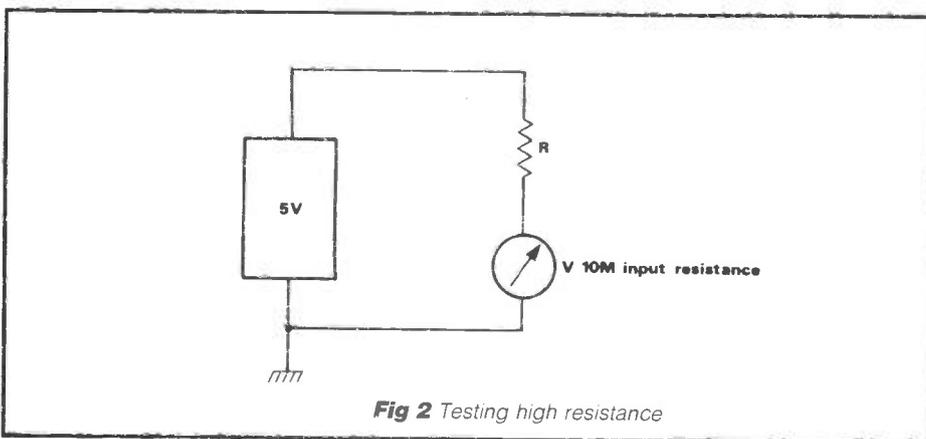


Fig 2 Testing high resistance

Most multimeters have ranges up to 1000V or so, and up to a few amps; for resistance, 2 or 20MΩ is normally the maximum. At the low end, corresponding limitations apply. Where measurements outside these conventional ranges have to be made, it is frequently possible to get by with some simple improvisations. A number of these are described below.

Resistance

In production and test, there are occasions when very low or very high resistances need to be checked. If it is shorts between PCB tracks that have to be found, it is probably best to purchase one of the fault locators now made specifically for the purpose¹. However, for many measurements it is an extravagance to tie up expensive test gear, whereas the schemes shown in Figures 1 and 2 allow awkward values to be tested with little more than a multimeter and a DC supply. The calibration curves in Figure 3 allow measurements to be made down to 1 milliohm and up to at least 1 Gighm using any 3½-digit DVM with 10 Megohms input resistance and a 5V, 1A supply. The test set-up should be screened from mains pick-up to avoid undue errors. The two ruling equations are:-

$$r = \frac{V}{1 - v/5}$$

$$R = \frac{50}{V} - 10M\Omega$$

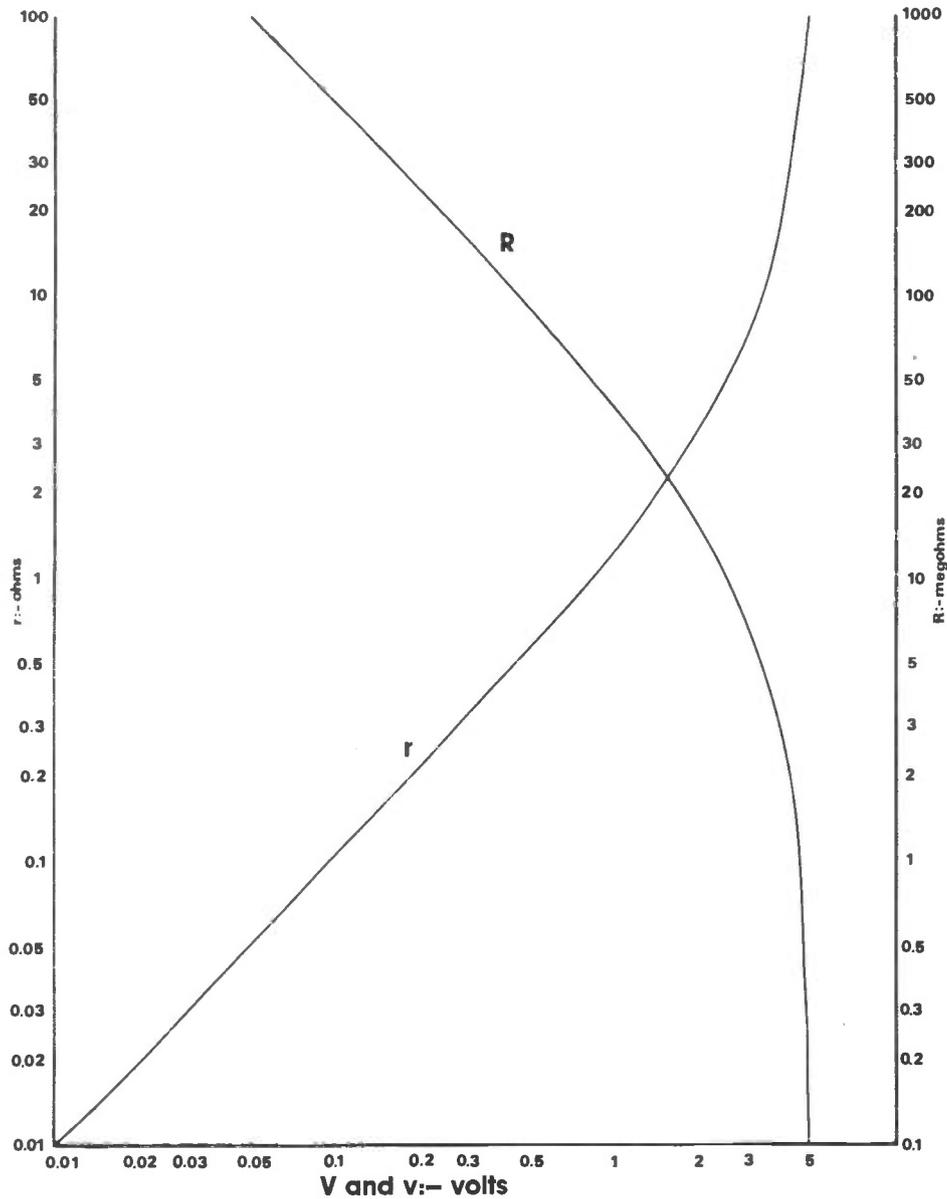
Voltage

On occasions when it is necessary to measure high voltage pulses, an AC-divider can be made simply from a loop of coaxial cable with the screen bared back as shown in Figure 4 and a compensating capacitor C. For the dimensions illustrated, and using Uniradio M67 cable, C is

Table 1 Resistance of standard equipment wire when the conductor is at 55°C

Equipment wire size	Single-cable rating	milliohms per 100mm
16/0.2mm = 0.5mm ²	3A at 70°C ambient	4
24/0.2mm = 0.75mm ²	4.5A at 70°C ambient	2.7
32/0.2mm = 1.0mm ²	6A at 70°C ambient	2
30/0.25mm = 1.5mm ²	20A at 35°C ambient	1.3
50/0.25mm = 2.5mm ²	28A at 35°C ambient	0.8
56/0.3mm = 4.0mm ²	37A at 35°C ambient	0.5
80/0.4mm = 10mm ²	68A at 35°C ambient	0.2

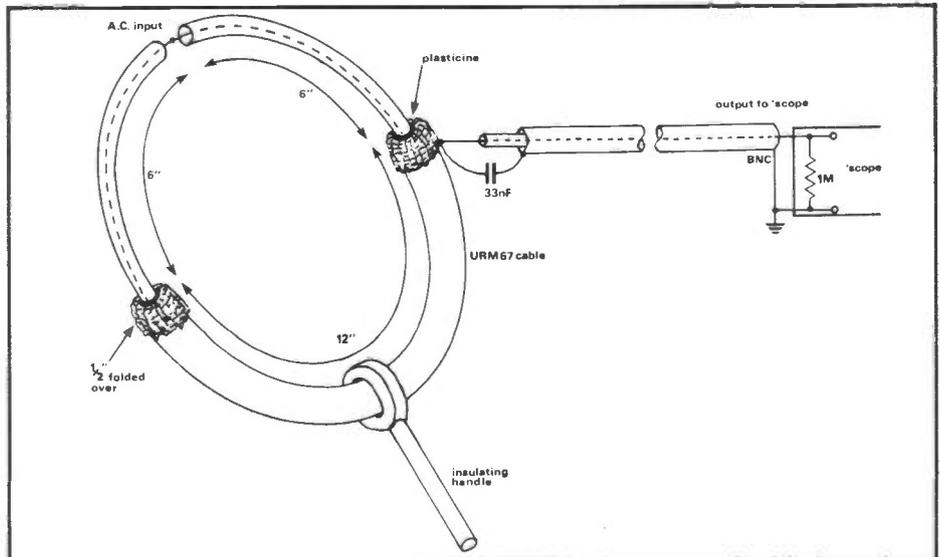
HIGH AND LOW MEASUREMENTS



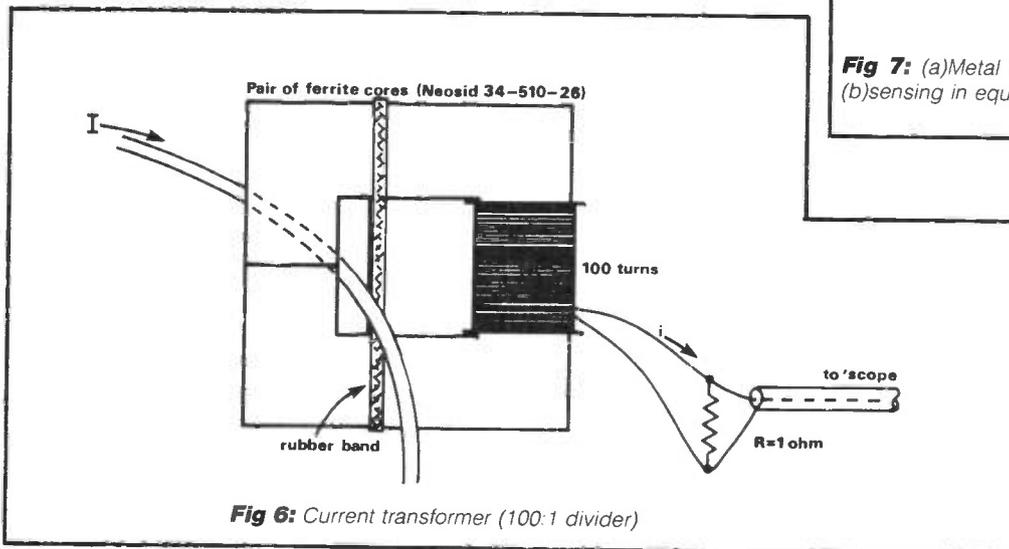
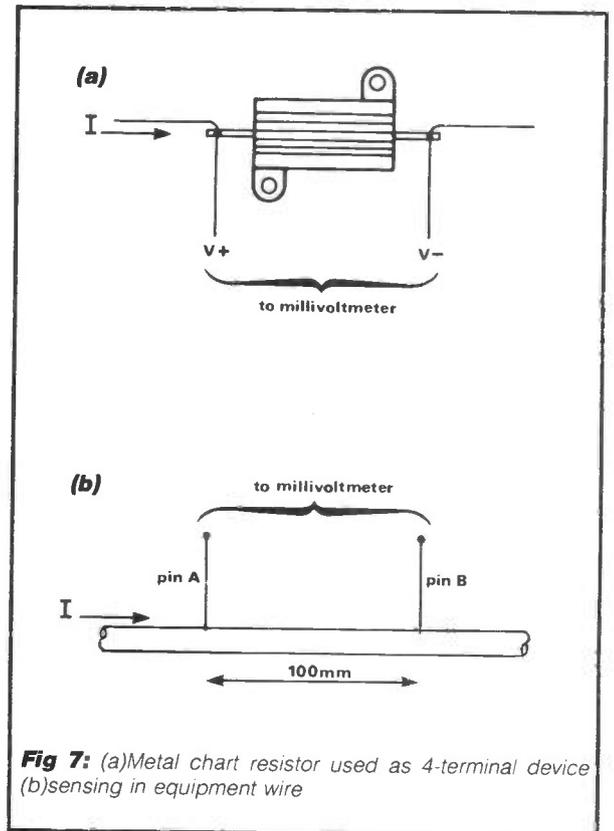
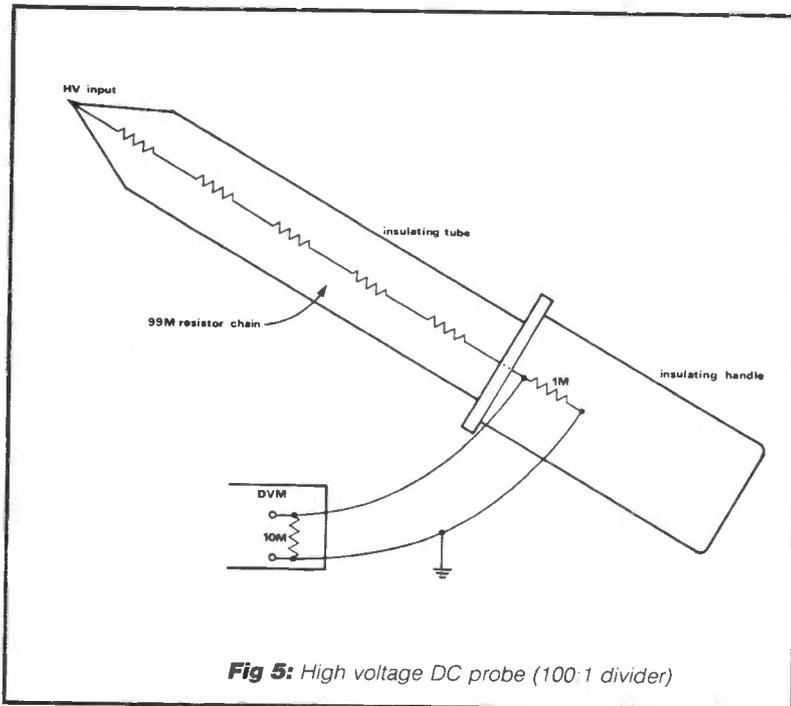
Above: Calibration curves for *r* and *R*

Right: High voltage AC probe (1000:1 divider)

trated, and using Uniradio M67 cable, *C* is 33nF for a divider ratio of 1000:1, ie input pulses of $\pm 10\text{kV}$ will give an output of $\pm 10\text{V}$ at the oscilloscope. Calibration can be performed with a square-wave input of $\pm 10\text{V}$ at 50kHz. The BNC connector should be fastened to a properly earthed oscilloscope before any high voltages are applied. The HV input should be rounded with a blob of solder to prevent corona, and it should be discharged to earth after use. The rating of the cable is 40kV DC, but 6.5kV peak RF. At moderate frequencies, $\pm 15\text{kV}$ may be applied as long as the 6-inch tails are free-standing and the braids are folded



HIGH AND LOW MEASUREMENTS



and filled as shown. The time-constant $1\text{M}\Omega \times 33\text{nF}$ gives a frequency response which is 3dB down at 5Hz.

Resistive divider

For measuring high voltages at DC and low frequencies, on the other hand, a purely resistive divider as shown in *Figure 5* is adequate. With the values shown, this has a divider ratio of 100:1, and can be used for checking CRT voltages, for example. The HV end is sometimes furnished with a tab that can slide under the anti-corona cap on a TV tube. To measure even higher voltages, a 1000:1 divider is better, and the $99\text{M}\Omega$ resistor chain should be increased to $1000\text{M}\Omega$; this may well require the use of rounded bushings to prevent corona.

Current

To measure a large alternating current, a 'clamp-on' ammeter is useful. With the ferrite cores and 100-turn secondary illustrated in *Figure 6*, we have a current transformer that gives $i=10\text{mA}$ for $I=1\text{A}$, and hence the oscilloscope sees 10mV per A. The response is 3dB down at 14Hz, and is level from 50Hz to 1MHz.

For a direct current measurement, a 100-milliohm four-terminal resistor is handy (*Figure 7a*) but, where it is inconvenient to cut the wire, measurements can often be made by inserting two pins 100mm apart (*Figure 7b*). Obviously this method should be used with caution if the wire is likely to be at a hazardous voltage. *Table 1* gives the resistance of standard equipment wire

when the conductor is at 55°C.

The temperature-coefficient of copper is +0.4% per °C.

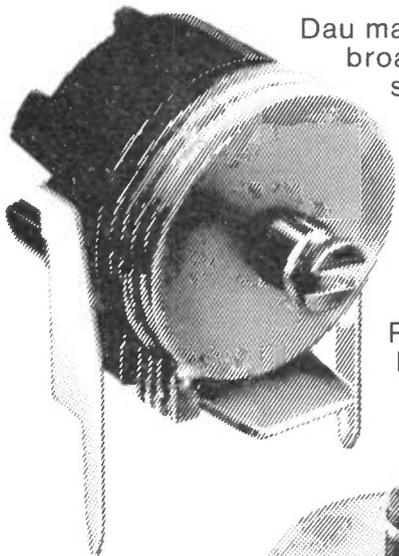
For low currents and voltages, it is relatively cheap and easy to make a pre-amp using a Bi-FET or a precision bipolar op-amp. It can be battery-powered, to avoid hum and earth-loop problems.

Conclusion

One need not be daunted if measurements are to be made outside the conventional ranges of the standard multimeter. A little ingenuity and a few sensible precautions are frequently all that are required.

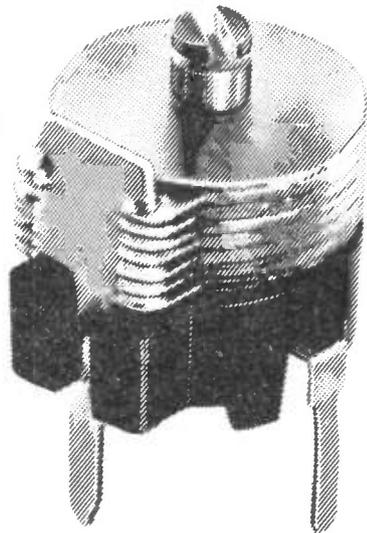
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Date	Function	Location	Contact
13 April	Talk on Radio Signalling In British Rail	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
15 April	Two metre FM contest	Stevenage & Dist AR Society	B Dean G6NZC
16 April	Talk on AMTOR	Leighton Linslade Radio Club	P Brazier G6JFN
16 April-15 May	Lectures on a variety of topics	IEEIE	Tel: 01 836 3357
17 April	Dealer demonstration CM Howes	Biggin Hill AR Club	I Mitchell G4NSD
	Quiz, round one at the AVRS in Aylesbury	Leighton Linslade Radio Club	P Brazier G6JFN
18 April	Start of Club VHF DX contest	S Bristol AR Club	Len G4RZY
	AMTOR - What is it?	Derby AR Society	J Shandlow. Derby 556875
25 April	10 Metre FM night	S Bristol AR Club	Colin G4SQQ
	Activity Night/Night on the air	Lincoln Short Wave Club	Pam Rose G4STO
	Brains Trust	Farnborough and District Radio Society	P Taylor G4MBZ
	Japanese Morse: talk by Norman Kendrick G3CSG	Wirral and District AR Club	G Scott G8TRY
	Talk on Video Recorders	The Home Counties Amateur Television Club	P W Andrews G6MNJ
27 April	DF Hunt 160 & 2m	Dunstable Downs Radio Club	P Seaford G8XTW
	Homebrew Contest: 3 classes of entries, junior (under 18), novice & senior	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
28-29 April	RSGB National AR exhibition	NEC Birmingham	RSGB, Potters Bar 59015
1 May	RF Power Transmitters talk by Dick Brocks G3WHR	Chelmsford AR Society, Marconi College	J Martyr G3PMX A C Mead G4KGB
2 May	Lecture-23cms operation	S Bristol AR Club	Steve G4MCQ
4 May	Discussion Evening & Preparation for weekend contest	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
4-7 May	Midland Computer Fair	NEC Birmingham	Fiona Howell 01 643 8040
6 May	Anglo-Scottish Rally (weekend accommodation available)	Kelso	
8 May	Talk: Confessions II - continuation of Clive Hardistry's talk: Confessions of a TV repair man	Bury Radio Society	B Tyldsley G4TBT
9 May	Inter-club Quiz Night - 1st round, at Chester AR Society	Wirral and District AR Club	G Scott G8TRY
	QSL card and awards rally	S Bristol AR Club	Les Wooldridge
	'Let's build a repeater', by John G8UZZ and Co	Wirral and District AR Club	G Scott G8TRY
	Amsat-UK - Talk on Latest Developments	Farnborough and District Radio Society	P Taylor G4MBZ
10 May	Talk by representative of Marconi (Provisional)	Southgate AR Club	R Snary G40BE
11 May	TV Show repeat	Dunstable Downs Radio Club	P Seaford G8XTW
	Japanese Morse: talk by Norman Kendrick G3CSG	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
13 May	First Sunday DF Contests	Wirral and District AR Club	G Scott G8TRY
15 May	Operating evening using club callsigns GARQT & G6TBH on HF & VHF	Biggin Hill AR Club	I Mitchell G4NSD
16 May	Fox hunt briefing	S Bristol AR Club	G8X1H/G40PQ
18 May	AGM	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
	AGM	Kent Repeater Group	M W Stoneham G4RVV
21 May	Model Engineering - Michael Kingston	Leighton Linslade Radio Club	P Brazier G6JFN
23 May	2 Metre SSB night	S Bristol AR Club	G6ZTX/G6ZTY
	Equipment Demonstration by Gordon Adams. G3LEQ	Wirral and District AR Club	G Scott G8TRY
	Talk on Slow Scan TV	The Home Counties Amateur Television Club	P W Andrews G6MNJ
	HF Field Day Preview	Farnborough and District Radio Society	P Taylor G4MBZ

DATES FOR YOUR DIARY

25 May	Oscar 10 by G3VZV Talk by winners of Homebrew contest	Dunstable Downs Radio Club S Manchester Radio Club	P Seaford G8XTW G3FVA, G3UHF, G8SMR
27 May	Plymouth Rally	Devonport Secondary School, Park Ave, Devonport, Plymouth	
30 May	ATV Night DF Practice. From Heswall lay-by	S Bristol AR Club Wirral and District AR Club	Peter G8WAX G Scott G8TRY
1 June	Modifications to the Club's FT221 by G4MYB	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
2-3 June	HF National Field Day	Leighton Linsdale Radio Club	P Brazier G6JFN
3 June	70 MHz CW contest, 6 hours section	Wirral and District AR Club	G Scott G8TRY
4 June	Quiz: round two	Leighton Linsdale Radio Club	P Brazier G6JFN
6 June	Lecture: Radio Interference Service	S Bristol AR Club	Len G4RZY
8 June	Summer Barbacue at Old Warden Club quiz	Dunstable Downs Radio Club S Manchester Radio Club	P Seaford G8XTW G3FVA, G3UHF, G8SMR
10 June	Contest-425MHz Trophy Contest-432 Trophy	Wirral and District AR Club Leighton Linsdale Radio Club	G Scott G8TRY P Brazier G62FN
13 June	Longleat Preparations Talk on Racal Equipment G3VCX	S Bristol AR Club Farnborough and District Radio Society	G4KUQ/G4RZY P Taylor G4MBZ
15 June	Latest Developments on Top Band Direction Finding Techniques by Dave Holland G3WFT.	Manchester Radio Club	G3FVA, G3UHF, G8SMR
17 June	Royal Navy ARS Mobile Rally DF Hunt	HMS Mercury nr Petersfield Wirral and District AR Club	A Walker G4DIU G Scott G8TRY
18 June	G8ELA on Packet Radio	Leighton Linsdale Radio Club	P Brazier G6JFN
19 June	Spring sale of surplus equipment	Biggin Hill AR Club	I Mitchell G4NSD
20 June	Longleat Final Briefing	S Bristol AR Club	G4KUQ/G4RZY
22 June	VHF NFD Planning Mid Summer 1.8 MHz direction finding competition followed by barbecue	Dunstable Downs Radio Club S Manchester Radio Club	P Seaford G8XTW G3FVA, G3UHF, G8SMR
24 June	Car boot sale	Dunstable Downs Radio Club	P Seaford G8XTW
27 June	Rig Tweaking Night The Eileen Medley Challenge Cup DF Hunt Outside Activity Night on 70cm and 23cm TV VHF Field Day Preview	S Bristol AR Club Wirral and District AR Club The Home Counties Amateur Television Club Farnborough and District Radio Society	G4SDR Mark G Scott G8TRY P W Andrews G6MNJ P Taylor G4MBZ
29 June	An introduction to operational amplifiers by Chris Ward G4HON	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
2 July	Electrical and Electronic Tool Aids for the Radio Enthusiast, by Mike Wells of AB Engineering Co Ltd	Leighton Linsdale Radio Club	P Brazier G6JFN
4 July	Lecture - RSGB BBQ	S Bristol AR Club Wirral and District AR Club	G4FRG/G4ROX G Scott G8TRY
6 July	Preparation for VHF NFD contest at weekend	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
7-8 July	VHF NFD 4 band club entry VHF National Field Day	Wirral and District AR Club Farnborough and District Radio Society	G Scott G8TRY P Taylor G4MBZ
9 July	Quiz, round three at MK and DRS in Newport Pagnell	Leighton Linsdale Radio Club	P Brazier G6JFN
10 July	Visit to IBA Transmitter Site at Emley Moor	Bury Radio Society	B Tyldsley G4TBT
11 July	70cms night	S Bristol AR Club	G4EIA Martin
13 July	the synthesis of the elements by Mike Ellis G4ROM	S Manchester Radio Club	G3FVA, G3UHF, G8SMR
15 July	DF Hunt	Wirral and District AR Club	G Scott G8TRY
17 July	QRP Operating Christopher Page G4BUE	Biggin Hill AR Club	I Mitchell G4NSD
18 July	Computer night	S Bristol AR Club	G1DBH Brian
21 July	Radio & Electronics Fair. Open 9.30am-5pm	Royal Victoria Hall, Southborough	W Kent AR Society
25 July	HF night (Revenge) DF Hunt for the G8PMF award Slow Scan Operating Evening	S Bristol AR Club Wirral and District AR Club The Home Counties Amateur Television Club	G4TXW Alf G Scott G8TRY P W Andrews G6MNJ

A bargraph S-meter that uses single IC electronics and a purpose-built PCB for fitting the display to the front panel of this popular scanning receiver



SX-200N RELATIVE S-METER

by Peter Rouse

I have always been frustrated by the SX-200 not having a means of measuring received signal strength. Some may not find this a disadvantage, but I use the set for monitoring propagation by means of various amateur and navigational beacons, as a means of experimenting with different aerial designs and listening in on amateur transmissions. Such uses call for some kind of S-Meter. However, as owners of this scanner will verify, there is little room either on the back or front Panels for the addition of any kind of control, socket or indicator.

The obvious solution was some kind of bargraph display of the type now popular on such things as CB sets and Hi-Fi equipment. However, even this presented difficulties as the only 10 LED bargraphs available commercially appear to be the types housed in IC style packages and these were too wide to fit anywhere on the front panel.

The final solution was to make a bargraph that was compact and rigid and this was eventually done by using 3mm LEDs on a purpose built strip of PCB (Figure 1)

It is perhaps worth noting that the PCB presented here could of course be used for bargraphs in other applications.

How it works

Driving bargraphs presents little problem these days as there are quite a number of ICs designed specifically for the job. The one eventually chosen for this application was the National LM3915. This contains an operational amplifier followed by 10 comparators which drive the LEDs direct without any need for current-limiting resistors. There are several IC's within this range including the LM3914 which has a linear response. However, the 3915 was chosen because it's logarithmic response assures a closer response to a conventional S-Meter.

A look at the circuit diagram of the SX-

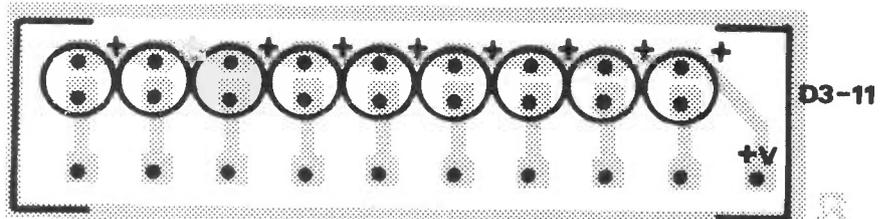


Fig 1a Component overlay for the LED display (actual size 1 3/4" x 1")

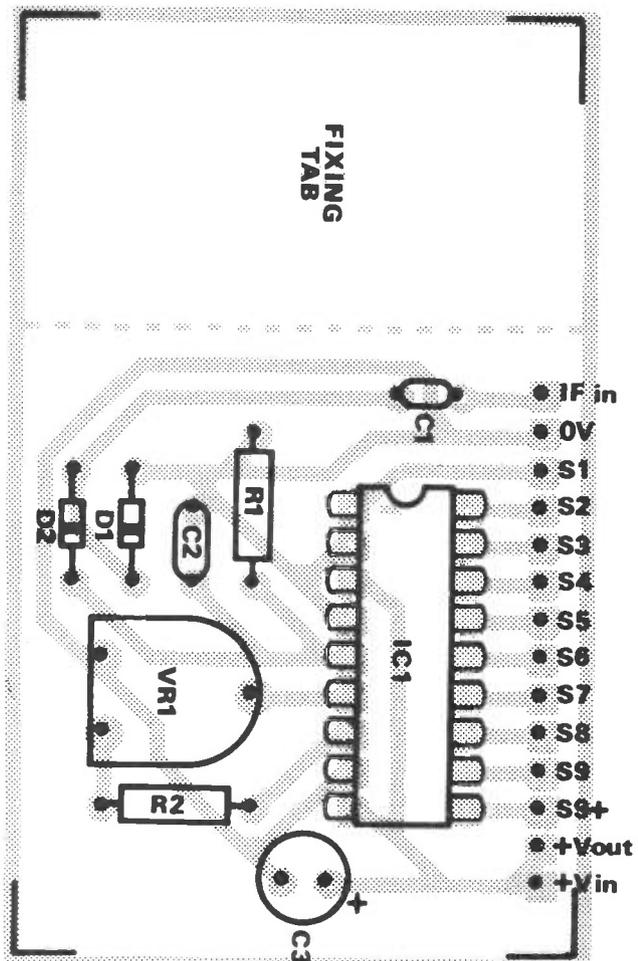


Fig 1 Component overlay for display driver (actual size 2" x 1 1/4")

S METER

200 revealed that most IF amplification takes place in a Motorola 3357 communications FM/IF chip (refer to *Figure 2*). The 10.7MHz IF signal is fed from the tuning heads to this IC via two 2-Pole crystal roofing filters. On board the IC is a second conversion mixer and crystal controlled oscillator to give a final IF of 455KHz. This signal is fed out to a ceramic filter via a matching transformer for final selectivity and the output from that filter is not only fed back into the 3357 for FM-demodulation but also to the AM IF detector. The output from the transformer, IFT-101, is also fed to the AGC amplifier.

Initially the common point for both FM and AM IF following the ceramic filter appeared to be the ideal point at which to measure the signal strength. However, tests showed that signal level at this point was very low, possibly because there is a high insertion loss through the filter and transformers and these stages are quite heavily loaded by the other circuits. Further investigation then revealed that a healthy signal level was available at the input to the filter which is available at pin 3 of IC101.

In theory it would appear that this relatively broadband point in the circuit is not ideal to use because there could be readings from signals generated on adjacent channels as well. In practice this rarely happens (the 10.7MHz roofing filters provide a fair degree of selectivity) and, adopting this stage for measurement, means we can simplify the metering circuit by dispensing with the need for additional signal amplification.

In practice, IF signal is fed from pin 3 of IC-101 on the set to capacitor C1 on the meter board (*Figure 3*) and this, in turn, feeds the signal to a simple detector circuit comprising D1 & D2. The output of this network is a voltage which is proportional to the strength of the IF signal. Capacitor C2 de-couples any remaining IF and R2 matches the input impedance of the device. R2 and RV1 set the meter sensitivity by setting up a comparison with a stable reference voltage, generated within the IC. The application shown uses the device in its true bargraph mode, but it can be set to operate in dot mode simply by connecting pin 9 to ground instead of to +V.

Construction

Construction of the main circuit board is very straightforward and the layout is shown in *Figure 4*. Note that the large area of groundplane on the track side of the board is necessary because it forms the mounting for the board. This is secured to the VCO box, using double-sided tape or sticky pads.

The bargraph PCB is a little more complicated, if only because the LEDs must be modified slightly before they will fit. Although such LEDs are quoted as 3mm, this only refers to their main body diameter and does not take into account the small rim that appears near the leads. It is therefore necessary to remove that part of the rim which would otherwise be

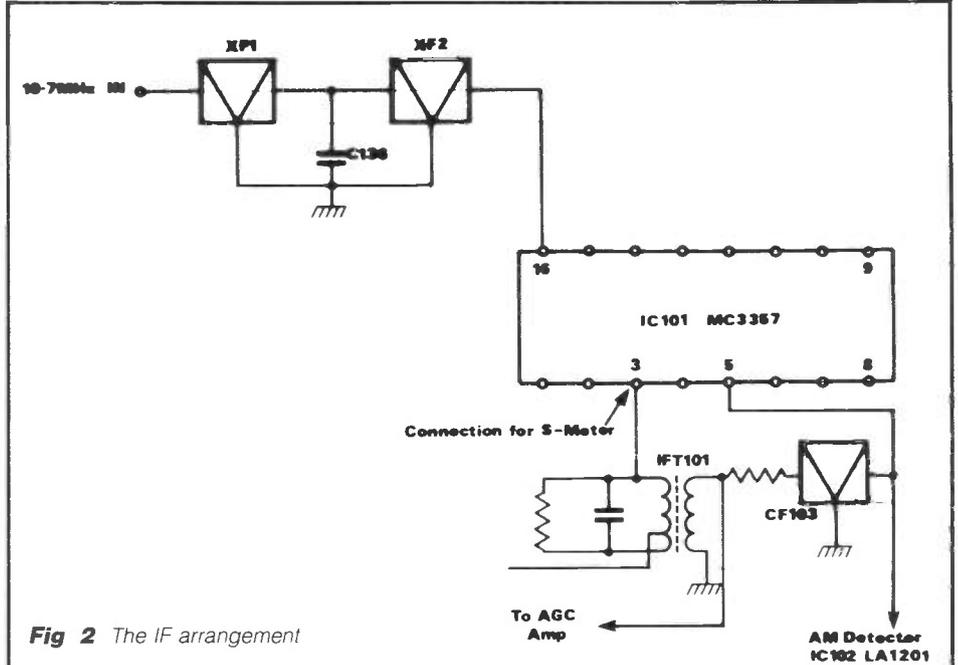


Fig 2 The IF arrangement

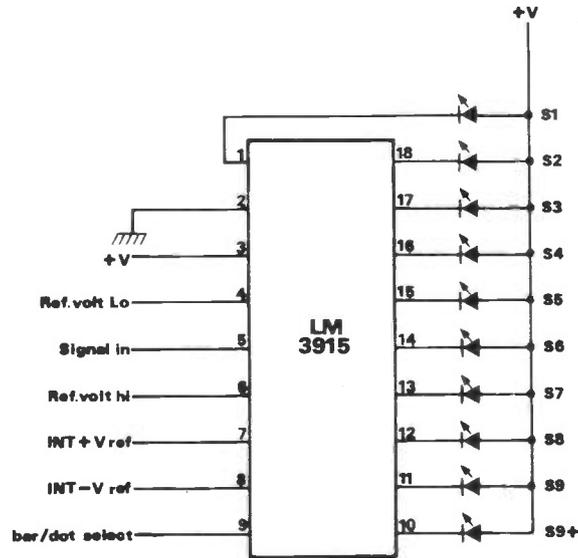


Fig 3 LM3915 Bargraph IC pin information

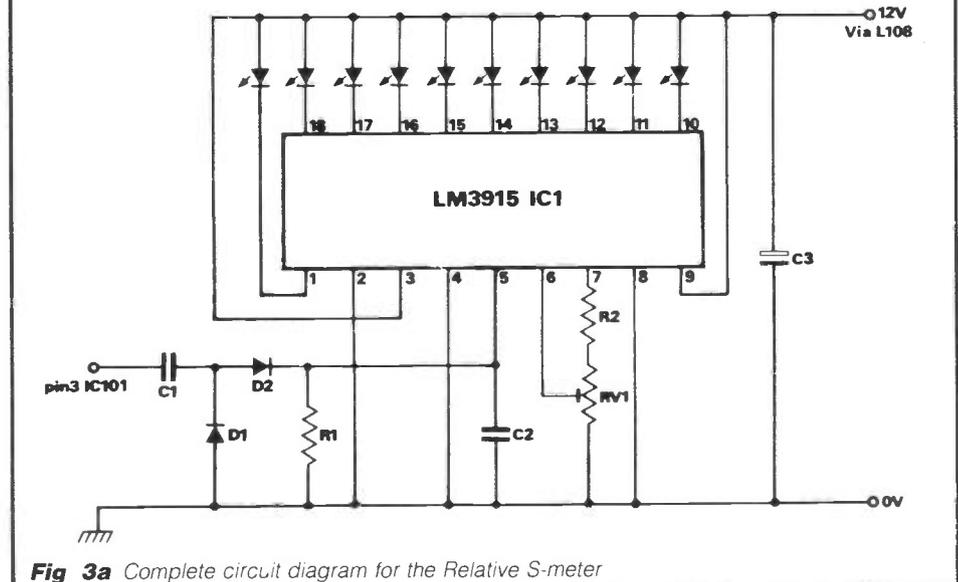


Fig 3a Complete circuit diagram for the Relative S-meter

S METER

next to the next LED on the board. In practice this is easily done as on most LEDs, two strokes of a sharp modelling knife will shave away the rim.

This provides a much tighter display,

giving a far better visual effect than when the LEDs are spaced by their rims. It also shortens the required front panel slot by about 10mm.

Only two other points are worth

mentioning about the display board. First, the overlap at the ends is to provide mounting points and second, the connection wires (which should be colour coded) are connected to pads on the track side and not soldered through the board, otherwise the board will not mount in place. Make connections with fairly thin stranded wire, ribbon cable would look good but does not get around the tight corners.

The choice of coloured LEDs is for the individual to decide and, of course, it is possible to use a mix of colours. The prototype version was fitted with green LEDs and as they provide a match to the green fluorescent display on the set they do not look out of place.

Fitting

Cutting a slot in the front panel of such an expensive piece of equipment may seem a daunting prospect but in practice it is a lot easier than it may seem. This is because all front panel displays, switches and slide controls are connected to the main circuit board by a plugging system.

When the upper and lower casing have been removed (note that the speaker connection is plugged), the front panel is released by undoing four screws. After unplugging three connectors the whole control panel will then separate from the rest of the set. Remove the small bracket and it should be possible to drill and file the panel, but if necessary the panel can be stripped of the display, switches and controls. This is done by removing all small screws visible on the back of the panel but be warned that it is difficult to get it together again.

Using some kind of scribe or marker, mark-out a slot 30mm long and 3mm wide...it will look better if it is centred and the base of the slot finishes level with the middle of the power switch.

The front panel consists of a fairly thin metal sheet over a fairly thick plastic base and the best way to cut the slot is to drill a closely spaced line of holes slightly less than the required 3mm width thus allowing some slight margin of error. Then use a miniature steel flat file to cut the slot. An 80mm by 5mm file is ideal and if you do not have one, they only cost a few pence, at your local hardware stockist or modellers shop. Be patient, and if you are careful you will get an acceptable result.

The final trick is to disguise any slight imperfection in the straightness of the slot. This is achieved by blacking-out both the inside of the slot and the shiny metal edges of the front panel where it has been cut. Matt black paint can be used, but the author found that a black, thick felt-tip pen (the chunky indelible types favoured by people who address parcels) gave even better results because it's semi-matt finish matched the black of the front panel.

Once you are satisfied that the bargraph fits into the slot, it can be glued into place using impact adhesive. It is best to only use a small amount of glue

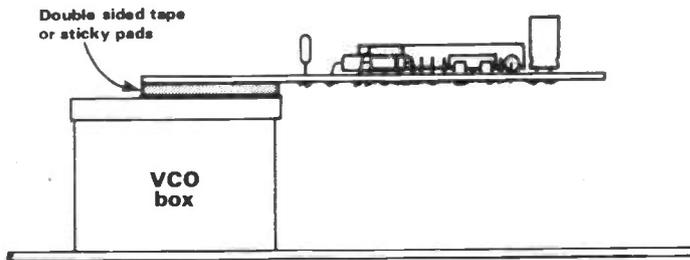


Fig 4a Method of attachment of main board to receiver interior



Fig 4b Soldering details of LEDs

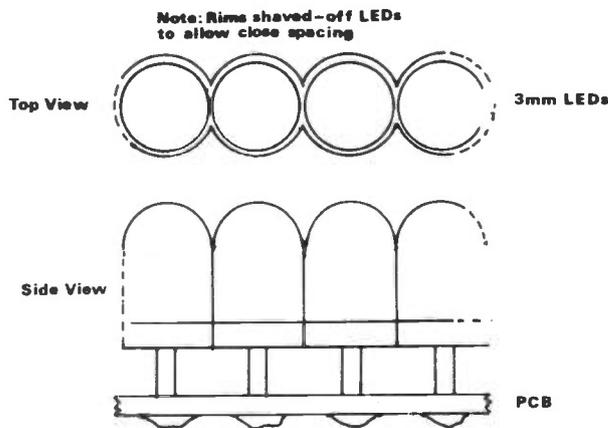


Fig 4c Plain view and elevation of LED mounting

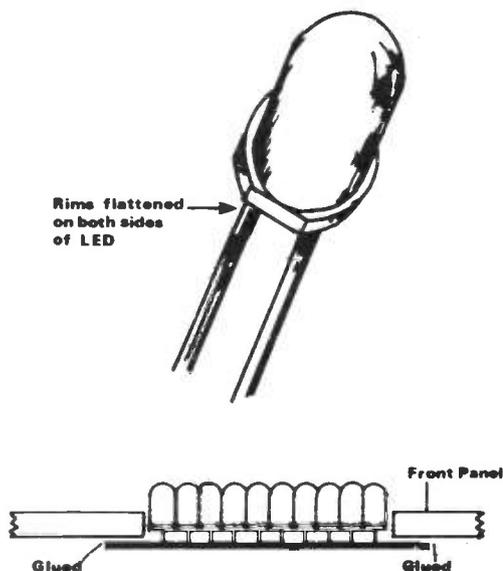
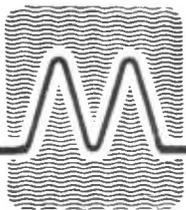


Fig 4d Modification to individual LEDs and display mounting details



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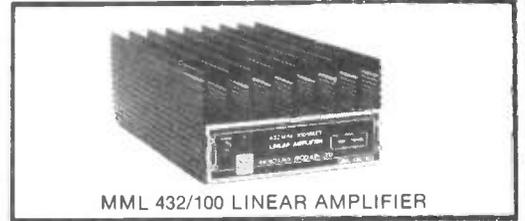
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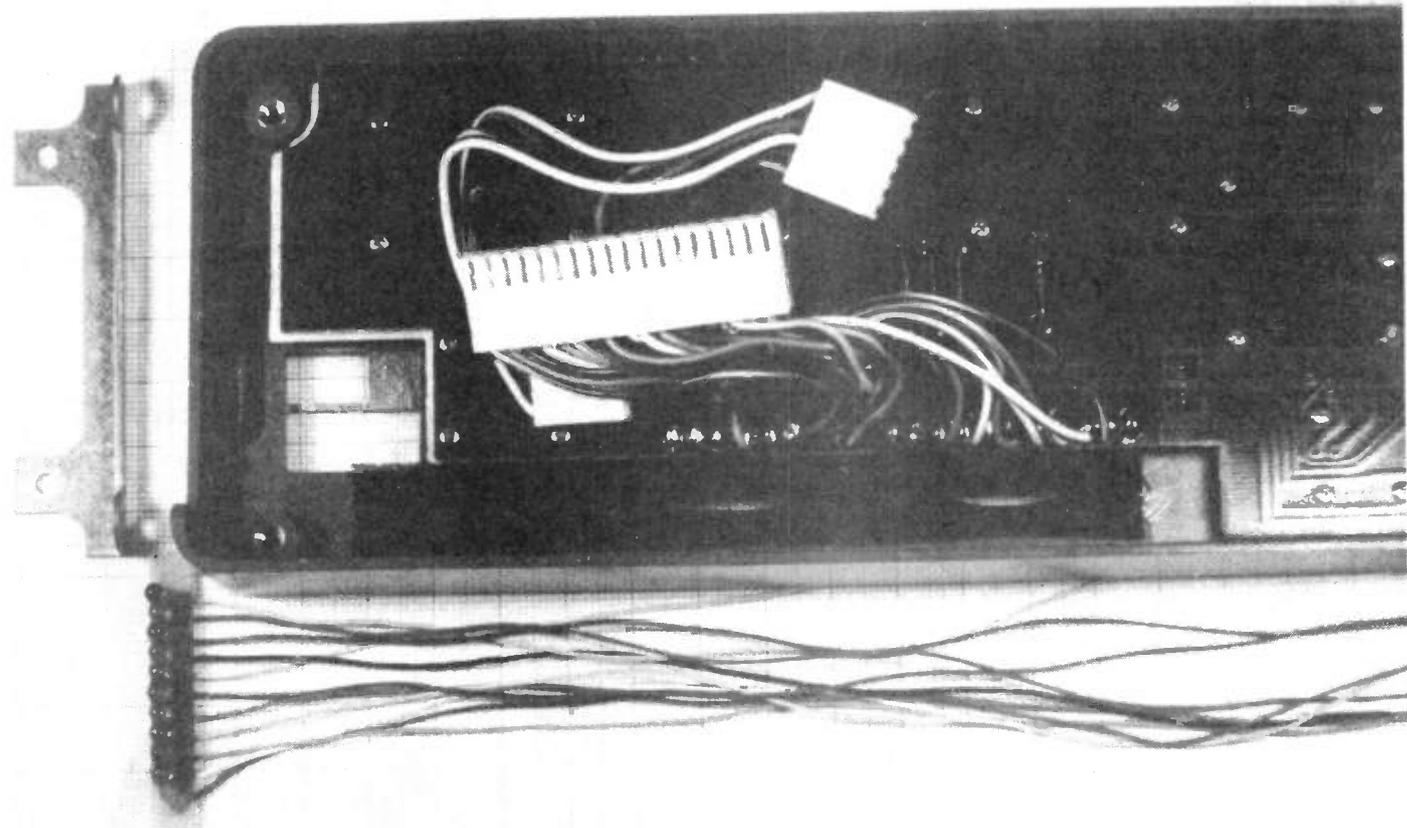
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S METER



Plugging system shown in situ

just in case you need to replace an LED at any time (some last for ever, others do not).

Once you have connected all the leads from the bargraph to the circuit board, use a short length of miniature co-axial cable and connect the input to pin 3 of the MC3357 IC. Next connect the power input. Although there are several well stabilised voltages available in the set, none seem happy at having extra circuitry tacked onto them but this is no problem as the S-Meter circuit power

requirements are not very demanding. The best connection point is the smoothed 12V DC input after the power switch as it's easy to get at since it is the wire nearest the base of the set from the small PCB that forms part of the power switch.

Setting-up

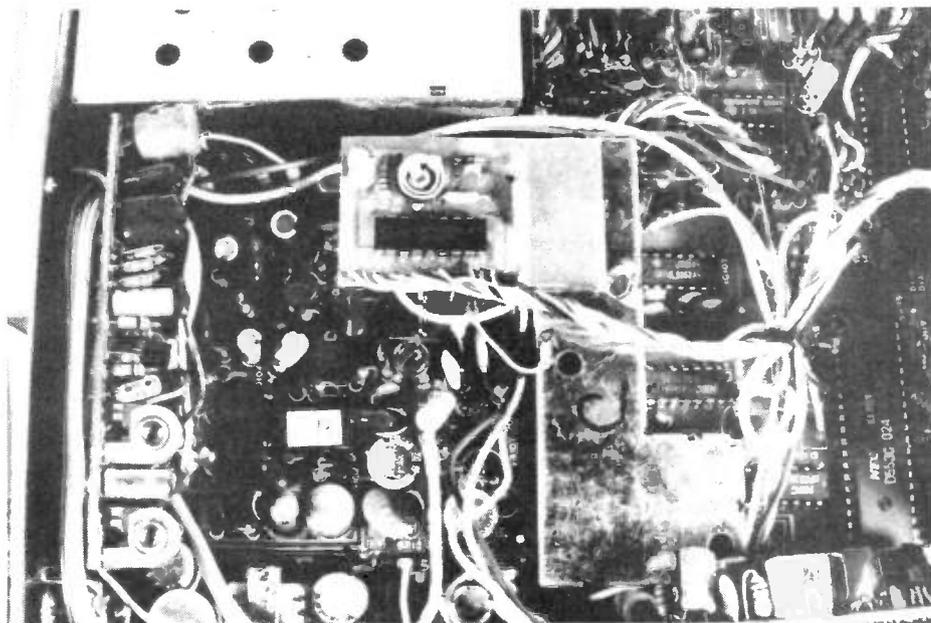
If you are satisfied that all the connections are right, it now only remains for the pre-set control to be adjusted.

With no aerial connected, it should be possible to swing the pre-set resistor so that either most of the LEDs are lit or all are extinguished. Now tune the set to around 50MHz (this is about centre band for the VHF-Low tuning head) and trim the pre-set so that the lowest LED just goes out. Check at approximately 140MHz and 450MHz that the light is still out under no-signal conditions (again centre bands of the VHF-High and UHF tuning heads). Should the first LED light up on either of these, then again trim until it just goes out.

Now test the meter using a suitable source of regular signals such as the UK CB band between 27.6 and 28MHz.

First impressions may indicate that the meter responds better to some AM signals than FM ones. This is purely illusion and is due to the fact that, because of capture effect, many FM signals sound strong and loud whereas, in reality, they may be relatively weak. Tests on this meter circuit have been carried out by comparison with a professional VHF communications receiver and the meter readings on that set corresponded quite reasonably with the bargraph on the SX-200. Do remember, though, that readings on the bargraph will only be relative and no claim is made that this is a properly calibrated S-Meter.

One final point concerns the scanning and search modes. When the set is so operated, it will be noticed that the first two or three LEDs flash rapidly. This is quite normal and is caused by the synthesiser as it chops from one frequency to the next.



Main board shown fixed inside the receiver

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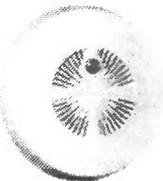
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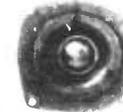
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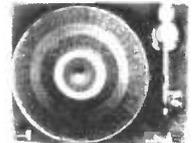
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LATEST LITERATURE

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

BABANI BOOKS

Bernard Babani (Publishing) Ltd have three new publications available:- BUILDING SHORTWAVE BROADCAST BAND AERIALS (Price £1.95)

This concise book describes how to build 25 shortwave broadcast band aerials that are simple and inexpensive to construct and perform well. The designs start with the simple dipole and proceed through verticals, helicals and umbrellas to triangle and even end-fire arrays, etc.

Much information is also given on shortwave bands, aerial directivity, time zones as well as a complete set of dimension tables that will help you spot an aerial on a particular frequency. Dimensions are given for various style aerials and other data needed for spacing and cutting phasing lengths.

BASIC & FORTRAN IN PARALLEL (Price £1.95)

This book could be used to learn FORTRAN or BASIC, or both languages at the same time.

FORTRAN is an acronym for FORMula TRANslation. It was developed in the mid 1950s, was one of the first high-level languages to be developed and the first to be used extensively. It is available on at least seventy microcomputers.

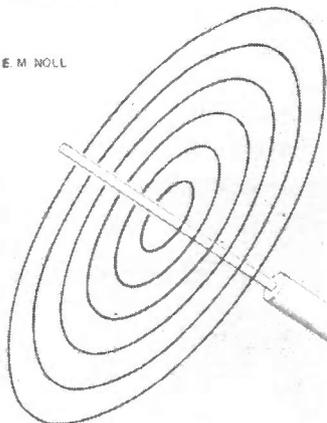
This book includes a FORTRAN interpreter written in Sinclair Spectrum BASIC which should also run with little modification on the Sinclair ZX81. This supports most of the commonly used features of FORTRAN, and makes it possible to 'get a feel' of what writing programs is like.

AUDIO AMPLIFIER CONSTRUCTION (Price £2.25)

The aim is to provide the reader with a wide range of preamplifier and power amplifier designs that prob-

25 Simple Shortwave Broadcast Band Aerials

E. M. NOLL



ably cover most normal requirements.

The preamplifier circuits include low noise microphone and RIAA types, a tape head preamplifier, a guitar preamplifier and various tone controls. The power amplifier designs range from low battery operated to 100W MOSFET types and also include a 12V bridge amplifier capable of giving up to 18W output.

All the circuits are relatively easy to construct, using the PCB or stripboard designs given. Where necessary any setting-up procedures are described, but generally no setting-up or test gear is necessary for successful completion of the project.

The designs match the capabilities of constructors with limited experience as well as more advanced hobbyists.

*Bernard Babani (Publishing) Ltd,
The Grampians,
Shepherds Bush Road,
London W6 7NF. TEL: 01-603-2581/7296.*

BITS AND PIECES

Greenweld Electronic Components latest catalogue (price 70p or £1 including

postage) is now available. It has been expanded to include many new lines: IDC connectors, audio modules, computer books, hardware, stylii and many more semi-conductors.

Increased to 84 pages it comes with the latest bargain list, bulk buyers list and wholesale discount list together with a pounds worth of discount vouchers.

The catalogue appeals to the home constructor who requires 'bits and pieces', as well as to schools, colleges, universities and small manufacturers who buy in larger quantities.

*Greenweld Electronic Components & Equipment,
443 Millbrook Road,
Southampton SO1 0HX.
TEL: (0703) 772501.*

NETHERLANDS WORLD BROADCASTING

Robert D Haslach traces the development of Netherlands international broadcasting from the early years of the twentieth century to the present day. It includes interesting chapters on Holland's first overseas service, the role of Dutch broadcasting during the Second World War and in the post war years and gives a profile of one of Holland's first broadcasters.

The book is well illustrated with photographs, drawings and tables.

*Lawrence Miller Publishing Media,
PA 19063, USA.*

LOGIC FAMILY DATABOOK

This comprehensive databook provides information on National Semiconductor's MM54HC/MM74HC high speed CMOS family of SS1/MS1/LS1 logic components. The family utilizes microCMOS™ Technology to achieve the input and power

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The MM54HC/MM74HC family has the same pin-out as equivalent 54LS/74LS functions, in addition, many popular CD4000 series logic functions are offered where no equivalent TTL function exists. Also, this high speed logic family incorporates a growing number of new functions not previously implemented in either a CMOS or TTL logic family.

The MM54HCT/MM74HCT are a subfamily of MM54HC/MM74HC offering TTL compatible inputs. These MM54HCT/MM74HCT devices offer convenient TTL level translation to CMOS for those interface points where only TTL levels are provided, i.e. NMOS microprocessor bus 54S/74S, 54ALS/74ALS, etc.

The broad line of MM54HC/MM74HC functions greatly simplifies the task of designing complete high speed systems in CMOS.

*National Semiconductor (UK) Ltd,
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THE BAEC NEWSLETTER

This 43-page journal is sent to all members of the BRITISH AMATEUR ELECTRONICS CLUB.

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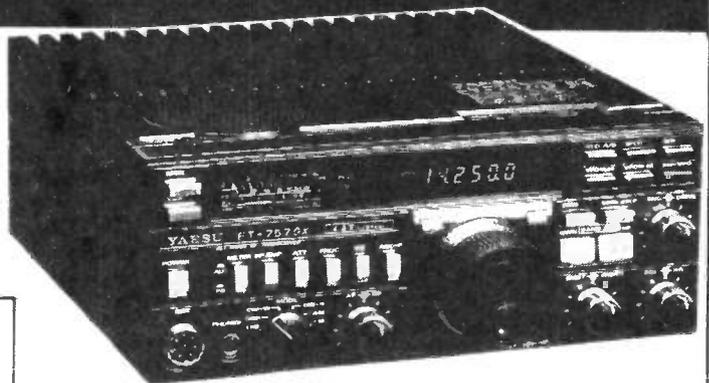
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EQUIPMENT REVIEWS

The TRIO TS430S transceiver is reviewed by Tony Stokes who describes his first-hand experiences with this popular equipment.
James Dick reviews the HP41CX calculator and describes the many advantages provided by this versatile instrument.

DATA FILE

Ray Marston's Data File reveals the mysteries of National Semiconductors LM381, LM382, LM387 range of dual audio-amplifier ICs

ONE NIGHT'S WORK

D R Lock describes how a plug-in EPROM can be constructed in a few hours.

HIGH SPEED DATA

An introduction to high speed data transmission. R J Redding describes how the radio amateur can participate in this interesting aspect of the hobby

DATA BRIEF

Circuits and information about the MC1648 voltage-controlled oscillator.

DOT MATRIX PRINTER

An inexpensive way to extend the home computer facility by adding a hand copy printer.
Graham Moore explains

PLUS all the usual features!

New Products • News • Reception Reports...

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DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

Intense low-pressure systems dominated most of the UK during January which put paid to any chance of tropospheric reception in Band III or at UHF. The weather also produced severe gales which caused the demise of many DX-TV aerial systems. Fortunately, those of us still operational found Band I reasonably active for the time of year with several excellent but minor Sporadic-E openings occasionally reaching an m.u.f. of 84MHz.

Meteor scatter (MS) activity due to the Quadrantids proved exceptional at the beginning of the month with signals in Band III as high as channel E11 (217.25MHz).

Running a receiver on channel E5 on the 2nd paid dividends when at 1352 GMT the Swedish PM5544 test card appeared via MS with the identification 'TV 1 SVERIGE', together with several co-channel programmes lasting several seconds. A quick flick through the remainder of Band III resulted in the Finnish FuBK test card with 'YLE TV 1' on E9 and unlocked line syncs on E11. Conditions were extremely active from the north-east during the afternoon of January 2nd with many channel E5 signals springing up. We have found that the higher channels tend to be affected first. A signal would appear on E5 followed by Band I signals in descending channel order.

Reception reports

Clive Athowe (Blofield, Norfolk) tells us that his new Western Electronics 58ft tiltover tower survived the January gales but he has added guys for extra protection.

The Quadrantids brought in several Band III stations from countries such as

East Germany, Norway, Russia, Austria and Czechoslovakia, all on channel E5/R6 (175.25MHz). Full details of meteor-shower predictions for the year were given in the March edition of **R&EW**.

During the late afternoon of the 16th an unusual signal was noted on E2. It consisted of a programme from the south-west with typical F2/Trans-Equatorial quality displaying smeary, low-bandwidth video. The linehold had to be re-adjusted to lock the picture and this suggests that it originated in a country using a non-standard TV system. This could have been Ghana. The signal was later swamped by the Portuguese transmitter at Muro operating on the same channel.

Bob Brooks (South Wirral) has received many test cards throughout the month from various European countries including Sweden, Norway, Denmark, Poland and Austria. A test pattern appeared on channel E3 with a mystery identification of the 24th at 1250 GMT. It resembled the name 'Ochsenkopf' which is the transmitter identification radiated on the West German FuBK pattern from the Bayerischer Rundfunk outlet on channel E4. We have further details of the equipment used by **R&EW** reader William Pitte in France. He lives 15km west of Le Havre.

An Otake colour portable type 1400 VM is in use. This is a PAL/SECAM 'export' portable capable of receiving virtually all the systems in use throughout Europe such as B,G,H (625 lines negative video with 5.5MHz sound), D, K, K1 (625 lines, negative video 6.5MHz sound), system I (6.0MHz sound - UK standard) and French system L (positive video with AM sound). It won't however resolve the

American Forces 525-line system M standard as used at their bases in Belgium and West Germany.

William's receiving aerials are at a height of 12 metres situated on a hill behind his home. They consist of separate wideband Band III and UHF arrays and a Band I aerial cut to channel E4 (62.25MHz). To date, he has received at least 20 different countries.

January log

1/1/84: /Sweden (SR-1) on channel E3 with the PM5544 test card; unidentified programmes on R1 and E3.

2/1/84: Norway (NRK) E3 with 'NRK GAMLEN' PM5544: SR-1 on E2, E5 and E9 at various times throughout the afternoon on test card; Denmark (DR) E3 on 'DANMARKS RADIO' test card; Czechoslovakia (CST-1) on R1 and R2 radiating the EZO test card with 'RS-KH' identification; Poland (TVP-1) R1 on PM5544 (dark background) without ident; Austria (ORF) E2a on test card, also programmes on E2a and E10 at 1934; Finland (YLE) E9 on FuBK test card with 'YLE TV 1' identification from the 50kW outlet at Lahti at 1352 via MS.

3/1/84: NRK E5 with 'NRK STORD' PM5544; SR E3 on 'TV 1 SVERIGE' test card; unidentified prog via SpE at 1328 on channel R2.

4/1/84: NRK E5 using PM5544; CST R2 with 'RS-KH' pattern.

5/1/84: NRK E5 PM5544; CST on R1 and R2 with test card; ORF E2a radiating the Telefunken monoscopic test card.

6/1/84: Unidentified programmes via SpE (Sporadic-E) consisting of cartoons on R1 and R2 at 1615.

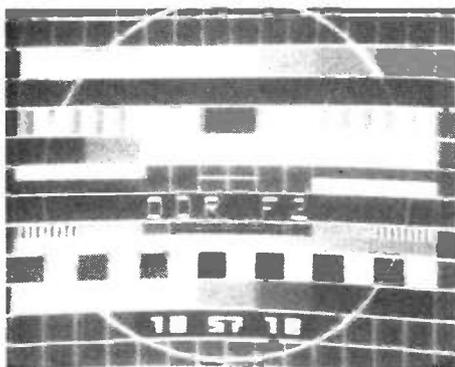
7/1/84: ORF E2a PM5544; progs via SpE during late afternoon with several OIRT (Eastern European) FM radio stations present between 66MHz and 70MHz; Rumania (TVR) R2 via SpE at 1635 using the monochrome EBU Bar pattern followed by an FuBK test card with the identification 'TVR BUCURESTI' prior to programme commencement.

8/1/84: Sporadic-E activity on channels R1 and R2 from 1045 onwards.

9/1/84: CST on channel R1 radiating the 'RS-KH' test card.

10/1/84: CST R1 and R2 on 'RS-KH' pattern; ORF E2a on PM5544; unidentified PM5544 on E5 via MS.

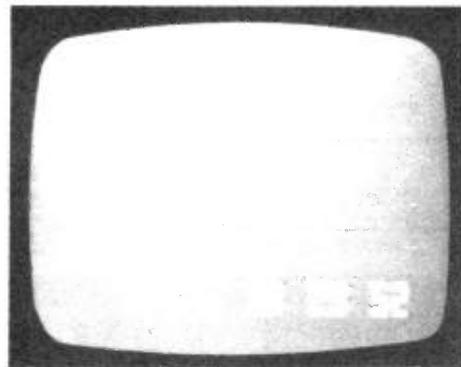
11/1/84: SR E3 on PM5544; CST R1 and R2



Electronic test card radiated by East Germany's Second network, DDR-F2



News programme from East Germany. Photograph courtesy of Jürgen Klassen, West Berlin



DDR-F News caption and digital clock - see **R&EW** Feb '83 for alternative version

plus channel R6 radiating the test card.
12/1/84: CST R1 and R2 on test card; ORF E2a on PM5544; DR E3 on test card; Belgium on E3 (RTBF 1 from Liège) showing sample teletext pages from their service known as 'Percival'; Netherlands (NOS) on E5 with the 'PTT-NED.1' PM5544 via weak tropo; progs via MS on E5/R6; Spain (TVE) E2 and E4 with programmes during the early evening via SpE; Italy (RAI) on channels IA and IB with programmes via SpE.

13/1/84: CST R1 and R2 on test card; ORF E2a radiating the PM5544 and later the Telefunken TO5 test card carrying the identification 'ORF FS1'.

15/1/84: Poland R1 and R2 on 'dt' News capiton (Dziennik Telewizyjny - see **R&EW**, March '84) followed by News programme.

16/1/84: CST R1 and R2 on EZO test card; NRK E3 from Gamlen and E4 from Kongsberg on PM5544 test card.

17/1/84: CST R1 on EZO test card; Hungary (MTV-1) R1 with 'MTV-1 BUDAPEST' PM5544; TVR R2 radiating the 'TVR BUCURESTI' EBU Bar pattern.

18/1/84: A good day for SpE: CST R2 on EZO test card; Yugoslavia (JRT) E3 with the 'JRT RTV LJNA' PM5544 from the Ljubljana studios with co-channel 'TV BGRD' PM5544 from Belgrade; TVE E2 on colour bars and later on E4 with cartoons, Portugal (RTP-1) E3 on programmes and the 'RTP-PORTO' FuBK test card.

20/1/84: CST R1 and R2 with their 'RS-KH' test card.

22/1/84: ORF E2a on PM5544; progs via meteor-shower on E5/E6.

23/1/84: East Germany (DDR:F1) E4 on electronic test card; TVP R1 with 'dt' News prog; CST R2 on usual test card; West Germany E4 radiating the 'SWF-RBG' FuBK test card from Südwestfunk's transmitter at Raichberg.

25/1/84: CST R1 on test card; TVPR1 with the PM5544 which has a dark background; SWF E4 showing 'SWF-RBG' FuBK.

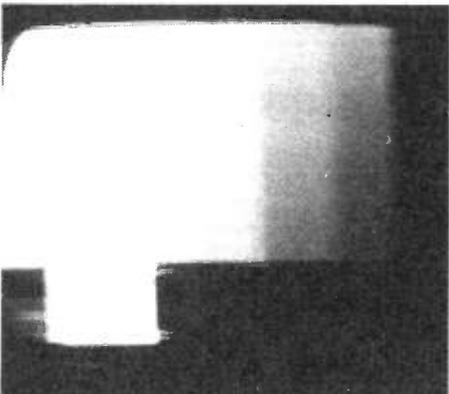
27/1/84: CST R2 on test card.

28/1/84: TVE E4 with 'tve' identification on the GTE colour test card (see **R&EW**, September 1983).

30/1/84: TVP R1 PM5544; Russia (TSS) R2 with 'BPEMR' News programme.

31/1/84: CST R1 on test card; ORF E2a on 'ORF FS 1' PM5544 test card.

Full details of channel frequency allocations were given in the August 1983 edition of **R&EW**.



Test pattern radiated by AFN-TV in West Germany. The 525-line system M standard is used

Sporadic-E activity should soon be on the increase by the time this column is read. Many potential TV DX-ers are intrigued by the success of others but are discouraged and feel that a DX receiving system is very technically demanding and difficult to initially set up. This is not the case and DX is possible even on a very simple aerial. This is especially so in the case of Sporadic-E where signal strengths can often be in excess of 1mV. Russian and Spanish signals have at times been seen on literally nothing more than a screwdriver!

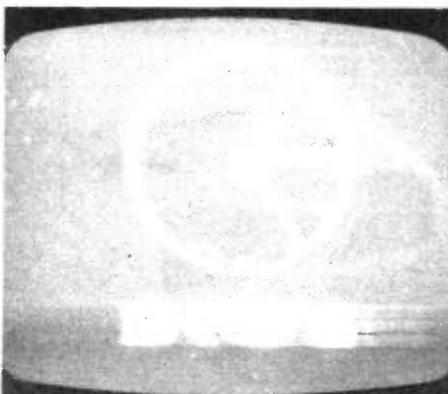
The main problem seems to be in obtaining equipment which will cover Band I. Adding or substituting a VHF varicap tuner to a standard UK receiver is possible. The supply voltage requirements are roughly the same and the tuners are cheap enough. Many mini-portables are available with VHF coverage as standard. Look out for tuning scales marked channels 2-4 and 5-12. These correspond to Bands I and III respectively.

Multi-standard receiver

South West Aerials, 11 Kent Road, Parkstone, Poole, Dorset, can often supply multi-standard receivers suitable for DX-TV. A SAE should be sent with any enquiries.

Several video recorders have VHF tuners fitted - the Sanyo VTC 9300 and the Hitachi VT11E are two examples. The enthusiast would simply connect an aerial to the VCR and set the band switch to Band I. By using the recorder and TV receiver in the E-to-E mode the recorder will act as a frequency converter. Colour signals may also be received provided the signal strength is adequate. If a VCR is used as a converter one has the added bonus of recording off-air DX signals.

Sporadic-E activity is extremely high between mid-May and early September and can occur at any time of the day or night. The duration of reception can be a matter of only minutes, or all day if conditions are good. On some days reception will be non-existent while on others activity will be high. Signals can arrive from virtually any European country on six different channels throughout Band I. Signals are reflected by the unstable E-layer and consequently a skip distance is involved, typically 800 to 1000 miles.



Clock caption used by the British Forces Broadcasting Service in West Germany. Most BFBS programmes are produced in London

French DX-TV book review

'Télévisions du Monde' is the latest book specifically intended for DX-TV enthusiasts to come our way for review. The author is French DX-er Pierre Godou. This practical guide to long-distance television reception covers many aspects of the hobby. It should be noted however that constructional details for aerials and amplifiers are not included.

The 120-page book has short chapters dealing with reception of multi-standard TV signals, international broadcasting systems and channel allocations. A potted history of TV is also included along with brief details of methods to identify DX signals and the production of television test cards.

Various modes of propagation are discussed with notes on Sporadic-E and the F1 and F2 layers. Unfortunately tropospheric and meteor-shower reception modes are only mentioned in passing. Satellite TV reception via OTS and ECS, off-screen photography and mobile TV-DXing completes the text content of the book. The remainder is taken up with hundreds of photographs showing DX reception of test cards, studio captions and programmes.

The emphasis unfortunately appears to be a quantity rather than quality with many of the illustrations being several years out of date. There are a few inaccuracies but perhaps these are bound to occur in a publication of this size.

The book, published November 1983, should appeal to enthusiasts who are conversant with the French language and seeking a general guide to the hobby. It costs 110 francs and further details (in French) are available from the author at 16, Bd. Oscar Leroux, F-35100 Rennes, France.

Service Information

We have just one item of Service Information this month, mainly for the benefit of our overseas readers.

The familiar BBC Test Card 'F' is still occasionally radiated on both BBC-1 and BBC-2 at approximately 0852 prior to sample Ceefax pages which begin at 0900 depending upon programme commitments. Full details about the discontinuation of normal BBC Trade Test Transmissions were given in the January 1984 edition of **R&EW**.



Identification caption used by the French 'tfti' network for transmissions relayed to West Berlin

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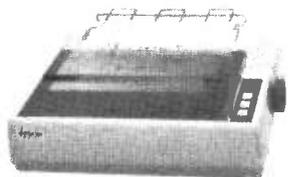
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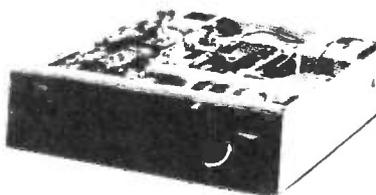
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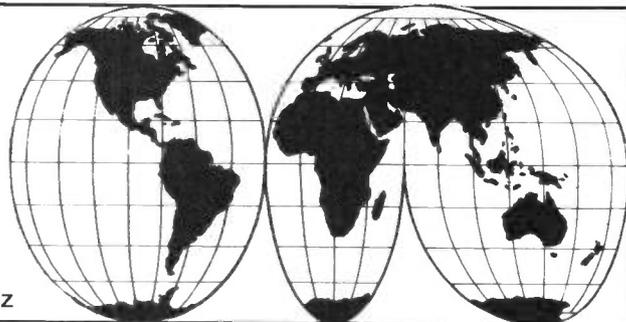
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SHORT WAVE NEWS FOR DX LISTENERS

by Frank A Baldwin

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



For many years a mass of information about operating schedules, frequency changes, new channels, new stations and the like has poured into my shack. To cope with this material and maintain some semblance of order I have struggled to keep records up to date. These have been written into ledgers, notebooks, loose-leaf binders and even put on tape for recall on the reel-to-reel and/or cassette recorder.

At one time a card index existed. The snag was the time spent keeping it up-to-date.

Salvation appeared last year with a micro-computer – a Commodore 64. Now in the shack scheme of things, complete with a TV and a tape library, the orderly retention of data is assured. Moreover, an almost instant recall facility is available using the tape memory bank and changes and amendments are easily edited.

The computer greatly assists with listing frequencies in numerical order after entering them into the memory haphazardly, as is the case when working with many differing sources of information at one time, dealing with times in GMT and, at the same time, entering the language in use during a particular transmission period.

In the tape library at this QTH is data about particular regions of the world, notably Latin America, the Far East and South-East Asia; tapes devoted to stations in Peru, Indonesia and China (regionals) and others with records of the monthly loggings in the correct order for reports to the ISWL (International Short Wave League), and to help with these articles. Still more tapes bear such titles as DX targets, Clandestines and DX programmes.

AROUND THE DIAL

Note the times and frequencies, spin your dials and try for some of the following.

AFRICA

Algeria

Algiers on a measured **7246** at 2146, YL with songs, together with some local-style music in a programme of the National Network 2 which is on this channel from 0500 through to 2200. The languages used are Berber and Kabyle.

Algiers on **11715** at 1450, YL with station identification, OM songs in the Arabic-language service scheduled from 0600 to 2300.

Gabon

Libreville on **11940** at 2045, YL with song in vernacular then OM with announcements in French. Transmissions from 0500 to 0600 and from 1800 to 2300. I checked this one as being in parallel on **4810** – which it was.

Morocco

Rabat on **15335** at 1444, OM's song in vernacular, presumably Berber, with local-style music in the Domestic Network which may be heard from 1000 to 2100.

Rabat on **15360** at 1550, OM with songs and music in a relay of the Arabic Domestic Service, scheduled from 1100 to 1700.

Nigeria

Kaduna on **4770** at 0502, YL with a newscast in English in a Channel 2 presentation. Channel 2 uses both English and Hausa and is on the air from 0400 to 0100, identifying as 'Radio Nigeria'.

Lagos on **7255** at 0559, military music, OM with station identification in English as 'This is the National Network of Nigeria'. This was followed by the talking drum, some rapid drumbeats from another drum and then a newscast in English with items of both national and international events. This is the West African Service which is in English and on this channel from 0500 to 0600, 0800 to 1700 and from 1900 to 2030.

South Africa

Johannesburg on **25790** at 1437, OM with a talk about gold mining and refining together with the problems of marketing, all in the English transmission for Africa, Europe and the Middle East and timed from 1300 to 1600.

Tunisia

Sfax on **7225** at 1724, OM and YL with a talk in Arabic interspersed with local-style music in a programme of the Domestic Service listed on this part of the dial from 0430 to 2330.

AMERICA – CENTRAL

Leeward Islands

Antigua on **9735** at 0853, Cologne relay transmitter with the German programme intended for Europe and Australasia and scheduled from 0800 to 1000.

AMERICA – SOUTH

Argentina

Buenos Aires on **15345** at 2032, YL with the station identification in Spanish followed by the programme in that language directed to Africa, Europe and the Middle East and scheduled from 2030 to 2100.

Colombia

La Voz del Cinaruco, Arauca on **4865** at 0349, OM with a talk in Spanish all about local affairs and the political scene. LV del Cinaruco is on the air from 0900 to 0400 (Sunday until 0200) but on occasions – just to fool us all – it radiates around the clock. The power is 1kW.

Radio Caracol, Neiva on **4945** at 0358, OM with a talk in Spanish – but not in parallel with the above – all about programme times. This station, in the Caracol Network, operates on a 24-hour schedule but has been reported closing at 0400 on occasions. The power is 2.5kW.

Radio Sutatenza on **5095** at 0137, OM with a newscast – mainly of South American

events – in Spanish, followed by station identification. This one is on the air from 0900 to 0400 with a power of 50kW.

Radio Difusora Nacional, Bogota on a measured **15332** at 2028, guitar music then OM with the station identification in Spanish at 2030. This station is listed on **15335** at 25kW!

Equador

Sistema de Emisora Atalaya, Guayaquil on a measured **4792** at 0338, OM with an excitable sports commentary in Spanish, this also being logged in parallel on **4920** Quito – and that is one way of confirming reception of the **4792** transmitter. Sistema de Em. Atalaya operates irregularly, the evening schedule – when in being – commences at 0100 and closes at 0455. The power is 5kW.

Slightly up band, on **4795** is La Voz de los Caras, in Bahia de Carques, where it operates from 1100 to 0430 (Sunday until 0200, Friday until 0500), the power being 5kW. Logged here at 0150, OM with songs complete with orchestral backing in a local tempo then OM with promos.

Guatemala

Radio Tezulutlan, Coban on **4835** at 0202, OM with station identification, some announcements in Spanish and then some typical local-style music. With a power of 3kW this one has an evening schedule from 2100 to a variable closing time around 0200. Obviously very variable from my logging!

Venezuela

Radio Barquisimeto on **4990** at 0213, OM with some announcements in Spanish about various Venezuelan broadcast stations. Radio Barquisimeto is scheduled from 1000 to 0400 and the power is 15kW.

EUROPE

Austria

Vienna on **7170** at 0956, interval signal, OM with sta-

tion identification and the German transmission for Europe and Australasia scheduled from 1000 to 1100.

Bulgaria

Sofia on **7115** at **2157**, YL with a talk about Himalayan Expeditions in an English programme for Europe, timed from 2130 to 2200.

Greece

Athens on **9855** at 0632, interval signal played on flute and sheep bells this rendition being the opening notes of the Greek folksong 'Tsopanakos imouna'. The National Anthem was followed by OM with the station identification and the Greek programme for Europe timed from 0630 to 0730.

Radio Station Macedonia on **9815** at 1504, YL and OM with a Greek drama. This station is in Thessalonika and is on the air from 1000 (Sunday from 0700) to 1730 and can also be heard in parallel on **12000**.

Poland

Warsaw on **7285** at 1514, OM with a talk about dye making in Poland in an English presentation for Europe which may be heard from 1500 to 1530.

FAR EAST

China

Xinjiang PRS, Urumqi on **4735** at 1515, YL with announcements during the Uigher programme, this session being timed from 1030 to 1730. This station has also been logged on **4500** at 0050 when relaying a Radio Beijing programme in Chinese.

Xizang PBS, Lhasa, Tibet on **4750** at 0055, YL and OM with announcements in Chinese during the scheduled 2300 to 0205 transmission.

Radio Beijing on **8566** at

1448, YL with some songs during the Kazakh session of the Domestic Minorities Service programme, this particular one being scheduled from 1400 to 1455.

Radio Beijing on **11675** at 1135, YL announcer then songs and Chinese music in a Domestic National Minorities programme for Tibet, timed from 1100 to 1155.

Korea-North

Pyongyang on **4770** at 1522, OM with a talk in Korean in a Foreign Service programme. Pyongyang operates irregularly on this channel but when transmitting is scheduled from 1200 to 1300 and from 1500 to 1555. The power is 120kW.

Vietnam

Hanoi on **10010** at 1410, YL with the Chinese programme for the Far East, timed from 1400 to 1430. Hanoi also logged on **10060** at 1430, YL with a talk during a programme in the Domestic Service scheduled from 2215 to 1500 on this channel – all in Vietnamese of course.

MIDDLE & NEAR EAST

India

AIR Delhi on **7280** at 1532, YL with news of local events in a Domestic Service English newscast timed from 1530 to 1545.

AIR Delhi on **17875** at 1005, OM with news of both local and world events in the English transmission intended for North East Asia and Australasia being timed from 1000 to 1100.

Iraq

Baghdad on **21585** at 1441, YL with announcements followed by some local-style music in the Domestic Service which may be logged on

this channel from 0000 to 2305.

Pakistan

PBC Quetta on **4880** at 1525, OM with announcements in Urdu, YL with songs prior to sign-off at 1600 without the National Anthem.

Karachi on **21802** at 1010, OM with announcements in Urdu, YL with songs during the Urdu programme for the UK being timed from 0715 to 1100.

Qatar

Doha on **9905** at 0655, Arabic music, 'pips' time-check at 0700, YL with station identification and newscast in Arabic in the Domestic Service which is on this frequency from 0245 through to 2130.

Saudi Arabia

Holy Quran Radio, Mecca on **11730** at 0608, OM with quotations from the Holy Quran. This station is scheduled from 0500 to 0800 on this channel.

Riyad on **11870** at 0620, OM with songs in Arabic, local-style music in the Domestic Service General Programme timed here from 0500 to 2300.

BACK TO THE COMPUTER

One interested reader – WM Rigby of Morecambe, Lancs – sent a list of stations with their frequencies and times, radiating programmes in English. All these loggings had been made since August last year and checking with the computer resulted in the omission of many for the reason that schedules had changed. Those extant at the time of writing have been computer sorted with reference to GMT and published here.

0730 **9655** HCJB Quito; 0930 **17780** Cologne; 1030 **21695** Dubai; 1245 **9730** East Berlin;

1400 **17610** Brussels (not Sat or Sun); 1500 **11940** Bucharest; 1600 **6135** Warsaw; 1630 **7345** Prague; 1800 **15120** Lagos (one hour programme); 1900 **9765** and **11840** Madrid (one hour programme); 2000 **11690** Havana; 2030 **11775** Lisbon; 2050 **4765** Monrovia (time logged); 2130 **6070** Sofia and 2200 **11620** AIR Delhi.

Most of these programmes are of 30 minutes duration although Delhi is scheduled from 1845 to 2230 whilst Monrovia is listed from 1725 to 1800 and from 1900 to 2300 on weekdays for the evening session. Our thanks to WMR for his effort on our behalf.

CLANDESTINE

'Voice of Lebanon' on **6550** at 2040, OM's with a drama production and a following military music and choral rendering with the station identification at 2044 in Arabic as 'Huna Sawt Lebnan, Sawt al-Hurriyah wa al-Karamah' which translates as 'This is the Voice of Lebanon, the Voice of Freedom and Dignity'.

The schedule of this clandestine is from 0415 through to 2125 and the programmes are in Arabic except for short newscasts in English from 1400 to 1405 and from 1815 to 1825 and in French from 1315 to 1320 and from 1800 to 1810.

The Voice of Lebanon programmes are pro-Phalangist in content.

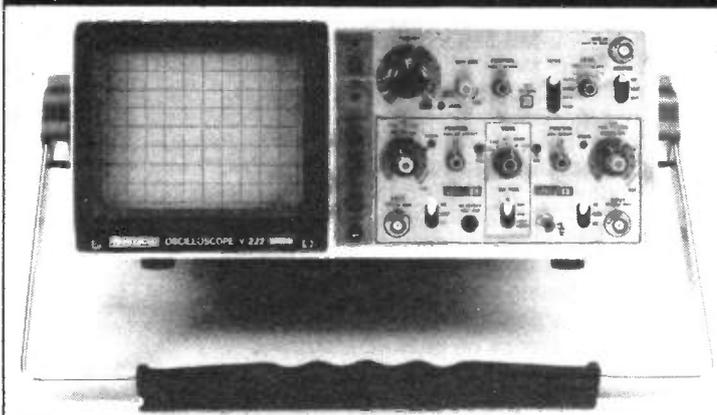
NOW HEAR THIS

Melbourne on **7205** at 1510, OM with station identification followed by a talk about local sporting and cultural events – all in the English programme for the Pacific and Papua/New Guinea. The schedule on this channel is unknown to me at time of writing.



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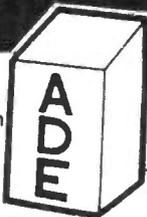
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AH221	39.00	ECB81	1.50	EL34	2.25
AH238	39.00	ECB90	0.90	EL34 Philips	1.50
AL60	8.00	ECB91	0.90	EL36	3.50
AN1	14.00	EB91	0.60	EL37	2.00
ANP12	0.70	EBF80	0.65	EL38	6.00
ARP34	1.25	EBF83	0.65	EL41	3.50
ARF25	2.00	EBF85	0.95	EL42	2.00
BL52	2.00	EBF89	0.70	EL81	6.95
BS450	87.00	EBF93	0.95	EL82	0.58
BS810	55.00	EEL21	2.00	EL85	4.50
BS814	55.00	EC52	0.75	EL86	0.85
CIK	18.00	EC70	1.75	EL90	1.50
C3JA	16.00	EC80	9.50	EL91	6.00
C112G	20.00	EC91	7.85	EL95	0.70
C1108	54.95	EC96	8.20	EL97	12.15
C1134	32.00	EC88	1.00	EL183E	3.50
C1148A	115.00	EC90	1.10	EL183P	3.50
C1149/1	130.00	EC91	5.50	EL360	7.95
C1150	135.00	EC92	1.25	EL500	1.40
C1534	32.00	EC95	7.00	EL504	1.40
CCA	2.80	EC97	1.10	EL519	6.95
CC3L	2.00	EC8010	12.00	EL802	3.65
CV NOS Prices on request		EC932	3.50	EL821	8.50
D63	1.20	EC933	1.55	EL822	12.95
DAF91	0.45	EC95	1.10	EM4	9.00
DAF91	0.70	EC82 Philips	1.35	EM40	60.00
DC70	1.75	EC81	1.50	EM5143	155.00
DC90	1.20	EC82	0.55	EM801	0.70
DCX4-1000	12.00	EC83 Philips	1.35	EM8079	6.00
DCX4-5000	12.00	EC83	1.95	EM8082	0.70
DET16	25.00	EC84	0.50	EM8083	3.25
DET18	28.50	EC85	0.60	EM8091	7.50
DET24	39.00	EC86	0.75	EM8096	3.00
DET25	22.00	EC87	0.85	EM8098	5.00
DF91	0.70	EC88	0.85	EM8099	5.00
DF92	0.80	EC89	0.70	EM8100	5.00
DF96	0.85	EC90	0.70	EM8101	5.00
DF97	1.00	EC91	0.70	EM8102	5.00
DH63	1.20	EC92	0.70	EM8103	5.00
DH77	0.90	EC93	0.85	EM8104	5.00
DH79	0.58	EC94	0.85	EM8105	5.00
DH149	2.00	EC95	0.85	EM8106	5.00
DK91	1.20	EC96	0.85	EM8107	5.00
DK96	2.50	EC97	0.85	EM8108	5.00
DL35	1.00	EC98	0.85	EM8109	5.00
DL63	1.00	EC99	0.70	EM8110	5.00
DL70	2.50	EC100	0.70	EM8111	5.00
DL73	1.50	EC101	0.70	EM8112	5.00
DL92	1.50	EC102	0.70	EM8113	5.00
DL93	1.10	EC103	0.70	EM8114	5.00
DL94	2.50	EC104	0.70	EM8115	5.00
DL96	2.50	EC105	0.70	EM8116	5.00
DL120	13.50	EC106	0.70	EM8117	5.00
DL156	10.00	EC107	0.70	EM8118	5.00
DM70	1.95	EC108	0.70	EM8119	5.00
DM160	2.75	EC109	0.70	EM8120	5.00
DY51	1.50	EC110	0.70	EM8121	5.00
DY96/97	0.65	EC111	0.70	EM8122	5.00
E800C	8.50	EC112	0.70	EM8123	5.00
E800F	11.00	EC113	0.70	EM8124	5.00
E801	11.50	EC114	0.70	EM8125	5.00
E811C	3.50	EC115	0.70	EM8126	5.00
E818	3.50	EC116	0.70	EM8127	5.00
E820C	3.50	EC117	0.70	EM8128	5.00
E830C	3.50	EC118	0.70	EM8129	5.00
E83F	5.50	EC119	0.70	EM8130	5.00
E86C	9.50	EC120	0.70	EM8131	5.00
E88C	7.95	EC121	0.70	EM8132	5.00
E88CC	3.50	EC122	0.70	EM8133	5.00
E90CC	3.50	EC123	0.70	EM8134	5.00
E90F	7.95	EC124	0.70	EM8135	5.00
E91H	4.50	EC125	0.70	EM8136	5.00
E92CC	3.95	EC126	0.70	EM8137	5.00
E93F	6.95	EC127	0.70	EM8138	5.00
E130L	19.95	EC128	0.70	EM8139	5.00
E180CC	6.50	EC129	0.70	EM8140	5.00
E182CC	6.50	EC130	0.70	EM8141	5.00
E180F	6.50	EC131	0.70	EM8142	5.00
E186F	8.50	EC132	0.70	EM8143	5.00
E280F	19.50	EC133	0.70	EM8144	5.00
E283CC	10.50	EC134	0.70	EM8145	5.00
E288CC	13.00	EC135	0.70	EM8146	5.00
EB10F	18.50	EC136	0.70	EM8147	5.00

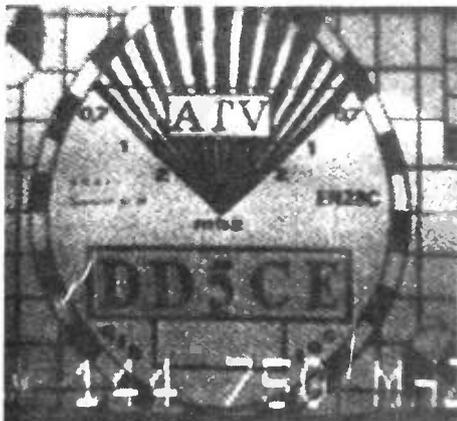
HAA91	1.00	PCF87	0.40	QV06-20	29.50
HABC80	0.90	PCF200	1.80	QV08-100	145.00
HBC90	0.75	PCF201	1.80	QY3-125	49.50
HBC91	0.80	PCF800	0.45	QY4-250	85.00
HF94	1.50	PCF801	1.30	QY4-400	71.95
HK90	1.05	PCF802	0.80	R10	1.25
HL2K	3.50	PCF806	0.00	R16	12.00
HL23DD	4.00	PCF808	1.25	R17	1.50
HL41	3.50	PCH200	1.50	R18	2.50
HL41DD	3.50	PCL82	0.85	R19	2.50
HL42DD	3.50	PCL83	2.50	R21	1.20
HL30	0.70	PCL84	0.80	R1169	55.00
HL32	1.50	PCL85	1.25	RG1-125	4.95
HL33 DD	3.50	PCL86	0.85	RG1-240A	1.50
HR2	4.00	PCL200	1.80	RG3-250A	3.50
HY90	1.00	PCL800	0.80	RG3-1250A	5.00
HVR2	3.50	PCL805	0.90	RPY13	52.50
K391A	95.00	PD500	3.50	RK2K25	62.50
K3168	85.00	PD100	3.50	RG4-1000	2.00
KR6/3	45.00	PEN42D	2.00	PEN25	2.00
KTBC	7.00	PEN45D	2.00	PEN40DD	2.50
KT33C	3.50	PEN45	3.50	PEN45DD	3.00
KT36	2.00	PEN46	4.00	PEN47	2.50
KT37	4.00	PEN48	4.00	PFL200	1.25
KT45	6.00	PEN49	4.00	PL21	2.00
KT61	4.00	PEN50	2.00	PL36	0.95
KT62	2.00	PEN51	2.00	PL38	3.50
KT66 OSRAM	2.00	PEN52	2.00	PL39	1.75
KT66 USA	10.50	PEN53	2.00	PL41	0.80
KT66 GEC	8.00	PEN54	2.00	PL82	0.60
KT77	14.95	PEN55	2.00	PL83	0.52
KT78	9.50	PEN56	2.00	PL84	0.78
KT79	9.50	PEN57	2.00	PL85	1.75
KT88 USA	9.00	PEN58	2.00	PL86	0.72
KT88	6.00	PEN59	2.00	PL87	0.60
KT89	1.50	PEN60	2.00	PL88	0.52
KT89P	3.50	PEN61	2.00	PL89	0.52
KTW61	2.50	PEN62	2.00	PL90	0.52
KTW62	2.50	PEN63	2.00	PL91	0.52
KTW63	2.50	PEN64	2.00	PL92	0.52
KTZ63	2.50	PEN65	2.00	PL93	0.52
L63	1.50	PEN66	2.00	PL94	0.52
L102/2K	6.95	PEN67	2.00	PL95	0.52
L120/2K	12.00	PEN68	2.00	PL96	0.52
LS98	8.95	PEN69	2.00	PL97	0.52
MS02A	60.00	PEN70	2.00	PL98	0.52
MS37A	60.00	PEN71	2.00	PL99	0.52
M5143	155.00	PEN72	2.00	PL100	0.52
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M8082	0.70	PEN74	2.00	PL102	0.52
M8083	3.25	PEN75	2.00	PL103	0.52
M8091	7.50	PEN76	2.00	PL104	0.52
M8096	3.00	PEN77	2.00	PL105	0.52
M8098	5.00	PEN78	2.00	PL106	0.52
M8099	5.00	PEN79	2.00	PL107	0.52
M8100	5.00	PEN80	2.00	PL108	0.52
M8101	5.00	PEN81	2.00	PL109	0.52
M8102	5.00	PEN82	2.00	PL110	0.52
M8103	5.00	PEN83	2.00	PL111	0.52
M8104	5.00	PEN84	2.00	PL112	0.52
M8105	5.00	PEN85	2.00	PL113	0.52
M8106	5.00	PEN86	2.00	PL114	0.52
M8107	5.00	PEN87	2.00	PL115	0.52
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M8109	5.00	PEN89	2.00	PL117	0.52
M8110	5.00	PEN90	2.00	PL118	0.52
M8111	5.00	PEN91	2.00	PL119	0.52
M8112	5.00	PEN92	2.00	PL120	0.52
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M8117	5.00	PEN97	2.00	PL125	0.52
M8118	5.00	PEN98	2.00	PL126	0.52
M8119	5.00	PEN99	2.00	PL127	0.52
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M8121	5.00	PEN101	2.00	PL129	0.52
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M8123	5.00	PEN103	2.00	PL131	0.52
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M8125	5.00	PEN105	2.00	PL133	0.52
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M8127	5.00	PEN107	2.00	PL135	0.52
M8128	5.00	PEN108	2.00	PL136	0.52
M8129	5.00	PEN109	2.00	PL137	0.52
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M8131	5.00	PEN111	2.00	PL139	0.52
M8132	5.00	PEN112	2.00	PL140	0.52
M8133	5.00	PEN113	2.00	PL141	0.52
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M8138	5.00	PEN118	2.00	PL146	0.52
M8139	5.00	PEN119	2.00	PL147	0.52
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M8149	5.00	PEN129	2.00	PL157	0.52
M8150	5.00	PEN130	2.00	PL158	0.52
M8151	5.00	PEN131	2.00		

ATV on the Air

Presented by Andy Emmerson, G8PTH

Repeaters are go! The licences have at last been issued and as I write these words the ATV calling channel is buzzing with people working the new Leicester TV repeater. The time is probably right to have a look at what these ATV repeaters are, what they mean for ATVerS and how you will be able to use them.

The most obvious factor is that the TV repeaters are up at 24cm as there is clearly no room for two widely spaced TV

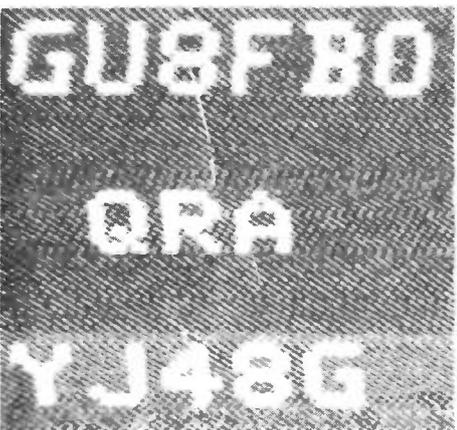


channels in our narrow little 70cm band. Accordingly we are speaking of frequencies between 1240 and 1325MHz, but you should not let this put you off. Although 24cm seems alien territory to many amateurs, the techniques used are no different to those employed at 70cm. Obviously you have to take a bit of care in connecting the whole thing up and power generation is a little harder, but with repeaters high power is not an essential.

AM versus FM

Commercial equipment is not so widespread for 24cm – this might even encourage a bit of good old-fashioned homebrew construction – but it can be obtained, from Fortop and Wood & Douglas for instance.

There are in fact two separate transmission systems used at 24cm, the



conventional AM (which we use on 70cm) and FM (as used for satellite TV and inside home video recorders).

Transmitters and receivers for the AM system are easier to construct, but the problems start when you try to amplify the transmitted signal. The power amplifier must be a linear device and getting a decent amount of *linear* amplification at 24cm is going to be expensive both in outlay and time spent on getting it just right. It can be done, of course.

With FM, on the other hand, linearity is not on the list of essentials, so we can go for QRO class C amplifiers which are much simpler to get going.

Receivers, on the other hand, are a bit more complex; a simple downconverter is not the best answer. It will work, because a conventional TV will slope

**‘The new
ATV
repeaters,
what they
mean and
how you will
be able to
use them’**

detect an FM signal, but a true FM receiver is better. With modern integrated circuits an FM receiver is no longer the problem it used to be, and kits have been designed to take the drudgery out of tweaking the FM demodulator.

Having said that, you may have gathered that I favour the FM system, and you would then be right. In France, where 24cm ATV is widespread, they have been FM from the beginning and in Germany, too, they are starting on FM after several years of AM. With the forthcoming direct to home satellite transmissions being FM as well, we amateurs might as well move with the times and go the FM way. Three out of the five British ATV repeaters are FM, by the way.

These three FM-only repeaters are situated near Luton (GB3TV), Worthing (GB3VR) and Stoke (GB3UD). The other two, Leicester (GB3GV) and Bath

(GB3UT) accept either AM or FM on the input and relay it as AM. Experience will tell which is the more successful technique; my personal suspicion is that Leicester at least will change to FM after a while (most of its users have FM gear as well!)

Repeater facilities

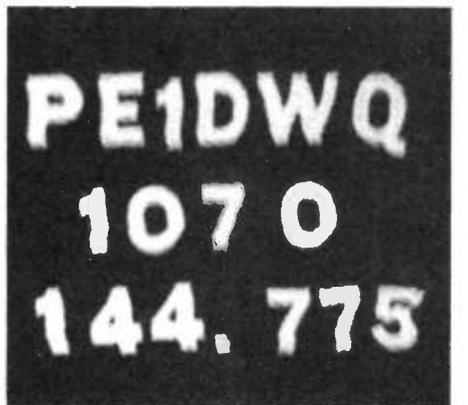
What will the repeaters do? At the simplest level they will relay an incoming video signal over a wider area. Special circuitry will ensure that they react only to video signals. There are already several successful video ‘nets’ on 70cm but these are often hampered by the directional aeriels used, and not everyone can see what’s going on at once. With a repeater and its omnidirectional aerial this is a problem no more, so a station will be able to bore much larger



numbers of viewers with holiday slides (or whatever ATVerS show – there’ll be no chance of neighbours or Buzbies eavesdropping at 24cm!)

Another advantage of a repeater is that you can see your own signals coming back, so you can do on-air tests to get the best out of your equipment. In beacon mode the repeater will put out colour bars or some similar test signal so if you are one of those people like me who finishes a piece of equipment at 3am and wants to test it straightaway, you can call up the repeater. No-one else would come back to you at that time of day.

I think repeaters on 24cm will make a lot of difference to the popularity of ATV. Repeaters seem to attract a lot of users on two metres and 70cm, and the same will doubtless apply to the ATV ‘boxes’. They will also take over the long-winded but enjoyable local natter/gawp sessions off 70cm, which will probably please the



ATV ON THE AIR

other users of that band.

With the wide frequency separation possible at 23 and 24cm, I suspect that some public-spirited stations will go in for in-band relay operation and extend the working distance possible. It may be possible to equal or improve upon the Fenland to London ATV relays practised on 70cm some fifteen to twenty years ago when the 70cm band was wider than it is now. All in all I think 24cm and repeaters hold out great promise for us ATVerS.

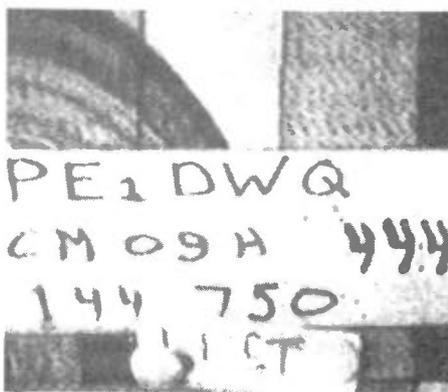
Station planning

Now is therefore the time to start planning your station if you are in the coverage area of one of these repeaters. There have been a number of constructional articles in CQ-TV over the past two years.

A SAE to Wood & Douglas and Fortop will inform you of the products they have and you can get suitable aerials from Jaybeam and Tonna. Low-loss connectors and cables are essential for 24cm; N-type plugs and Pope H-100 coaxial feeder are ideal. If you need further inspiration the next item is for you.

An event for ATVerS

And now a plug for 'the' amateur television event of 1984, the BATC amateur TV convention. To be held on Sunday May 13th, it will be a superb day-out for anyone interested in ATV. Live



demonstrations will show satellite and microwave TV, and there will be at least one outside broadcast scanner van plus equipment to look over.

A lecture programme and video show will keep you occupied after you have spent all your money on the trade stands. BATC club supplies will also be available, so if you want a cheap vidicon, a test card or a PCB for a club project they will all be there.

Bring and buy

There will be the usual selection of trade stands – people like Fortop and Wood & Douglas – and a members' bring and buy area, so you can sell off all your old rubbish and come away with someone else's instead.

Admission is free, as always, and you don't have to be a BATC member. This year the venue has changed, and there promises to be a lot more room than in years past. The new location is closer to London and only 300 yards off the motorway, so access for mobile people should be easy. Arrangements will also be made for people coming by train (see the next issue of CQ-TV, the BATCs magazine).

The venue

Place to come to is the Post House Hotel, Crick near Rugby. This is about 60 or 70 miles north of London on the M1 motorway; turn off at junction 18 and head off east towards Northampton. The Post House is on the left, literally 300 yards from the motorway exit.

Together with the rest of the BATC team I shall be there and look forward to seeing lots of you. The hotel is set in pleasant countryside, with large gardens, so the whole family should find something to occupy themselves with.

Pictures show more of the 70cm ATV DX worked in recent months. The photos, taken by G6LTZ, are from Guernsey, West Germany and Holland.

CORRECTIONS AND MODS

Whilst every effort is made to minimise errors in diagrams we will correct these as they come to our knowledge and we also appreciate the co-operation of our readers in notifying these.

We occasionally receive suggested modifications from readers who have constructed projects from **Radio & Electronics World** and we will publish those that would interest other readers.

For example, it may be possible to extend the use of a particular item by minor circuit changes or re-arrangement only. If this can be done for minimal cost and the idea has been proved in practice, others may benefit from the information.

Write to Corrections and Mods, **Radio & Electronics World**, Sovereign House, Brentwood, Essex, CM14 4SE.

RGB Interface for Ferguson TX90 (Jan '84 issue)

We regret that TR9 (BC108) is shown incorrectly connected in the circuit diagram. The collector and emitter connections should be transposed.

Note that PCB's for this project are available from the author. These cost £5 each (including P&P) or the complete kit can be supplied for £25 (including P&P). Cheques for these items should be payable to A S Warne; addressed to 113 Queens Road, Vicars Cross, Chester CH3 5HF.

Cymar Q Meter (Jan '84) The PCB in Figure 3 is incorrectly shown for the BF254 configurations. The pin-outs for TR2 and TR4 are shown here, as is the correct PCB foil pattern.



2N3819 BF254
Base view.

