

Radio & Electronics

The communications and electronics magazine **World**

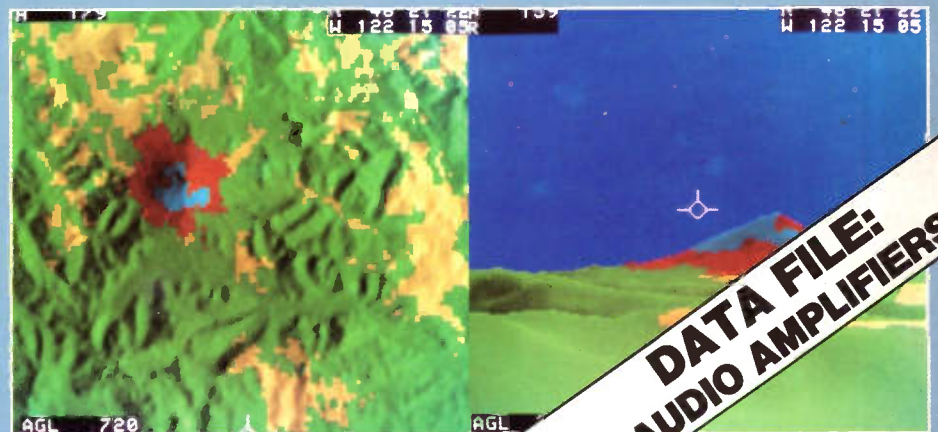
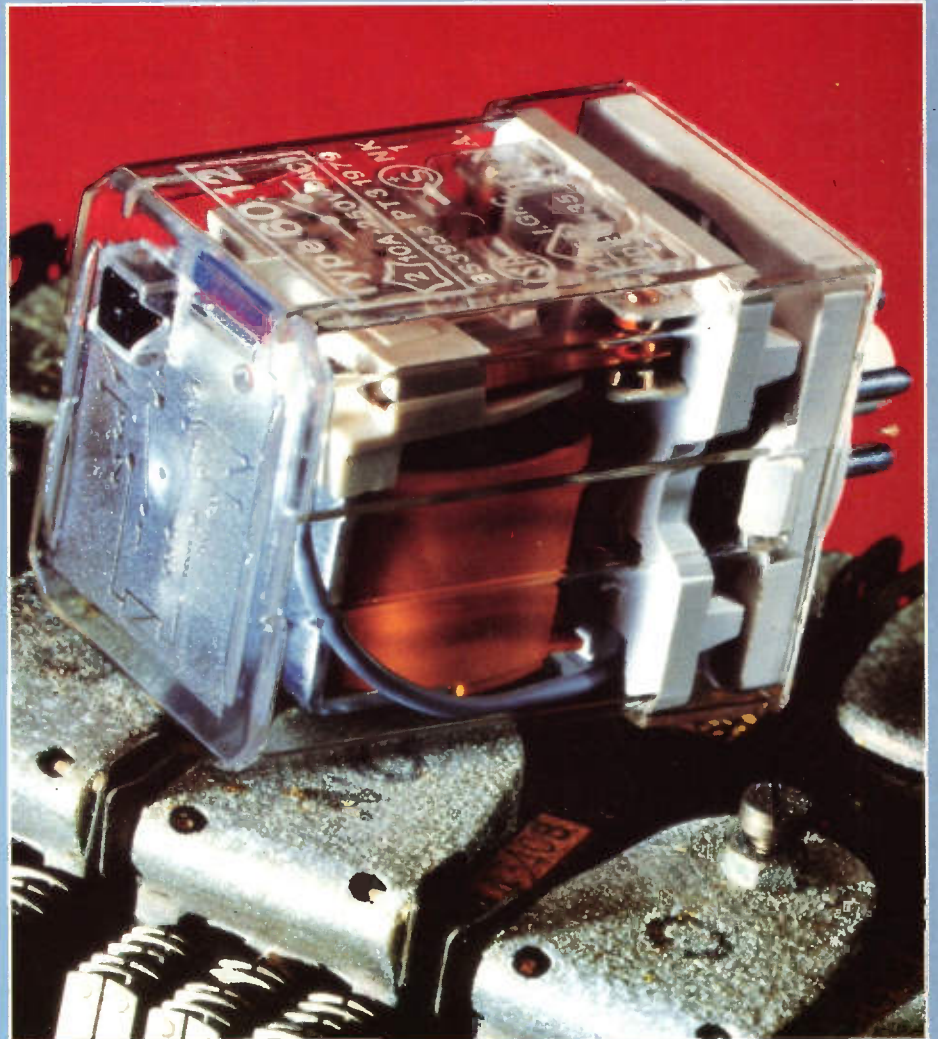
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HOLLAND
NEW ZEALAND
NORTH AMERICA \$2.95
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**DATA ON RADIO:
SOME THOUGHTS ON
FUTURE TRENDS**

**ICOM IC-735:
THE COMPLETE
HF RADIO?**

**SATELLITE
TELEVISION
PROJECT:
A DO IT YOURSELF
DESIGN FOR A
SET-TOP TUNER
TO DEMODULATE TV
SIGNALS FROM
ECST AND INTELSAT V**



**DATA FILE:
AUDIO AMPLIFIERS**

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Safety in the shack

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

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

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

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

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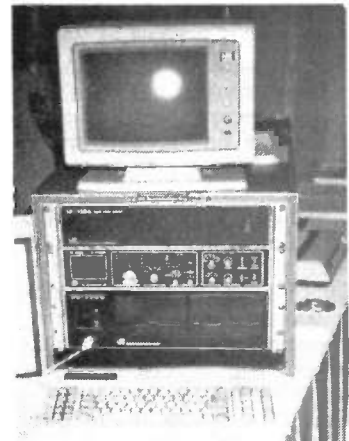
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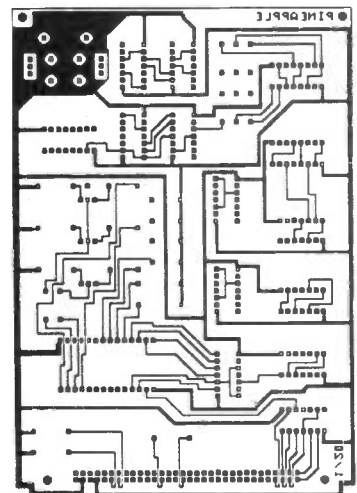
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PRODUCT NEWS

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

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

MODULAR TEST SYSTEM

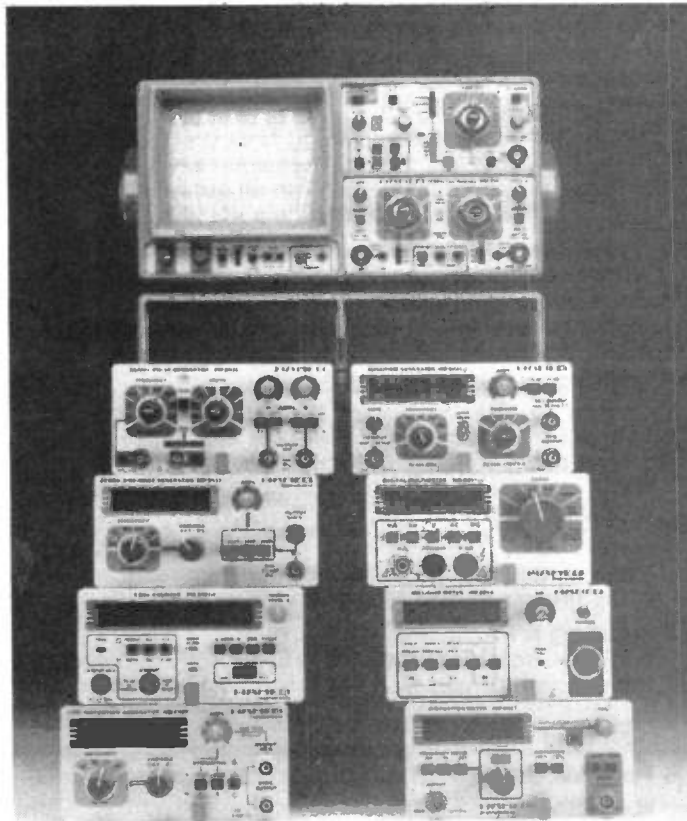
Hameg Limited, noted for their range of low cost, high performance oscilloscopes, have now entered the general test and measurement market with the introduction of the HM8000 modular test system.

The heart of the HM8000 series is the HM8001 mainframe, built to match the Hameg range of flat line oscilloscopes, and it can therefore be stacked above or below, singly or in multiples.

The HM8001 holds up to two modules of the series side by side and has eight independent floating voltages to supply power to the modules.

There are nine modules presently available for use in the HM8001 mainframe:

- a 4.5-digit digital multimeter with true rms capability.
- a 200m-20k, 4 point measurement milliohm meter.
- a 1GHz counter with period measurement.
- a distortion meter with auto frequency nulling.
- a 0.1Hz to 1MHz function generator.



a 20Hz to 20MHz sine wave generator.

a 2Hz to 20MHz pulse generator with variable width and period.

a 5Hz to 50kHz sine wave generator, distortion <0.01%, a triple power supply, 2 off 1.3V-20V, 0.4A + 5V, 0.5A.

Full specifications of the range of modules plus the mainframe are included in an attractive catalogue which is available upon request.

New modules will be added at regular intervals to further enhance the system.

The HM8001 mainframe costs £121.00 plus VAT, and the modules vary in price from £134.00 to £243.00 plus VAT and have a two year warranty.

The HM8000 series is available ex-stock from Paxton Instruments of Letchworth, Herts and other selected Hameg distributors.

*Hameg Oscilloscopes Ltd,
74-78 Collingdon Street,
Luton,
Bedfordshire LU1 1RX
Tel: (0582) 413174.*

POCKET DMM

A new pocket size digital multimeter from AB European Marketing is supplied in a plastic wallet complete with permanently attached test probes and operating instructions.



It weighs less than 80g including the two long-life LR44 button cells with which it is supplied, and measures 108 x 54 x 8mm.

The meter has a large 3½-digit display and a rotary mode selector for ac/dc voltage ranges, resistance and continuity and diode testing. It is fully autoranging in all modes.

Warning indicators show the user when the batteries are running low and which measurement mode the meter is in. An audible tone indicates a low resistance path in the continuity test mode.

The digital multimeter retails for £24.60 excluding VAT, postage and packing.

*AB European Marketing,
Forest Farm Industrial
Estate,
Whitchurch,
Cardiff CF4 7YS.
Tel: (0222) 618336.*

BENCHTOP MULTIMETER

The Fluke 37 benchtop multimeter from Electronic Brokers features the combined analogue/digital display pioneered in the Fluke 70 series along with the accuracy and input overload protection found in the Fluke 20 series.

Features include an innovative case style which has been specially designed for ease of use and functionalism, either on the bench or in the field. The front panel has a 15° slope for optimum visibility and switch access, whilst a large compartment at the rear of the case enables storage of test leads and small accessories inside the meter. A built-in carrying handle allows easy portability.

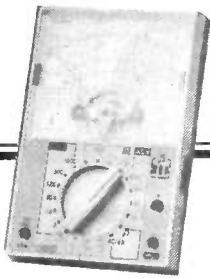
The Fluke 37 is claimed to meet or exceed the specifications of any 3½-digit bench digital multimeter currently available, having a basic dc accuracy of 0.1% and a wide

bandwidth ac response. Exceptional shielding against electromagnetic interference is provided by unique internal design and construction techniques.

The instrument offers many features which have never before been available on a bench meter, including min/max and relative recording modes, Fluke's 'touch hold' capability, and a combined analogue/digital display with a 3200 count resolution. Autoranging with manual range selection and a continuity/diode test beeper are also included.

Operation is from either an internal 9V battery with a typical life of 1000 hours, or from line power using an optional Fluke battery eliminator.

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



TOUGH METERS

Kaise distributor Eagle International has announced two new drop-proof multi-meters, designed to withstand a drop of 1 metre.

The SK 300 is a 20,000 ohm meter with comprehensive measuring ranges, and has an integral bench stand for convenience. As well as having a drop-proof body and move-

ment, the SK 300 is protected by fuse/diode and has a carrying case.

The SK 322 is very similar to the 300 but has extra features: 12 amp ranges on dc and ac, and a continuity test function with a buzzer. As with all Kaise equipment, these products are backed by Eagle's 2 year guarantee.

*Eagle International,
Unit 5, Royal London Estate,
29/35 North Acton Road,
London NW10 6PE.
Tel: (01) 965 3222.*

20MHz OSCILLOSCOPE

A compact, dual trace 20MHz oscilloscope, the model 9020, has been added to Beckman Industrial's range of test instruments. It incorporates a sweep delay to facilitate waveform analysis, a feature usually only available on higher bandwidth oscilloscopes. It costs around £319.

Maximum sweep speed is 50ns per division and sensitivity is 1mV per division. The six-inch CRT provides a variety of displays: channel 1 only (normal or inverted), channel 2 only, alternate chop or channel 1 plus channel 2

display. An X-Y feature has also been incorporated.

The built-in component tester makes the 9020 both an oscilloscope and a component curve tracer. This function gives the user fast good/bad indication of resistors, capacitors, inductors, diodes, transistors, transformers etc. The testing can be done on components both in and out of circuit.

*Beckman Industrial Ltd,
Queensway Industrial Estate,
Queensway,
Glenrothes,
Fife KY7 5PU.
Tel: (0592) 753811.*

PATTERN GENERATOR

Thandar Electronics Ltd have announced the introduction of a new battery powered portable PAL colour bar pattern generator.

Designated the LCG403, it offers the following features: standard PAL colour bars; eight colour rasters; cross-hatch and dot patterns; RF output covering VHF bands I & III (ch2-11) and UHF bands

IV & V (ch21-70); a composite video output and sound inter-carrier at 6MHz.

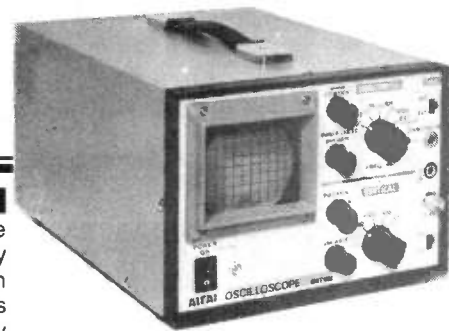
Priced at £326 + VAT, its applications include television and video service and installation.

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



LOW COST SCOPE

An inexpensive portable single beam 5MHz frequency range oscilloscope from Semiconductor Supplies is claimed to be particularly suitable for observing the waveform of electronic signals. The OST5M has a 3-inch screen, a vertical sensitivity of 10mV/division and direct cascade amplifier. It costs £147.75 + VAT, with p&p a further £6.



*Semiconductor Supplies
International Ltd,
Dawson House,
128/130 Carshalton Road,
Sutton,
Surrey SM1 4RS.
Tel: (01) 643 1126.*

MEMORY MODE DMM

Mercer Electronics has introduced the model 9370 digital multimeter. It offers autoranging or manual selection of voltage and resistance ranges, and measures up to 1000V dc (5 ranges), 750V ac (4 ranges), 10A ac and dc (2 ranges), or 2 megohms (5 high power and 4 low power ranges).

The memory mode provides up to 99 counts of zero offset. Also included is an audible continuity indication. Basic V dc accuracy is 0.5%. Low

and high energy fusing are provided.

The unit is housed in a 5.9 x 2.95 x 1.34 inch high-impact case and weighs 3/4lb. A 9V battery, colour-coded test leads with screw-on alligator clips and an operator's manual are also furnished. It costs \$59.

*Mercer Electronics,
859 Dundee Avenue,
Elgin,
Illinois 60120,
USA.
Tel: (312) 697 2265.*

FIELDMETER

Now available from Dage is a one-shot electrostatic fieldmeter designed to overcome the inconvenience associated with previously available instruments.

The new model FM200 from Simco allows speedy and accurate determination of the potentials associated with static charges using a unique autoranging facility and LED measuring distance indication. The instrument measures up to 50kV, with sensitivity ranges 0 to 10kV and 0 to 50kV. A liquid crystal display gives a direct reading, with no necessity for multipliers.

Switched on to 'auto' the instrument detects surface potential and if it is below 10kV automatically switches to the lower range. An LED indicates that a 1 inch measuring distance is required. If the potential is above 10kV the instrument switches to the higher range, and an LED indicates that a 4 inch measuring distance is required. An audible alarm sounds to alert the operator to the necessity to increase the measuring distance.

The autoranging facility may be overridden, in which event the instrument measures from 0 to 50kV at the 4 inch measuring position.

Accuracy is 10% of full scale, response time less than 1s. The instrument is powered by a 9V battery.

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



TWO FOR THE ROAD.

The very latest IC-28E 2m. FM mini-mobile from ICOM.

This new 2 metre band transceiver is just 140mm (W) x 50mm (H) x 133mm (D) and will fit nearly anywhere in your vehicle or shack. Power output is 25 watts or 5 watts low power and is supplied complete with an internal loudspeaker.

The large front panel LCD readout is designed for wide angle viewing with an automatic dimmer circuit to control the back lighting of the display for day or night operation.

The front layout is very simple, all the controls are easy to select making mobile operation safe. The IC-28E contains 21 memory channels with duplex and memory skip functions. All memories and frequencies can be scanned by using the HM-15 microphone provided. Also available is the IC-28H with the same features but with a 45 watt output power.

Options include IC-PS45 13.8v 8A power supply, SP8 and SP10 external speakers, HS15 flexible mobile microphone and PTT switchbox.



→ Rx Range 138-174 MHz. ←

IC-290D/490E Mobiles

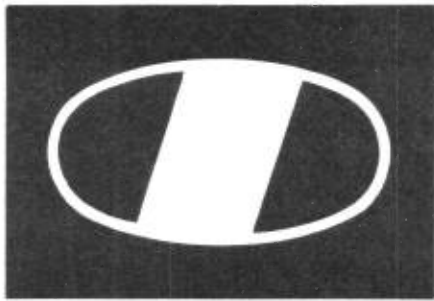
These SSB, CW, FM transceivers are ideal for mobile or base station operation. The IC-290D for 2 metres produces 25 watts/5 watts low power. The IC-490E for 70 centimetres produces 10 watts/1 watt low power. Both transceivers have a range of operating features, these include 5 memory channels, dual V.F.O.'s and a priority channel to automatically check your most used frequency. Squelch on FM and SSB to allow silent scanning whilst searching for signals, slow or fast AGC for SSB and CW and a noise blanker to suppress pulse type QRM. Sidetone is provided on CW.

Memory and full or programmable band scan with internal switches to stop on busy or empty channels. Programmable offsets are included for odd frequency splits.

Options include: IC-PS45 13.8v 8A power supply, IC-BU1 memory back up battery unit, IC-SP8 and SP10 mobile speakers.



Thanet ICOM
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ICOM

The ICOM Control System

If you have a BBC Micro (Model B) or Commodore 64 or 128, the ICOM control system can control up to four (or more) ICOM radios in the range IC-751, 735, R71, R7000, 271, 471 and 1271 (and 745 with modification). The help menu shows the available functions.

H = HELP	↔	Frequency Steps
F0 Frequency	↑ ↓	Up/Down (arrows)
F1 Select Mode	M	Memory Channel
F2 Freq/Memory Scan	/	Memory Up/Down
F3 Mode Scan	/	VFO/Memory
F4 VFO → Memory	B	Bargraph Select
F5 Memory Write	@	Occupancy On/Off
F6 Memory Clear	.	Scan Stop Off/On
F7 Set 'SIG' Level	S	Change Set
F8 Memory File Read	DEL	Speech (If fitted)
F9 Memory File Write	Q	Quit



IC-735, The Compact HF Radio

The new ICOM IC-735 is ideal for mobile portable or base station operation. It has a general coverage receiver from 0.1MHz to 30MHz and transmits on all amateur bands from 160m to 10m. SSB, CW, AM and FM modes are included as standard. RTTY and Amtor are also possible. The IC-735 has a built-in receiver attenuator, pre-amp, noise blanker and RIT to enhance receiver performance. A 105dB dynamic range with pass band tuning and a sharp I.F. notch filter for superior reception. The twin VFO's and 12 memories can store mode and frequency. The HM12 scanning mic is supplied. Scanning functions include programme scan, memory scan and frequency scan. The IC-735 is one of the first H.F. transceivers to use a liquid crystal display which is easily visible under difficult conditions. Controls that require rare adjustment are placed behind the front panel hatch cover but are immediately accessible. Computer remote control is possible via the RS-232 jack. Output power can be adjusted from 10 to 100 watts with 100% duty cycle. A new line of accessories are available, including the AT150 electronic automatic antenna tuner and the PS55 AC power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories. See the IC-735 at your authorised ICOM dealer or contact Thanet Electronics Limited.

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 Thanet Electronics
 Sea Street, Herne Bay, Kent CT6 8LD
 Tel: (0227) 363859
 Dept. REW



MINI MOBILE

Icom's new IC-28E 2 metre mobile transceiver is almost small enough to fit inside a Dinky toy, measuring a mere 140 x 50 x 133mm. It features a 25W output, with a switchable 5W low power facility, and has 21 fully programmable memories. All memory channels and frequencies can be continuously scanned.

Although the guaranteed range is 144-146MHz, the unit will actually cover 138-

174MHz on receive.

The large LCD display features a backlight which varies automatically with changing light levels. This and the simple front panel design combine to make the IC-28E very easy to use.

The IC-28E retails for £325.

*Thanet Electronics Ltd,
Sea Street,
Herne Bay,
Kent CT6 8LD.
Tel: (0227) 363859.*

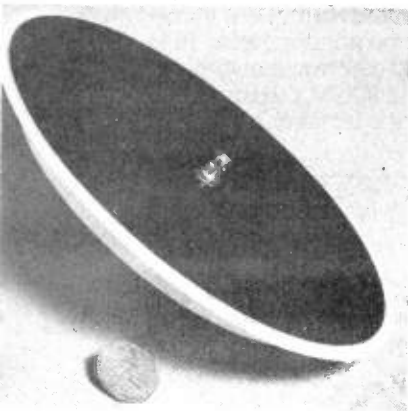
LOW PROFILE ANTENNAS

Antenna Products Limited have introduced a range of low profile antennas covering 190-225MHz and 800-950MHz.

Both antenna types have been designed to meet the specific requirements of public transport, railways and truck and lorry applications. The height of the antenna has been kept to a minimum by using a micro-strip technique, the LP200 being just 25mm tall and the LP900 (for cellular radio) 20mm high.

Because they use a magnetic field radiator the antennas are less affected by the presence of close metal objects, eg ventilators on the roof of the vehicle. In addition both types are ground plane independent, which makes them ideal for mounting on fibreglass cabs.

*Antenna Products Ltd,
Unit 48, Edison Road,
Rabans Lane Industrial
Estate,
Aylesbury,
Bucks HP19 3TE.
Tel: (0296) 34455.*



COAXIAL SWITCHES

A new ultra-reliable miniature microwave switch series for frequencies from dc to 24GHz, the Wavecom SP3T-6T, is now available from Anglia Microwaves Ltd.

With lifetime figures of the same order as Wavecom's larger proven switch series, the new miniature devices have a 1.375 inch diameter, making them some 22% smaller. 1,000,000 reliable switching cycles are guaranteed per switch position, without intermittent contacts, without increasing RF contact resistance to more than 15 milliohms, and with less than 0.1dB increase in insertion loss. Four models are available, the SP3T with three switch positions, the SP4T with four, the SP5T with five and the SP6T with six. Max-

SIGNAL GENERATOR

The new NATO-approved Micro-Tel SG811B microwave signal generator is designed for receiver, ECM and EW test procedures in laboratory, field and production environments.

It covers the frequency range 10MHz to 18GHz, which can be increased to 40GHz with an optional extender.

Unique features are claimed to include a built-in switchable attenuator covering 1-110dB, with vernier control range of -5 to +10dB, and a tracking filter which reduces the harmonic output to below -60dBc. An integral pulse generator with an on-off ratio greater than 70dB, an adjustable delay between 0.05

DUMMY LOAD

Nevada Communications, the manufacturing division of Telecomms which deals in high quality 934MHz personal radio and cellular test equipment, has introduced a dummy load into its Professional series.

This British-made unit is intended for 934MHz/cellular applications, but should find many uses in other areas. It covers 0-3000MHz with a power handling capacity of 15W and costs £29.95 including VAT.



*Telecomms,
189 London Road,
North End,
Portsmouth,
Hants PO2 9AE.
Tel: (0705) 698113*

imum VSWR is 1.5:1 and insertion loss specification is less than 0.5dB. Insulation is quoted at 60dB or greater.

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

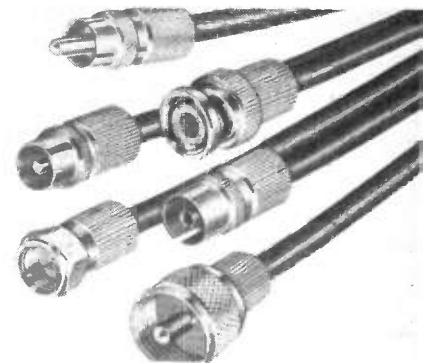
RF CONNECTORS

A new range of low cost high quality RF coaxial connectors is now available from Electroustic Ltd. The range consists basically of 5 single-pin connectors and one cable coupler.

Designed for rapid and accurate connection of coaxial cables with no soldering, all that is necessary is to cut and square off the cable, push into the main body of the connector and tighten the

single screw. Length is between 27mm and 34mm with a main body diameter of 11mm, and they are made from the highest quality materials.

*Electroustic Ltd,
Hayward House,
Northchapel,
Petworth,
West Sussex GU28 9HL.
Tel: (042 878) 611.*

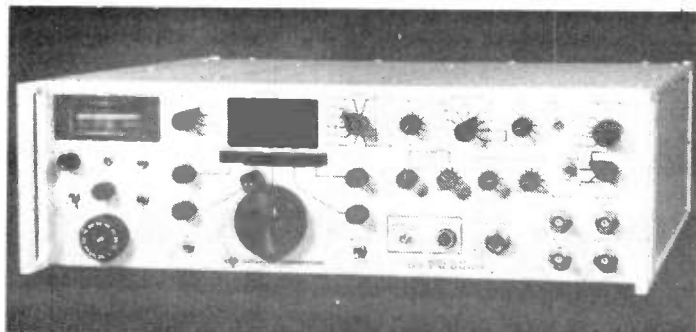


and 200 milliseconds and rise and fall times of less than 20 nanoseconds, offers similar operator benefits.

Other user aids are full IEEE control; a removable RF assembly for remote operation up to 200ft to eliminate transmission line loss; and

optional full synthesis control (100Hz steps).

*Tony Chapman
Electronics Ltd,
Electron House,
Hemnal Street, Epping,
Essex CM16 4LS.
Tel: (0378) 78231/2.*



JUICY FRUITS

Pineapple Software's 'Diagram' drawing program for the BBC micro has been available for about a year now, and with sales having passed all expectations the company has now released two new related products.

The first is a utilities disc for Diagram. Produced by one of Pineapple's customers, it offers half a dozen useful facilities, including the addition of a border around any part of the diagram, screen numbering to assist in locating a given position in a large diagram, shifting diagrams etc. It costs £10 + VAT.

Pineapple offer a free updating service for customers purchasing Diagram, and one such major update is imminent. Versions are also now available for the Master series and ADFS systems (with a Winchester drive it is possible to produce diagrams covering no less than 3800 mode 0 screens, with fast scrolling over the diagram area).

The other new product is called 'PCB'. Since many customers were using Diagram for PCB design, Pineapple have produced a dedicated program for this purpose. It is supplied on 16K EPROM for any 32K BBC micro, and will produce high quality artwork for the direct production of PCBs.

The program offers extensive component layout and track drawing facilities (with tracks in different colours for double-sided boards), and all files can be stored on disc for future use.

To use PCB, a system must include a medium resolution colour monitor and an Epson FX compatible printer with the quadruple density graphics command ESC "Z" available.

A future addition to PCB will be an auto-routing add-on which will allow intelligent auto-routing of tracks on both sides of a double-sided board. This will be supplied at a reduced cost to anyone already using the program.

*Pineapple Software,
39 Brownlea Gardens,
Seven Kings, Ilford,
Essex IG3 9NL.
Tel: (01) 599 1476.*

THERMOMETER KIT

A thermometer adaptor kit designed to work with any type of millivolt measurement instrument is now available from Electronic & Computer Workshop Ltd.

Having an output resistance of less than 1.0k, the kit-K2607 - consists of a small PCB, two ICs, capacitors, resistors and a sensitivity potentiometer. The sensitivity can be varied over a wide range to give outputs from 10 to 40mV/°C. Measurement range is -25 to +85°C.

Linearity is typically $\pm 0.5\%$ and the zero point can be adjusted within a wide band. Supply voltage requirement is from ± 12 to $\pm 15V$ dc. The buffered output can be fed to any type of digital or analogue instrument from a DVM to a computer-based measurement system.

ECW offers the K2607 kit at £10.46 including post/packaging and VAT.

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

ELECTRON RTTY

A kit is now available to provide the Acorn Electron with 8 input/output lines (plus 2 control lines).

It's based on the 6522 VIA, and the I/O socket is compatible with the BBC user port connector. This enables the Electron to be used for RTTY transceiver operation, and G3WHO's BBC RTTY program is now also available for the Electron.

Prices are £25 for the kit and £29.95 ready-built (including p&p). The bare PCB is available from the British Amateur Radio Teleprinter Group (BARTG).

*Chris Rudge G6LAW,
5 Teal Close, Fareham,
Hants PO16 8HG.*

ALL RIGHT JACK

Version 2.1 of the JACK17 linear circuit analysis program from Spaceheights is now available.

Additions to the program include automatic circuit validity checks, faster 'what



PC TRAINER

With the ever increasing use of programmable controllers in industry, L J Electronics have launched a programmable controller training system.

The PC2000 incorporates all the facilities of a typical programmable controller, and also features easy access to the internal electronics (the micro board and the I/O board, etc) for test and trouble shooting work.

The system comprises a

stand-alone programmable controller and a hand-held programming console, with 8 inputs and 8 outputs, LED I/O state indication, and sequence design using standard relay ladder logic diagrams.

Full back-up is available in the form of curriculum texts and technical manuals.

*L J Electronics Ltd,
Francis Way,
Bowthorpe Industrial Estate,
Norwich NR5 9JA.
Tel: (0603) 748001.*

if?' investigation, harmonic analysis, and voltage generator input (existing features include gain and phase of V_{OUT}/V_{IN} from 1Hz to 10MHz etc).

Computed results and circuit details are stored in Basic random access data files suitable for further processing.

JACK17 is intended for electronic engineers and the education market, and runs on Apricot and Sirius computers.

*Spaceheights Ltd,
6 Prospect Place,
Chapelhay,
Weymouth,
Dorset DT4 8JY.
Tel: (0305) 771974.*

SOLDERING STATION

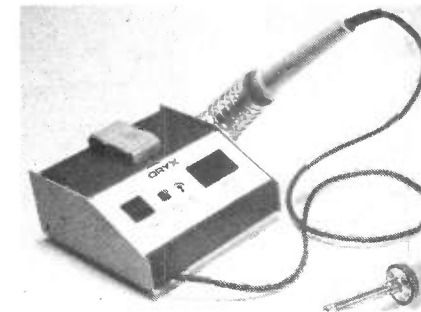
Oryx have now completed work on a new soldering station, the DPU-45.

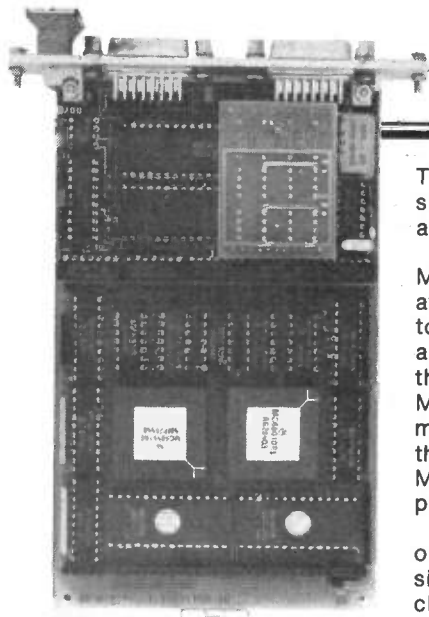
The station is presented in a 2-tone grey steel case complete with iron stand and tip cleaning sponge. A digital read-out shows the iron tip temperature whilst in general use, and a push-button action

shows the desired set temperature.

All the electronics are in the case, with sensing from a platinum thick film sensor in the soldering iron, which also utilises a unique thick film element. Both offer ultra-stable temperature control and long-life reliability. The electronic circuit is designed to eliminate switching spikes by using a zero crossing detector system, and temperature overshooting is avoided by proportional control electronics.

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





VME SBC

PEP Modular Computers is now offering a new 16/32-bit microcomputer for VMEbus applications with an MMU or a floating point co-processor.

The VMPM68KB micro-computer module further expands PEP's broad range of VMEbus modules in the reliable single-Eurocard format for real-time applications in harsh environments.

With its feature set the module can be used as a powerful single-board computer for control applications as well as a system MPU module for VMEbus systems.

The bus arbitration logic also supports multi-processor applications.

There are two different MPU piggy-back modules available for the VMPM68KB to configure it for individual applications:

the MC68010 MPU with MC68451 memory management unit; the MC68000 MPU with MC68881 floating point co-processor.

The current speed is 8MHz or 10MHz and a 12MHz version will be offered as the chips become available.

The unit has 128K DRAM and two 28-pin sockets for up to 64K ROM, with an access time of 200ns. Beside the parallel I/O with 8 programmable I/O lines and 2 control lines there are also two independent serial I/O ports available. Each port can be configured to work as: RS232C (V24) up to 19200 baud; RS422 up to 307kbaud, sync/async, SDLC/HDLC; 20mA current loop, up to 2400 baud.

*PEP GmbH,
Am Klosterwald 4,
8950 Kaufbeuren/Allgäu,
West Germany.
Tel: (08341) 89 74.*

SIGNAL PROCESSOR

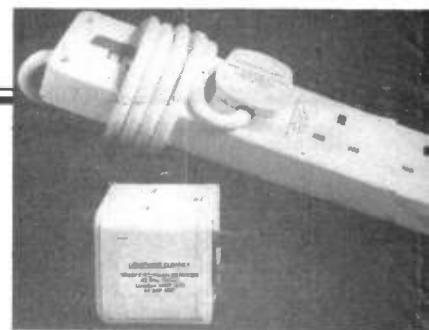
National Semiconductor has announced its LM32900 single-chip digital signal processor (DSP).

The LM32900 is the result of three years of extensive research at National. These studies resulted in a unique, yet simple architecture which is fabricated using one of National's most advanced 2-micron dual-layer micro-CMOS processes.

Utilizing CMOS, with its resultant low power consumption (500mW at 20MHz and 50mW when powered down), combined with very close circuit layout, makes possible a machine cycle speed of 100ns. The LM32900 will operate within a temperature range of -55 to +125 degrees Celsius and will be the first dedicated digital signal processor IC fully specified over the military temperature range.

National's DSP will be available in two package options: 172-pin leaded chip carrier and 172-pin grid array.

*National Semiconductor,
Industriestrasse 10,
D-8080 Fürstfeldbruck,
West Germany,
Tel: (08141) 103376.*



CLEANER CLEANERS

The 'Computer Cleaners' launched by Tony Firschman Services last year have now been updated, and complemented by a 2-way adaptor.

These filters, designed to reduce mains-borne interference, contain three elements:

- a capacitive delta filter for the 1-30MHz range (better than 30dB reduction) with a paper dielectric for low inductance;
- an inductive suppressor for frequencies up to 130MHz;
- a transient suppressor for short voltages above 630V (peak current 1200A, power dissipation 400mW, response time <50ns).

The one-way, two-way and four-way devices retail at £14, £18 and £24 respectively (including VAT and postage).

*Tony Firschman Services,
43 Rhyll Street,
London NW5 3HB.
Tel: (01) 267 3887.*

COMPACT PRINTERS

Epson's P-80 range of printers combines compactness with most of the features found on more expensive printers.

All three models, P-80P, P80S and P-80X, are suitable for screen dumps and other occasional print-outs.

Designed for the home and professional computer markets, the P-80 and P-80X offer emphasised, enlarged, condensed and underlined

styles. The P-80X also provides superscript and subscript printing and seven bit-image graphics modes; the P-80 has two bit-image modes.

The P-80, in serial or parallel versions, is compatible with most PCs and home computers, while the serial-only P-80X is additionally attractive for use with portable computers such as Epson's own PX-8.

Like the popular P-40, both

models are battery powered, operating on rechargeable nickel cadmium batteries which power each printer for up to 1.5 hours before the need to recharge.

Because of the P-80's thermal transfer technology Epson recommend the use of their surfaced paper. Paper is friction fed on the P-80 and paper sheet widths from 144mm to 216mm can be used, which includes A4. The P-80 and P-80X can also be used as thermal printers without ribbon, using Epson-recommended paper or an accepted thermal transfer paper. Epson plans to introduce a roll paper holder shortly.

The P-80 costs £160 and the higher performance P-80X is £250.

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

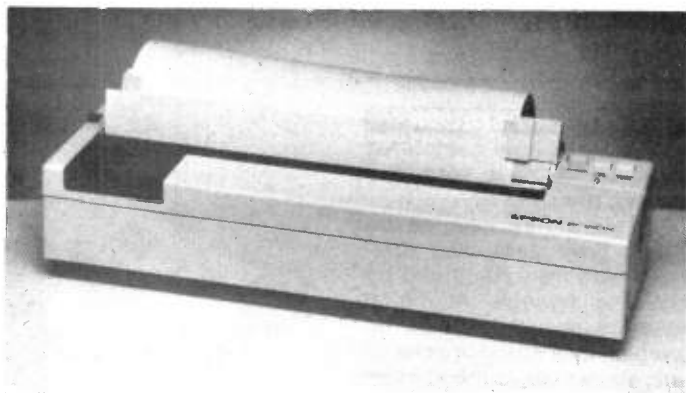
HDLC PROTOCOLLER

Now available from Online Distribution Limited is the Mitel (MT8952) HDLC protocoler.

The MT8952 frames and formats the data packets according to CCITT packet switching protocol X.25 (level 2). It provides the C channel interface required by Mitel's DNIC (MT8972) and performs as a control interface between the ST-bus and digital networks.

Other features include: automatic flag detection and synchronisation; zero insertion and deletion; address detection; abort/idle/go-ahead sequence detection and transmission; and a microprocessor port.

*Online Distribution Ltd,
Melbourne House,
Kingsway,
Bedford.
Tel: (0234) 217915.*



TELETEXT PROCESSOR

ITT Semiconductors has announced its teletext processor, designed to handle Level-1 teletext (Videotext in Germany) as transmitted by European TV stations.

Now teletext can be added to a TV design by using just one IC and a single low-cost RAM.

This is made possible with the TPU 2732 teletext processor, which is an n-channel VLSI MOS circuit housed in a 40-pin DIL plastic pack. Functions on the single chip include teletext processing (except for external RAM); ghost picture compensation; seven-bit video signal generation; simultaneous reception and storage of up to eight pages of teletext; function extension by automatic language-dependent character selection; and a PAL/NTSC switchover facility.

Operation of the TPU 2732 is timed by the vertical cycle of the TV receiver. A comparator pre-selects the teletext pages requested and loads them into RAM. Speed problems with external RAMs are eliminated by an internal RAM buffer. The processor is

designed to control one dynamic 16K or one dynamic 64K external RAM.

An integral display control unit selects one of eight stored pages for display. Eight-bit character words are transformed into 6 x 10 dot matrix with PAL or 6 x 8 with NTSC by a ROM character generator of 96 characters, and are displayed in 24 rows of 40 characters each. Eight different national 96-character sets are available, selected by the control bits of the teletext page display. When the RAM is not accessed by the TPU 2732, the memory control refreshes the memory and handles requests for RAM access.

The associated control unit can, via the IM bus, read from and write into all RAM locations. It controls the TPU 2732 by loading appropriate registers in the RAM, so the TPU can be used to display text from other sources. It can also independently display a menu of the stored eight pages.

*ITT Semiconductors,
145-147 Ewell Road,
Surbiton,
Surrey KT6 6AW*

GLASS ENCLOSED CRYSTALS

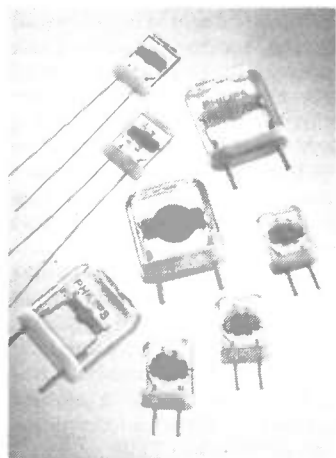
Now available from Piezo Products is a range of glass-enclosed crystals from Philips. These crystals, designed for operation from 1.5 to 175MHz, are suited for use in temperature-compensated crystal oscillators and are claimed to offer many advantages over cold-welded metal-encapsulated crystals.

Philips has approximately

30 years experience in the production of crystals encapsulated in glass for exceptional long-term stability. Quality standards are ensured by complete computerized characterisation of each crystal, test results being made available to the user if required.

These devices feature high Q factors for lower noise oscillators, and consistently low long-term ageing, typically 2×10^{-9} /day max. Carefully selected bonding cements and curing processes enable the crystals to withstand continuous operation up to 200°C without mechanical degradation. The crystal leads are hot-tin dipped to provide good solderability for wave solder applications.

*Piezo Products Ltd,
Millstream Trading Estate,
Christchurch Road,
Ringwood,
Hants BH24 3SD.
Tel: (0425) 479337.*



SUB-MIN DIL DPM

A compact LCD DPM ideally suited for low or high volume applications has been introduced by Lascar.

The meter, which is in a 28-pin DIL integrated circuit format, can be plugged directly into a DIL socket or panel mounted using the 1/8 DIN snap-in bezel (48 x 24) provided.

The DPM 400 features 10mm digits, with various symbols and 'low battery' warning on the display. Auto-zero, auto-polarity, programmable decimal points and 200mV fsd are standard features. On-card

pads make selection of operating mode quick and easy.

The low-profile bezel incorporates a flat, reverse printed window. Black, dark brown or grey windows are available to suit most case colours although other designs or colours can be supplied for an even closer match when fitted to an instrument.

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

NEW RELAY

Relays installed in a panel give no indication of their operational status, so malfunctions have to be located with a meter. This laborious task is rendered unnecessary with IMO's new 60 series relay because it incorporates a mechanical indicator. When the relay is energised a bright red panel can be seen; when it is not, it disappears.

Because the indicator is physically linked to the relay contact, true indication, even under conditions of contact welding, spring break or coil failure, is guaranteed. This is an obvious advantage over illuminated relays which have an indicator wired parallel with the relay coil; these can render incorrect information under the above circumstances.

The device also has a push button incorporated into its mechanism to facilitate manual testing.

The 60 series relays cover voltages from 6 to 230V ac and from 6 to 110V dc.

*IMO Ltd,
1000 North Circular Road,
Staples Corner,
London NW2 7JP.
Tel: (01) 452 6444.*

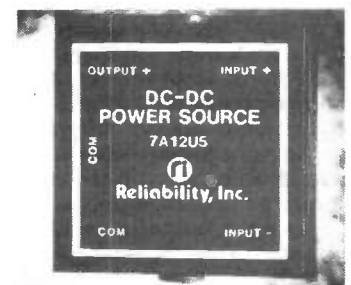
DC-DC CONVERTERS

RR Electronics Ltd can now supply the new Z-Pac series of converters from Reliability.

This new series of converters provides the performance advantage of conventional linear converters with a minimum efficiency of 90%.

Designed to encompass A/D, D/A, operational amplifiers, RS232, 424 and 488 as well as negative voltage biasing, these units can be used in a wide variety of equipment including those powered by battery or solar cell.

The series operates from inputs of 5 and 12V dc ($\pm 20\%$) with single and dual outputs. Standard pinouts are used throughout.



*R R Electronics Ltd,
St Martins Way,
Cambridge Road,
Bedford.
Tel: (0234) 47211.*

NEWS DESK



Yes, that is Samantha Fox, and yes, I did meet her, but no, that's not me she's sitting on in the pic. The occasion was a presentation by Beckman Industrial, but don't ask me what it was about - I was too preoccupied to notice

Radio control frequencies

The Department of Trade and Industry has announced plans to release new radio frequencies for use by radio controlled models.

Following consultations with the Joint Radio Control Users Committee (JRCUC) it has been agreed that frequencies at 40MHz will be made available for the use of radio control surface models operating on FM and PCM. This band coincides largely with a European allocation for surface modelling and will thus facilitate the movement and operation of radio controlled models. There is a distinction between surface and aeronautical models, and for the latter further channels are to be released at 35MHz to add to an existing allocation for aeronautical modelling.

The main band for surface model control at present in the UK is 27MHz. Although this will continue to remain available for modellers, the introduction in 1987 of a European specification for Citizens' Band radio operating on 26.96 to 27.40MHz, FM

only, has sharpened the search for new additional frequencies for model control.

Amateur morse test

The DTI has also announced that a pass in the Radio Amateur Morse Test will from now on be regarded as valid for life. Previously, where a break of over 12 months had occurred in licensed operation, or where a licence had not been obtained within 12 months of having passed a morse test, a further test was required. This change of policy will bring into line the currency of the morse test with that of the Radio Amateur Examination, where a pass is already valid for life.

Eutelsat news

Eutelsat, the European Telecommunications Satellite Organisation, has decided on firm orders for three Ariane launch vehicles, as well as one Shuttle launcher for its next generation of satellites. Each of these two orders is accompanied by two option flights. Since the new satellites will be compatible with both types of launch vehicles, the decision gives Eutelsat maximum flexibility in overall planning.

The organisation's Board of Signatories, meeting in Tenerife during June, also authorised the procurement of long-lead items for a fourth Eutelsat II satellite in addition to the three already ordered from Aerospatiale, the European consortium recently selected for this contract. The Eutelsat II satellite network will thus initially comprise three operational satellites (each carrying 16 active transponders) and one ground spare satellite.

The Eutelsat II satellites of which the first flight unit is expected to be launched in mid 1989, are specially

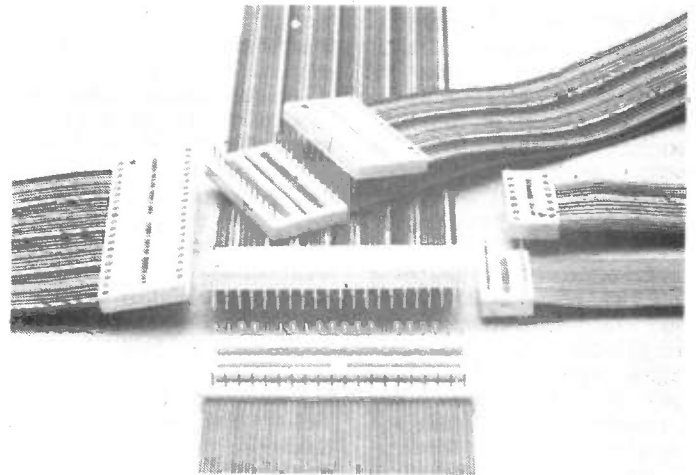
designed for high EIRP TV distribution over a large part of the European continent.

Agreement was reached in Tenerife on the use of the Eutelsat satellites already in orbit to restore services in case of failure of submarine telecommunications cables between the Canary Islands and the Spanish mainland. This service is expected to be extended to the entire service zone of Eutelsat satellites.

The board is reported to have noted with satisfaction the results of an in-depth

study performed by the executive organ of Eutelsat on the potential for direct broadcast satellites (a service permitting reception over Europe of television programmes using very small rooftop dish antennas). Further action on this project will be decided at the next meeting of the board in September.

Chairman Emmanuel Sartorius of France was re-elected for a second one-year term of office, and Carlos Herrera of Spain was elected to the post of Vice Chairman.



Prices take a dip

During July and August Custom Cables International Ltd of Saffron Walden are offering DIP ribbon cable assemblies at half the normal price.

CCI DIPs are available in 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 28, 32 and 40-pin format. Cables can be any length and are available as standard flat ribbon, twist and flat, jacketed and shielded. Delivery is from stock.

Further information is available from Custom Cables International Limited, Units 3 & 4, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ. Telephone: (0799) 25014 or 22036.

PC price cuts

British Olivetti's Micro Division has announced price reductions across its range of personal computers of up to 11%. The price reductions affect the new M19 and M28 PCs launched in April, as well as the M24.

While following the overall

downward trend of prices in the PC industry, the new prices also reflect Olivetti's strategy to supply fully configured systems. The company believes that the market's starting point for PC configurations is higher than that reflected in most manufacturer's price lists. Furthermore, by putting more into the basic configurations, economies are achieved in production and better value is passed on to the consumer.

This strategy is highlighted by the announcement of the availability of a new model of the M24 personal computer that includes as standard a 20M hard disc, the full 640K of RAM and the bus converter - the seven slot expansion bus that is both 16-bit and 8-bit bus compatible.

The new hard disc M24 configuration is priced at £2,753 including keyboard, monochrome display and MS-DOS. This compares with the previous price for a similar system configured from price list options of £3,094.

Digital map systems

New digital electronic map systems for aircraft have been developed by Hughes Aircraft Company, Radar Systems Group, of Los Angeles, USA. The development programme follows the transformation of map data from paper charts to digital form by the US Defense Mapping Agency (DMA).

With this data in machine-readable form, on-board processors can utilise knowledge of the terrain to solve flight control and navigation problems. While radar cannot see what is beyond a hill, for example, such information can be retrieved from an on-board database.

There are different methods of presenting the electronic maps. The pictures on the cover show a plan view and a shaded relief perspective view of Mount St Helens before its eruption. The pictures here show a perspective view of a populated area between Tacoma and Seattle in Washington State, with arrow-like symbols indicating tall buildings or other possible obstructions, and a perspective view of Mount Rainer, Washington, showing the contour lines.

The colour coding adopted for surface features is green to represent vegetation, dark blue for water, light blue for snow, rust-brown for rock or residential areas and mustard-yellow for bare ground. The symbol at the centre

of the perspective views indicates the position of the aircraft relative to the horizon, while the triangular symbol at the bottom of the plan view represents the aircraft's position and direction of travel.

Overlaid menu data gives the aircraft's altitude above ground level (AGL), above sea level (ALT), its latitude (N), its longitude (W) and its heading (H). R is the range to the point where the aircraft's flight path would intersect the ground if the present heading and altitude remained unchanged.

The DMA digital data utilised in the Hughes systems is generated from existing cartographic and other data sources by overlaying an imaginary grid on the terrain. There are separate databases for elevation and terrain features. The latter may be represented as two-dimensional (ie forests, lakes, ice or snow and urban areas), one-dimensional (rivers and roads), or points (towers, other vertical obstructions and navigation aids).

During development a variety of dynamic display formats were produced. In one such format the terrain is depicted by using shaded relief to bring out the relative highs and lows. The shading is created by modelling the effects of an artificial sun shining on the terrain. However, this light source can be moved in real time, if

necessary, to simulate the light of the sun on the real world through which the aircraft is flying, or to otherwise enhance the readability of the display.

Such a display continuously shows the pilot where he is with respect to prominent land forms. Colour is used to identify certain kinds of feature; for example, green indicates forests and red indicates urban areas. Colour can also be used in a different way to indicate altitude contours.

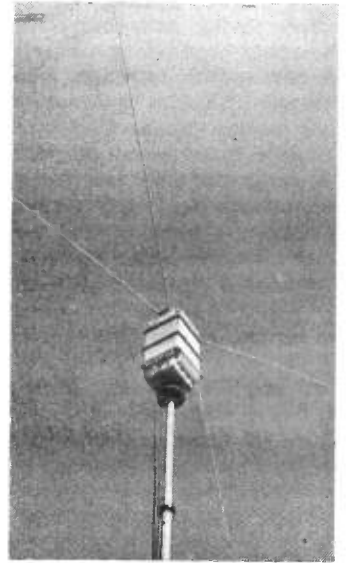
Landing and approach information is one class of data that can be overlaid on terrain maps, to aid landing in poor visibility. Runway configurations, approach paths, missed approach procedures, the heights and positions of vertical obstructions, and communication frequencies are examples of data vital to the pilot.

By presenting the data in the form of a topographic model, the pilot will see towers in the correct relationship to the runways and his flight path. With accurate position data from ILS and/or DME systems the pilot can be presented with a synthesised view of his approach, even during 0/0 conditions.

The ultimate HF dipole?

The new self-tuning HX 002 HF dipole developed by Rohde & Schwarz is a transmitting antenna covering the frequency range 2 to 30MHz and capable of handling a transmitter power of 1kW. It is claimed to ensure optimal communication reliability over any distance despite its overall length of only 10m, with excellent radiation characteristics resulting from the favourable shape of the radiator, integration of a low-loss tuning network into the antenna and a high-grade balun.

The content of the non-volatile tuning memory is updated after each tuning correction, meaning that the tuning time of the antenna is continually and automatically minimised. In an adapted state a change of frequency takes 60ms; a tuning correction is typically accomplished in 2s, the VSWR at the antenna input then being 1.3.



No control signals are required from the transmitter for tuning, so the HX 002 can also be used in existing systems without the need for any modifications.

Mains signalling

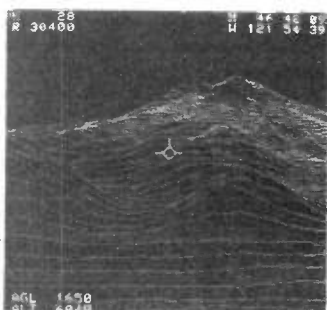
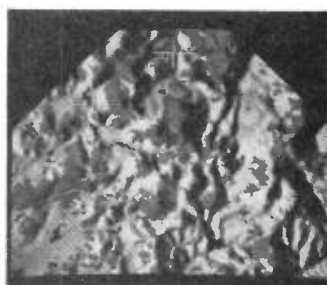
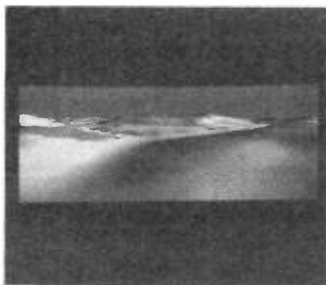
ERA Technology has completed a comprehensive survey of mains signalling within the United Kingdom. The survey was carried out under contract from the Department of Trade and Industry and is the first on this subject undertaken in Britain.

A specialist team drawn from two of ERA's six technical divisions tackled such problems as the interaction of multiple signalling systems on the same network, interference from electrical noise, and the possibility of malfunction due to such causes as switching transients or other disturbances.

The survey includes a literature review listing scientific papers and trade journal references, and includes national and international standards and guidelines for mains signalling systems and related topics.

One section is devoted to trial results covering systems impressing signals in the frequency range from 3kHz to 150kHz.

For further information and/or copies of the survey (Report No. 86-0038) contact the Information Centre, ERA Technology Ltd, Cleeve Road, Leatherhead, Surrey KT22 7SA. Telephone: (0372) 374151.



More bloody acronyms

The RARE association, a European organisation of national research networks, was formally founded in Amsterdam on the 13 June 1986.

RARE is an association of networks and their users, and is independent of manufacturers, governments and international organisations. The objective of RARE is to establish a European infrastructure for the benefit of communication between scientists and research workers within Europe as well as between the European research community and researchers in other parts of the world. This European infrastructure will provide access to the important computer centres in Europe, and will support the consultation of international scientific databases.

This will be achieved by unifying all national research networks to guarantee interconnection and to establish one harmonised communication facility for European researchers.

RARE stands for *Reseaux Associés pour la Recherche Européenne*.

Prestel gateway

The cost of linking external computers to Prestel is set to fall following a development that allows IBM personal computers to function as Prestel gateways.

This development means that companies can use the cheaper, but increasingly powerful IBM PC (and compatibles) to provide interactive Prestel services such as sales order entry, database enquiries and bookings. Until

now these services have been available only through much larger mainframes or mini-computers.

A basic eight-channel 'Low Cost Gateway' will consist of a single IBM PC XT (or equivalent). This can be installed complete with software from £15,000, less than a third of start-up costs for a minimum gateway installation on a minicomputer.

A system based on the IBM AT can handle 16 simultaneous calls from Prestel. Larger configurations are possible by using one PC to handle the communications and a second to control the application.

In addition to stand-alone operation, the PC would be capable of operating as a front-end processor to other, larger computers.

In this type of configuration the PC would act as a normal gateway computer but would appear to the mainframe as a terminal.

The Low Cost Gateway is designed around a combination of the advanced Gateway 2.3 protocol and the QNX multi-user operating system. It is being promoted jointly by Prestel and Icams Ltd, the British subsidiary of a West German company which has successfully installed similar systems on the German Bildschirmtext videotex service.

Let there be light

In the middle of June British Telecom was successful in sending pulses of laser light along long distance optical fibre both ways at once. BT is the first operating company in the world to accomplish

this feat in a commercial cable installed as part of its public network.

Engineers from BT's research laboratories at Martlesham Heath established simultaneous both-way (duplex) transmission over a 77km optical fibre system between Birmingham and Derby. This link was one of the first (last year) in Britain to support higher capacity optical transmission at 565 million bits a second (Mbit/s) - four times the rate currently being used for long distance systems and equivalent to nearly 8,000 phone calls at once. Part of the link was also used to demonstrate transmission at 16 times the present rate, 2 billion bits a second (Gbit/s) - equivalent to more than 30,000 simultaneous calls.

Duplex transmission in a single fibre is accomplished by splicing an optical directional coupler to each end.

The coupler consists of a short length of two adjacent fibres which have been fused together by heating. The fusing is precisely controlled so that the outer cladding glass of each fibre merges with the other, while the two cores - in which the light ray travels - remain separate. This allows a proportion of the light in one core to transfer to the other, the amount being determined by the dimensions of the fused section.

Light in the 'go' direction is transferred from one core to the other without interfering with light in the 'return' direction in the second core.

These optical couplers will be manufactured and marketed commercially by BT & D

Technologies, the new optoelectronics component company jointly owned by British Telecom and Du Pont.

More light relief

British Telecom International (BTI) has announced orders worth a total of £4,000,000 for its transatlantic optical fibre cable services on the planned TAT-8 link following the publication of BTI's price discount scheme early in June.

TAT-8 will be the eighth underwater telecommunication link between Europe and North America, and the first transatlantic cable to employ optical fibre technology. It will come into service in June 1988.

The \$335 million cable can carry up to 40,000 simultaneous telephone calls, trebling the capacity of all the existing transatlantic cable links.

Monopoly money

On 19 June Sir George Jefferson, chairman of British Telecom, announced that the group had achieved a profit of £1,828 million for the year ended 31 March 1986. This represented an increase of no less than 20 per cent over the previous year.

I could comment here on the direct benefit this could have brought to the public as a whole if BT was still state owned; or on the bargain basement price BT was privatised for; or on the absurd profit margins on some of BT's business services; or on the fact that we enjoy(?) one of the highest local call tariffs in Europe; but that would be churlish, wouldn't it?

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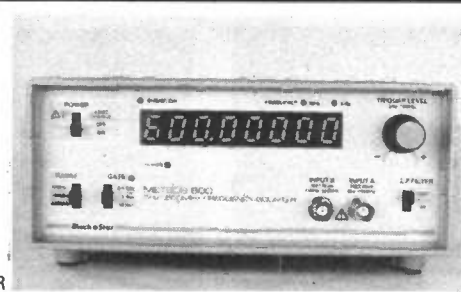
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SPECTRUM WATCH

NIGEL CAWTHORNE G3TXF

The UK's two national cellular network operators, Cellnet and Vodafone, may each be getting a further 360 channels for use in the London area only. It is in the London area that congestion problems are the greatest. Each cellular operator currently has 300 channels in paired (one for mobile transmit and one for base transmit) 7.5MHz wide allocations.

Cellular radio in the UK has been operational for just 18 months, and the total number of subscribers is fast heading for 70,000, many of whom use their car telephone mostly while in the London area.

Until recently the pressure has been for the cellular operators to move 'up' in frequency and encroach on the part of the 900MHz band (905-915MHz and 950-960MHz) earmarked for a future pan-European system.

In what is very much a surprise move, cellular network operators are reported as being in discussions with the DTI over the use of frequencies which up until now have been the exclusive reserve of the MoD. Using the 'MoD' frequencies would enable the cellular network operators to spread 'down' in frequency from their present allocations.

The new frequencies being discussed are understood to be 870-888MHz (mobile transmit) and 915-933MHz (base

transmit). An additional 9MHz of spectrum for each operator would provide 360 channels.

It is reported that if these frequencies are indeed allocated to the cellular car telephone service, then they will be available only in the London area. The MoD would keep hold of them elsewhere.

Tactical tropo

Internationally, frequencies around 900MHz are often used by the military for tactical tropo applications, which involves squirting several kilowatts of RF into the troposphere with the statistical certainty that a small part of the signal will be scattered forward. Tactical tropo provides a unique means of providing relatively secure communications over a range of a few hundred kilometres without the need for any intermediate relays.

If the cellular operators do succeed in getting the 900MHz extensions, it will be good news for all concerned. The cellular operators will be able to solve their overload problems in London. There will still be a nominal and untouched reserve of frequencies at 900MHz for a pan-European system (without raising questions of whether 10MHz at 900MHz is enough or of possible transition problems between



Antenna towers at Radio France International's transmitter site at Issoudun

today's cellular network and that of the 1990s). It will also mean, in London at least, that this part spectrum is being used more efficiently, and not left almost entirely fallow.

Swiss get Jordan Tx project

Switzerland's high-power broadcast transmitter company Brown Boveri (BBC) have been awarded a contract to supply broadcast transmitters to Jordan. The project covers three 500kW short wave, one 1000kW medium wave and two 600kW long wave transmitters together with the associated antenna arrays.

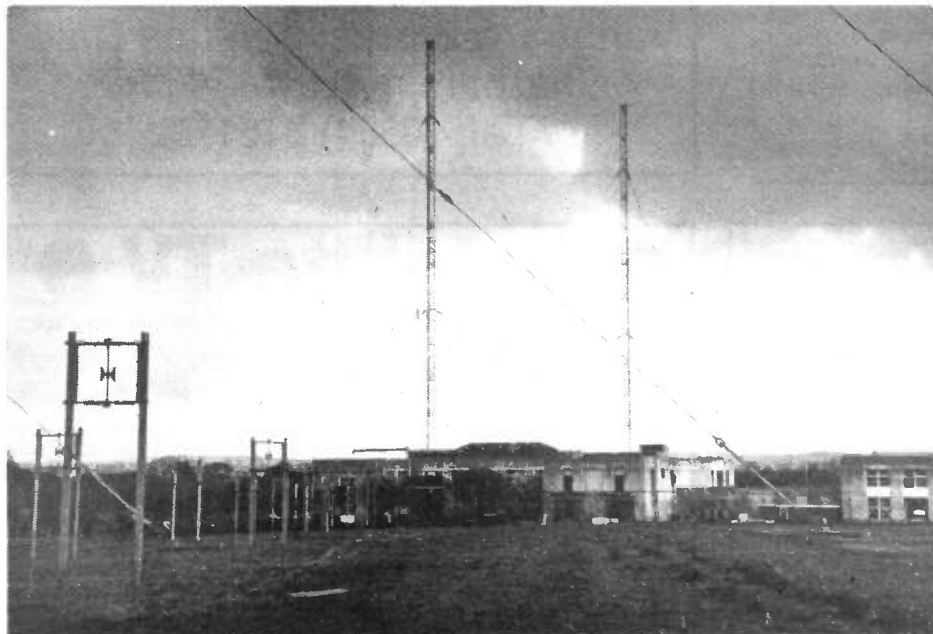
New private teletext service

The UK radio-paging and communications company Air Call has launched a subscription-only teletext and data service which can be used for a private information service, making use of spare line capacity on the IBA's transmitter network to achieve national coverage.

The provisions of the UK's Broadcasting Act were amended in 1984 to give subscriber user groups access to the broadcast network. Following negotiations with a number of bidders, the IBA finalised an agreement last September with Air Call allowing them sole rights to offer and promote a major data transmission service using the existing ITV broadcast transmitter network as the bearer of the subscription-only service.

The new service, which enables a user to distribute information from one point to any number of receiving points over a

Mast radiators at the BBC's Droitwich transmitter site



wide geographical area simultaneously, uses vertical blanking interval (VBI) line 14. There are a number of 'lines' above a TV picture, not normally seen by the viewer, which are not used for picture information, but which can be used for teletext, system control signalling or engineering measurement applications. The ITV's own public Oracle teletext service uses six lines (12 through 18 less 14). Lines 19, 20 and 22 are currently used for engineering measurement tests.

Oracle, the IBA teletext organisation, owns 25% of the joint venture company Air Call Teletext.

The latest population coverage figures for the IBA's TV transmitter network for England, Scotland, Wales and Northern Ireland are 99.5%, 98.2%, 97.3% and 98.3% respectively for the ITV network and 99.1%, 97.2%, 97.2% and 97.9% respectively for Channel 4. As the new Air Call Teletext service is using the ITV transmitter network it will be accessible to almost the entire population.

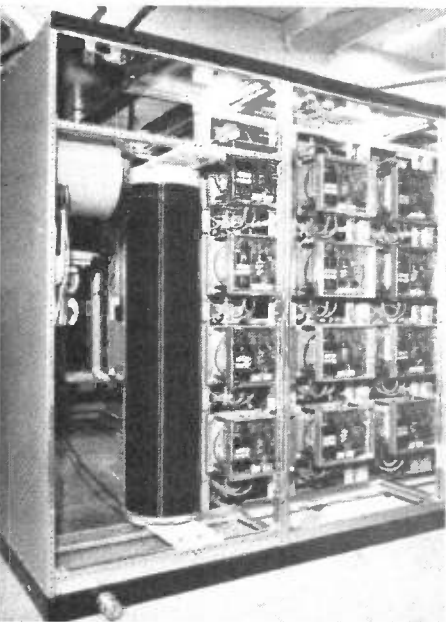
Air Call believe their service will be attractive to information services requiring predominantly one-way data. These include financial and equity services, travel, news, betting, electronic publishing and weather information.

The Air Call Teletext service is the first use in the UK of a broadcast transmitter network for a private data transmission application.

Euro-DBS delays

The failure of Ariane flight V18 on 30 May has increased doubts over the launch of France's first direct broadcasting satellite TDF-1. Even before the recent accident, which resulted in the loss of a \$50 million Intelsat communications satellite, the much postponed

Pulse step modulator for a high power short wave transmitter in Switzerland



TDF-1 launch had been put back again to January or February next year from the previous scheduled launch date of November.

The failure rate in Ariane missions, four in eighteen missions (the last failure was only last September, when flight V15 carrying two communications satellites also had to be destroyed a few minutes into the flight), along with the Shuttle disaster, is causing 'tremendous concern' in the satellite industry.

It has emerged in recent days that the cause of the latest Ariane failure may turn out to be serious enough to stop flights at least until the end of the year. Euro-DBS launches will now have to wait their turn in the international backlog of satellite launches caused by the recent disasters.

French broadcasting: further turmoil!

France's terrestrial broadcasting services are in for another shake-up. The newly elected French government recently announced controversial broadcasting plans. These include the privatisation of France's oldest and largest state TV network, TF-1.

The proposed reforms also include TDF (France's transmission authority which provides the microwave and transmitter networks for state-run TV) losing its frequency management role. The whole broadcasting question has developed into a major political storm in France between the Socialist President Mitterand and the right wing government.

It is the privatisation of TF-1, the public channel with the closest links with the previous Socialist administration, that is the most controversial issue. The French government plans to sell the large state TV network to a consortium of private operators. The consortium will control 50% of the shares of the privatised network. Another 40% will be offered to the public, while 10% will be offered to the network's employees.

The French government also plans to cancel the concessions granted by the former Socialist government to TV entrepreneurs to operate France's new private commercial TV network, the so-called Fifth Channel (see 'French Revolution' - *Spectrum Watch*, *R&EW* May 1986). The concessions for the new private music channel, known as the Sixth Channel, will also be cancelled. However, there are no plans to change France's over-the-air pay TV channel, Canal Plus, which is now beginning to pay its way after a difficult start.

The French government proposes to create a new regulatory body for broadcasting in France which will replace the existing high authority for broadcasting. The new commission will allocate the concessions for private channels, including TF-1, and watch over programme standards, as well as have



Dutch PTT were demonstrating their microwave link antennas at the EuroComm show

responsibility for broadcast frequency allocations.

'Voice of France' row

France's overseas short wave services are carried by Radio France International (RFI) which has major transmitter installations at two sites in France, Allouis and Issoudun. RFI also has two overseas relays: Moyabi in the Gabon, Central Africa and Montsinery in French Guiana, South America.

In sharp contrast to the French government's plans to privatise TV they are trying to get closer control of France's overseas voice, RFI.

In the past few years, with the addition of new overseas relay stations, RFI has developed rapidly from a station essentially focussed on French speaking Africa and French overseas territories to a more international service. But the new Conservative government feels RFI has drifted increasingly into the hands of Socialist sympathisers. The Cabinet in future will name the head of RFI, and not the new independent communications commission.

600 ohms tail-piece

Andy Emmerson, *R&EW's* ATV and 934MHz scribe, covers a broad spectrum. Down at the dc end, Andy's new illustrated booklet *Old Telephones* (Shire Publications Ltd, Aylesbury, £1.25) traces the story of the telephone in Britain from its introduction in 1878. If you're into 'telephones', this one is definitely for your bookshelf! **REW**

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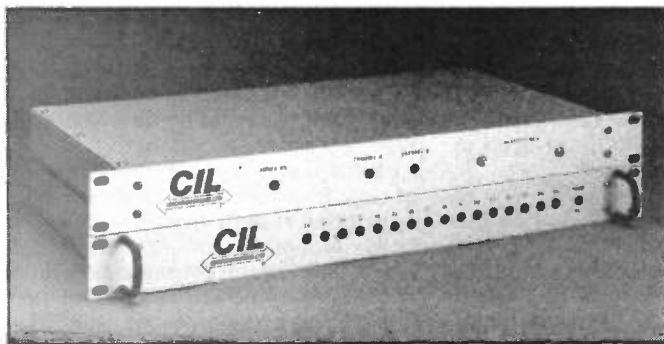
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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

The DTI has now authorised the use of morse code by Class B amateurs on a permanent basis. Class B licensees are those who were authorised to transmit on the bands above and including 144MHz by telephony only. Class A licensees have to pass a test to show their proficiency in morse code, and they can use all the amateur bands. Both classes of course have to pass the RAE (the Radio Amateur Examination), and a pass in this examination entitles the holder to apply for a Class B licence. To get a Class A licence, one must also pass the morse test.

Learning problems

Some people find it very difficult to learn morse code to a level sufficiently high to be able to use it for 'communication'. The B licence was introduced to enable these folk to participate in amateur radio, though on a limited basis. At least it gave them a chance to participate and thereby increase their interest in amateur radio.

For some time there has been pressure from certain quarters to abolish the morse code requirement entirely. The view taken by this section of would-be amateurs is that CW is out of date these days, that it is not as strongly upheld by those who control the licence regulations and that they have consistently refused to even consider abolishing it as a requirement for full amateur radio transmitting facilities.

In order to help the Class B licensee to become proficient in morse code, and to encourage him to do so and obtain a Class A licence, the suggestion was made that if he were allowed to use morse on the air it would stimulate his interest in it and give him a chance to get some 'real' practice in using it. So, as an experiment, a concession was made just over a year ago to permit limited use of CW by Class Bs on the 144MHz band for an experimental period of one year.

This experiment proved to be very successful and as a consequence the DTI has agreed to make the concession a permanent feature of the Class B licence. The intentions behind this new licence condition are to enhance the ability to practice sending and receiving morse code in preparation for the amateur radio morse test; to demonstrate the advantages of morse code in

overcoming language barriers; and to allow Class B licensees to gain experience in using morse under real operating conditions.

The DTI held consultations with the RSGB to work out a practical system for making this concession workable. They have agreed to the following suggestion: when Class B licensees use CW they must identify their transmissions using telephony in the usual way, as their morse may be unreadable (!) From this it follows that they should not use those parts of the band which have become exclusively used for CW or other specific purposes by other users of these bands, particularly the 144MHz and 430MHz bands.

In other words, internationally agreed band plans must be adhered to. It is recommended that Class B licensees should use the 'all-mode' section of the bands, ie 144.500 to 144.845MHz for the 144MHz band and 432.000 to 432.800MHz for the 430MHz band.

For our part, we would suggest that Class B licensees should not attempt to use CW on the air if their morse is still in the 'unreadable' state. Best get some more practice on the buzzer until you can at least be 'read'.

Satellites in trouble

What with rocket launcher failures and the Shuttle disaster, the prospects for amateur satellite launches seem grim. With the exception perhaps of the Japanese JAS-1, the other projected

amateur satellite launches appear to have been postponed indefinitely at the moment. The projected launches for future satellite projects will have to take their place in the queue, and it is quite impossible to predict when they will take place.

Not only are the projected launches giving problems, but existing satellites are having problems too. Oscar 10 is again in trouble. It experienced a 'spacecraft emergency' on 18th May last. The New Zealand control station reported that "the satellite appears to be locked into Mode B... The change from PSK to RTTY or CW is also inoperative... The PSK telemetry is not normal".

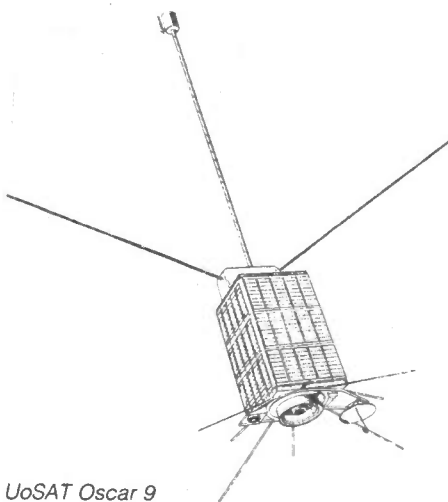
Oscar 10 suffered a similar 'glitch' previously when the problem was thought to be due to a high energy cosmic particle impacting the computer or its associated memory, and it is thought that this may be the cause of this present upset (Oscar 10 is in a much higher orbit than amateur satellites heretofore, and at times is in the Van Allen belt, where radiation hazards are greatly increased).

Hard or soft error?

However, on that occasion things soon improved. The first step was to ascertain if the fault was due to a 'hard error' or a 'soft error'. Hard errors are caused by permanent damage to memory cells. Soft errors are due to the memory absorbing enough charge to change from '0' to '1' or vice versa in the binary memory system. Soft errors can be cured by rewriting the effected part of the software. With a hard error the software has to run without using the effected byte in the memory.

By the following Sunday (25th May) the software had been reloaded and the telemetry composer reactivated. Software diagnostic runs are being continued to ascertain the location of the suspected memory faults. We are assured that Oscar 10 is in no immediate danger, but the transponders are to be kept in an 'idle' mode for a week or so.

UoSAT 1 has also been experiencing difficulties. Its usual schedule has suffered some interruptions due to difficulties in loading software. A 'diagnostic program' was fed into the spacecraft to sort out the difficulties, and at the time of writing there is every hope of getting things back to normal shortly.



UoSAT Oscar 9

AMATEUR RADIO WORLD

Even the Russian satellites have been erratic! Both RS 5 and RS 7 have not been keeping to their schedule lately. The Russians conserve their satellites carefully, turning them off when any signs of 'overloading' or low battery voltage appears, so maybe this is what has been happening.

The Chernobyl disaster

We have referred on several occasions to the interesting observations Harold Meerza produces from his regular observations of UoSAT 1 and 2. He has come up with some very interesting observations from the UoSAT 1 radiation detector following the Chernobyl disaster. He writes:

"The UoSAT 1 radiation detector (channel 3) had been unreliable and was switched off during the week following the Chernobyl accident. During the next week, on 6th May, very high radiation readings were recorded in the WOD (whole orbit data) at some locations. As a result, the University of Surrey substituted WOD readings for the weekend bulletin and invited reports of any unusual readings, especially in the eastern European region. As radiation experts were said to be interested, it was evidently

considered that there might be some effect at satellite altitude."

Harold's report has graphs showing very high readings on 6th May, and distribution maps indicating that the high activity passes on the 6th were those closest to Chernobyl. Harold concludes his report by saying that:

"It would be useful to have a report from someone nearer to Chernobyl who was studying the 'live' telemetry. A detailed report from those radiation experts is also eagerly awaited. Needless to say, our sympathies go to those who suffered, or will suffer, from the accident and our best wishes go to those who have the difficult and dangerous job of solving the problems involved."

A sentiment we all subscribe to.


RSGB membership drive

As the RSGB points out in the editorial in *Radio Communications* for June, there are good reasons for everyone interested in amateur radio to become a member of the society. Of the many reasons, one may mention the success they had in getting the 50MHz allocation for amateur radio recently. There is also the Class B morse facility. The morse testing service is another contribution to

the newcomer which is much appreciated. And the 'watch-dog' activities of the society deserve appreciation from all radio amateurs, members and non-members alike. The changed role of the Radio Investigation Service, the vulnerability of amateur radio frequencies, antenna planning problems and so on are typical examples of spheres in which an effective watch-dog service is essential.

There is also the economic side of being a society member. More members mean more subscriptions and thus more money available for services.

Responsible Individuals

So, the society is looking for more members. But not at any cost. They want responsible individuals who will contribute to the work of the society and who will reflect the best traditions of self-discipline, good operating practices and consideration for others; attitudes which have always been a feature of amateur radio. Consequently the society is asking its members to help interest such folk who are not RSGB members to seriously consider joining, so that the society can go from strength to strength, thus ensuring an even better future for amateur radio. 

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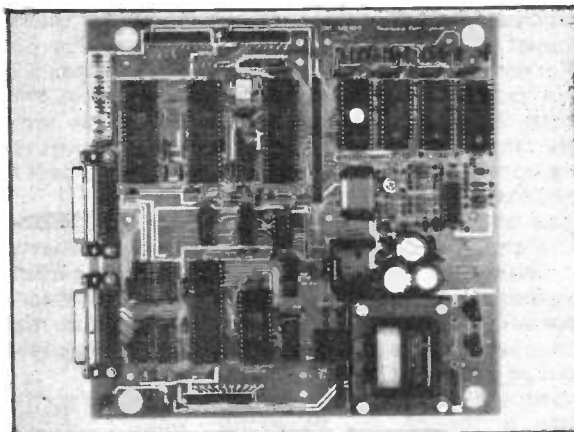
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Icom IC-735 HF transceiver

reviewed by Ken Michaelson G3RDG

It was with great interest that I approached the task of reviewing this new piece of equipment. It is one of the new breed of amateur gear which incorporates the latest developments in computer technology. In addition to the actual transceiver with its power supply, I also had the Icom AT-150 HF automatic antenna tuner to use, together with the serial interface and software giving me a total of 21 commands which would operate the transceiver from my BBC computer.

As my own equipment is by comparison old-fashioned, (a Trio TS820S transceiver and a KW 107 ATU), I had to watch my step. The complete set-up is automatic in operation, and there is no knob twiddling to achieve resonance on a chosen band.

The IC-735 is very small, only 94mm high x 241mm wide x 239mm deep. The power supply is separate and is the same height and depth, but the cooling fins project further back by about 28mm. It is 180mm wide. The AT-150 antenna tuning unit is the same size as the power supply apart from the extra finning at the back of the latter, and the three matching units certainly make a fine-looking amateur radio station.

The transceiver covers all the amateur frequencies from 1.8MHz to 30MHz, including the 10MHz, 18MHz and 24MHz bands, in the SSB, CW, AM and FM modes. It is completely solid-state, and the RF power is stated to be 200 watts PEP for SSB, 200 watts for CW and FM and 40 watts output for AM. The power is continuously adjustable from 10 watts to the maximum at any time.

The microphone supplied with the unit is a 'fist' type 600 ohm electret condenser item with push-to-talk switching and useful scanning buttons for up or down frequency changes. In addition to this the IC-735 acts as a general coverage receiver with a range of 100kHz to 30MHz without a break in all four modes.

The frequency control is a CPU (central processor unit)-based 10Hz step

digital PLL synthesizer, and independent transmit/receive frequencies are available. The 10Hz steps can be adjusted to a greater degree of accuracy if required by the RIT (receive incremental tuning) control. The frequency read-out is in the form of a six-digit liquid crystal display to the nearest 100Hz. The frequency stability is of a high standard, being, according to the published specification, less than $\pm 200\text{Hz}$ from one minute after switch-on to 60 minutes, and less than $\pm 30\text{Hz}$ after one hour at 25° Celsius.

Specification apart, I can tell you that I used the unit as a receiver to copy FAX weather broadcasts on the HF bands, where absolute stability is essential to achieve satisfactory results, and it performed perfectly. I was able to leave everything running and return to find that there had been no drift and the print-outs were faultless.

Receiver section

The general coverage receiver section is a triple conversion superheterodyne with continuous bandwidth control. There are three intermediate frequencies, the final one being the usual 455kHz. The sensitivity is stated to be less than $1.0\mu\text{V}$ for 10dB S/N from 0.1-1.6MHz and less than $0.15\mu\text{V}$ for 10dB S/N from there up to 30MHz for SSB and CW. The figures for AM are less than $6\mu\text{V}$ for 10dB S/N from 0.1 to 1.6MHz and less than $1\mu\text{V}$ from there to 30MHz. FM sensitivity is less than $0.5\mu\text{V}$ for 12dB sinad.

The selectivity is stated to be 2.3kHz at -6dB and 4kHz at -60dB for SSB and CW, 6kHz at -6dB and 18kHz at -50dB for AM, and 15kHz at -6dB with a figure of 30kHz at -60dB for FM.

The unit reviewed was fitted with the FL-32A CW filter, available as an extra, which could be brought into use either in the AM or CW mode: particularly in the CW mode it was quite amazing the way any interfering signal could be disposed of by bringing in the filter. The passband of the filter is 'more than 500Hz at -6dB'

and 'less than 1340Hz at -60dB'. In use I found that there was all the selectivity and sensitivity required, particularly with the use of the notch filter, passband tuning, the RIT facility and the CW filter.

The equipment takes a fair amount of current, requiring approximately 20 amps at 13.8 volts for full transmitting output. Of course, in the receive mode the current required is considerably less, being 1.5 amps at maximum audio output and 1.2 amps when the squelch is in use. The power drawn at full load from the mains supply is 450 watts, and the 20 amp output at 13.8 volts is based on a 50% duty cycle, 10 minutes on and 10 minutes off. It is to be hoped that an operator does not continue transmitting at full output for more than this time. Frankly it seems unlikely, ten minutes being a long time to talk without a break!

The whole assembly will, of course, run from a nominal 12 volt car battery, and a special dc power cord is supplied. The manual suggests that one runs the car engine while transmitting, and points out that the engine should be started before switching on the transceiver.

Easy operation

It took a while to become familiar with the equipment in use because, as previously mentioned, my own rig is so vastly different. It was quite an experience just to turn the main tuning knob to the desired frequency and discover that not only was it unnecessary to 'tune and dip' the PA, but the antenna tuner also worked by itself and tuned the antenna for the lowest SWR!

There are a great number of controls on the front panel. On the left there is a column of four: power on/off, audio output concentric with squelch, phone input and microphone input. The next column starts with a transmit/receive push-on/push-off button. Obviously most microphones, including the one supplied with the rig, have a 'push to talk' switch, so normally the manual switch is not used, but of course it would be operated when transmitting CW without 'break-in'.

Below this we have the four mode switches for SSB, CW, AM and FM.

A little further along is the meter, which acts as a power output indicator, SWR meter and ALC indicator when in the transmit mode and as an S meter when receiving. There is a switch on the back panel marked 'PO', 'SET' and 'SWR', and in order to check the SWR reading one has to place this switch in the SET position and inject an FM signal of low value. Then adjust the output of the signal by means of the 'RF power' control in the front recess until the needle of the meter comes up to the SET position on the meter dial.

Below the meter are five knife-shaped push-on/push-off buttons which control noise blanker on/off, attenuator on/off,

preamp on/off, AGC slow/fast and COMP (speech compressor). The noise blanker level can be altered by means of one of the controls situated in the recessed box below. Other controls in this recess are RF gain, RF power (out), VOX gain, VOX delay and mic gain. Below these controls and also in the recess are six push-on/push-off switches, AM (filter) wide/narrow, CW (filter) wide/narrow, Meter ALC-Power, VOX on/off, Break-in full/semi and Speed Elec Key/manual.

In the centre top of the front panel is the liquid crystal display which shows the state of a number of functions in the transceiver. Frequency, transmit / receive, mode and Memory Channel number are obvious, but perhaps the others (scan, VFO A or B and split) need a little explanation.

Duplex operation

There are two VFOs in the unit so that one can operate duplex or simplex. When operating duplex it's possible to transmit in one mode and receive in another, which is quite something (although I can't really imagine where one would do this). When working duplex the display will show 'split' in addition to whichever VFO is in use at the time.

Immediately underneath the display area is the tuning knob, which has a very smooth feel to it, and has an adjustment for a brake, called 'tuning control tension' in the manual. To the right of the tuning knob are four more push-on/push-off switches. The top two move the frequency either in kHz or MHz steps, and final trimming, if required, is carried out by the RIT control.

The switch below this requires explanation, it being the first time I have come across a rig which has such a facility. It is labelled 'HAM': with it switched on, when the tuning knob is rotated the unit automatically (!) switches from one ham band to the next making the appropriate mode changes, eg LSB below 7MHz and USB above. It is a continuous cycle, so that when the knob is rotated anti-clockwise the frequencies go downward until they reach 1.8MHz and then start at 29MHz and go downward again. Turning clockwise gives the opposite effect, of course.

Not only does it do this, but it also automatically operates the antenna tuner to provide the correct tuning for the band desired. This HAM switch has priority over both the kHz and MHz switches.

The last of these switches is labelled 'SCAN' and brings into operation the scanning of the memory channels in various ways which will be described later.

At the top right of the front panel are 'VFO', 'A=B' and 'SPLIT'. Pressing VFO either brings up VFO A or VFO B alternately. A=B means simply that one

makes VFO A equal to VFO B, and SPLIT gives two VFOs on different frequencies, for, say, duplex working.

Below the VFO switch is a knob called 'PBT' (passband tuning). This narrows, by electronic means, the bandwidth of frequencies which are allowed to pass through the filter. Alongside this is the 'notch' control, which can be switched in or out by the button immediately below it. These two facilities were of great help when attempting to resolve signals on the crowded bands, particularly during a phone contest over the Easter weekend.

To the left of the notch switch is the 'RIT' (receiver incremental tuning) knob. This will shift the receiver frequency $\pm 800\text{Hz}$ from the display figures. It does not, however, alter the figures shown on the display.

This brings us to the memory operation and 'SCAN'. There are twelve memories which can be programmed from either VFO A or VFO B, and these are programmed to include the mode used. Thus when finding Radio 2, say, the unit is placed in the AM mode and the frequency is stored with that mode. Similarly, tuning to the calling channel for AMTOR on 3588kHz one would be using USB, and again this information would be stored.

The five switches below the RIT knob are 'MEMO' (memory recall), 'MW' (memory write), 'M-VFO' (return to 'VFO' operation) and memory channel 'Down' and 'Up'. By pressing the scan button the unit will either scan all the memory channels consecutively if in the memory mode, or if in a VFO mode will go up or down in either kHz or MHz steps according to which button is depressed. There is also a limited scan facility for scanning a particular portion of a band.

There are more controls situated on the back panel for speech compressor level, microphone tone, AM carrier and anti-vox control. On the bottom panel are two more controls, the receiver audio tone adjustment and the CW sidetone volume control. In addition there is a slide switch which adjusts the power output to either 50 or 100 watts. Access to this can only be obtained by removing the underside panel.

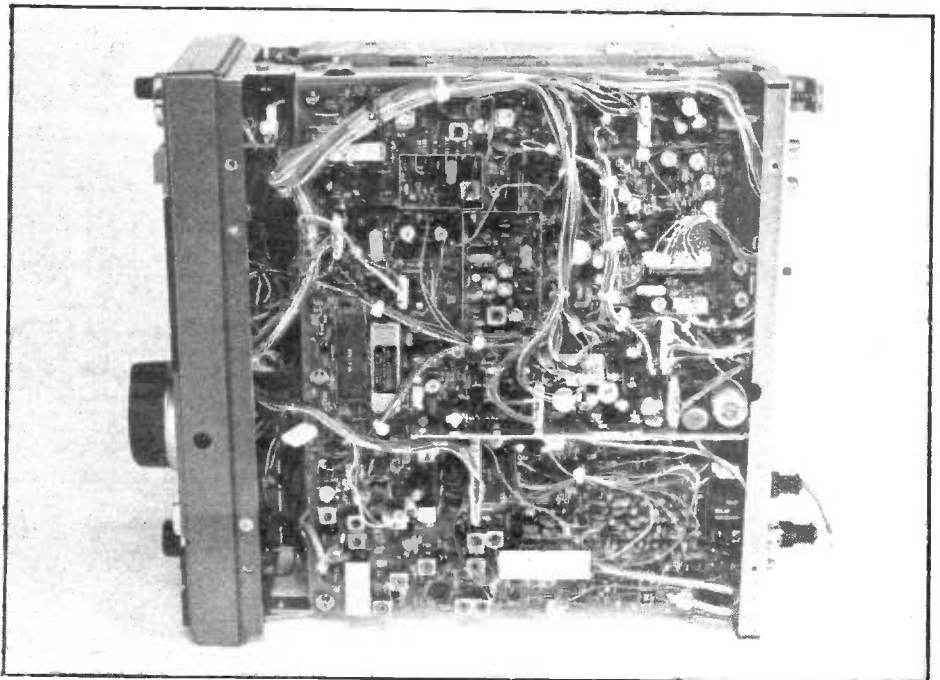
There is a control on the left-hand side for adjustment of the display illumination, and finally a 25kHz marker switch and a scan timer switch, access to which again can only be obtained by removing the top cover.

Automatic ATU

A brief comment about the AT-150 automatic antenna tuning unit now seems in order. I must say I was vastly impressed with this unit, which takes its power from the main transceiver via a specially made lead. It will accommodate three nominally 50 ohm co-ax leads plus a long wire antenna, and one can operate it 'straight through' or on 'auto tune'. A red light comes on while the unit is tuning, and should go out when the job is completed. A green light shows the band in use.

I started operating with an inverted L antenna, but with this the bandwidth was very narrow. However, I changed to a Sagant EL-40X 40/80 metre dipole erected horizontally which improved conditions considerably. The AT-150 can cope with a VSWR of up to 3:1 and can take an input of 100 watts (200 watts PEP). The band switching time is given as 3 seconds or less and the auto-tuning time is the same.

Moving on to the transceiver's opera-



IC-735 USER REVIEW

tion, the first contact I had was on 80 metres (after some time spent studying the manual, or rather three manuals: one for the transceiver, one for the antenna tuning unit and one for the power supply module). The ease with which one can shift from band to band with this rig is really something to be experienced. No more five minute retunes after remarking 'Let's try 40' when on 80, for instance, as I've experienced in the past. Just turn the knob to the desired frequency and that's that! The ATU works by itself and the PA in the rig is wideband so it requires no tuning (is this taking some of the fun out of amateur radio operating, one wonders...?).

However, to continue. One of the unit's attributes was the beautifully engineered tuning drive. It was absolutely smooth, with no play whatsoever. What's more, frictional resistance to turning could be adjusted to the operator's requirements by the brake facility.

When operating on 80 metres in the evening the 'notch' filter was a blessing. Without exaggerating, at times it would have been impossible to complete a QSO without it. And, of course, one mustn't forget the passband tuning. This facility could be used either in conjunction with the notch filter or on its own, to drag a station out of the noise and make it readable. Both very useful aids.

Operation in the AMTOR mode, without any modification, was most satisfac-

tory, and I established several long contacts. As far as the 'fist' type microphone had up and down buttons for frequency selection made operation extremely simple. It was not even necessary, on some occasions, to touch the tuning knob. Mere pressure on the required button was sufficient.

Computer controlled

This brings us to one of the latest facilities available on 'state of the art' units: complete control of transceiver operation from a home computer. In my case the micro is a BBC Model B, and this required a simple serial interface, the JT602, for it to function.

Data is sent via the RS423 port of the micro and the remote socket on the rear panel of the transceiver. An additional connection has to be made, however, and I had to open up the unit to connect a wire from diode D98 on the main board to accessory socket number 1, pin 1. This gives the varying voltage to display the 'S' meter on the screen. The other two connections, 0 volts (earth) and +5 volts for the TTL input from the computer go to a normal 3.5mm plug.

There is, of course, either a cassette or a disc with the necessary software on it. In my case it was an 80-track disc, and it just had to be 'booted' and I was away. As already mentioned there are 21 commands plus H for help available. In the

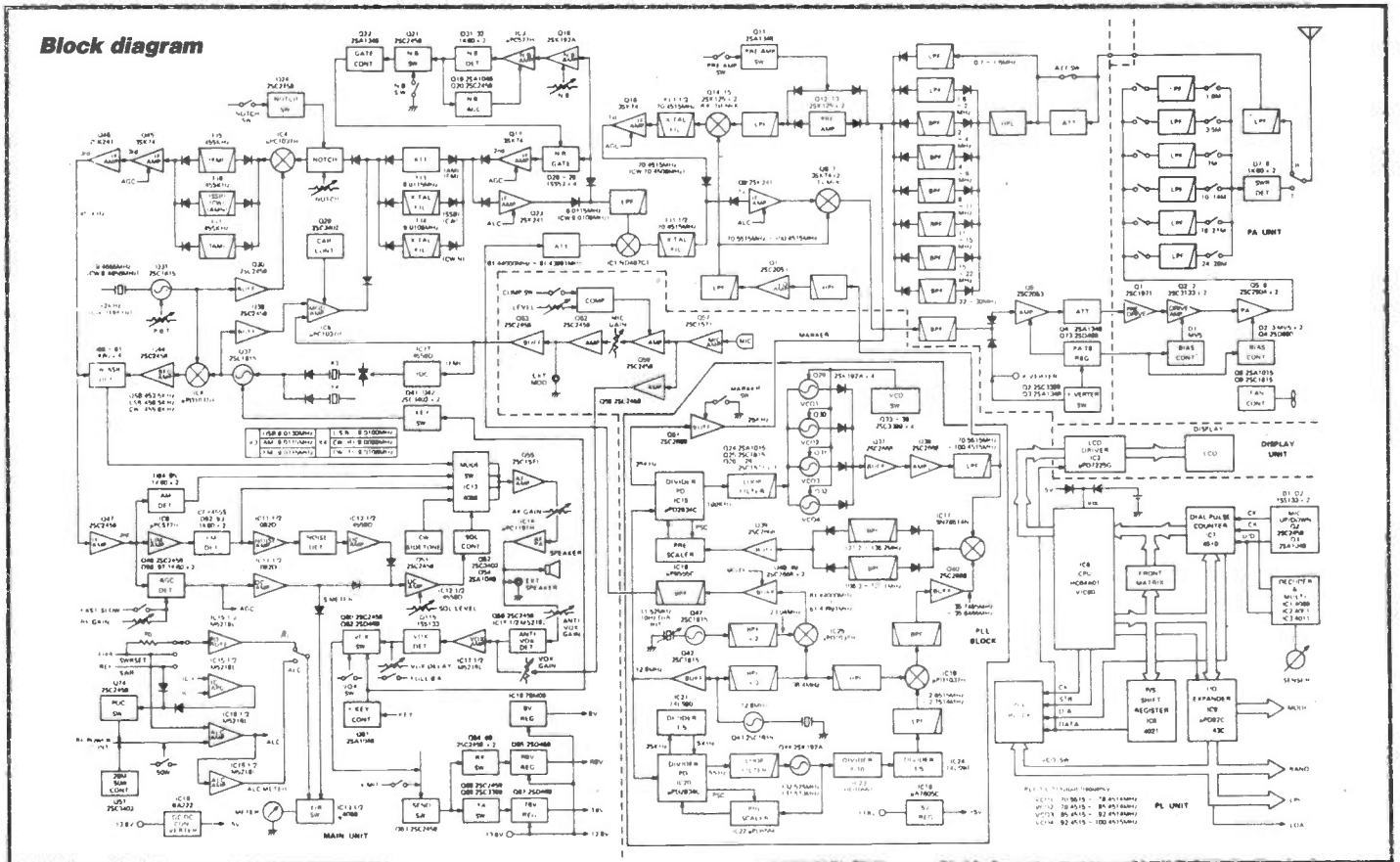
case of the BBC all ten function keys are used, together with the cursor arrow keys and things like '/', '@' and ':' to give the necessary commands. One of the interesting things is that although the actual transceiver has only 12 memories, when this software is used 99 memories are available.

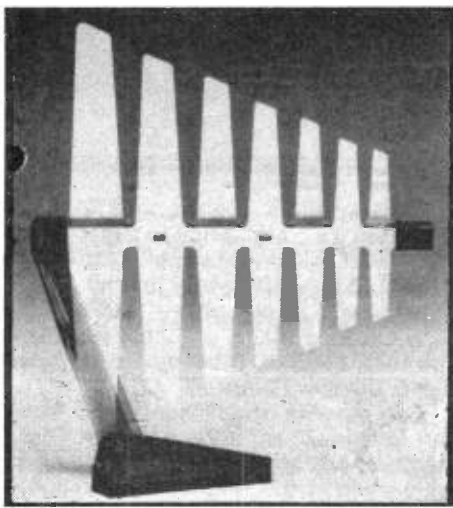
As a user I only have one grouse: the controls under the flap in the front of the unit are very fiddly to operate. On a unit as expensive as this one shouldn't have to operate the RF gain, mic gain etc with a finger-nail.

Furthermore, it seems a great shame that controls like receiver audio tone and CW sidetone volume are so randomly placed, some underneath, some at the side and others which cannot be altered unless the top or bottom cover is removed. Admittedly these controls are only used occasionally, but even so they could be more conveniently sited.

Aside from these criticisms everything's just dandy. The cases of all three units are steel, and the general appearance of the circuit boards is, if a trifle cramped, very workmanlike. In short, performance is impressive, and providing one reads and understands the owners' manual the facilities offered are more than any radio amateur could possibly want. I like it very much, and to have to return to the old-fashioned method of 'tune and dip' on my old rig now appears like hard work!

REW





THE SILVER SENSOR

No, not a new variety of space-age Durex! A new high performance set-top aerial that can provide picture quality similar to an outdoor array.

A USER REVIEW

by Garry Smith and Keith Hamer

Most television service technicians frown upon the use of indoor set-top aerials because they are so often the perfect recipe for unnecessary service calls. Their use can give wide variations in picture quality of the four different TV services. It is quite common for one channel to be of adequate clarity while the remaining three may have more ghosts than a haunted house.

Some of the cheaper set-top aerials available, and indeed the loop or rod type supplied with portables, only seem to function satisfactorily when used within a stone's throw of the transmitter. The poor polar response of such an aerial means that the picture may be influenced by movements within the room. Consequently, as soon as aunt Mabel lifts her behind off the sofa to pluck a banana out of the fruit bowl on the sideboard, the colour invariably vanishes!

Now a new high performance set-top aerial has just been released by Antiference. It is called the 'Silver Sensor' and apparently has taken two years (and £250,000) to develop. It is considered by the manufacturers to be a major step forward in set-top aerial design. Under normal reception conditions the Silver Sensor can, in many cases, provide the same picture quality as an outdoor array.

The concept of the Silver Sensor is, of course, not new. It is based upon a log-periodic design in which any given element is active at a particular frequency within its designed operating bandwidth. One major factor which contributes to the high performance of this aerial is the use of elements with large surface areas.

Most other set-top aerials are based on the yagi principle where the dipole is the only active element cut to a specific frequency. The reflector and directors are passive and cut in such a way as to give a compromise in performance in terms of gain and polar response over the UHF spectrum. Usually with a wideband yagi the rods are cut to enhance the performance on the higher channels; the gain of the array is therefore not constant throughout the band.

The polar response of a wideband design often leaves something to be desired, especially on the lower channels. Consequently, signal pick-up from

the sides can be a problem, resulting in ghosting and undesirable effects due to movement within the room.

An aerial based on the log-periodic principle overcomes these problems to a large extent. The polar response is constant throughout the operating bandwidth of the aerial, and theoretically no readjustment should be necessary when selecting different channels, assuming that the signals are being received from the same transmitting site.

Practical results

So much for the theory: what about the actual results obtained from the Silver Sensor?

To be honest, there was an immediate feeling of scepticism as soon as the small, slim package arrived from the Editor for review.

The aerial comprises three parts, namely the array itself, the base and the support. These are easily clipped together, although reference to the picture on the box is necessary since the accompanying slip of paper showing base assembly was somewhat confusing.

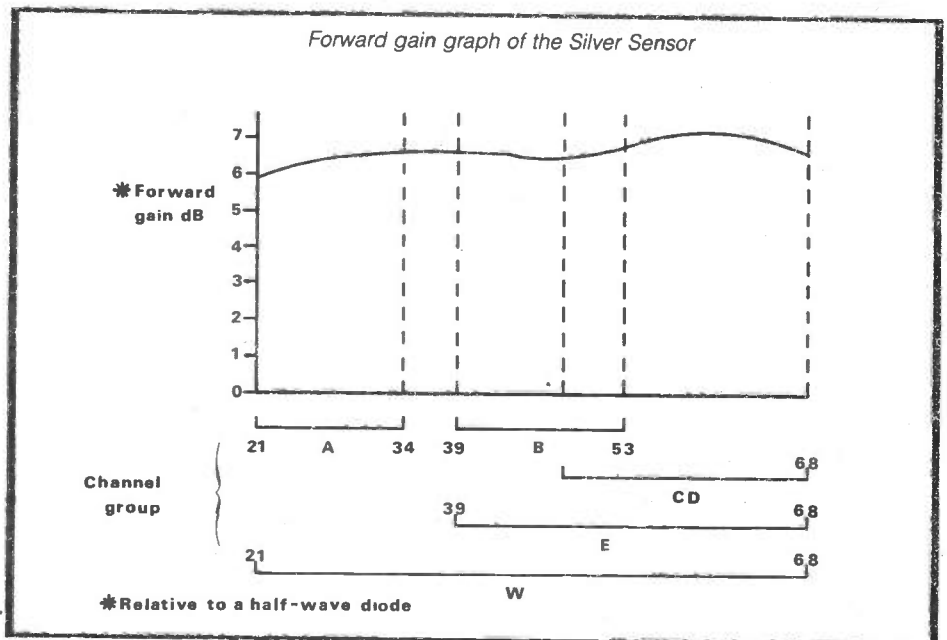
Once assembled the aerial looks very space-age with its solid aluminium planar elements, dark grey base and smoked plastic support arm. The array can be quickly adjusted to suit either

vertically or horizontally polarised transmissions simply by unclipping the array from its support arm and rotating it through 90 degrees.

The Silver Sensor was tried at a couple of locations in excess of 22 miles from the nearest high power group B transmitter and thirty miles from a high power group C/D outlet. Initial scepticism was replaced by enthusiasm upon connecting the aerial to a TV set. Performance matching that of a grouped loft aerial was obtained from the Sutton Coldfield transmitter.

Actually, the Silver Sensor improved the results of Channel 4 reception (this state of affairs must be investigated!), although it had to be rotated slightly for optimum quality on the BBC-2 channel. The same effect was observed with another set-top aerial from a different manufacturer, so the one sent for review wasn't in any way to blame. Results from the Waltham transmitter were equally impressive.

The aerial was next tried in a rear room where signals had to penetrate several walls and the adjacent neighbour's property in order to reach the array. Again, results were impressive with viewable pictures in colour. In an upstairs room, signals from a 2kW group A relay station were resolved but in



SILVER SENSOR REVIEWED

monochrome only. Further up the band, line syncs from the Wrekin transmitter (some seventy miles away) were detectable.

This particular observation may be of little importance to the average viewer, but the aerial's obvious potential for the DX-TV enthusiast must not be overlooked. There must be many TV DXers who are flat-dwellers or perhaps are unable to erect external arrays. Years ago, TV programmes from West Germany, France, Belgium and the Nether-


lands were seen using a typical loop aerial attached to the rear of a portable set. It's a pity the Silver Sensor wasn't around for review fifteen years ago!

During evaluation a colleague offered to lend another make of set-top aerial based on the log-periodic design to permit comparison tests. Without doubt the performance of the Antiference array was noticeably better.

The suggested price for the Silver Sensor is expected to be in the region of £10.00 and should be available from most

TV retail outlets. The average TV viewer may feel it's a high price to pay for a set-top aerial, but having sampled the results it should be worth every penny.

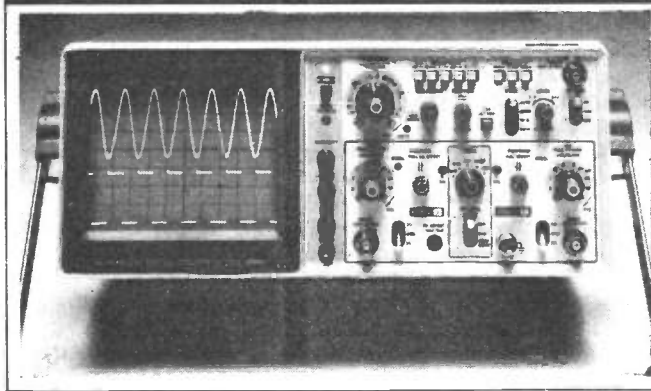
Further information about this impressive aerial is available from Antiference Limited, Bicester Road, Aylesbury, Buckinghamshire.

For readers requiring details about other types of aerials suitable for TV and radio reception there is our article on this topic in the August 1983 edition of *Radio & Electronics World*. 



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COMPUTERS, RADIO RECEIVERS

AND

INTERFERENCE

Joe Pritchard explains . . .

Recently, spurred on by an urge to combine my two main hobbies of amateur radio and computing, I built an FSK decoder to convert morse code tones from my radio receiver into TTL signals for input into the user port of my BBC microcomputer. On wiring up all the bits and pieces, I suddenly became painfully aware of the amount of radio frequency interference generated by microcomputers. Most of the signals received by my receiver now seemed to be generated by the micro rather than by official radio transmitters.

It is rather ironic that a computer endorsed by the BBC should cause so much interference. However, it's not just the Beeb that causes trouble, most microcomputers that I've come across generate RFI to some degree. Unlike in the States, where the Federal Communications Commission ensures that all new products generate as little interference as possible, we seem to be quite happy to have all sorts of rubbish generated by our gear. In this short article I want to look at why this is so, and some possible ways of reducing the interference.

Where does RFI come from?

The passage of data around a computer circuit involves signals switching between 0 and 5V, as often as a few million times a second, with rise times of tens of nanoseconds at the most. This means that radio frequency signals are generated at the frequency of switching, and at multiples of this frequency due to the square waveform involved. This results in the computer acting as a broadband transmitter, capable of emitting signals into the VHF area of the spectrum - just try holding a receiver tuned to around 90MHz or so near a computer running a program! In addition, if a TV output is provided there is the intentional production of radiation on channel 36 for input to the television receiver.

The monitor or TV receiver used also generates interference. A TV set typically generates its high voltages

using a switching circuit and a transformer. The usual switching frequency employed is around 15kHz, and so harmonics of this frequency are audible all around the LF, MF and HF spectrum; a kind of poor man's frequency marker! Monitors generate similar problems. Other parts of the computer system, such as printers or disc drives, don't seem to generate as much noise as the monitor and computer.

How does the noise get to the radio?

There are three main routes:

Radiation: The receiver picks up RF signals through its aerial, as if they were normal radio signals.

Mains Injection: There are two routes in this category. The first is simply that the computer injects noise into the mains wiring, and hence the radio receiver, taking power from the mains, receives the RF signals circulating there. The second route is radiation from the mains wiring in the house. RF signals enter the mains from the computer, and the mains wiring then radiates the RF, acting as a simple aerial. In this case, the radio receiver does not need to be connected to the mains to be interfered with.

Direct Injection: This situation covers those cases where there is a direct electrical connection between a part of the computer system and a part of the radio system. RF signals circulating in the computer are passed by the connecting leads into the radio circuitry. *Figure 1* shows a typical source of direct injection interference.

Getting rid of interference

We've discussed the sources of interference, now we want to deal with the problem. To begin with, I will direct you to two books which I have found very useful. These are *Radio Servicing Pocket Book* by V Capel, published by Newnes, and *The Radio Communication Handbook* published by the RSGB. Both these books have sections on interference and should be used to supplement the information in this article.

Each of the aforementioned interfer-

ence 'entry routes' are dealt with in different ways, but you are likely to suffer from all of them to some extent.

The radiation problem can be eradicated by totally screening the computer by lining the case of the micro with metal foil and earthing the foil, or by spraying the case with a metal based paint and earthing this. The paint used, of course, should be selected so as *not* to affect the plastics used in the case. Care should be taken to make sure that there are no shorts between the PCB of the computer and the metal screen.

This solution is only 100% effective if the whole of the case is screened; breaks in the metal lining will cause RF 'leaks' which can still cause severe interference. Thus, you would have to find some means of screening the keyboard of the computer. I would try everything else before attempting this screening option.

Removing the computer from the proximity of the radio receiver will also reduce interference. Try and use an external aerial, running away from the computer as far as possible, with screened coaxial cable between aerial and receiver to cut down pick-up of computer signals between the aerial and receiver. In my own shack I have the radio and computer about 5 feet apart, and this cuts down interference by radiation quite nicely.

Direct injection via the mains can be solved in a simple if expensive way by running the radio on batteries. This breaks the link, via the mains, between computer and radio and will decrease the interference.

However, to clear up the problem totally it is necessary to prevent the noise getting into the mains from the computer. This can be done by putting a low-pass filter in the mains lead to the computer which prevents the passage of RF into the mains wiring of the house. It consists of a simple 'pi' or 'T' filter.

Typically, these filters begin filtering RF signals out at a frequency of around 150kHz, the amount by which the RF is decreased increasing with frequency. The important thing is to make sure that the RF filter selected can handle the current needed by the computer; for a computer with a 5 amp fuse, use a filter rated for 5 amps or above. These filters are put between the mains supply and the computer.

Simple filters can be built at home, but I don't like to fiddle with mains electricity too much. Suitable filter designs can be found in the *Radio Communication Handbook* from the RSGB.

Try to power the computer and the radio receiver from different power outlets; try and avoid double adaptors or four-way distribution boards. Even better, but not feasible in most houses, is to have the computer and radio powered from different 'rings' of the mains power supply to the house.

Use of filters in this way will cut down the radiation from the mains cable. In addition, the cable supplying the computer should not run near to any of the cables supplying your radio or by the aerial lead for the receiver.

Direct injection

The final route for interference to get into your receiver is via a direct electrical connection of some sort. What type of connections are made between the receiver and computer? Well, a common set-up, like the one I use, is to take an audio signal from the receiver and feed this to a phase locked loop tone decoder circuit of some sort which generates a TTL output when a tone of a certain frequency is present at its input. The tone input to the PLL can come from a morse code signal, or an RTTY signal.

The TTL signal can then be passed to the input of a computer user port or other logic circuit. There is thus a direct link, as shown in *Figure 1*, between the ground of the computer and that of the radio receiver. In addition, it is possible that the PLL circuit and any accompanying electronics could generate additional interference.

It is thus necessary to 'break' the connection between the computer and the receiver as far as RF signals are involved in order to minimise interference. The simplest way to do this is to insert RF filtering between the receiver, PLL decoder (or whatever electronic equipment is used to interface receiver and computer), and the computer. *Figure 2* shows a few methods.

Total isolation

I tried the above isolation techniques on my rig but still suffered from some RFI. Finally, I constructed the simple interface shown in *Figure 3*, which is put between the PLL decoder and the computer user port. This will work on any computer system and requires a TTL level input and gives a TTL level output. The 5V supply could be taken from the computer, but shouldn't be taken from the PLL decoder or receiver; this would defeat the object of using the optoisolator.

Note that there is *no* direct connection between the TTL input, which will come from the PLL decoder, and the TTL output, which goes to the computer. A '1' input to the circuit in *Figure 3* will give a '1' output and vice versa. If you want a '0' output for a '1' input then simply omit the inverter package. This circuit proved to be very useful and totally removed direct injection RFI.

A combination of the techniques mentioned in this article allowed me to use my Beeb and my receiver together for RTTY and morse decoding with little interference. I hope that it will help you with any similar problems that you might be having.

REW

Fig 1 Showing the direct link between the ground of the computer and that of the radio receiver

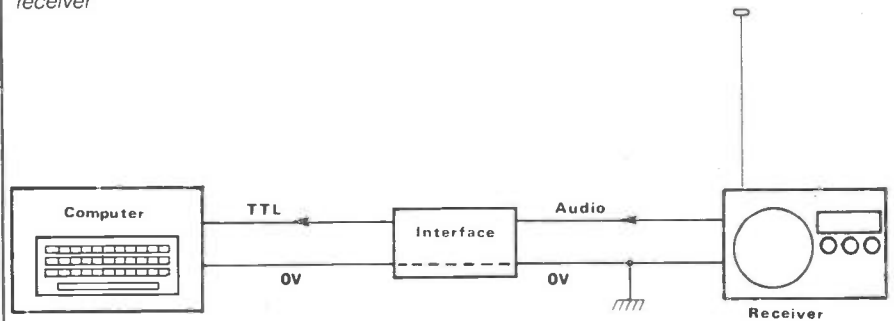


Fig 2 Methods of 'breaking' the connection between the computer and the receiver to minimise interference

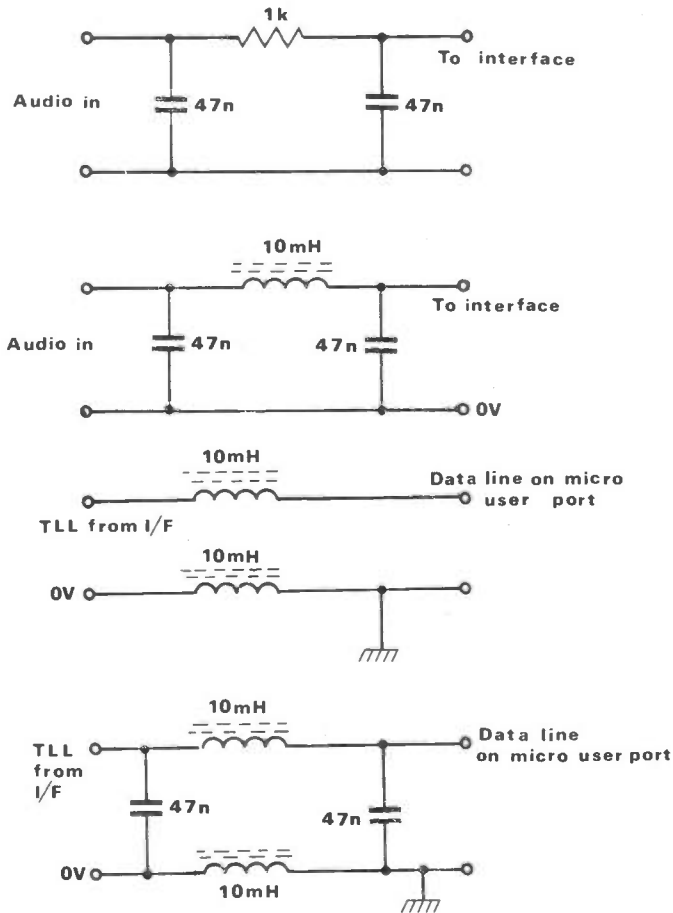
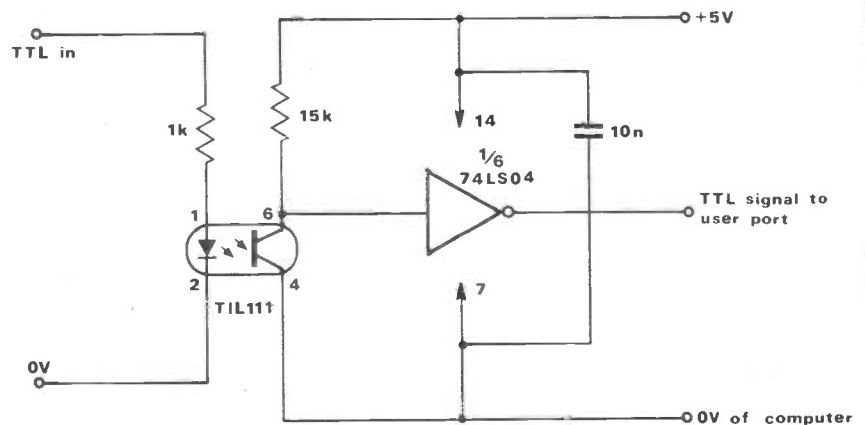


Fig 3 Simple interface which is placed between the PLL decoder and the computer user port



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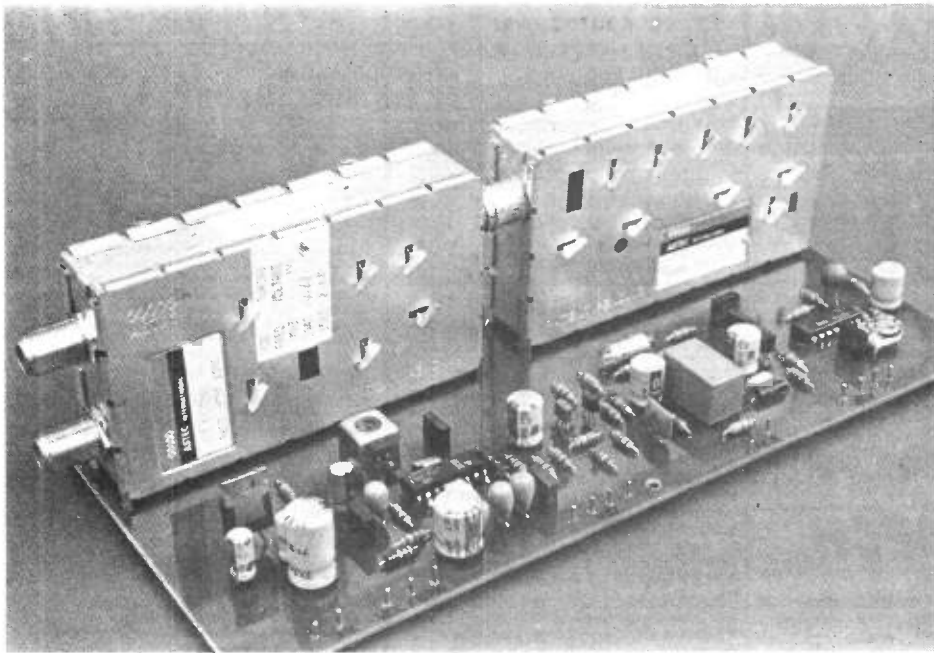
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TVRO RECEIVER



Impress your friends and be the envy of your neighbours with your own satellite TV set-up

John Wood G3YQC

A little while ago Astec announced two new modules intended for use in satellite TVRO (television receive only) receivers. Thanks to the valuable assistance given by Rob Nicholls of Astec Europe, CQ-TV has had the opportunity of evaluating the units and has produced a complete receiver module design. It includes not only video processing, but also a single chip intercarrier sound demodulator which can be configured for any of the broadcast sound systems.

AT-1020 TVRO TUNER HEAD

This unit is a dual input TVRO tuner which accepts a standard 950 to 1450MHz signal from a block downconverter (LNB) and produces a 612MHz IF output. The AT-1020 is intended for use in a block conversion satellite receiver. Its features include:

- 950 to 1450MHz block IF, minimising UHF/VHF interference from other services.
- 612MHz IF, eliminating image and in-band interference problems.
- VCO on 1564 to 2060MHz eliminates interference between receivers.
- Dual inputs for horizontal and vertical polarizations, or C and Ku IF signals.
- Built-in ± 256 prescaler for external frequency synthesizer.
- Conversion gain of 30dB min.
- 7dB typical noise figure.
- Wide range for input signals.
- Standard TVRO F connectors for RF

input, Belling-Lee output connector. External gain control for cable loss compensation.

A gain control range of 30dB (typ) can be achieved by applying between 0V and +12V to pin 7, maximum gain being achieved at 12V. The VCO operates in fundamental oscillation mode and a tuning voltage applied to pin 4 can tune the VCO from 1564 to 2060MHz.

The dual RF inputs (A/B) are provided for both horizontally and vertically polarized signals and are switched by an internal relay; +12V on pin 2 selects A, and 0V selects B. An LNB supply pin is provided which conveys the voltage applied to it up the coaxial cable centre conductor in order to power the block downconverter (max +35V).

The AT-1020 pin connections are shown in *Figure 1*.

AT-3010 TVRO IF/DEMODULATOR

The AT-3010 is a TVRO IF/demodulator which accepts a 612MHz IF input signal and provides a composite baseband signal output, and is intended for use in conjunction with the 1020 tuner head.

The module incorporates a surface acoustic wave (SAW) IF filter which provides excellent adjacent channel rejection. The IF filter switch can extend the noise threshold by suppressing the 602MHz and 622MHz signal frequency by at least 5dB, which results in an improvement in noise threshold of

around 2dB and is a very useful facility for assisting the reception of weaker signals.

IF demodulation is achieved by the use of a single-chip quadrature FM discriminator and a level limiter, the input of which is at the IF frequency of 612MHz. The baseband video output level at pin 6 is dependent upon the deviation of the received transmission; typical amplitudes lie between 0.5 and 1V p-p when terminated in 75 ohms.

Wideband operation is achieved with +18V applied to pin 1, whilst 0V switches in the threshold extension filter. The automatic gain control voltage on pin 2 rests at around +12V with no signal applied, and reduces depending on signal strength. The signal strength meter drive output rests at around +17V with no signal, which again reduces depending on signal strength.

The baseband video output impedance is 75 ohms. Constructors should note that ac coupling is recommended as applying more than +5V to this pin could result in damage to the demodulator.

The AT-3010 pin connections are shown in *Figure 2*.

Circuit considerations

When deciding upon suitable circuitry to use with the two modules several considerations had to be borne in mind.

First, the video circuits needed to be kept reasonably straightforward without sacrificing the essential facilities. Since the receiver could be used with a variety of signals (commercial, amateur, wide/narrow deviations), a wide range of video amplitudes from the demodulator could be expected, so it was considered essential to provide some form of video gain control. Since it is also desirable to have a video invert facility, I felt that the obvious gain controllable amplifier to use would be the NE592 (uA733).

Of course a CCIR de-emphasis facility should be provided, and this has been included on-board and controlled by a changeover relay.

As it is often desirable to drive more than one display device from the video output, an output driver has been used which has two outputs on-board, although a couple more can be added if necessary. Each output will provide 1V p-p across a 75 ohm termination.

There are several sound systems in use, and skysearchers will no doubt have their own preferences for intercarrier sound demodulators. Nevertheless I felt it essential to provide an on-board sound demodulator. The choice of the TDA1035 was made mainly because it is well-known in domestic TV circles, is widely available and does the entire job in a single chip.

The circuit and parts list give component details for the UK 6MHz intercarrier sound system. However, it is possible to change these components for other

frequencies, and the table suggests some alternatives.

Freq	C9	C4	F1
5.0MHz	800pF	680pF	SFE5.0
5.5MHz	650pF	560pF	SFE5.5
6.5MHz	470pF	390pF	SFE6.5
7.0MHz	400pF	350pF	SFE7.0
7.5MHz	350pF	300pF	SFE7.5

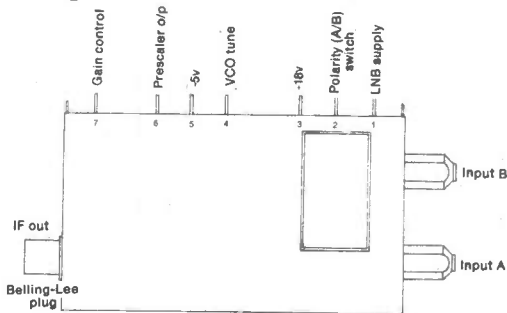
(capacitor values are to the nearest 10pF and are calculated only)

Just changing the capacitors means that the specified inductors are retained. It is not certain whether SFE ceramic filters are available for all the listed frequencies, so constructors will need to ascertain this for themselves.

The Comex Systems board has an extra pin at its edge (compared with the BATC board) to enable an intercarrier sound signal to be brought out to an external demodulator. The signal level available should be sufficient to drive two demodulators without further amplification.

The whole unit requires +5V, +12V and +18V rails. The +18V, and more particularly the +12V, draw a fairly high current and need heatsinks on the regulators. There is insufficient room on the board for all the regulators, but since the +5V rail draws a modest current its regulator is mounted on the board and driven from

Fig 1 AT1020 TVRO tuner head



+12V. This 5V rail is only needed to power the LO prescaler in the tuner and may be omitted if this facility is not required.

Circuit description

The complete circuit diagram of the receiver board is shown in Figure 3 (excluding module connections). Composite video from the demodulator is applied to the input of an NE592 wideband video amplifier via a 75 ohm matching resistor. Since the level applied to this amplifier is relatively high, the range of gain has been restricted to between 1.0 and 15.0.

Either positive or negative-going video is available at IC1's output and the selected signal is passed to an emitter follower (Tr1). This stage provides a low impedance output to the de-emphasis network, and it has also been provided with a sound trap in its emitter circuit. The values shown are for 6MHz, but other frequencies can, of course, be used instead.

The de-emphasis network is a well-known circuit, and is switched in or out by a miniature relay. In theory an attenuator equal to the loss through the de-emphasis network should be provided for 'straight through' video. On test, however, the difference in output level was considered small enough to be not worth the effort. Thus the component count is kept down.

Video is then passed to a distribution amplifier which has a gain of four. A number of independent outputs can be taken from this circuit, although only two are provided on-board.

The intercarrier sound signal is extracted from the output of IC1 and passed to a ceramic filter via a matching resistor. IC2 is a limiter, amplifier, audio preamplifier and audio power amplifier all in one package. A single ceramic filter provides adequate selectivity, and a fairly non-critical quad tuned circuit contains the only frequency determining

components. Audio gain control is accomplished electronically by a 10k linear potentiometer. The audio output voltage drives a 15 ohm loudspeaker, and more than sufficient volume for normal needs is available (around 1W).

In the interests of simplicity and versatility no extra circuitry associated with the various facilities provided by the two modules has been incorporated, with the exception of an optional resistive potential divider for range setting the tuning control.

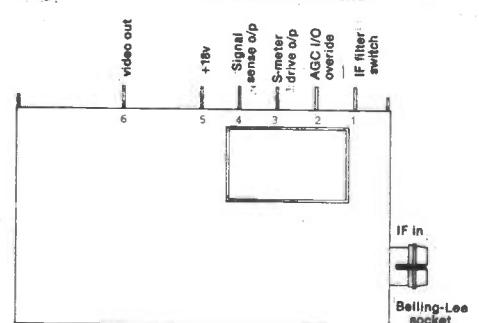
Printed circuit board

A printed circuit board has been designed for this project. It measures 8.4 inches x 3.9 inches, is single-sided and comes complete with a layout diagram.

The two modules are intended to plug directly into each other via the IF input/output connectors, one being a plug and the other a socket. This method of construction obviates the need for a coaxial coupling lead and ensures a loss-free transfer of signal from tuner to IF with maximum screening. The modules are mounted on edge and soldered into the PC board (see photo). However, they should not be installed until after preliminary checks have been carried out.

Each of the pins to which access may be needed (with the exception of the

Fig 2 AT3010 TVRO IF/demodulator



Description	Max	Typ	Min	Unit
RF input level (@VG=0V)	-25	-	-45	dBm
RF input level (@VG=12V)	-40	-	-70	dBm
Dual input (A/B) isolation	-	28	24	dB
IF output frequency	-	612	-	MHz
Conversion gain	-	36	30	dB
Gain control range	-	30	28	dB
3dB IF output bandwidth	-	45	24	MHz
Image rejection (950-1450MHz)	-	60	-	dB
Noise figure	9.5	7	-	dB
VCO tuning voltage - 1582MHz	-	2.4	0.8	V
2042MHz	17.5	13.0	-	V
VCO output frequency - VCO=1582MHz	-	6.18	-	MHz
VCO=2042MHz	-	7.98	-	MHz
Prescaler O/P level	1.2	1.0	0.8	Vp-p
Polarity switch voltage 'A'	13	12	10	V
'B'	1	0	0	V

B+ supply = 18V ±5%
Vcc supply = 5V ±5%
Astec specification details - 1985

Description	Max	Typ	Min	Unit
IF input frequency	-	612	-	MHz
602 and 622MHz suppression at IF filter 'ON'	-	7	5	dB
IF demodulator bandwidth at IF filter 'OFF'	-	-	24	MHz
(-35dBm IF input) at IF filter 'OFF'	-	-	18	MHz
(-30 dBm IF input)	-	-	-	-
Noise threshold at IF filter 'OFF'	11	9	-	dB
at IF filter 'ON'	9	7	-	dB
Video demodulation sensitivity	60	50	40	mV/MHz
Video output level (at no modulation)	3.0	2.8	2.6	Vdc
Signal sense output (at IF filter 'OFF', AGC=12V)	4.5	2.5	0.5	Vp-p

B+ supply = +18V ±5%
Source: Astec specification details - 1985

TVRO RECEIVER

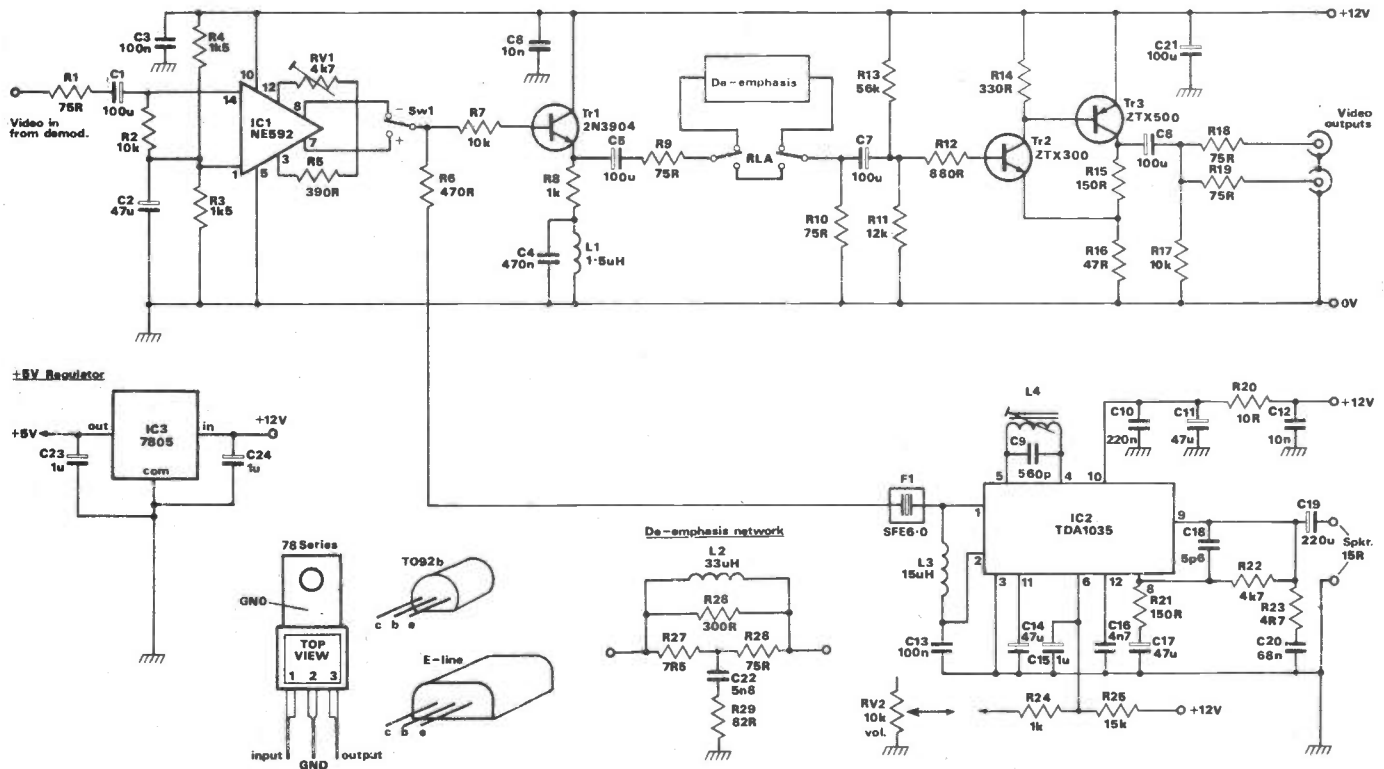


Fig 3 TVRO receiver circuit diagram

LNB supply pin) is brought to a 14-way PCB connector plug. The +5V supply is connected on-board and an external terminal is therefore not provided: the same goes for the demodulator output.

All other components are mounted alongside the modules, and 1mm circuit pins installed for the various external connections.

It will be necessary to cut slots in the board to accommodate the four earth tags at the corners of each module and the earth tab/heat sink lugs on IC2. Some holes will probably need to be opened out before fitting such components as RV1, L4, IC3, PL1 and the module pins and Vero pins.

Components

There are no 'special' or hard to get components used in this design. Most of the component information is contained in the accompanying parts list, but there are one or two points which should be mentioned:

The Signetics NE592 (IC1) may be directly replaced by a uA733 - these are pin-for-pin compatible.

L1, L2, L3 are fixed axial-mounted chokes.

IC2 must be a suffix 'S' or 'T' version which has two large metal lugs protruding from the IC for heat sinking. No extra heat sinking was found necessary on the prototypes ('T' suffix), although if it is required then a simple shape may be formed from a piece of tin, copper or brass sheet and soldered to the IC's metal lugs (see Figure 4). The legs of IC2

are formed in staggered groups of three.

A Toko coil is specified for L4. However, other coils, even home-made ones, may be used just as effectively. Remember that the loaded Q of this tuned circuit should be quite high.

The 4.7 ohm resistor at the audio output may be formed by wiring two 10 ohm resistors in parallel.

The SFE 6.0 ceramic filter is the flat type with three in-line legs.

Tuning control

As you can see, the tuner will cover 500MHz with a tuning pin voltage range of 0.7 to 18V, and as an aid to determining frequency against voltage Astec individually mark each tuner with the tuning voltage required for both 2042 and 1582MHz.

Obviously if a single-turn potentiometer was connected between ground and +18V (Figure 5a) then the tuning rate would be very fast. If the full band is required it is much better to use a good quality 10-turn potentiometer. For even more precise tuning a range switch could be provided as well (Figure 5c, d).

Some constructors may not wish to tune the whole 500MHz range of the tuner (amateur TV enthusiasts for example), and so positions for two resistors have been provided, one returned to +18V and the other to ground. The purpose of these is to allow the installation of a potential divider to restrict the tuning range to only that required (see Figure 5b).

In fact it has been found that both

tuners tried in amateur service covered the complete 1.3GHz allocation with an applied tuning voltage between about 9 and 11V, which means that a 12V rail could be used in this application if required.

The dc current to the 'tune' pin is of the order of 1mA, and it is therefore necessary to choose the total resistance of the potential divider such that it draws around 10 times the pin current, ie 10mA. This is achieved by making the total resistance (tuning control plus two padding resistors) about 1.8k. Choosing this value has the added advantage of easing calculation - the voltage drop across the potential divider is then 1V per 100 ohms.

Power supplies

Power requirements for the two modules are +5V, +12V and +18V. As previously mentioned +5V is derived on the printed circuit board from the +12V line using a 1 amp 3-terminal voltage

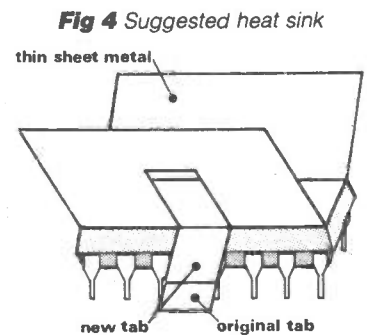


Fig 4 Suggested heat sink

regulator. However, since there is insufficient space on the board for the other regulators they must be arranged separately.

The total current drawn from the supplies (under 'normal' audio level conditions) is: +5V = 100mA, +12V = 900mA and +18V = 750mA. The +12V supply can rise to almost 1.5A at maximum audio volume. A suggested power supply is shown in Figure 6.

Adjustment

The modules should not be installed yet. Connect the video output to a monitor terminated in 75 ohms, a gain control for the audio stage, a loudspeaker and a +12V supply. Switch on and check that +12V is available on all ICs. Check that +5V is present at the output of IC3 (if fitted). Turning up the audio gain should produce noise and adjusting RV1 should produce noise on the screen.

Now install the two modules. Connect an input signal to RF input B; a +18V supply; a tuning control (around 2k); and take the tuner pin 7 (gain control pin) to +12V. Upon switch-on you should now be able to tune in to a TV signal (the modules may take a few moments to 'warm up' from cold).

When a signal is found monitor the video output on an oscilloscope (making sure that it is terminated) and display a couple of lines of composite video. Adjust RV1 for a total amplitude of 1V p-p.

The video inverting switch should be set so that the displayed video is positive-going.

This may be either by a front panel switch (use short leads) or a wire link on the appropriate board pins.

Once a signal has been tuned in, turn up the volume and adjust L4 for best sound. Check that the de-emphasis switching relay operates correctly by grounding the relay pin.

External controls

To aid constructors the following external controls and provisions are necessary:

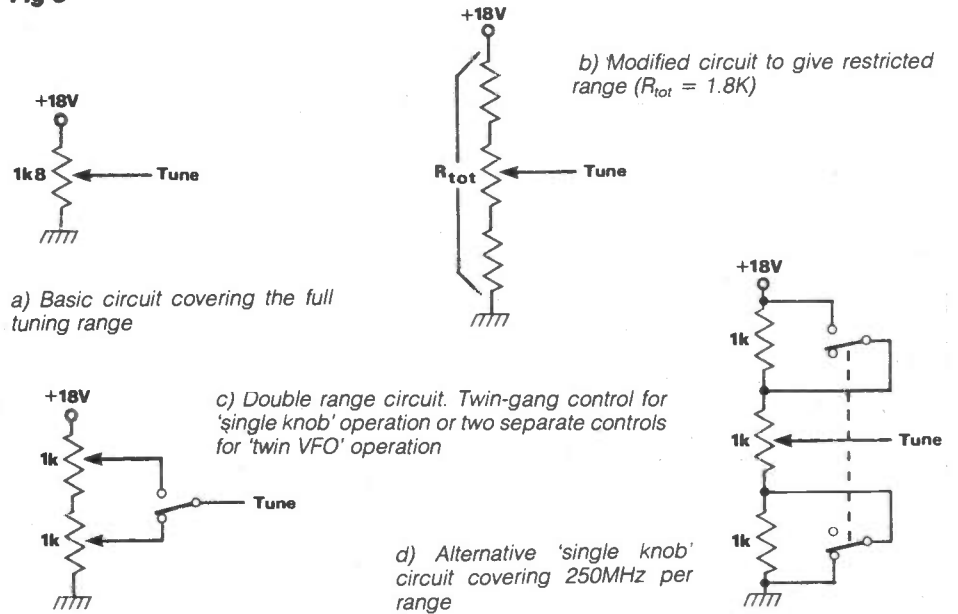
- Main tuning control.
- Video IF filter switch.
- De-emphasis select switch.
- Audio gain control.
- Loudspeaker.
- Video output co-ax socket(s).

The following are optional:

- RF input polarity (input A/B) select switch.
- Gain control pot (tuner pin 7).
- Signal strength meter.

Of course one doesn't necessarily need to use the relay for de-emphasis changeover; wire links could be used for semi-permanent operation or, since the network has 75 ohm input/output impedances, short lengths of co-ax could convey the signal to and from a front panel switch.

Fig 5



Results

Here I must make a confession: I do not own a satellite receive system and therefore most of my work with the modules has been conducted using amateur TV signals in the 1.3GHz spectrum and bench test equipment. Nevertheless I have briefly tried the unit on one TVRO installation and found the results to be first class; equal in performance to a receiver costing many times more than this unit.

I have also received reports from others using the Astec modules for satellite work and their findings support my own. One user, however, did suggest that the passband of the IF/demodulator was a little narrower than that normally used to receive 'European' satellites in the 12GHz band. The modules seem to have been designed more for 4GHz operation in the USA.

Nevertheless two independent comparisons which have been carried out indicate that any degradation of signals which may be caused by a narrower passband cannot be detected by eye. In fact a narrower system is likely to produce a rather better noise threshold.

The quality of recovered video is very high indeed, good colour and sound being received even on quite weak

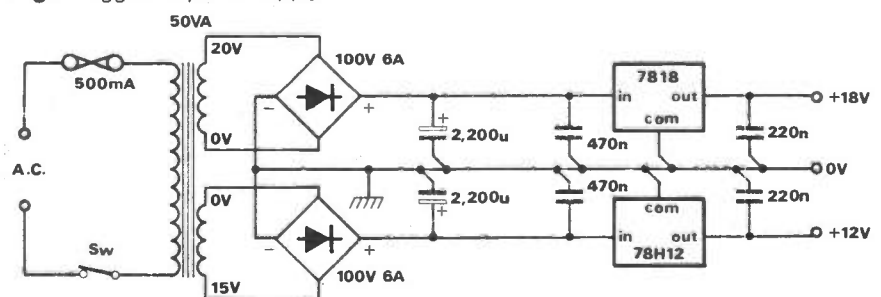
transmissions. The receiver is very smooth in its tuning, and noise and 'sparklies' disappear quickly as signals become stronger. The local oscillator is remarkably stable considering its high frequency and fundamental mode of operation. At first I thought of designing a frequency synthesiser, but, certainly for general use, the stability is such as to render such a system rather unnecessary.

Amateur television application

The AT-1020 tuner head comfortably covers the complete 1.3GHz amateur TV allocation, making it virtually ideal for amateur applications. There are, however, one or two points which should be considered.

Although the tuner's conversion gain is high (around 30dB) the overall noise figure, compared to custom-designed amateur tuners, is quite poor (around 7dB). The reason for this is primarily the fact that these tuners were not designed for low noise, direct aerial connection applications, but are intended as a first IF following a microwave block down-converter. Therefore since the system noise performance is largely governed by that of the block converter there is no need for the tuner noise to be kept low.

Fig 6 Suggested power supply



TVRO RECEIVER

Coupled to this is the wideband capability of the RF circuitry. The result is that for ATV use a good low noise preamplifier must be provided ahead of the tuner for best performance.

The 612MHz IF output is almost ideal if the unit is to connect to a conventional varicap TV tuner. The tuner can be set to around channel 37 and left (band tuning being accomplished by the Astec module). This system is likely to find favour with existing stations, since an FM-TV demodulator will already be available with an IF of around 36MHz. Of course, if just the tuner is purchased then the PCB board will not be necessary.

The use of the AT-3010 IF/demodulator as well, together with the PCB, will provide a complete 24cm receive system needing no extra equipment (except for an RF preamp and a display monitor), and will give very high quality results with the added bonus of being able to double for satellite TV use.

Comparison tests

I consider the Wood & Douglas combination of a 1250DC tuner and VIDIF IF/demodulator to be probably the most sensitive 24cm ATV receiver in popular use. I have therefore based my tests and observations on comparisons between the W&D and Astec systems, using a common 26-element JVL loop yagi and a Comex Systems low noise wideband preamplifier.

I must state, however, that I have incorporated one or two modifications in my W&D IF/demodulator board, mainly in an attempt to reduce the noise produced within the circuit. Modifications have also been made to the video amplifiers to produce a standard 1V p-p output with minimum distortion. The IF has been carefully adjusted using sweep equipment and optimised for best overall noise performance, so it may be that my particular unit performs slightly better than a 'standard' system.

The first thing I noticed when tuning in to a weakish (P2-3) picture was that the Astec system appeared to be slightly less sensitive than the W&D, an estimation of around half a 'P' point being typical.

This apparent lack of sensitivity continued until signals became stronger (above P4), then the noise and 'sparklies' on the picture diminished somewhat earlier on the Astec system than the W&D. In fact when all trace of noise had just disappeared using the Astec, only a P4.5 report could be given on the W&D since there was still a significant amount of noise discernible on the picture.

I use the word 'apparent' when referring to a lack of sensitivity since that is the effect one sees on the screen. However, the reason can almost certainly be attributed to the *truly* wideband performance of the Astec IF system, which as a consequence produces a

Resistors		Capacitors	
R1, 9, 10, 18, 19, 27, 28	75R	C1, 5, 7, 8, 21	100µF 25V vert
R2, 7, 17	10k	C2, 11, 14, 17	47µF 25V vert
R3, 4	1K5	C3, 13, 25	0.1 ceramic
R5	390R	C4	470pF polystyrene 5%
R6	470R	C6, 12	10n ceramic or mylar
R8, 24	1k	C9	560pF polystyrene 5%
R11	12k	C10	0.22 tant
R12	680R	C15, 23, 24	1µF 35V tant or 50V elec
R13	56k	C16	4n7 ceramic
R14	330R	C18	5p6 plate ceramic
R16	47R	C19	220µF 16V vert
R20	10R	C20	68n mylar
R21, 15	150R	C22	5n6 polystyrene 5%
R22	4k7		
R23	4.7R		
R25	15k		
R26	300R		
R29	82R		
RV1	4k7 hor preset 10mm		
RV2	10k lin carbon*		
Semiconductors		Miscellaneous	
Tr1	2N3904	AT-1020 TVRO tuner head	
Tr2	ZTX300	AT-3010 TVRO IF/demodulator	
Tr3	ZTX500	Type 'F' co-ax plug	
IC1	NE592N, uA733N	L1	1.5µH axial fixed inductor
IC2	TDA1035T or S	L2	33µH axial fixed inductor
IC3	7805	L3	15µH axial fixed inductor
		L4	Toko MKANSK1731HM (6MHz)
		SW1	SPCO toggle*
		F1	SFE 6.0
		PL1	0.1 inch PCB connector 14-way
		RLA	12V DPDT
			* Not supplied with kit

Note: this parts list is based on the kit available from Comex Systems Ltd, for which certain changes have been made. It therefore does not correspond exactly with the circuit diagram, although this should cause no problems.

For those who do not intend to purchase the kit the TDA1035, and probably F1 (check first for correct style), is available from Sendz Components, 63 Bishopsteignton, Shoeburyness, Essex SS3 8AF. Tel: (0702) 332992.

Other components from Bonex Ltd, 102 Churchfield Road, London W3 6DH

somewhat noisier IF.

Coupled to this, the use of a quadrature discriminator, which doesn't have the benefit of threshold extension as is possible with phase-locked loops, does nothing to improve or enhance the noise performance.

This properly tailored wideband IF and superbly linear demodulator, which is designed specifically for FM-TV reception, makes the quality of the recovered video signal very high indeed. Even when receiving quite weak amateur pictures good colour is still obtainable well after it has disappeared on the W&D.

The same can be said of the audio. You know how annoying it is when you tune in a weak commercial broadcast station on a domestic TV set and can still receive perfectly good sound, and then you try the same thing on an amateur signal: it's just not there. Well, with the Astec system the sound remains almost to the point of sync loss caused by a weak picture.

Now that the new system has been in use for some weeks I must conclude that (at least in my case) the Astec set-up is slightly worse at receiving weak signals.

So if you are a DXer and like dredging around in the noise, or if you don't have fairly local stations from whom you regularly receive stronger signals, or a repeater, then the new receiver is unlikely to better your existing equipment (assuming, of course, that your present system is up to scratch!).

If, however, you own a questionable receive set-up or mainly receive stronger signals (perhaps from the local TV repeater), then you will certainly appreciate the sheer quality of reception offered by the Astec receiver. Don't forget, of course, that it doubles as a satellite TV receiver as well.

TVRO receiver - motherboard and kit	£35.00
Board only	£11.75
AT-1020 tuner module	£35.10
AT-3010 IF/demodulator	£54.65
F type plug for AT-1020	50p
Mitsubishi heterodyne 10GHz receiver	£47.00
Scalar horn	£42.00
60 - 1700MHz wideband low-noise preamp kit	£35.00
Other equipment including a dish antenna, a tuning display and a tunable sound IF to give stereo sound will soon be available.	
Comex Systems Ltd, Comet House, Unit 4, Bath Lane, Leicester. Tel: (0533) 25084.	



DATA ON RADIO

by Bob
Redding

I believe there will be great advances in the use of data on radio in the next few years, for two reasons:

1. A break with tradition on transmission techniques, and
2. The use of broadcast data for reception anywhere within an area.

This cannot be proved – only time will tell – but there are parallels with what has happened in the past which point to what might well happen in the future, and in all these aspects it is the enthusiastic amateur who really makes the breakthrough, not the multi-national or some other large scale operation.

Take for example the growth of radio. We knew about Hertz waves in the Victorian era and made use of them on ships and for military purposes, but it was not until 1921, when the British Broadcasting Company started putting out programmes on 2LO, that a widespread impact was really felt. From then on the enthusiastic amateur has pioneered most of the techniques which have brought us to the present day state of the art in telecommunications and broadcasting.

The Future of Data Communications on Radio

Over the next few months we hope to have a series of articles on 'The Future of Data Communications on Radio'. The author, Bob Redding, will be familiar to *R&EW* readers from articles in June and October 1984, December 1985 and in other journals. He feels there is a great future for information dissemination by radio, not just in inter-office communications, but in broadcasting and electronic publishing, even in receiving newspapers at home where you choose the contents! The recent troubles in the newspaper industry make it clear what happens when you try to innovate, but Bob has been in electrical instruments since 1938 and seen this field go from mechanical clockwork devices to the digital weighing scales in today's High Street shops. He feels many of our present ills are mainly due to an inability to use technology properly. We take the odd circuitry but insist on using traditional methods and practices and the result is often a travesty.

Bob has a theory that the only people who do things for the right reasons are the amateurs and hobbyists. No doubt this will show through the series of articles he is writing for us, which may eventually appear as a book.

The first appears here, and outlines the future scenario for data communications for the man in the street. Another, which shows what can happen if you break with convention, describes a line-powered modem he has invented which requires no power supply, so that the bogey about electrocuting a man on a telephone pole does not arise! He then asks: do we really need

The same sort of progression can be seen as far as computers are concerned. We have long known the need for a powerful mathematical tool. When it became available in the late '40s there followed perhaps twenty years of using equipment in the manner we had previously. It was the space race that caused us to use the new tools for novel problems that led to effective use of the technique.

The impact on the man in the street occurred when the newly available logic components appeared in domestic equipment like electronic watches and calculators. The real breakthrough in usage was the recognition that the general purpose computer could be a personal and even a pocket sized animal, hence the home computer revolution.

Let us now look at the role of industry and the establishment in this progression. Once the potential and implications are clear then large scale industry and central government become involved – to avoid proliferation and provide research funds etc. This regulates technical advance while organisations carve a niche in the market and a national edifice evolves.

In the course of time it becomes obvious that the rate of further developments has slowed, and we have a phase of liberalisation and denationalisation to encourage rivals of the monopoly.

Through the whole of this process the driving force is really the hobbyist and enthusiast who pursues the technology for the right reasons, namely, because it

wants doing and the movement forward is satisfying.

Now look at the computing scene, where the home enthusiast commands a fair slice of the action, particularly now that the two areas of communications and computing are interacting.

Home computing has gone through the pure fun stage and is now useful within the house. It seems to me to be clearly destined to become an intrinsic part of communications with the outside world. Possibly it will replace the postal system and the newspaper – and to a certain extent the radio and television as far as the receipt of news and factual data is concerned.

There are already clear examples. For instance, communications concerns such as British Telecom and Cable & Wireless have evolved electronic mail systems, and clearly the growth area is the general public rather than the business field.

A technical 'edge' behind the recent new newspaper *Today* is the fact that the link between the keyboard and the printing press (perhaps many miles) is all electronic. The extension of this to idle radio transmitters at night presenting the digital data in homes as the morning newspaper is a small step (at least to radio amateurs, who have been doing this with teletype machines and are now using error-free packet systems).

Whilst there is obviously considerable mileage in electronic mail, viewdata and bulletin boards as we know them, I feel sure the future lies in data which is

modems at all on radio? Why not shift the carrier itself? The results look quite startling, and include the possibility of high speeds on a narrow-band VHF channel. It even looks as if radio telephony is possible at the same time, so that you know what to grab into memory for later study.

However, the fascinating point is that such experimentation is within the scope of the amateur, and alteration to standard radio equipment is minimal.

Another article on error correction discusses a procedure that does not need a transmitter to call for repeats, and is aimed to enfranchise the 'listener' who has to depend on what he receives.

Bob asked *R&EW* to publish his work, rather than one of the learned societies, because "they take too long, perhaps because they are so careful not to upset the status quo or the advertisers." It is the mass market demand that drives technology, and he finds the amateurs less inhibited than the industrialists, and the academics worst of all. He became a member of the IEE in 1942 and was a Vice President of the IMC before it received a Royal Charter. He was involved in digital computers from the early '50s, and in 1965 was displaced from the industry for pressing too hard for the computer-aided design of chemical plants. He has since operated his own company – Design Automation Limited – dealing with intrinsic safety and other innovations with the theme that, "what isn't there can't go wrong, and the lower the energy level the better the thing works."

DATA ON RADIO

broadcast by radio for reception over an area on a selective basis whereby the recipient chooses what he wants by the press of a button (the software then looking for keywords, codes, etc). This does not involve new techniques or components, merely the application of well established technology in a different configuration for a new duty.

However, to get started the amateur has to show that he can improve on current practice, and I think this is possible. Speed must be a main factor, for we can use the machine to search what it has in store, as well as being selective in what it grabs 'off the air'.

Data transmission involves the use of modem techniques in order to send serial data, and the practice with modems has been largely influenced by telephone practice. Here again in the last five years modems have changed from an exotic item which could only be rented from the Post Office to devices in High Street shops, some of which do not even require a power supply!

The speed of data transmission is either 300 baud or 1200 baud, and although the latter represents 100 characters per second, there is pressure to go faster.

On telephone lines this means very complex modems which at present cost

over £500 to go up to 2400 baud, and even more expensive items are envisaged to go that much faster. This is because the telephone channel is limited to a bandwidth of perhaps 3500Hz. One trick is to encode groups of bits by pulse and amplitude modulation so that the effective 'bits per baud' is increased.

On radio the same bandwidth is the maximum for a narrow-band FM channel as used by amateurs on UHF and VHF, with a channel spacing of 25kHz (and a strong possibility that it will be reduced to 12.5kHz). If we use standard modem codes, the frequency shift keying technique which is usually employed means in fact that there is one tone representing 'zero' and a different tone representing a 'one'. The difference between these tones, or the 'shift', should generally be about two-thirds of the baud length, so at 300 baud we use a shift of 200Hz but at 1200 baud we use a shift of 800: ie one tone is 1300 and the other 2100Hz. This leaves some margin on the available bandwidth of perhaps 30 - 3500Hz.

In FM radio we modulate the carrier with a deviation of perhaps 5kHz. This works well and appears to be the limit, but if we analyse the radio signal we are actually sending out two separate frequencies, representing zeros and ones. Why not make the carrier deviation the

shift between zeros and ones? This would give us a shift of a maximum of 5k tolerable and so a data rate of perhaps 9600 baud seems practicable on VHF/UHF radio.

The great advantage is that in fact it can be very simply implemented without a telephone type modem. The transmitted frequency is generated by a crystal, oscillating at 12 or 16MHz and multiplied to give a final value of 144 or 432MHz. One tunes the crystal by a parallel small capacitor. If we pick a capacitor of the right size and switch it on and off by a data signal, we will shift the carrier between two specific values. This gives 'direct FSK data'.

Reception seems even easier. If we look at such a data signal as an SSB one, carrier insertion gives a signal which is easily transformed by a simple transistor circuit into received data.

This looks like a potential breakthrough which shows the superiority of radio over the telephone line techniques.

There have been suggestions of imposing data on top of the FM broadcast transmissions, and clearly this would serve a number of useful purposes. However, each broadcast transmitter takes up a much wider bandwidth than several narrow-band FM systems. **REW**

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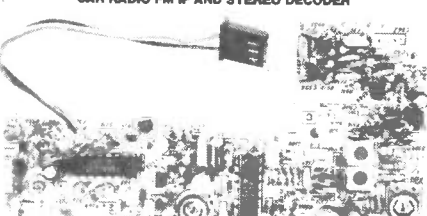
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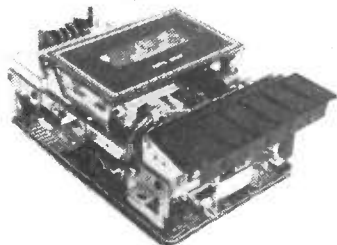
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DATA FILE . . .

Ray Marston looks at a variety of transistor audio amplifier circuits

In recent editions of Data File we have taken in-depth looks at the operating principles and applications of the discrete bipolar transistor, including practical low power amplifier circuits and different types of multivibrator and oscillator design. In the present edition of 'The File' we continue the theme by showing how transistors can be used in a variety of audio preamplifier and tone control circuits etc.

Audio amplifier basics

A modern 'stereo' amplifier system consists of two virtually identical 'hi-fi' audio amplifier channels. Usually, each of these channels has a switch-selectable option of several input signal sources (radio tuner, tape player, disc player, auxiliary input etc), and provides a single output signal to a high power loudspeaker. For most practical purposes, each channel can be broken down into three distinct circuit sections or 'blocks', as shown in *Figure 1*.

The first of these circuit sections can be described as the selector/preamplifier block. It enables the user to select the desired type of input signal source, and automatically applies an appropriate amount of amplification and frequency correction to the signal so that the resulting output signal is suitable for use by the second circuit block.

The second section of the amplifier can be described as the tone/volume control block. It enables the user to adjust the frequency characteristics and the amplitude of the audible output signals of the system, to suit individual tastes. This circuit section may sometimes contain additional filter circuits and gadgets, such as scratch and rumble filters and audio mixer circuitry etc.

The final section of the amplifier system comprises the power amplifier stage, which may be designed to handle maximum power levels ranging from as low as a few hundred milliwatts to as high as hundreds of watts. Such amplifiers are designed to span the audio frequency range and to generate minimal signal distortion, and almost invariably incorporate some form of automatic overload protection and thermal runaway protection etc.

The three sections of the audio amplifier system are all powered from a single built-in power supply circuit, which may be fairly sophisticated. All three amplifier sections incorporate individual supply decoupling networks to prevent unwanted signal interactions. We'll look at practical versions of the first two types of amplifier section in the next few pages, and will deal with power amplifiers and power supplies next month.

Simple preamps

The basic function of an audio preamplifier circuit is that of modifying

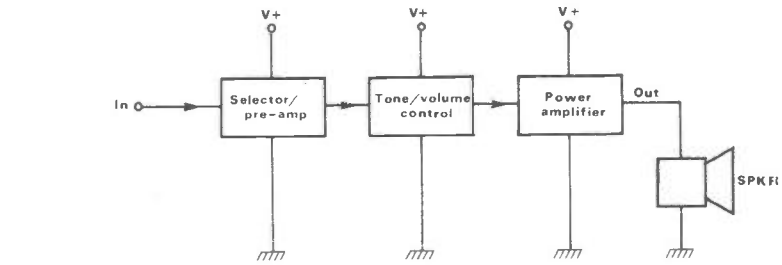


Fig 1 Basic elements of an audio amplifier system (one channel shown)

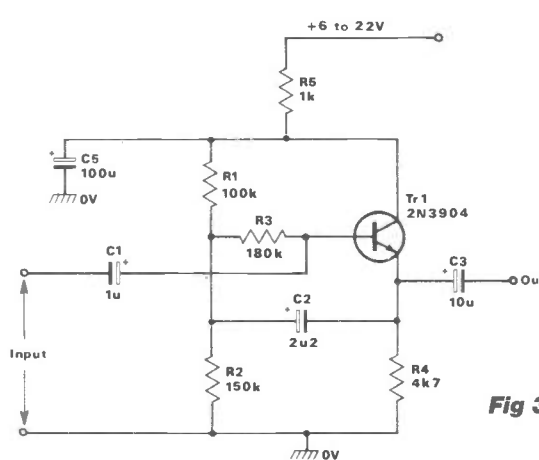


Fig 2 High impedance microphone preamp

the characteristics of the input signal so that it has the level frequency response and nominal 100mV (approximately) mean output amplitude necessary for driving the tone control sections of the amplifier system. If the input signal is derived from a device such as a radio tuner or a tape player, the signal characteristics are usually such that they can be fed directly to the tone control sections, bypassing the preamplifier circuit. If, on the other hand, the signals are derived from a microphone or pick-up device, they will almost certainly need modification via a preamp stage.

Microphones and pick-ups come in two basic types; they are either magnetic devices, or they are ceramic/crystal devices. Magnetic devices usually have a fairly low output impedance and a low signal sensitivity (about 2mV nominal); their outputs thus need to be fed to high gain preamplifier stages. Ceramic/crystal devices, on the other hand, usually have a high output impedance and a high sensitivity (about 100mV nominal); their outputs thus need to be fed to a high impedance preamplifier stage with near-unity voltage gain.

Most microphones have a virtually flat frequency response, and can thus be used with simple flat response preamplifier stages. *Figure 2* shows a practical unity gain preamplifier circuit that can be used with most types of high impedance ceramic/crystal micro-

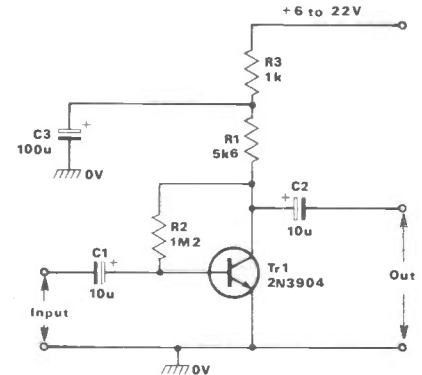


Fig 3 Magnetic mic preamp, 46dB gain

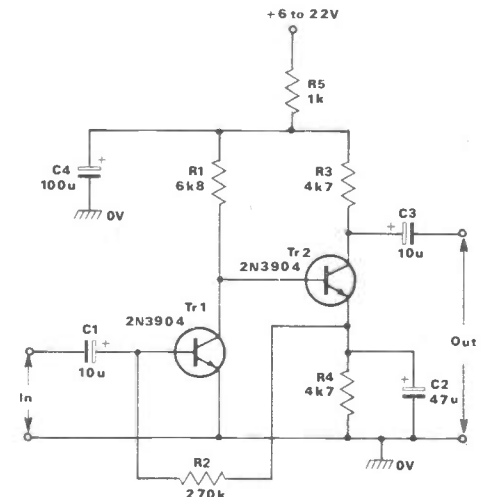


Fig 4 Magnetic mic preamp, 76dB gain

phones. The circuit is that of an emitter follower (common collector amplifier) with a bootstrapped (via C2-R3) input network, and has a typical input impedance of about 2M. The circuit is supply-decoupled via C5-R5.

Figures 3 and 4 show alternative preamplifier circuits that can be used with low sensitivity magnetic microphones. The single-stage circuit of *Figure 3* gives 46dB ($\times 200$) of voltage gain, and is suitable for use with most types of magnetic microphone. The 2-stage circuit of *Figure 4*, however, gives 76dB of voltage gain, and is specifically intended for use with magnetic microphones with very low sensitivity.

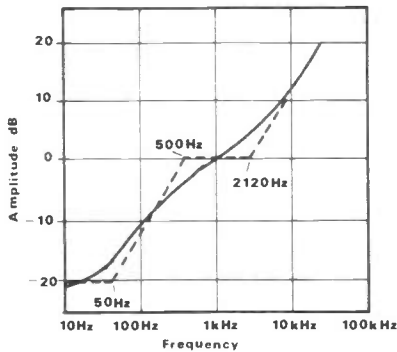


Fig 5 Typical disc playback curve

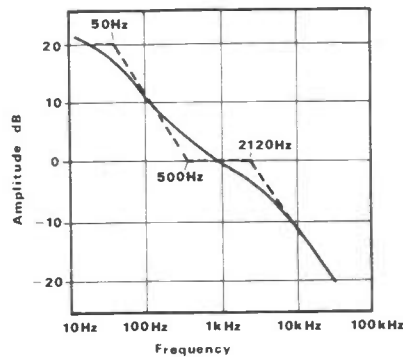


Fig 6 RIAA playback equalisation curve

recordings to be made with excellent signal to noise ratios and wide dynamic ranges, and they are applied to all normal records. The most important point to note is that when a disc is replayed the output of the pick-up device must be passed to the power amplifier circuitry via a preamplifier that has a frequency equalisation curve which is the exact inverse of that used to make the original disc recording, so that a linear overall record-to-replay response is obtained.

Figure 6 shows the actual form of the necessary 'RIAA' equalisation curve, which is named after the Record Industry Association of America, who have standardised the precise specification of the curve. A practical RIAA equalisation preamplifier circuit can easily be made by wiring a pair of frequency-dependent C-R feedback networks into a standard preamp circuit (so that the gain falls as the frequency rises), with one network controlling the 50Hz to 500Hz response and the other controlling the 2120Hz to 20kHz response. Figure 7 shows the practical circuit of such an amplifier.

The Figure 7 circuit can be used with any magnetic pick-up cartridge. It gives a 1 volt output from a 6mV input at 1kHz and provides equalisation that is within 1dB of the RIAA standard between 40Hz and 12kHz. The actual preamp circuit is designed around Tr1 and Tr2, with C2-R5 and C3-R6 forming the feedback equalisation network. Tr3 simply acts as an emitter follower buffer stage and drives optional volume control RV1.

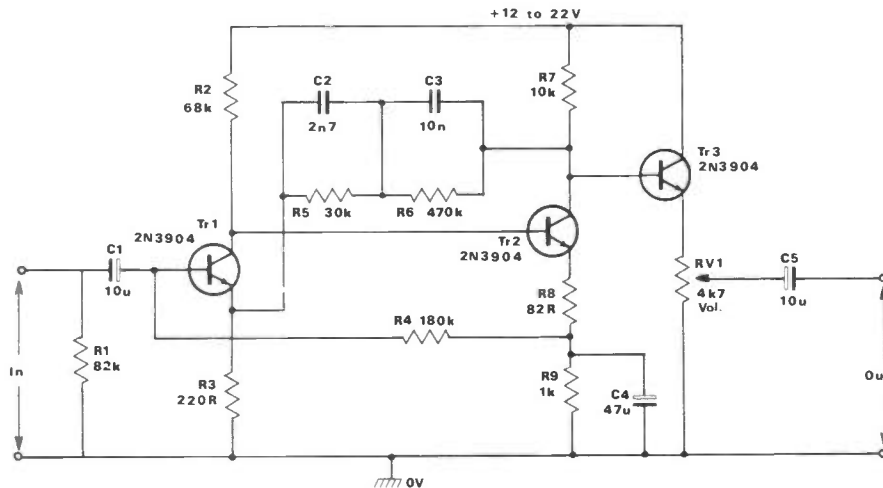


Fig 7 RIAA equalisation preamp for use with magnetic pick-up cartridges

'Popular' pick-ups

Ceramic/crystal pick-ups usually give a poorer reproduction quality than magnetic types, but produce output signals of far greater amplitude. This type of pick-up can thus be used with a very simple type of equalisation preamp, and these devices are consequently found in many 'popular' record player systems.

Figures 8 and 9 show alternative phono preamplifier circuits that can be used with ceramic or crystal pick-up cartridges. In each case the preamp equaliser circuit is designed around Tr1, and Tr2 is an emitter follower output stage that drives optional volume control RV1.

The Figure 8 circuit can be used with any pick-up cartridge that has a capacitance in the 1000pF to 10,000pF range. Two-stage equalisation is provided via C1-R2 and C2-R3, and the preamp equalisation is typically within 1.6dB of the RIAA standard between 40Hz and 12kHz.

The alternative Figure 9 circuit can only be used with pick-ups with capacitance values in the range 5000pF to 10,000pF, since this capacitance forms part of the frequency response network. The other part of the network is formed by C1-R3.

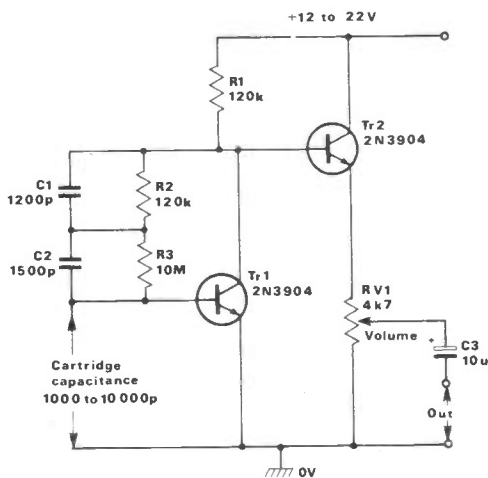


Fig 8 RIAA equaliser for ceramic cartridges

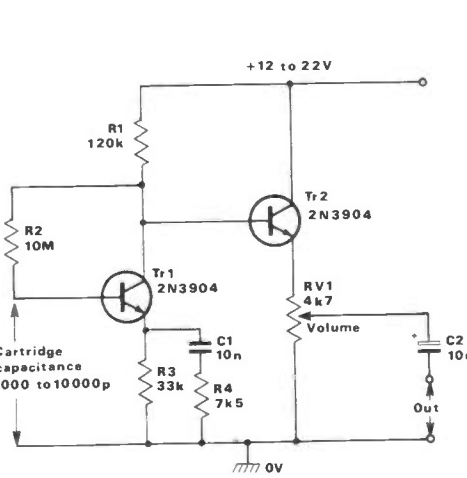


Fig 9 Alternative ceramic cartridge preamp

RIAA preamp circuits

If a constant-amplitude 20Hz to 20kHz variable frequency signal is recorded on a phonograph disc (record) using conventional stereo recording equipment, and the record is then replayed, it will generate the highly non-linear frequency response curve shown in Figure 5. Here, the dotted line shows the 'idealised' shape of this curve, and the solid line shows its practical form.

Looking at the idealised (dotted)

version of the Figure 5 curve, it can be seen that the response is flat between 500Hz and 2120Hz, but rises at a rate of 6dB/octave (20dB/decade) above 2120Hz, and falls at a 6dB/octave rate between 500Hz and 50Hz. The response is flat to frequencies below 50Hz.

There are good but very involved reasons why the precise Figure 5 recording curves are used; all that the reader needs to know at the moment, however, is that they enable disc

At 50Hz this circuit has a high input impedance (about 600k), and causes only slight cartridge loading; as the frequency is increased, however, the input impedance decreases sharply, thus increasing the cartridge loading and effectively reducing the circuit gain. The equalisation curve approximates the RIAA standard, and the circuit performance is adequate for most practical applications.

A universal preamp

Most practical audio amplifier systems require the use of preamplifiers with a variety of different characteristics, eg high gain linear response for use with magnetic microphones, low gain linear response for use with a radio tuner, and high gain RIAA equalisation for use with a magnetic pick-up cartridge etc. To meet this requirement it is normal practice to fit the system with a single 'universal' preamp circuit of the type shown in Figure 10. This is basically a high gain linear amplifier that can have its characteristics altered by switching alternative types of resistor/filter network into its feedback system.

Thus when the selector switch is set to the 'MAG PU' position, S1a connects the input to the magnetic pick-up cartridge, and S1b connects the C4-R8-C5 RIAA equalisation network into the feedback loop. In the remaining switch positions alternative input sources are selected via S1a, and appropriate linear response gain-controlling feedback resistors (R9, R10 and R11) are selected via S1b. The values of these feedback resistors should be selected (between 10k and 10M) to suit individual requirements; the circuit gain is proportional to the feedback resistor value.

Volume control

The volume control circuitry of an audio amplifier system is normally placed between the output of the preamplifier stage and the input of the tone control circuitry, and usually consists of little more than a variable potential divider or 'pot'. This pot can form part of an active circuit, as shown in Figures 7 to 9, but a snag here is that rapid variation of the control can briefly apply dc potentials to the following circuitry, possibly upsetting circuit bias and generating severe signal distortion. Figure 11 shows the ideal form and location of the volume control. It is fully dc-isolated from the output of the preamp via C1, and from the input of the tone control circuitry via C2. Variation of RV1 slider thus has no effect on the dc bias levels of either circuit. RV1 should be a 'log' type of pot.

Figure 11 shows the ideal form and location of the volume control. It is fully dc-isolated from the output of the preamp via C1, and from the input of the tone control circuitry via C2. Variation of RV1 slider thus has no effect on the dc bias levels of either circuit. RV1 should be a 'log' type of pot.

Passive tone control

A tone control network lets the user alter the frequency response of his amplifier system to suit his own particu-

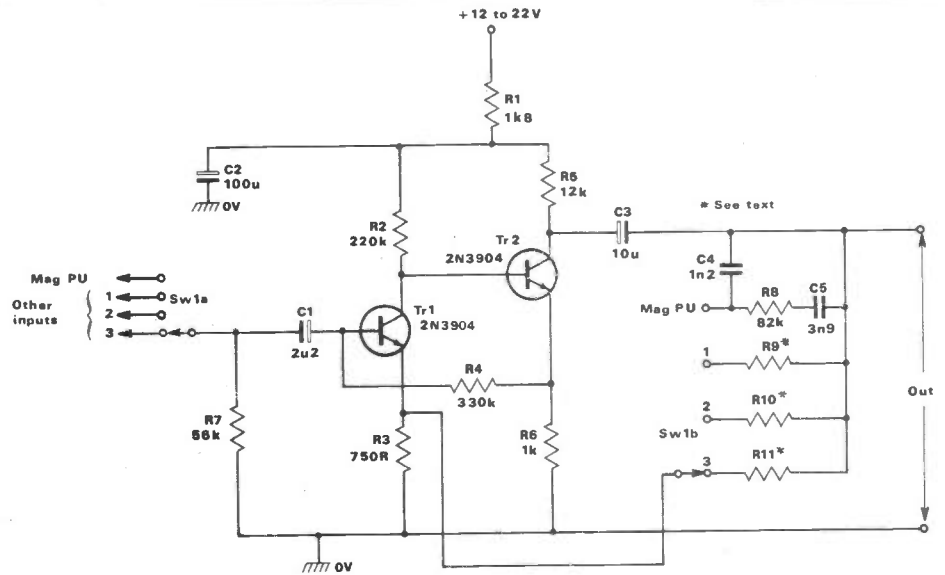


Fig 10 'Universal' preamplifier circuit

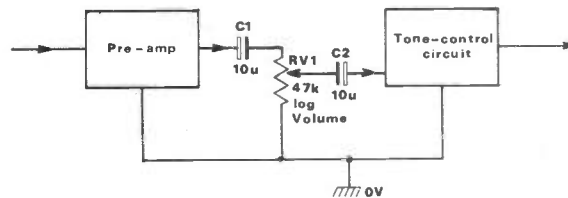


Fig 11 Ideal form and location of the volume control

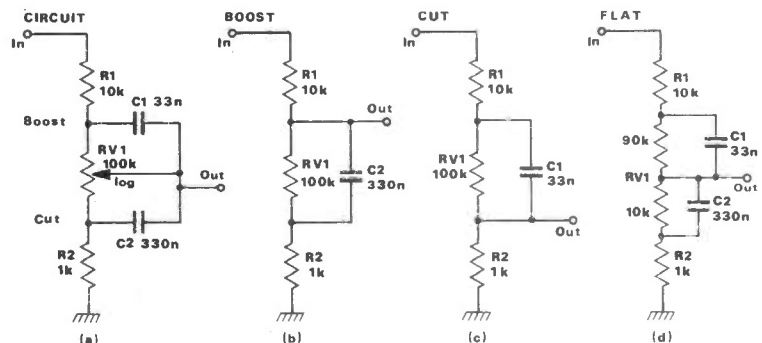


Fig 12 Circuit and equivalents of bass tone control network

lar mood or requirement. He can, for example, use it to boost or cut the low frequency (bass) or high frequency (treble) parts of a musical piece, to emphasise the effects of certain sections of the orchestra etc.

Tone control networks consist, in essence, of fairly simple collections of C-R filters through which the signals are passed. These networks are passive, and cause some degree of signal attenuation.

Tone control networks can, if desired, be wired into the feedback lines of simple transistor amplifiers to enable the systems to give an overall signal gain; in this case they are known as 'active' tone control circuits.

Figure 12a shows the typical circuit of a passive bass tone control network, and Figures 12b to 12d show the equivalent of

this circuit when RV1 is set to the maximum 'boost', maximum 'cut', and 'flat' positions respectively. C1 and C2 are effectively open circuit when the frequency is at its lowest bass value, so it can be seen from Figure 12b that the boost circuit is equivalent to a 10k-over-101k potential divider, and gives only slight attenuation to bass signals.

The Figure 12c cut circuit, on the other hand, is equal to a 110k-over-1k divider, and gives roughly 40dB of signal attenuation. Finally, when RV1 is set to the flat position shown in Figure 12d (with 90k of RV1 above the slider, and 10k below it) the circuit is equal to a 100k-over-11k divider, and gives about 20dB of signal attenuation at all frequencies. Thus the circuit gives a maximum of about 20dB of bass boost or cut relative to the flat signals.

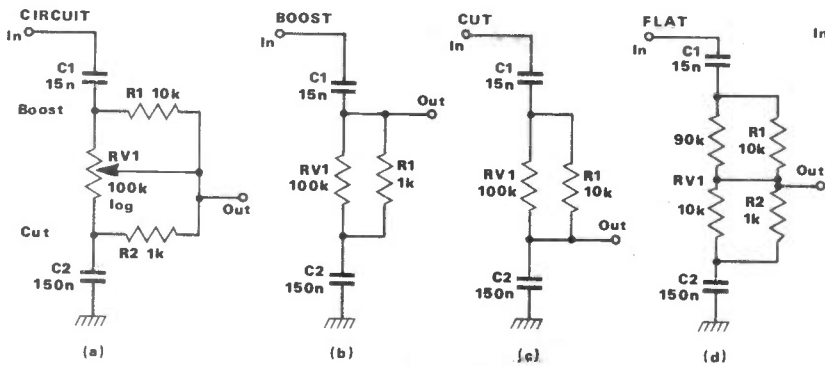


Fig 13 Circuit and equivalent of treble tone control network

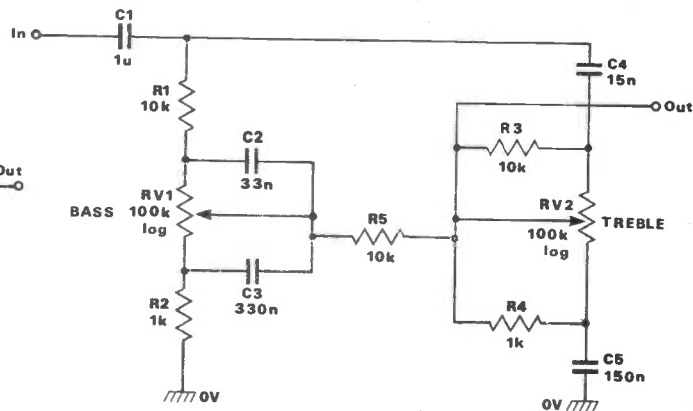


Fig 14 Passive bass and treble tone control network

Figure 13 shows the typical circuit of a passive treble tone control network, together with its equivalent circuits under the maximum boost, maximum cut, and flat operating conditions. This circuit also gives about 20dB of signal attenuation when RV1 is in the flat position, and provides maximum treble boost or cut values of about 20dB relative to the flat performance.

Finally, Figure 14 shows how the Figure 12a and 13a circuits can be combined to make a complete bass and treble tone control network: 10k resistor R5 has been added to minimise unwanted interaction between the two circuit sections. The input to this circuit can be taken from the circuit's volume control, and the output can be fed to the input of the main power amplifier.

Active tone controls

A tone control network can easily be wired into the feedback path of a transistor amplifier so that the system gives an overall signal gain (rather than

attenuation) when its controls are in the flat position. Such networks are often simplified versions of the basic Figure 14 circuit, as shown in the practical active tone control circuit of Figure 15.

Inspection of Figure 15 will show that its bass control section is a simplified version of Figure 12a, with the two capacitors of Figure 12a replaced by the single 39nF capacitor (C2). Similarly, the treble section is a simplified version of Figure 13a, with the two resistors (R1 and R2) eliminated. Resistors R3 and R4 are used to balance the performances of the two sections of the Figure 15 circuit.

An audio mixer

One useful gadget that can be fitted in the area of the volume tone control section of an audio amplifier is a multi-channel audio mixer. As the title implies, this gadget enables several different audio signals to be mixed together to form a single composite output signal. This can be useful if, for example, you wish to be able to hear the 'emergency'

sounds of a doorbell or baby-room microphone etc while listening to normal entertainment sources.

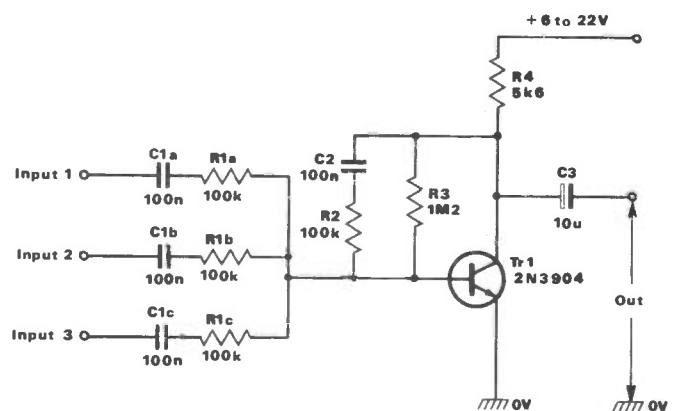
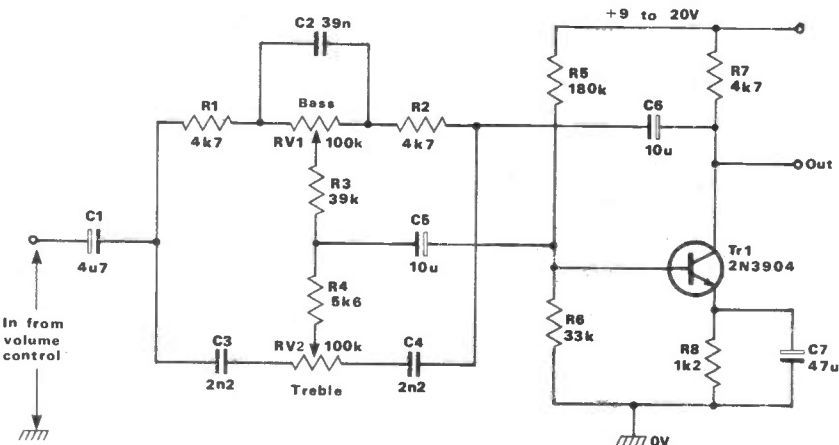
To conclude this edition of 'The File', Figure 16 shows the practical circuit of a 3-channel audio mixer which provides an overall gain of unity between the output and each input channel. Each input channel comprises a single 100nF capacitor (C1) and 100k resistor (R1), and presents an input impedance of 100k. The circuit can be allocated any desired number of input channels by simply adding more C1 and R1 components.

In use, the mixer should be placed between the output of the tone control circuitry and the input of the main power amplifier. One input should be taken from the output of the tone control circuit, and the other inputs should either be grounded or taken from the desired signal source.

In next month's edition of *Data File* we will look at audio power amplifier and power supply circuitry, and at a variety of transistor gadgets.

Fig 15 Active bass and treble tone control network

Fig 16 Three-channel audio mixer

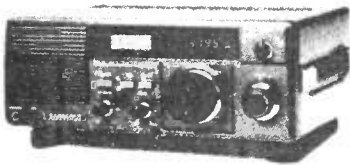


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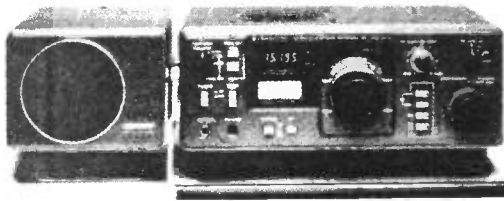
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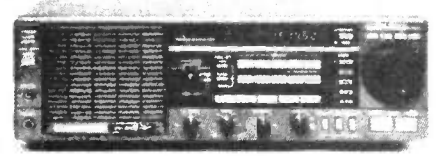
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R-600



R-1000



R-2000

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R-600

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R-2000

The R-2000 provides outstanding performance through use of microprocessor controlled operating functions, allowing maximum flexibility and ease of operation throughout its operating range. An all mode receiver, it covers 150 kHz — 30 MHz in 30 bands, on SSB, CW, AM and FM. Key features include digital VFO's, ten memories that store frequency, band, and mode information, memory scan, programmable band scan, digital display with 24 hour dual clock, plus timer, and a host of other features to enhance the excitement of listening stations around the world.

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At last sporadic-E activity is with us again. After seemingly endless months of practically nothing, it was smiles all round on April 29th when intense activity from all over Europe bombarded the UK. The opening lasted for several hours. Another opening took place on the morning of April 30th with Eastern bloc countries in Band I.

The previous few weeks showed a build-up in DX-TV conditions, especially via meteor shower. This is usually noticeable before the main season gets under way. April 1st was a classic day for DX via MS, with pictures popping up throughout the band.

Tropospheric DX proved to be a flop, with very little appearing on our screens apart from the customary French 'Canal Plus' transmissions on channel L5 and NOS from the Dutch outlet at Lopik on channel E4.

DX-TV logs for April

This month we are featuring two logs. The first indicates reception conditions noted by the authors in Derby.

1/4/86: NOS-2 (Netherlands) on channel E4 from Lopik with the 'PTT-NED.1' PM5544 test card; NOS-2 from Wieringermeer on E39 showing the 'PTT-NED.2' PM5544; TDF (France) Canal Plus service with programmes on channel L5 via weak tropospheric conditions; DDR:F1 (East Germany) on E4 from the Cottbus outlet radiating the electronic colour test card; CST (Czechoslovakia) on R2 with the 'RS-KH' EZO-type test pattern; unidentified chessboard pattern on channel R2, possibly of Russian origin; ARD (West Germany) on E2 showing the ARD/ZDF logo; SRG-1 (Switzerland) from Bantiger on channel E2 with the '+PTT SRG 1' FuBK test card; TVP (Poland) with their dark PM5544 pattern on R2; SR/SVT-1 (Sweden) on channels E2 and E3 showing the 'TV 1 SVERIGE' PM5534, received mainly via meteor shower (MS).

21/4/86: CST on R2 transmitting the 'RS-KH' electronic test card via a small sporadic-E opening.

22/4/86: Unidentified signals via sporadic-E on R2 including a news programme and skating at around 2020 BST.

23/4/86: TVE (Spain) with a bullfight on E2 via a short SpE opening.

24/4/86: Unidentified programme with subtitles, possibly from NRK in Norway; unidentified programmes on R1 and R2 at approximately 1910 via SpE.

27/4/86: ORF (Austria) on E2a with the 'ORF FS1' PM5544 test card; unidentified programme on R1 via short-duration SpE.

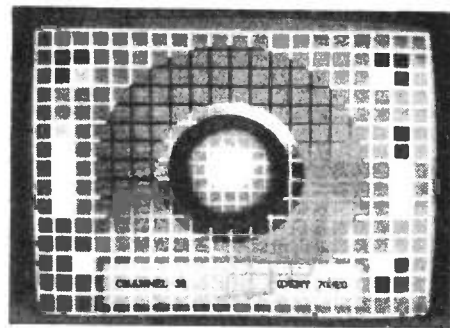
29/4/86: SRG-1 with the '+PTT SRG 1' FuBK test card on channel E2 via sporadic-E.

30/4/86: TSS (Russia) on R1 radiating the electronic test pattern (UT 0167-type); TVP on R1 with the modified PM5544. Both signals noted via sporadic-E.

Our second DX-TV log comes from Bob Brooks of South Wirral, who often leaves his video recorder running on a DX channel while carrying out more mundane chores. Playing back, using the picture search mode, reveals whether it was worth the effort. Usually it is.

DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith



Repeated sightings of the word 'SCANDI' has baffled Bob (and us). On the 20th it was noted on channel E2 at 1416 and again on the 21st at 0840. It has also been received earlier in the year.

Sporadic-E was detected on the 28th with an opening to Italy which consisted of an RAI programme schedule and commercials at 1240 on channel 1A. The 29th proved to be the big day, with intense sporadic-E DX from 1145 through until 1515. Bob has recorded some of the opening on video tape and hopes to be able to send a few photos shortly. His log for the 29th is as follows:

- 0735 MTV-1 (Hungary) on R1 with the 'MTV 1 BUDAPEST' PM5544 test card;
- 1143 CST on R1 showing the 'RS-KH' electronic test pattern;
- 1224 Unidentified colour teletext page. This probably originated in West Germany or Switzerland;
- 1230 TVE on E2 airing a local news programme;
- 1252 TVE on channel E4 with a bullfight in full gory technicolour;
- 1315 TVE with a discussion programme on channel E3;
- 1325 RAI (Italy) on channel 1A with programmes in colour;
- 1335 Unidentified programme in colour, thought to have come from West Germany;
- 1348 Bayerischer Rundfunk (BR-1) from West Germany on channel E2 showing the 'GRÜNTEN' FuBK test card. Reception was in colour;
- 1351 Südwestfunk (SWF-1) from West Germany) on E4 transmitting the 'SWF RBG' FuBK pattern from the outlet at Raichberg;
- 1354 ORF (Austria) on E4 using the PM5544 test card carrying the identification 'ORF FS1';
- 1407 JRT (Yugoslavia) on E3 with the 'RTV LJNA' PM5544 test pattern;
- 1422 BR-1 on E4 radiating the FuBK pattern including the transmitter identification 'OCHSENKOPF';
- 1429 ARD (West Germany) on E4 with sample teletext pages;
- 1432 CST on R2 using the PM5544 test card with the identification 'SR1 TV' at the top and 'BRATISLAVA' at the bottom;
- 1443 TVP with the dark PM5544 pattern received in SECAM colour on channel R1;
- 1504 DR (Denmark) with their clock

caption showing 1605 on channel E3;

1509 Unidentified programme on channel E4;

1511 Denmark on E4 showing the PM5534 pattern and the usual 'DR DANMARK' identification.

Finally, Bob noted a smaller sporadic-E opening during the morning of April 30th. From 1044 BST he noted test cards on channel R1 from Russia, Poland and Czechoslovakia.

Reception reports

The meteor shower activity during the early part of April 1st broke the pattern of months of inactivity in Band I. Within the space of an hour or so various test cards appeared, including a mystery in the form of a chessboard pattern on channel R2. We have heard reports of TSS in the USSR using this at times so perhaps it was them.

The first significant taste of sporadic-E occurred on the 24th at 1910 when a subtitled programme appeared on channel E2. A check throughout Band I revealed other SpE signals on R1 and R2 with different programmes.

Leaving the video recorder running and tuned to one of the lower Band I channels paid off during the morning of April 30th. Upon playing back the tape Russian and Polish signals were found, both showing test cards between 1100 and 1130 BST.

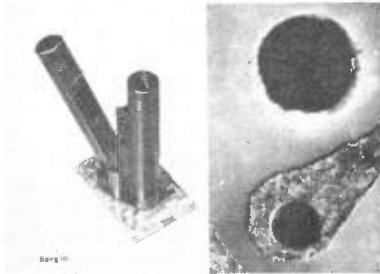
So much for conditions experienced in Derby. Let's dip into reception reports sent in from some of our readers...

Simon Hamer of New Radnor in Powys found it a struggle to receive anything in April (didn't we all?). The best day turned out to be the 29th, when he noted West Germany (ARD) with the 'GRÜNTEN' FuBK test card from Bayerischer Rundfunk on channel E2, the 'KREÜZBERG' test card on E3 (also from BR-1), and the 'SWF RBG' pattern from Raichberg on E4. Also logged on the 29th were Czechoslovakia on R2 with the 'RS-KH' pattern, Poland (TVP) on R2 showing the PM5544 test card, the PM5534 from Danmarks Radio (Denmark) on E4, Austria (ORF) on channels E2a and E4 radiating the PM5544, and JRT from Yugoslavia on channel E3 transmitting the PM5544 pattern which carried the identification 'RTV-LJNA'. This signal originated from the studios in Ljubljana.

Simon has commented that he can now

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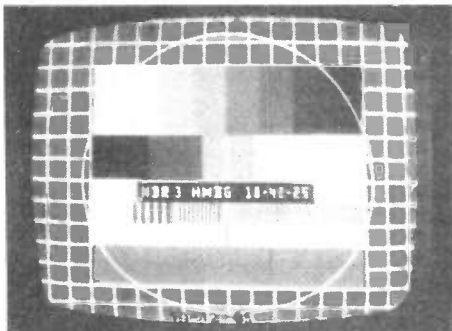
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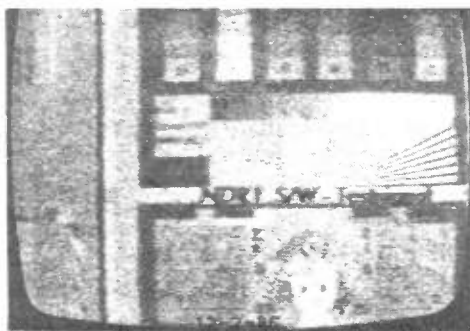
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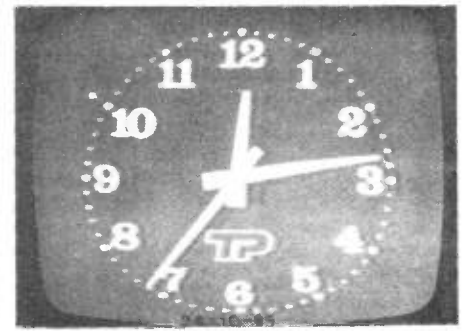
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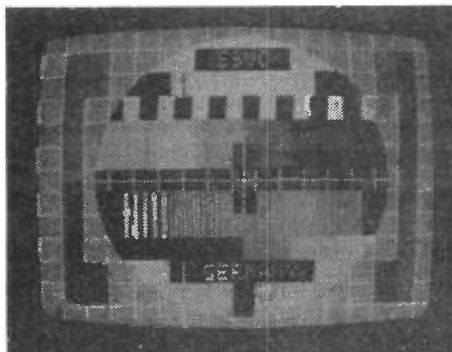
West German FuBK from NDR-3 in Hamburg.
Note digital clock



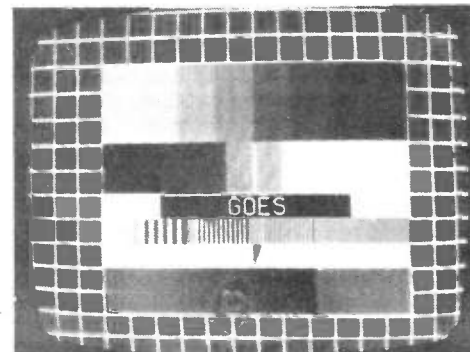
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infrequently by NDR-1



Polish clock caption from Telewizja Polska (TVP)



PM5544 testcard transmitted in W Germany by
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New FuBK testcard from the GOES transmitter in
the Netherlands



Teletext from 'Services Sound & Vision
Corporation' West Germany
Pics: Rijn Muntjewerff and Jürgen Klassen

DX-TV RECEPTION REPORTS

receive the RTE-2 service from Eire on channel J at about the same strength as RTE-1 on channel H from the same transmitting site at Kippure. Either the reception path has improved for some reason or there has been an increase in the ERP. He also commented that the new BBC-2 logo looks 'horrible'! He could well have a point there but BBC-TV presentation has been going through a bad patch for the past couple of years.

John Bray of St Neots in Cambridgeshire saw a strange FuBK test card on channel E4 one morning in early April. It appeared from out of the noise, and although fairly weak the inscription 'CH4' could be deciphered. Unfortunately reception was rather short lived. John forgot to log it at the time so we do not have details of the exact date, only the time, which was 0810 BST.

This subject has been discussed with other DX-TV enthusiasts. One theory is that it may have been from the La Dôle transmitter in Switzerland, using a different form of identification. The theory goes that 'CH' indicates 'Confoederatio Helvetica' (Switzerland's Latin name), and the number 4 denotes the channel. It is unlikely that CH is an abbreviation for channel, particularly if it originated from an outlet in Germany where K for Kanal is normally used.

SEB-TV mystery solved

We have in the past mentioned reception of 'SEB-TV' broadcasts by enthusiasts living in Kuwait. Southern European Broadcast TV programmes are intended for American Forces personnel stationed in Italy. No wonder our Kuwaiti readers were surprised to find it popping up on their domestic UHF receivers.

Roger Bunney of Romsey has supplied the answer to this mystery. Apparently reception is via a downlink from transponder 9 on the Intelsat 5 craft. It is being picked up by a grade B Intelsat system purchased from Scientifica Atlanta and installed at the home of the Prime Minister of Oman. According to Roger, programmes are re-broadcast as a 'local' service via a 100W Microdyne transmitter in 'real time'.

In other words, AFRTS transmissions are being shown in Oman 'live' rather than being delayed in order to censor any sensitive material. It would appear that enthusiasts in Kuwait are receiving the relayed American SEB-TV signals from Oman. So now we know!

Grundig multi-standard TVs

Joop Prosée of Spanbroek in the Netherlands, has sent details about multi-standard receivers which are ideal for DX-TV work and are widely available in the Netherlands. The models are the M70-290 Multi (27-inch stereo), the ST66-260/9 Multi (26-inch stereo), the P55-245/9 Multi (22-inch) and the P40-242/90 Multi (16-inch).

Having tested the P55 model, Joop concludes that it is perhaps the best TV available for DX-TV. It's certainly a big improvement on earlier Grundig multi-standard sets, with no cross-modulation or overload problems. Mind you, it's almost £500 for the teletext version.

Joop's latest DX project is an experiment with two stacked FuBA XC391-D UHF aerials. Despite the general lack of activity the first indications are that the system looks 'promising'. Daily reception of the 20kW RTB outlet on E57 and E63 from Tournai in Belgium is now possible at a distance of 155 miles. For some strange reason the Belgian BRT transmitter at Oostvleteren on channels E49 and E55 cannot be received although the site is in almost the same direction. It's ERP is also 20kW.

Various types of arrays are used by Joop for DX-TV reception. For Bands I and II he uses a home-made log-periodic which feeds a Band I/II amplifier. A 3-element wideband yagi is also employed. For Band III reception he has constructed a 25-element log-periodic terminated into a Triax 400/3LN amp.

UHF is provided by four stacked TWA multi-element arrays for channels 17 to 65 and two stacked home-made Band V antennas for channels 55 to 70. Triax 400055B amplifiers have been incorporated into the system.

At the other end of the receiving chain he uses a host of TV sets including four Philips X12T740 chassis, one of which has facilities for resolving transmission systems B, G, H, I and L with sound. Systems B, D, G, H, K', K and M, are covered by a JVC 7255EE/A. This set caters for the PAL, SECAM, NTSC 3.58 and NTSC 4.43 colour systems. Added to all these receivers, Joop also finds space (and, no doubt, square eyes) for an NEC 12-inch PAL set for systems B, G, H and I plus a Philips 2436 monochrome receiver for B, D, G, H, I, K', K, M and N transmissions. He must have one of the most impressive DX-TV set-ups in the Netherlands.

Crete still on A2

We recently mentioned that there was a possibility of receiving the American Forces TV service based in Crete during the sporadic-E season. Some years ago AFN transmissions were noted in the UK from the AFTV outlet at Iraklion on channel A2, but nothing has been seen from this transmitter for some time.

Joop Prosée also tells us that while he was on holiday in northern Italy during August 1984, he received AFTV on channel A2 via sporadic-E on his portable DX-TV equipment. Joop is certain that the A2 signal was a system M 525-line transmission, because he has had quite a lot of experience in receiving these types of broadcasts from the American AFN station on channel A80 at Soesterberg in the Netherlands.

He points out that the last time AFTV-

Iraklion was received on channel A2 was during the last sunspot minimum (between 1973 and 1976), so DX-ers should be on the look-out for strange 525-line transmissions this year!

Service Information

Netherlands There are a number of pirate television stations currently in operation. Some have a service area of over 20 miles, and under favourable tropospheric conditions it may be possible for some signals to be received by DX-TV enthusiasts living along the East Anglian coast. All pirate transmissions are horizontally polarised with most operating in Band IV, particularly between UHF channels 25 to 34. Pirate TV first came to the Netherlands in 1979 when there were some 60 illegal stations, mainly in the cities of Alkmaar, Hoorn, Schagen and Medemblik. Today there are about 20.

Use of the FuBK electronic test card is being gradually extended by NOS. Initial tests with the FuBK began during the summer of 1985 from the Lopik (Ijsselstein) transmitters on channels E4 and E27. Since then the old familiar PM5540 test card has not been seen. The FuBK is now also radiated from Goes (channels E29 and E32), Markelo (E7 and E54) and Roermond (E5 and E31). This test card will also be broadcast from Smilde (E6 and E47), Arnhem (E50 and E53) and Wieringermeer (channels E39 and E45).

France The following transmitters are expected to come into service at the end of September for the fifth TV network, 'La Cinq' (TV5): Belfort on channel 30; La Baule on 38; Niort, 38; Rouen, 59; Angoulême, 31; Bourges, 21; Limoges, 38; Pau, 29; Vannes, 58.

The sixth TV service (TV6) is now available from the following transmitters: Paris on channel 33; Marseille, 38; Lijon, 22; Lens-Bouvigny, 54; Bordeaux, 43; Toulouse, 34; Grenoble, 62; Nîmes, 37; Nevers, 46; Nantes, 65; C Ferrand, 61; Dijon, 57; Toulon, 60; Amiens, 52; St Nazaire, 52; St Quentin, 33; Montluçon, 52; Nancy, 49.

Iceland Ríkisútvarpid-Sjónvarp (RUV) have changed their very familiar clock caption. It now incorporates the RUV logo instead of the eye-catching outline map of Iceland.

Licences for private radio and television stations have recently been issued by the Icelandic authorities. The first private TV station will probably open in Reykjavik on UHF during September.

Czechoslovakia The CST-1 relay station at Praha (Prague) which operates on channel R41 has had its ERP increased to 20kW. This makes it the most powerful relay, although some other outlets may also be increased to 20kW in the near future.

Our thanks to Gösta van der Linden (Rotterdam), Joop Prosée (Spanbroek) and the Benelux DX Club (Netherlands) for the above information.

REW

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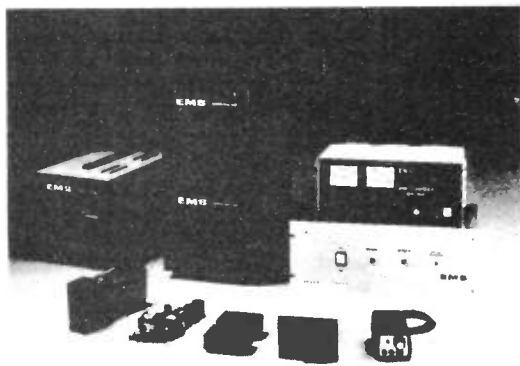
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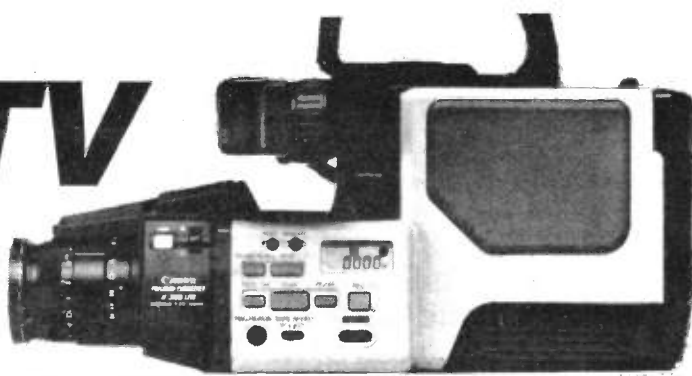
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ATV



ON THE AIR

Andy Emmerson G8PTH puts you in the picture

I thought I'd start off with a provocative statement. We've had a few sunny days, but where is all the tropo DX we deserve? The past winter and spring have been some of the worst in memory for flat conditions. Still, the rally season is upon us, and so far I have not been over-impressed with the video 'junk' on offer this year. Less than last year and higher prices as well. Never mind . . .

Dates for your diary

Mark up 16 November if you're a slow-scanner. There will be a national SSTV contest on that date and I'll let you have more details when (if) I get them.

Next year's ATV convention at Crick will be on 3 May, but no need to hold your breath on that one.

This September sees the first official meeting of the EATWG – the European ATV Working Group. Delegates from the ATV organisations of Switzerland, Austria, Germany and Britain will be present, together with ATVers from France and the Netherlands who have no ATV clubs of their own.

Meeting in Basel, we intend to co-ordinate our approach to negotiations with national societies and radio regulatory bodies. Hopefully in this way we shall protect our bands against the anti-ATV meanies. A four-man contingent is representing the UK, so I hope to report significant progress later this year.

The R&EW test card

The electronic test card design first described by Colin Edwards G8FQT in the July and August 1983 issues of this magazine has been one of the most successful projects of recent years. The printed circuit board and a complete kit of parts are available from Cirkit, and the test card is in use in many shacks – and on several ATV repeaters.

Recently, however, constructors have experienced some problems over the availability of the programmed EPROMs and with the basic operation of the kit, which is not helped by the board having a circuit different to that on the paper-work.

However, help is at hand, thanks to those busy lads of the Worthing & District Video Repeater Group. Geoff Mather

G8DHE has written an extremely useful information sheet giving details on the necessary mods to try if your board doesn't work. You can get one by sending an SAE to him at 72 Cranleigh Road, Worthing, Sussex BN14 7QW, and you might care to send a small donation to the repeater group funds.

Help at last!

Here in a nutshell are the mods, although for all details and diagrams you'll need the full information sheet.

The synchronous counter IC1 drives both the multiplexer (IC5-7) select lines and latch input. As the outputs of the counter change simultaneously a race condition exists between which input is selected and when the data is latched.

To overcome this the select line signal needs to be delayed by a few nanoseconds. This is most simply achieved (if not most elegantly, says Geoff) by placing a capacitor on the line – a value between 100pF and 600pF connected between the line and deck will normally do the trick.

The effect the problem causes can vary from no output at all, to an effect similar to loss of off line sync; of course some early boards did not exhibit the fault at all. A convenient spot to put the capacitor is next to C13.

The second problem involves the width of the sync pulses and hence the position of the test card on the screen. Normally it is shifted over to the right of where it should be. The cure is a pull-down resistor between the base and emitter of Tr2, a value of 820 ohms being adequate. Fit this beside R18 and D1.

If you are in any doubt send for the information sheet – at the same time you can ask about the EPROM blowing service.

New EPROMs for old

The repeater group can provide two patterns of test card EPROM, customised with your own call letters and details. One is the 'traditional' IBA style design, while the other incorporates the BATC symbol and looks a little like Test Card C or the BATC cardboard design. They can also provide plain text captions, with or without BATC logos.

Prices are moderate, so send an SAE to find out the latest details.

The group has also produced an expansion board which enables you to have several EPROMs on board, selectable by rotary or thumbwheel switch. This PCB is the same size as the original test card and is an excellent idea. They have other projects, such as a video processing amplifier which cleans video up to a constant 1 volt signal, so send off that SAE!

Action stations

Once again our spectrum is under attack, at least if you believe some of the scaremongers.

Specifically, the suggestion that the 70cm amateur band is to be reduced to 430-435MHz has no official foundation. It is correct that the Ministry of Defence has called for a review of frequency usage, but pending its publication no new allocations are being made. When there is news you will have it here.

Moving up to 23cm, you can expect a bit more flak if you live in eastern England (sorry I can't be more precise!). It has been announced that the first Martello transportable three dimensional radar has been handed over by Marconi Radar Systems Ltd to the MoD Procurement Executive. During the summer the radar will be worked up to service acceptance by a team of RAF and Marconi personnel, so 23cm TVers may note more interference on the band than usual. Send me a report if it is excessive.

The S723 radar is in fact an extremely sophisticated piece of apparatus, giving continuous range, bearing and height (up to 150,000 feet) of small targets within ranges in excess of 250 miles. A total of four new installations will be incorporated into the improved UK Air Defence Ground Environment system (UKADGE). Being entirely solid-state it makes considerable use of high-power transistors, and we shall eventually benefit from the technology transfer, so don't complain too loudly!

More spectrum watching

By a strange coincidence, two large coloured charts of UK frequency allocations have appeared in the last month, and both are free!

One came with the June issue of *Wireless World*, and the other is available from the Radio Regulatory Division at Waterloo Bridge House. The *Wireless World* one is more detailed, and more accurate: according to the DTI our 23cm band has been extended to 1365MHz. Isn't it typical that it's never the RSGB that tells you this good news!

If you're hooked on this kind of thing, it would be worth purchasing the official book of UK frequency allocations from HMSO (about £12), and the excellent new book by Peter Rouse GU1DKD entitled *Scanners* (Argus Books, £7.95).

NETWORK

934

Andy Emmerson G9BUP

Screen Europe is the title of a new bi-monthly newsletter for people interested in ATV and DX-TV, costing a very reasonable 50p an issue for 6 illustrated pages. On the basis of the first issue I find it sufficiently interesting to want to subscribe, and the editors also publish detailed information sheets and a pair of video tapes for identifying exotic stations. Send 50p and a large SAE to Tim Anderson at 2 Burry Road, St Leonard's on Sea, Sussex, for more info.

That's it for now. Next month is the three-monthly activity round-up. I'm grateful for the pics received, but there's always room for more, so please send them in, care of the editor. **REW**

Several hysterical opinions have been heard, both on the air and at the 934 Club's annual general meeting, that PRS represents a threat to 934MHz CB. I must say I fail to see why: the Government has not indicated that it wishes to take away 934MHz, and indeed it said it would only introduce PRS if there was a demand from businessmen.

The plus points, if PRS took off, is that it would bring down rig and antenna costs and it would clear taxi firms and the like from 'our' band. For all that, the airwaves are scarcely clogged solid with commercial QSOs at the moment, are they?

Incidentally, the Government has renamed PRS as SRR – short range radio. Doubtless this will catch on like Open Channel did (not)!

Switches and relays

For one reason or another you may need a switch in your transmission line between the rig and the aerial. Perhaps you want to switch in the shack between two rigs or between the 934MHz transceiver and a scanner receiver. At masthead you may wish to select either a beam or a collinear.

In the shops you will find some excellent products for doing these tasks, but the prices are rather high. In fact anything with 'N' type connectors tends to be expensive, and if it doesn't have N sockets on it you shouldn't be using it at 934MHz!

For a manual two-way selector switch to use in the shack you can't beat the Welz CH20-N but it is a wicked £46: at least it is superbly made. For masthead switching the waterproof remote-controlled relay sold under the Nevada name is also good. Any cheaper devices are suspect and probably troublesome.

If, however, you feel like a little homebrew effort read on. You will need three round, single-hole mounting N connectors (Cirkit pattern 10-01301 or Maplin FJ79L) and a type G4Y152P relay. The latter is a special low-loss type used in many cellular radio rigs and is a bit specialist. You can get it for £7 including postage from LMW Electronics, 102

Stamford Street, Ratby, Leicester LE6 0JU – they also sell a hot little bare-board preamp.

The relay should be mounted inside a suitably sized diecast box, with all sockets on one side. Use subminiature co-ax for connecting up the plugs (see diagram) – RG174 or better. Cirkit sell this, but don't use the 75 ohm stuff Maplin sell as it won't be suitable for this application.

The inner of the cable is soldered to the centre pin on the rear of the socket, and a very short 'tail' of braiding should be soldered direct to the rim or edge of the socket for minimum VSWR. Note the subminiature 1pF and 2pF ceramic capacitors on the relay pins; keep lead length to a minimum.

For feeding the 12 volts (or more likely 13.8V) into the box a locking DIN plug and socket are nice and reliable, and if the relay is to be used in the shack you can fit a switch and indicator lamps or LEDs on the box as well. If the switch is to be used at masthead you'll need to feed switched power up a separate wire.

Do waterproof the box well if it is to go outside – use plenty of tape and silicone rubber. Mount the sockets underneath and drill a small hole on the underside for pressure equalisation – you do not want it airtight. If well made, a relay box like this will be as good as any you can buy.

Super preamp

Last time I previewed a new preamp, the Corona GS-903DX, imported from Switzerland. Supplies have now arrived in this country and Mike Machin of Selectronic let me have one to try.

The Corona is a set-side rather than masthead preamp device, which is a double-edged sword. Obviously this makes it easier to install, though you lose the advantage of having the preamp overcome losses in your coaxial feeder between the antenna and rig. For all that the Corona has an incredibly low noise figure (quoted as 0.5dB) and will make an improvement to the sensitivity of most, if not all, rigs. What's more the gain is adjustable – you have three switch settings, +10dB and +23dB as well as a -6dB attenuator position to cater for rock-crushing locals.

By nature I am suspicious of set-side preamps (there are some awful ones on the market) but this item worked well. I could switch out my masthead GaAsFET device and switching in the GS-903 brought back signals to the same level. If you already have a masthead preamp you don't need this one as well: using the two

in cascade does provoke cellular and other interference effects.

The preamp is beautifully made and finished, just like the best rigs, and each one is individually serial numbered. The price, at £168, is on the high side but not out of line with some of the best ranges of amateur gear.

Silent key

I was most upset to hear that David Dryden DD16/G3BKQ had passed on. He designed the LMW preamp and was responsible for many of the improvements people have made to their Reftecs, as well as offering assistance to anyone who asked. He's probably better off where he's gone, fortunately.

Hassles

It would appear that the boys from the Radio Investigation Service are paying more visits to people who employ long yagis, loops and other beam type arrays with more than 4 elements. It would also appear that these people have made their presence known to the authorities by making complaints about cellular radio interference. Silly billies!

It is a fact that with a properly installed legal set-up you are most unlikely to suffer cellular QRM, and high gain aerials will only aggravate the situation!

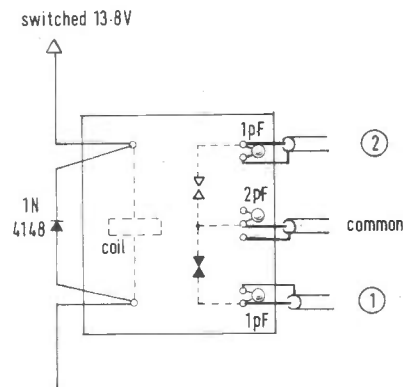
More interference?

If you live in the London area you will doubtless be pleased to hear that the frequencies between 915 and 933MHz are to be released for additional cellular base stations. Inevitably this will increase the risk of interference, though it remains to be seen what happens in practice. Both 934MHz CB and the potential 933MHz personal radio service stand at risk.

Looking on the bright side, cells tend to be smaller in London and the aerials will be very directional as the cells are sectorised (like slices of a pie). The new frequencies are not likely to come into use for a year or so.

Back next month – see you then. **REW**

Omron type G4Y152P relay used as an RF switch



MEDIUM WAVE



DXING

by Steve Whitt

By now, under normal circumstances, most radio listeners would have deserted the MW and LW bands either to take a well earned holiday or to tune the VHF and UHF bands which often come alive at this time of year. However, the inclement weather has kept many a listener indoors within reach of his receiver.

Summer is often seen as having no potential for the MW DXer, and to a certain extent this is true since reception of signals over a very long distance is largely a winter phenomenon. Nevertheless not all is lost for the keen DXer; the transatlantic path to the Americas (particularly Latin America) is often open during the few hours before local sunrise. In addition one may well be surprised by the results of daytime ground-wave DX and short-skip DX around dawn and dusk.

Propagation

Back in the April issue of *R&EWI* I took a look at some of the basic factors governing MW (and LW) reception, in particular the effect of the ionosphere and the influence of solar radiation and ground effects.

I deliberately restricted the subject to effects that affect MW reception in a regular or predictable manner; the sort of parameters that a planner takes into account when planning the reception area for a new station.

There are, however, many other occurrences that have a bearing on radio propagation at these frequencies, each with a greater or lesser degree of unpredictability. Although it is nice to be able to predict when good DX will be heard on the MW band, it is the possibility of the unusual occurring that adds a touch of excitement to the DXing hobby.

One of the overriding features of MW propagation is the effect of solar radiation on the upper regions of the Earth's atmosphere. Predictable effects of solar radiation can be seen as diurnal and seasonal variations in MW propagation as well as in the influence of the 11 year sunspot cycle.

Less predictable events can be broadly categorised as ionospheric storms, short wave fade-outs and polar disturbances.

These somewhat esoteric events result from disturbances occurring in the sun, which is, under such circumstances, referred to as 'active'.

The mechanisms behind such events are both complex and in some instances not yet fully understood, but fortunately the average DXer is likely to be more interested in knowing the effect rather than the cause. In addition it could be very helpful to know when such an event was in progress and to be able to gauge its possible effect on DXing.

A number of radio institutes around the world keep a watch on the sun and the ionosphere, but the DXer is faced with the problem of obtaining (and interpreting) this extensive scientific information.

Fortunately the American National Bureau of Standards can provide this information via the short wave standard time and frequency transmissions of station WWV.

This station, which is most likely to be heard on 5.0, 10.0 or 15.0MHz, transmits regularly updated radio propagation data during the 18th minute past every hour. It is also possible to obtain this information by phoning a pre-recorded announcement prepared by the NBS in Boulder, Colorado; from the UK call 010-1-303-497-3235.

Interesting info

One piece of information transmitted from the NBS that is particularly interesting is the Fredericksburg 'A' Index (more properly called the Fredericksburg Index of Geomagnetic Activity in the Earth's Magnetic Field), which can be used as a simple guide to propagation on the MW band.

It is a simple matter to construct a daily graph of the A indices (see *Figure 1* for an example) from which basic propagation predictions can be made. High values (above 20) indicate that medium wave signals in upper latitude paths are likely to be absorbed, leaving signals propagating via more southerly paths to dominate.

Low values over a period of time indicate a likelihood of improved reception via higher latitude paths. Long periods of very low (6 or less) values are needed to raise the possibility of good

high latitude reception throughout the entire MW band. For example, referring to *Figure 1*, the low activity between the 20th and 26th of November resulted in some of the best North American DX of 1985.

Station focus

It is likely that the very first 'American' station that the European DXer will hear will be rather closer to home than expected.

Since the end of World War II there have been a number of American operated stations in Europe, but the two most likely to be heard are Voice of America from Munich (1197kHz) and the American Forces Network. After the initial disappointment of realising the origin of these broadcasts has worn off, the MW listener will find the AFN stations an interesting source of local radio DX.

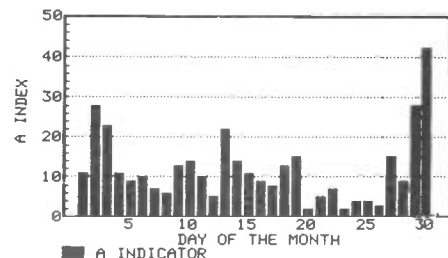
AFN is the European arm of the American Forces Radio and Television Service, and both its staff and its audience are American armed forces personnel. It operates a network of around 50 radio and TV transmitters around Europe, but for the MW DXer the prime area of activity is West Germany, where eight studios operate via 30 MW transmitters.

If you've never heard AFN before try tuning (after dark) to AFN Frankfurt on 873kHz, the flagship station in the network. You'll hear a mix of programming intended to keep the audience in touch with what is happening back home in the States. There's a variety of programmes produced in Europe and those relayed by satellite from the major networks in the USA (you'll notice that the commercial breaks are filled with public service style messages).

Whilst most European programming originates from the main studios in Frankfurt, the other seven studio stations opt out of the network with truly local material at certain times of the day.

These stations can be quite a DX challenge, since local material is usually aired for only a few hours each weekday—mainly 0600-1000 and 1600-1800 hrs local time. Try looking for Berlin on 1107kHz, Bremerhaven on 1143kHz, Frankfurt on 873kHz, Kaiserslautern on 1107kHz, Munich on 1107kHz, Nürnberg on 1107kHz and finally both Stuttgart and Würzburg on 1143kHz.

Fig 1 AFR Graph/November 1985



If you do positively identify any of these local stations it can be worth your while writing direct to the local studio, as AFN does verify correct reception reports with a QSL card.

DX file

As I write this column the summer solstice is very nearly with us, but despite the high levels of static and thunderstorm noise on the MW band and of course the shorter nights, some interesting DX is still being logged. My log

book reveals the following:

738 Energy 103, Dublin. 2230hrs. This is a brand new local station.


930 CJYQ St John's, NF with baseball commentary (unusual programme for this station). 0005hrs.

954 R España, Madrid with an excellent signal around 2330hrs. This regional station is independent of the main Spanish radio networks.

1220 R Globo, Rio de Janeiro celebrating World Cup victory over N Ireland (Portuguese language). 2350hrs.

Note that all times are GMT/UTC, frequencies are kHz.

Although the transatlantic signals heard around midnight are not as strong as they can be in winter, other DXers have reported exceptionally strong signals from stations such as WHN in New York at around 0300hrs.

That's about it for another month. Don't forget that your letters and DX tips, and loggings are always welcome, so why not drop me a line care of *Radio & Electronics World*. 

LIGHTING ATV PART ONE

by Norman E Ash

Lighting for television can be a headache, even for the experts. For the amateur, this situation can be further aggravated by a makeshift studio and limited resources. The author has spent many years working in closed circuit television, and I aim to offer some general guide lines for illuminating QSOs.

Studio lighting often mimics the natural lighting from the sun. This single light source is reflected and scattered in many directions, its diffusion slightly illuminating the shadows cast by the sun.

'Hard quality light'

In the studio this main light source, called a 'key' light, is normally a 'hard quality light'. Shadows from the key are illuminated by 'soft' light called 'fill' lighting (the term 'hard' and 'soft' refer to the edge effect of the shadow cast).

Figure 1 shows how this general photographic technique of 'portrait lighting' is used for television, where a static presenter is required. The key light is best placed slightly to one side of the camera, causing the opposite side of the presenter to be in shadow. This is filled by one or more soft lights.

The quality of this soft light depends on the area and quality of the diffusing

material used in front of the light source. A larger area further back is preferable to a little close in. The height of the key light is best just slightly higher than the camera lens, but this may have to increase to suit the presenter's tolerance or if spectacles are worn. If the key is too high, heavy shadows about the eyes and under the chin appear. The normally less powerful 'backlights' are directed forward onto the presenter to help separate the presenter's image from the background (one light immediately behind will do). The background should be lit and be as far away as feasible, to avoid the presenter's shadow appearing.

In Figure 2 the 'portrait' approach is used to light a general area, allowing a degree of movement with more than one person. Note how the key lights are arranged to overlap slightly to give continuous coverage across the studio. Both key and fill lights are spaced across in order to even out the drop in light level from one side to the other.

Figure 3 shows how all soft lighting from the front can be used to suppress shadow problems. This technique is especially useful for lighting equipment with three dimensional detail. Soft light only on people tends to be rather flat; with care, you can use both this technique and the previous one on the same scene.

Normally lighting is a compromise, and the shack studio may impose extensive limitations.

Figure 4 shows how reflective surfaces can be used to get light into restricted areas. Lighting the ceiling helps the general level of illumination and can make do for backlight and background lighting in a small area.

The key light can be reflected using a mirror, but as it is normally hard light it should be high up to minimise the amount of shadow on the close background. Suitable reflective surfaces should be matt white or silver, since these reflect the most light and will not

affect working in colour.

It is advisable to watch out for 'highlights' on a television screen while you are positioning the lights (remember you have three axes in which to move). Small 'flares' might be covered with a matt sticky tape or lightly chalked where feasible. Figure 5 shows how you can mask off the light from an offending source in the local area of the flare. If you have extreme problems reflected light alone might be the solution (the bright spot of the lamps is diffused on the reflective surface). However, you do require a lot of light to achieve a reasonable level of illumination.

Illumination problems

For amateurs with old, less sensitive cameras, the illumination level could be a problem. Even new high quality cameras cannot give good results below a certain light level.

Without a light meter a visual judgement on a reasonable television display can be made. Look for the least noise in the undetailed grey areas of the picture. In the case of some colour cameras check for the loss of response to the colours that aren't so bright. This procedure should be carried out in conjunction with the camera's electronic

Fig 1 'Portrait lighting a static' presenter

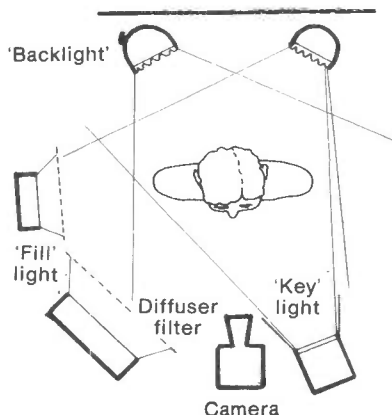


Fig 2 'Portrait lighting in wide area'

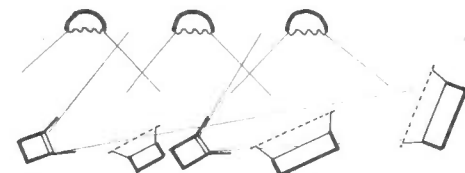
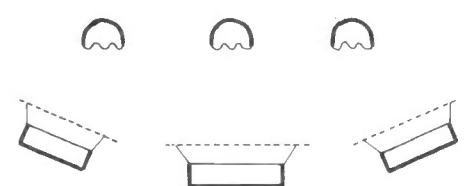


Fig 3 'All frontal soft lighting'



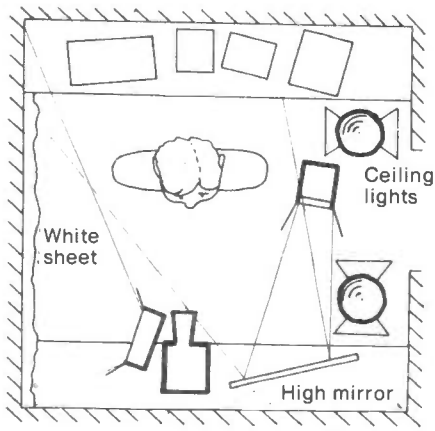


Fig 4 'Confined lighting'
(a plastic mirror is recommended)

gain and iris adjustments, where these are manual.

If on a correctly aligned camera the brightest areas of the picture starts 'limiting' (a washing out of detail) with a high level of illumination and the picture is still noisy, the camera tube(s) might be too worn out to respond. Adjustment of illumination levels beyond this point is not usually worthwhile; the increased contrast range worsens the effect of the

camera's limited range. Extra 'beam current' might help in this case. It is for this reason that the avoidance of 'white' in the picture is generally recommended. For example, avoid white shirts and white paper.

Extra consideration

Operating in colour requires extra consideration: the 'colour temperature' of the lighting used has to be taken into account.

White light can be simplified into a mix of three primary colours used in colour television: red, green and blue. Basically the balance between the red and blue determines the colour (colour temperature) of the white in use. This 'colour balance' is used in colour cameras to adjust for the light entering the camera, which differs from the white (colour temperature) used as a standard.

Daylight is very much bluer than normal household lighting, which has very little blue in it. Mixing light from a window and room lighting will not give consistent colour. The colour balance control cannot be used to correct mixed lighting: the use of one colour temperature source or the use of filters in front of the light sources is required. Such 'correction filters' are subtractive, so

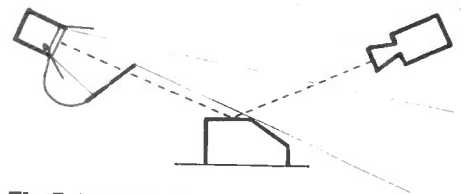


Fig 5 'Masking highlights'

they cut down the level of illumination. It is also not worthwhile placing a 'blue tungsten to daylight' filter over a normal domestic bulb to correct it to daylight: there is not enough blue in it!

Colour temperature meters are expensive for normal amateur use, but you should be able to use the manual colour balance method to check that the colour temperatures are the same for each source in turn, using the same conditions. Once you have set your standard colour temperature on the camera, use the correction filters in front of the lighting to correct any imbalance indicated on the same setting.

Correction filters for lighting can be obtained from theatre and film lighting suppliers. Normally small quantity sheets and half sheets are available (approximately 4ft x 21ins and 2ft x 21ins).

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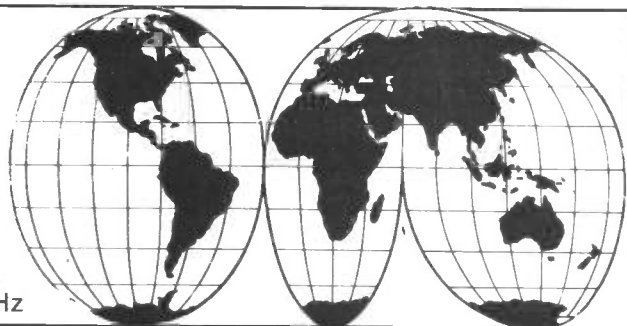
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SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

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



Chasing the Colombians on the 60 metre band (**4750** to **5060**) is an interesting proposition, and one that can provide many hours of both endeavour and satisfaction – provided some degree of success is eventually achieved.

The national networks with which the Colombian chaser will come into contact on the band are Cadena (Chain) Super, Caracol (Primera Cadena Radial Colombiana), Grupo Radial Colombiano and Todelar (Circuito Todelar de Colombia). These networks often feature the fast, rhythmical local music style of the country with folkloric vocals to match. After some experience listening to Colombian stations, one is quickly able to recognise the 'sound' of the transmissions – this often being the first clue to identification.

Remember that on the 60 metre band, apart from two exceptions, Colombian stations have allocated frequencies terminating with the digit five. Frequent time-checks and station identifications, often including the call letters (prefixed by HJ), are a feature of Colombian broadcasts.

Making a start

This is best done by tuning to **4945**, on which frequency the signals from Caracol Neiva, Neiva will be heard. At 20kW it works around the clock, and is commonly reported throughout the SWL world. A session on this channel and the newcomer will soon become accustomed to the sound of Colombian, as they often announce themselves.

On your marks

Get set and go – to **4775** (nominal) where signals from Radio Super in Medellin, which is now working to a 24-hour schedule, may be heard.

Previously on **4875** variable to **4876**, this 2kW transmitter

vanished for a while only to become reactivated on a precisely measured **4774.9**. It identifies as Radio Super and announces the network La Cadena Super, which is reported in the SWL press.

The 5kW Ecos del Combeima, Ibague, on **4785** nominal but identified on a measured **4785.1**, is also on the air around the clock. In the Cadena Super network, it is frequently listed in European DXers' reports.

A Colombian which frequently appeared in past reports was the 10kW Radio Guatapurí in Valledupar, which, unfortunately, is only on the air irregularly from 1000 to 0400 in the Todelar network on **4815** variable.

Another Colombian that was previously inactive has sprung to life on its original channel of **4845**. Radio Bucaramanga at 10kW is scheduled on the air from 1000 to 0400, at which time a full station identification and the National Anthem will be heard.

A particular favourite is La Voz del Cinaruco in Arauca operating in the Caracol network from 0900 to 0400 (Sunday until 0200). With a power of 1kW it is logged here quite often, presenting a typical format of local pops, *musica romantico*, newscasts, time-checks, *loteria*, *noticias* and promos. The channel is a good one – tune to **4865**.

Last laps

Another Colombian putting in an irregular appearance is Emisora Meridiano 70 in Arauca, which is on a variable **4925** and is scheduled from 1100 to 0200, when it is on the air. This one was frequently recorded in my logbook a few years ago, and in many others no doubt.

Ondas del Ortegua, Florencia has a 1kW transmitter that operates on an actual **4975.2** (nominal **4975**) from 1000 to 2302, but does sometimes extend the schedule to 0130. Listed as being in the

Todelar network it has been reported as giving frequent mentions of Caracol. It identifies as 'Emisora de los Campesinos', which roughly translates as Radio Station of the Countryman, ie rural. It is seldom heard by European DXers.

AROUND THE DIAL

After coursing for Colombians, perhaps a meander amongst the following will provide a comparatively restful occupation.

AFRICA

Botswana

Gaborone on a measured **3355.8** at 1805, OM with a talk in English about apartheid. This 50kW transmitter is on the air from 0400 to 0630 (Tuesday to Thursday inclusive from 0530) and from 1400 to 2100 in SeTswana and English. Newscasts in English are aired at 0510 (Monday to Friday inclusive), at 0600 (BBC relay), at 1610 and 1910 daily.

Egypt

Cairo on **17670** at 1825, OM with quotations from the Holy Quran in an Arabic presentation to Africa scheduled from 1300 to 1900.

Cairo on **21465** at 1343, YL with a talk in the Indonesian programme for South-East Asia scheduled from 1215 to 1345, YL with the station identification at 1545, time-check then OM with quotations from the Holy Quran in the Malay broadcast for South-East Asia, timed from 1345 to 1445.

Liberia

VOA (Voice of America), Monrovia, on **15445** at 1842, OM with a talk about the USA National Library of Medicine during an English broadcast to Africa, scheduled from 1800 to 2300.

VOA, Monrovia, on **15600** at 1736, Mel Tormé with a song in an English programme for Africa on this channel from 1600 to 2300.

Morocco

VOA, Tangier, on **15205** at 1929, YL with some sports news in an English presentation to Europe, timed from 1700 to 2200 daily.

Tangier on **15360** at 1514, YL with some songs complete with Arabic-style music in the Arabic transmission for Africa, scheduled from 1100 to 1700.

Tangier on **15335** at 2031, OM with a talk in the Arabic programme for Europe, on the air from 1000 through to 0100.

Namibia

SWABC (South-West Africa Broadcasting Corporation), Windhoek, on **3270** at 1820, OM with songs in a local vernacular then OM with announcements which have a slight echo effect. This 100kW transmitter is on the air with the Home Service 1 in Damara, Herero and Nama from 1625 to 0630 (to 0510 during local summertime), and includes the all night service 'Radio Orion' from 2200 to 0400.

Seychelles

FEBA (Far East Broadcasting Association), Mahe, on **15435** at 1729, YL with the station identification then OM and YL with news of African affairs in a transmission for African consumption, timed from 1730 to 1755 on this channel.

South Africa

SABC (South African Broadcasting Corporation), Johannesburg, on **4835** at 1812, OM with a talk about Libya in English. SABC Johannesburg on this frequency carries the Home Service in English from 0400 (Saturday from 0430, Sunday from 0500) to 0555 and from 1520 to 2200, with a power of 100kW.

SABC, Johannesburg, on **4880** at 1817, OM with a talk in Afrikaans followed by Frank Sinatra recordings. The

SHORT WAVE NEWS

Home Service in Afrikaans is listed on this channel from 0350 (Sunday from 0400) to 0550 and from 1520 to 2200, with a power of 100kW.

RSA (Radio South Africa), Johannesburg, on **4945** at 1832, OM with a talk in the Lozi programme scheduled from 1500 to 1956. The power is 250kW.

CENTRAL AMERICA

Costa Rica

Faro del Caribe (Lighthouse of the Caribbean), San Jose, on **5055** at 0404, OM with a talk in Spanish. This one shines its light from 1030 to 2000 and from 2300 to extinguishment at 0600. The power is 5kW. Founded in 1738, the city of San Jose to the west of central Costa Rica is the capital and largest city of the country. It is the centre of the economic, political and social life of the republic.

Cuba

Havana on **15230** at 2016, OM with a talk about Guatemala and El Salvador in the French programme directed to Europe from 2000 to 2140.

Netherlands Antilles

Radio Nederlands relay, Bonaire, on **15560** at 2104, OM and YL with news in a Dutch programme for West Africa, scheduled from 2030 to 2125.

RN relay, Bonaire, on **17605** at 1830, YL with the station identification and a newscast during the English transmission to Central and West Africa scheduled from 1830 to 1925.

NORTH AMERICA

Canada

RCI (Radio Canada International), Montreal, on **15325** at 2026, OM with a talk about salmon fishing in an English programme for Western Europe, timed from 1900 to 2030 Monday to Friday inclusive (Saturday and Sunday from 2000 to 2100).

USA

AFRTS (Armed Forces Radio and Television Service), Greenville, on **15430** at 2053, OM and YL with promos (promotions) during an English transmission for the North Atlantic area, including the Azores.

VOA, Greenville, on **15580**

at 2006, OM with a newscast in an English programme for Africa, scheduled from 1600 to 2300 on this channel.

SOUTH AMERICA

Brazil

Radio Cultura, Campos, on **4955** at 0349, OM with a talk in Portuguese during which several Brazilian place names occurred. At 2.5kW, Radio Cultura is on the air from 0800 through to 0400.

Radio Nacional, Brazilia, on **15155** at 1917, YL with the station identification, OM with announcements, then some music in the German programme for Europe, timed from 1900 to 1950.

Peru

Radio Atlantida, Iquitos, on **4790** at 0332, OM with a talk in Spanish until 0339, then some rousing military music, more announcements, then YL with a folk song and guitar accompaniment. This 5kW transmitter is operative from 0900 (Sunday from 1130) to sign-off around 0500 (Sunday at 0400). The town of Iquitos is located on the Amazon in north-west Peru.

Venezuela

Radio Bolivar, Ciudad Bolivar, on **4770** at 0012, OM with some promos then YL with a local pop song in Spanish. Radio Bolivar is on the air from 0900 to 0400 with a power of 1kW. Ciudad Bolivar (City of Bolivar), formerly named Angostura, in Bolivar State is a port on the Orinoco River.

SOUTH-EAST ASIA

Japan

NHK (Nippon Hoso Kyokai), Tokyo, on **15310** at 1530, YL with the station identification then YL with a song in the English programme for Europe and the Middle East which may be heard daily from 1500 to 1600.

North Korea

Pyongyang on **11665** at 1312, YL with an anti South Korean propaganda talk during an English transmission to Europe, from 1300 to 1350.

NEAR AND MIDDLE EAST

Bangladesh

Dhaka on **15525** at 1226, OM with a ballad then YL with the station identification fol-

lowed by sign-off with the National Anthem at 1300. This English programme for Europe is scheduled from 1230 to 1300.

Cyprus

BBC relay, Limassol, on **15310** at 1348, OM with a talk about the status of women in the third world during a World Service (English) presentation to the Middle East, on the air from 1330 to 1515.

India

AIR (All India Radio), Delhi, on **9910** at 2010, YL with a newscast in an English programme for Europe, scheduled from 2000 to 2230 on this channel.

Iraq

Baghdad on **9745** at 0624, YL with a song, OMs with chorus, OM announcer in an Arabic programme for Europe on this frequency from 0400 to 1000.

Kuwait

Radio Kuwait on **9840** at 1935, YL with a song together with some local-style music in an Arabic transmission to Europe, timed from 1530 to 2215.

Pakistan

Islamabad on **15605** at 0902, OM and YL with a discussion in the Urdu programme directed to Europe from 0715 to 1100.

United Arab Emirates

Dubai on **15300** at 2035, OM with a news review during a programme in Arabic for Europe, from 1645 to 2050.

North Yemen

San'a on **4853** at 2038, orchestral music in the Arabic style, OM with a song. Radio San'a is on the air on this channel from 0300 to 0700 (Friday until 2110) and from 1000 to 2110, with a power of 20kW. San'a is the largest city in southern Arabia and is a centre of Islamic culture.

EUROPE

Albania

Radio Tirana on **15435** at 1729, YL with the station identification, OM and YL with news of local affairs and events in English, broadcasting to Africa from 1730 to 1755 daily.

Austria

Vienna on **6155** at 1526, YL with the station identification, OM with frequencies and times of the English transmissions at the end of an English programme for Asia and Europe, timed from 1500 to 1527.

Czechoslovakia

Prague on **15110** at 1746, YL with a news review of both local and world events in an English programme intended for African consumption and scheduled from 1730 to 1825.

Finland

Helsinki on **11945** at 1259, interval signal, OM with the station identification, YL with a programme preview followed by news, mainly of Nordic events, in an English presentation to North America listed from 1300 to 1325.

Greece

VOA, Kavalla, on **15205** at 1444, OMs with a discussion about jazz music in the USA during an English transmission to Asia, scheduled from 1300 to 1500 on this frequency.

VOA, Kavalla, on **15260** at 1746, OM with a talk about research on sea life and the sea in an English programme directed to the Middle East and timed from 1500 to 1800.

Malta

Deutsche Welle (Cologne relay), Cyclops, on **115105** at 1438, OM with a newscast in the Urdu programme beamed to Asia from 1430 to 1520.

NOW HEAR THIS

Radio Rio Amazonas, Macuma, Ecuador on **4870** at 0332, OM with announcements in Spanish then YL with a folk song. This 5kW transmitter operates from 1000 to a variable closing around 0400.

VOFC (Voice of Free China), Taipeh, Taiwan on **15440** at 2057, Chinese-style music, five chimes repeated several times, OM with the station identification in both Chinese and English, frequencies and times of English programmes, the National Anthem and then YL with a newscast, mostly of local news but with some world affairs, all in the English transmission to Europe, from 2057 to 2157 daily. 

NEXT ISSUE

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

Wythall award

A Worked All Midlands Club Award (WAMC) has been organised by the Wythall Radio Club in conjunction with Eddystone Radio Ltd.

The award is open to radio amateurs and listeners operating on the 6m, 4m and 70cm bands and in any simplex mode. The aim of the award is to promote the existence of amateur radio clubs and societies. The award is operated on a points system, with 1 point scored for working/hearing a member of a club or society in the Midlands region using a personal callsign; 2 points for a member using a club callsign; and 5 points for a member of Wythall Radio Club using the

club callsign G4WAC (all claimants must work G4WAC).

The Midlands area is defined as the counties of Hereford, Worcester, Shropshire, Staffordshire, Leicestershire, Northamptonshire, Warwickshire and the West Midlands.

The Bronze award requires 20 points, whilst Silver, Gold and Platinum require 35,50 or 65 points respectively; only one contact per club can be claimed for the award.

Claimants are required to send in log extracts signed by two other amateurs. Summary logs are acceptable. Details on the log should include date, time, callsign, band, mode, name, QTH and the

club name (that's important).

The award commences on 1 July and has no time limit.

To claim the award, claimants should send their logs together with a cheque or postal order for £1.50 made payable to the Wythall Radio Club, stating the class claimed and how the points total is arrived at, to the Awards Manager, from whom details and a list of applicable clubs can be obtained if a large SAE is enclosed.

Contact Mick Pugh G4VPD, 37 Forest Way, Hollywood, Birmingham B47 5JS, or Telephone Chris G0EYO/G1RHH on 021-430 7267 for further information.

Scottish convention

This year Glenrothes and District Amateur Radio Club host the Scottish Amateur Radio Convention. The event will be known as 'Scotam 86' and is to be held on Saturday 13 September at the Lomond Centre in Glenrothes, Fife.

Five years ago, 'Scotam 81', was held at this venue and at that time visitors from all over the UK attended the convention.

This year, however, vastly improved and extended facilities at the Centre offer the opportunity to make this the most successful amateur radio event in Scotland to date.

Full catering facilities, including lounge bar, will be available throughout the day and, for those travelling from a distance, there are many reasonably priced hotels and guest houses in the area.

For further information contact: Ken Riddoch GM3ZSP, Garland Cottage, South Road, Cupar, Fife KY15 5JG. Tel: (0334) 53336.

IERE Conference

The Institute of Electronic and Radio Engineers (IERE) will be holding their fifth international conference on electromagnetic compatibility (EMC) from 30 September to 3 October this year at the University of York.

The latest trends in this field will be pinpointed, including both immunity of interference and suppression at source.

An innovation in this year's conference is that a complete

session has been devoted to the consideration of papers dealing with methods of improving immunity to interference arising within printed circuit boards as a result of EMC.

Also, as two universities in the UK are now offering EMC as a degree subject or as part of a postgraduate course, a special session will be devoted to the subject of EMC education. Included in the programme will be consideration of courses, and the use of demonstrations and computer graphics in electromagnetic education.

Another area to be covered is that of safety. A session on 'hazards' will include papers from various institutions who have been working on the evaluation of RF ignition and detonation hazards.

'Aerials and EM Fields' and 'Test Methods and Specifications' are the titles of two more sessions which are becoming increasingly more important.

On the first day of the conference tutorial papers on such subjects as spectrum analysis, screening, suppression components and filters, EMP, measuring techniques and instrumentation will be studied. These tutorials have been designed to appeal in particular to the newcomer to the subject of EMC.

Also of particular interest to newcomers will be the exhibition that is being organised to support the conference. More than 30 stands will be present and the latest developments from leading EMC specialists will be on show.


Attendance at the conference is open to both members and non-members of the Institution.

For further information and registration forms contact: The Conference Secretariat, Institution of Electronic and Radio Engineers, 99 Gower Street, London WC1E 6AZ. Tel: 01-388 3071.

Domesday anniversary

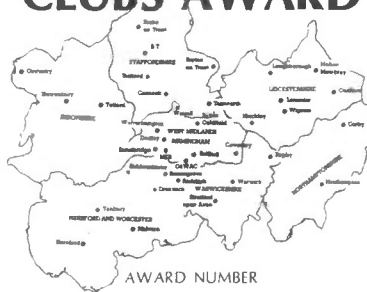
To celebrate the 900th anniversary of the Domesday Book the Gloucester ARS will be using the special event callsign GB9DB during September.

The station will commence



Wythall Radio Club G4WAC

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transmission on 6 September at 1200GMT on HF and VHF. This will coincide with the opening of the Gloucester Local History Festival on the same site. QSL cards will be available from the RSGB and incoming cards should be sent either to the RSGB at Lambda House or to G4AYM.

More details can be obtained from: Nicholas Negus G6AWT, 12 Laura Close, Longlevens, Gloucester GL2 9JH. Tel: (0452) 504515.

Marconi's Flat Holm

The Barry College of Further Education are mounting an expedition to Flat Holm Island to take place between 22 and 26 September 1986.

The station GB2FI celebrates the 89th anniversary of Marconi's pioneering tests from the island and will be active on all the HF bands, 6m as GW3VKL, 4m, 2m, 70cm, 23cm and 3cm wideband FM. Sked frequencies will be 50.12MHz, 70.22, 144.27, 432.27 and 1296.27MHz. For skeds on VHF, UHF and HF contact GW8NVN, GW1JCB or GW8CMU, all QTHR.

This station is one of the few required for the Marconi Award and is a rare square for WAB (ST26).

For further details please contact S Lloyd Hughes GW8NVN, 4 Blenheim Close, Highkight Park, Barry, S Glam CF6 5AN, enclosing an SAE.

Telford mobile

The Telford Amateur Radio Rally Group are holding a mobile rally at the Telford Raquet and Fitness Centre, Telford, Shropshire on 31 August from 11am. This new site, which is alongside the previous venue, can be reached from junction 5 of the M54 or via the A442. Talk-in via GB4TRG on S22 and SU8.

For further details telephone G8UGL (Telford 584173) or G3UKV (Telford 55416).

Starting line

On 2 November 1936 the BBC started the first High Definition TV Service in the world. Transmissions took place at Alexandra Palace in North London, using, alternatively, a mechanical Baird system and an electronic EMI

set-up. The latter soon became the accepted standard.

That was fifty years ago and to celebrate, Borehamwood and Elstree ARS, in association with the BBC, are staging a special event radio station.

They will be operating SSB, CW and possibly RTTY on 2, 10, 15, 20, 40 and 80 metres subject to propagation conditions. A special QSL card had also been designed.

Transmissions start on 20 September at 1200 hours GMT and continue until 2000 hours on 21 September under the call sign GB2 TV.

For further details contact: Ivor Rosenberg G4XEW, 11 Parkside Drive, Edgware, Middlesex HA8 8JU.

Absolute beginners

From 16 September the Radio Amateur's Examination course will be held at Paddington College, London.

This covers the syllabus for the City and Guilds RAE exam, and incorporates practical experiments in the theory covered.

Aimed at novices, in recent years there has been a RAE pass rate close to 90%. Attendance is required twice

a week between mid September and the exam in May.

Enrolments are between 8-10 September (1.00-4.00 - 6.00-8.00) or during the first few weeks of the course. Tutors are David Peace, G4KKM, and David Hunt, G6MFR.

For further details contact: Paddington College. Tel: 01-402 6221 or David Peace on (01) 892 7585.

Guildford RAE

The Guildford College of Technology will be running an RAE course again this year, commencing 15 September on Monday evenings.

If you live in this area and are interested, enrolment will take place on 8 and 9 September between 2.00-4.00pm and 6.00-8.30pm. Details are available from the college on (0483) 31251.

Amateurs on course

The North East Hants Adult Education Institute is running the following courses for 1986, at the Wavell school, Lynchford Road, Farnborough, Hants:

The radio amateur C&G 765 course, which starts on Thursday 25 September; the Morse - beginners' course, which



Last international meeting of the brains was two years ago in Bottrop, Germany. The EATWG (European Amateur Television Working Group) was formed then and it meets in earnest this September in Switzerland. Founder members included Heinz Venhaus DC6MR and, well, guess! (photo G8LJS)

starts Monday 22 September; and the Morse - advanced, 10 to 20wpm, which starts on Thursday 25th September.

Please contact the school for further information. Tel: (0252) 540084 or (0252) 518305.

Allan Santos G4PMJ, from Hull, has sent in a world time zone program which may be of interest to some of you computer bods.

The program is written for the CBM64 plus disk drive, although it can easily be altered for use with a cassette unit. The program when run gives full instructions for use.

If any more of you whizz kids have an idea that you think readers would find useful, just send them in - we're always interested to see how inventive you can be with your PCs!

```

10 POKE 53280,6:POKE 53281,6
20 PRINT:GOTO 210
25 PRINT:GOTO 210
30 AS=""
31 PRINT:G4PMJ RADIO SOFTWARE TIME ZONE WORLDWIDE I TIME ZONE'S SOFTWARE"
32 PRINT:PRESS SPACE BAR TO DISPLAY NAME OF COUNTRY"
33 PRINT:TYPE IN BACKUP THIS WILL SAVE COPY OF FILE"
34 PRINT:YOU CAN ALSO TYPE IN 'SAVE' TO SAVE COMPLETE FILE"
35 PRINT:TYPING IN 'END' WILL QUIT THE PROGRAM"
36 PRINT:TYPE IN 'LIST' SHOWS THE WHOLE FILE IN SEQUENCE,"
37 PRINT:DURING LIST, PRESS SPACE TO DELETE AN ENTRY"
38
40 DS=""
50 BS=CHR$(20):CS=BS+BS+BS
60 AS=CS+CS+CS+CS+AS+"":FORA=1 TO 43
70 PRINTDS:MID$(AS,A,20):CHR$(145)
80 FORX=0 TO 99:NEXTX,A
81 FOR T=1 TO 6000:NEXT
90 REM TIME ZONE PROGRAM
100 REM A.SANTOS 1986 G4PMJ"
110 DIM A$(41):A$(41)
120 OPENI5,9:15
130 SS=""
140 OPEN S.8.8,"@ NAMES.S.A"
150 N=0
160 N=N+1:INPUT@B,A$(N):INPUT@B,AC(N)
170 IF A$(N)<>"GMT"THEN GOTO 150
180 CLOSE 8
190 N=N+1
200 PRINT:GOTO 210
210 PRINT:"TIME ZONE CHECKER"
220 PRINT:"PLEASE SET CORRECT TIME (HHMMSS)"
230 PRINT:"IF TIME IS RIGHT, PRESS RETURN"
240 PRINT:"PRESENT TIME IS ",T:GOSUB 400:PRINT
250 IF DS=CHR$(13) THEN PRINT:GOTO 200
260 INPUT:"ENTER TIME STRING":T$=PRINT:G
270 T=0:PRINT:PRINT:TIME IS SET AT ",GOSUB 400:PRINT:PRINT
280 INPUT:"ENTER NAME OF COUNTRY":BS=PRINT:CHR$(145):SS$=CHR$(13):CHR$(145):
290 IF BS=""END"THEN GOSUB 630:CLOSE:15:END
300 BS=""SAVE"THEN GOSUB 630:PRINT:PRINT:GOTO 280
310 IF BS=""BACKUP"THEN GOSUB 720:PRINT:PRINT:GOTO 280
320 IF BS=""LIST"THEN GOSUB 780:PRINT:PRINT:GOTO 280
330 FOR N=1 TO MX
340 IF BS=LEFT$(A$(N),LEN(BS))THEN GOTO 440
350 IF BS=""A$(N)THEN BS=MID$(BS,2):GOTO 410
360 NEXTN
370 PRINT:"COUNTRY NOT FOUND"
380 PRINT:"SPACE TO SET TIME IN ",BS
390 GET J$:IF J$=""THEN GOTO 390
400 IF J$<>" "THEN GOTO 280
410 PRINT:"ENTER HOURS OFFSET FOR ",BS":INPUT OH
420 PRINT:PRINT:"TIME IN ",BS":IS ",T:OH:GOSUB 400:GOSUB 700
430 PRINT:PRINT:GOTO 280
440 T=AC(N):PRINT:TIME IN ",A$(N)":IS ",GOSUB 400
450 PRINT:PRINT:GOTO 280
460 REM*****
470 REM CONTINUOUS TIME DISPLAY:IT IS OFFSET
480 H$=LEFT$(T$,2):M$=""
490 IF HD23 THEN H$=24
500 IF HD2 THEN H$=24
510 H$=STR$(H)
520 H$=RIGHT$(H$,2)
530 M$=MID$(T$,3,2)
540 S$=RIGHT$(T$,2)
550 PRINTAB(24):H$:M$:S$:SS$
560 FOR K=1 TO LEN(H$)+10
570 PRINT:CHR$(157)
580 NEXT K
590 GET DS:IF DS=""THEN GOTO 400
600 PRINT:SS$
610 RETURN
620 REM*****
630 OPEN S.8.8,"@ NAMES.S.A"
640 N=0
650 N=N+1:PRINT@B,A$(N):PRINT@B,AC(N)
660 IF A$(N)<>"GMT"THEN GOTO 630
670 CLOSE 9
680 RETURN
690 REM*****
700 A$(MX)=BS:AC(MX)=OH:MX=MX+1:A$(MX)="LAST":AC(MX)=0
710 RETURN
720 OPEN S.8.8,"@ NAMES.S.A"
730 N=0
740 N=N+1:PRINT@B,A$(N):PRINT@B,AC(N)
750 IF A$(N)<>"GMT"THEN GOTO 630
760 CLOSE 9
770 RETURN
780 FOR N=1 TO MX
790 BS=A$(N):T=A$(N):PRINT:"TIME IN ",BS":IS ",GOSUB 400:PRINT
800 IF DS=""THEN GOSUB 830
810 NEXT:RETURN
820 REM THIS BIT REMOVES A COUNTRY
830 PRINT:PRINT:PRESS Y TO ERASE"
840 GET PP$:IF PP$=""THEN 840
850 IF PP$<>"Y"THEN RETURN
860 FOR P=1 TO MX-1
870 A$(P)=A$(P+1):A$(P)=A$(P+1)
880 NEXT
890 M$=M$-1
900 PRINT:PRINT:"**** ERASED ****":RETURN

```



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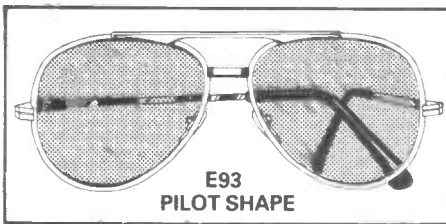
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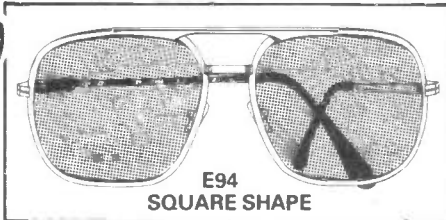
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E80 Unisex Top of the fashion range with a beautifully sculptured 'tortoise shell' type plastic frame in brown and crystal.

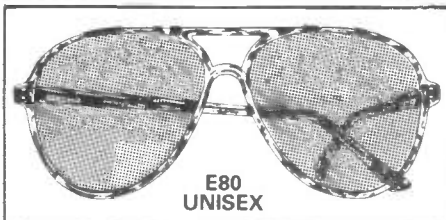
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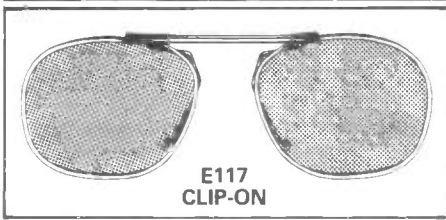
E93 PILOT SHAPE



E94 SQUARE SHAPE



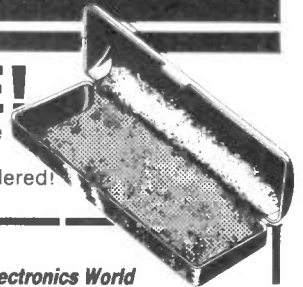
E80 UNISEX



E117 CLIP-ON

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- E80 in 'Tortoise Shell' frame
- E117 in Gilt frame

*Please delete.

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FOR SALE

■ Newnes radio and TV repair manuals vols one-six, 1946-1957, covers most valve models. Also Mullard maintenance manual of valve data and Mullard book circuits for audio amps (valve). £35 or swap for freq read-out, or active AF filter, FL2 etc, to suit FRG7. Jacobs, 11 Broad Leys, Sawyers Close, Windsor SL4 5HL. Tel: Windsor 852067

■ Shack clearout - brand new components. 100 assorted capacitors, £2.50. 50 assorted transistors, £2.50. 35 assorted power transistors, £2.50. 100 assorted diodes, £1.50. Multi-assortment pack, all kinds of new components, 200 for £7. Printed circuits, ex-equipment, hundreds of useful parts, at least 10 boards, weight over 5kg, £6.50. All prices include postage. Many other large items available to callers: scope, meters, PSUs etc. K Bailey, 40 Seymour Close, Selly Park, Birmingham B29 7JD. Tel: (021) 472 3688

■ Oric 4 colour printer/plotter, Centronics interface, £45. Advance Gould Alfa 4 digital meter, bench model, £75. Tamron lenses (fit anything); 35-70mm, F3.5, £65; 90mm, F2.5 macro, £125. Olympus 28mm F2.8, £55. Mel Saunders, 7 Drumcliff Road, Thurnby Lodge, Leicester LE5 2LH

■ Murphy CBH1500 FM base station CB rig, vgc, £50. Modulator Saturn legal base station CB antenna, £10. Midland 3001 AM mobile station CB rig, good condition, £10. Persuader magnetic mount CB antenna with co-ax, £10. SWR/power meter, £5. 20 feet of co-ax (no plugs), £5. Genuine reason for sale. Also Bremi 3A PSU, new, unused, £10. Graham Johnson, 95A Coventry Road, Nuneaton, Warwick CV10 7AA. Tel: (0203) 341368

■ Plans for building dc welder using car dynamo, £5.50. Electronic noise maker with 6 buttons and speaker, train, fire engine, laser gun etc, £5. Football game, 14 LEDs, 6 buttons, crowd noises etc, £5. Football game, 14 LEDs 6 buttons, crowd noises etc, £5. Post free. D Martin, 7 Griffin Crescent, Littlehampton, Sussex

■ FDK multi 700EX, with GPV5 collinear antenna, £175. G3VZM. Tel: (051) 339 5317 (after 6pm)

■ Advance J1/A audio generator, 15Hz-50kHz, recently serviced and calibrated, £30. Mr S Retter, 33 Albion Road, Sileby, Loughborough, Leics. Tel: (0664) 69234

■ Valves: 12V, 6.3V, octal yanks, 6A7G, 6L7G, British types, from 25p each. Number of 50L6GT, 25L6GT, 35L6GT, 25Z5GT, 35Z6GT, all unused. SAE for lists. Thanks to the kind people who offered info on Seavoice Dope - greatly appreciated. A E Jeffrey G3HWD, 42 Dennis Road, Padstow, Cornwall PL28 8DF

■ Quad II stereo valve amp and control unit, with Garrard AT60 turntable in modified cabinet. Offers, you collect. Salmon, 5 Truon Close, Chesterfield, Derbys. Tel: (0246) 703221

■ Bargain of a lifetime. All kinds of components, many new; equipment, meters etc. Selling due to retirement of enthusiast who has collected stuff over 40 years. First to see will buy. Valves estimated at over £1,000! Will sell the lot to a bona fide enthusiast for only £199, or might be prepared to split up. Come and see - you have nothing to lose! Mr Ken Bailey. Tel: (021) 472 3688

■ Printer: Taxan Kaga KP810, Centronics interface, 140CPs + 27CPs NLQ, suit BBC micro, as new, £140 ono. Tel: (0582) 36879

■ Rama mobile echo chamber plus mounting bracket, boxed, mint, £20. Micronta power supply, boxed, mint, £8 plus p+p. Offers to Peter, Box 3, Keswick, Cumbria CA12

■ Scanning receiver, Bearcat 210, coverage 32-50, 146-174, 416-512MHz, with service manual, boxed, mint condition, £115 ono. Realistic Pro-2001 scanner, coverage 30-50, 144-174, 430-512MHz, service manual available, in good condition, £150

ono. Shogun SEL call unit, new, £25. Tel: (01) 582 8738

■ Yaesu FT one gen coverage plus ham band transceiver, many fitted extras, commercial model. Also FC902 antenna tuner unit, both mint condition and still in boxes, complete with manuals, £1,100. A Cheyne, Crossfields, Turriff, Aberdeen AB5 7PQ. Tel: (08885) 254

■ AR2001, £260. FRG7 digital SSB filter, £150. Marconi sig gen, 15kHz-35MHz, £35. Eddystone 830/9HF Rx, vgc, handbook, £175. Sig gen, HF, UHF, £15. Scope D/B Cossor, large, £10. Working headset, Airlite 62 with carbon mike, £12. May deliver at cost. Tel: Leeds 677101

■ Drake TR7, DR7, AUX7, FA7S7, RV7, SP75, 7077 base mic, 7073 fist mic, AM/wide/SSB narrow/CW narrow. All filters 0-30MHz AM/SSB/RTTY/CW, PS7, FA7, vgc, £800. Service manual complete set-up less PSU, £650. Manual ICF2001D, £250. Sony portable + books, ferrograph reel to reel series six, stereo, £60, three speed, three motor, three heads. Commodore +4 computer C16 with 64K, books, 12 ace games, £60 or Icom IC2E + cash. Call or write to Les B, 31C Anerley Park, Penge, London SE20

■ Urgently wanted: information on running RTTY on a Sinclair QL computer. Details of software/hardware sources and connections required. Tel: Stoneyburn (0501) 62231 or write Mr G Allan, 6 Farady Place, Addiewell, West Lothian EH55 8NG, Scotland

■ Oscilloscope Telequipment type D83 with dual Y and X plug-ins, delayed timebase, 50MHz bandwidth, fully transistorised, in very good condition and complete with manuals, spare tube and probes, £350 ono. Tel: Stoneyburn (0501) 62231 or write Mr G Allan, 6 Farady Place, Addiewell, West Lothian EH55 8NG, Scotland

■ Apple peripheral cards: IC tester, checks 500 ICs, £80; speech, disc controller, wild card, communication, 16K, Z80 c/pm, £32 ea; Grappler parallel, serial, £40 ea; music, 80 col soft switch, £45; Rana elite three disc drive, £110; many other bits including lots of software. Reardon, 36 Radipole Road, Fulham, London SW6 5DL. Tel: (01) 736 7809

■ Icom IC2E 2m hand-held Tx/Rx, 2 watts, handbook, mains charger, £95. MPF1 single board Z80 microcomputer with 8255 and Z80 PIO, 16 parallel input/output lines, Z80 CTC 4 independent counter timers, cassette interface, mains PSU and all manuals. Good for robotics and other control applications, £35. Two Tangerine 6502 systems, one with Tanex and Asimov word processor mounted in portable case with full 74 key keyboard, all leads, mains PSU and manuals, £30; second with Tanex + 48 K memory board, RS232 interface, A-D converter board, EPROM programmer board (needs new ROM software), backplane in 19 inch rack mount, manuals and three rail PSU, £35. Oric Atmos micro with Author word processor and printer lead, £25. High precision Calcomp 565 drum plotter with pens, manual and transformer, £50. All original BBC micro software: BCPL ROM, utility disc and manual, £40. VU-CALC spreadsheet package, £9, Datascribe word processor and database ROM and utility disc, £20. HULK knowledge engineering system, £7. LISP on tape with Acornsoft BBC manual, £12. Chemical structures on tape, £5. Superb MERLIN macro assembler for Apple II+, with manual, £30. LEONARDO, the 'ultimate graphics package' for Spectrum 48K, £6. Original WORDSTAR manual, £9. Tel: John Dawson (01) 387 5539, 0830-1830 most weekdays or (0295) 77 269 weekends

■ Black Star 600MHz frequency counter, approx 6 months old, includes nicads and charger, cost £148, sell for £95 (inc p+p), or £85 for caller. Eimac

4CX250B valves: 2 in boxes, £40; two unboxed, £25. All pairs, all brand new, never used. Also small qty 7107CPL DVM chips (Maplin cat), £3. Also displays to match, £3 for four. All include p+p. Mr C J Barker, 52 Spode Street, West End, Stoke-on-Trent, Staffs ST4 4DY. Tel: Chris (0782) 46570

■ Hewlett-Packard 5004A signature analyser, £690 ono. STC3000 electronic Telex (same as BT Cheetah). Features include needle printer, EPROM blower, VDU, numerous spares and descriptions. Reasonable offers only please. R Hobbs, 14 Gannon Road, Worthing BN11 2DT. Tel: (0903) 35167 after 7pm

■ Shack clearance: Muirhead decade oscillator D-890A CRT, OK, complete with manual, vgc, £55. Ferrograph tape recorder with three heads, one stereo, 3.5 and 7 inches per second, series 5, splicer mounted bass and treble, vgc, £40. Marconi TF801D/1S signal generator, vgc, with 'carrier and % modulation' meters, two large circular scales, £50. Marconi universal impedance bridge TF373C, milli-henries, micro-farads, ohms, with manual, £25. Takgda-Riken TR557BC universal counter with 'video amplifier' TR310M and 'time interval unit' TR4011M, nine digits and five decimal points, with complete manual, as new, bargain, £45. Marconi Atlanta receiver 15kHz-28MHz, 40/1 (0-100 each turn) tuning knob, 10m waveband on tubular scale, also a 6-range large oblong scale for bandsread tuning, £60. Heathkit GR64 communications receiver, 4 bands with bandsread, ANL, BFO (SSB) S-meter, phone jack, built-in speaker, in new condition with manual, £40. Lafayette HE-40 communications receiver, 4 bands, ANL, bandsread, standby, phone jack, S-meter, tone switch, built-in speaker, £35. Pye PCR communications receiver complete with plug-in PSU, unmodified, £25. R1132A receiver, 100/124MHz airband (communication), beautiful slow motion dial, £30. Two off 115V fans flat type, £4.50 the pair. Fantavox VHF 105 converter for airbands, as new, £4.50. Assorted old type projector lamps (7), some brand new, £20. Zetagi 27-30MHz preamplifier, as new, AM/FM, SSB, £13. Decade box, as new, £7. Buyer collects or pays carriage. Methven G11PC. Tel: (0293) 27187

■ Yaesu FT207R handie, with pouch and 2 batts, YM-24A speaker mic, NC-2 charger. Sell or swap for 2m mobile. Cradley Heath. Tel: (0384) 64745

■ I have sorted out all new unwanted components and made a list. Please send SAE to Mr Lawrence, 7 Griffin Crescent, Littlehampton, Sussex, if interested

■ Portable mini VHS video recorder, colour (zoom) camera, dual charger, used ½ hour only, £595 ono. Selmer Thunderbird twin-50 valve amplifier, 2x12in speakers, about 20 years old, £90 ono. Goodmans amplifier (same valves as Selmer) ex-lab, offers? Fender jazz bass, 1960s, vintage, £180 ono. Collectors item - Ecco valve radio, L/M/S, motorised tuning, offers? Quantity Philips G8 colour sets, 22in/26in and spares, space needed, good cabinets, any offers? Roger Emens, 4 Tanners Lane, Hathern, Loughborough, Leics (Junction 23, M1) Tel: (0509) 843214 evenings

■ Grundig Concert Boy 220, FM/LW/MW, SW5, 9 to 18MHz, battery and ac, mint cond, manual, £30. HC Bach, 52 Tudor Close, London NW3 4AG. Tel: (01) 794 9790

■ Panasonic HF Rx, 150kHz-30MHz, AM/SSB/CW/FM, BFO, wide and narrow filter, mains or battery, with 2mtr converter, £160. Receive ATU, boxed, hardly used, cost £62, £45 ono. Reftec 934MHz MK2, mobile Tx 8 watts output, boxed with mag mount, collinear, or £300 the lot. May part exchange new and boxed RT852 CB. All can be seen working. Contact M Hynes, flat one, 3A High Street, Torrington North Devon EX38 8HN

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■ 70cms amateur television transmitter/receiver, 10 watts output, colour or B&W, £60. Also 2 metre linear amplifier, 1.5 watts in, 30 watts out, suit IC2E etc, £30. Tel: Batley, W Yorks (0924) 470619, after 6pm

■ Are you interested in medium wave and long wave radio? Yes! Then *Medium Wave News* is for you. This informative and up to date newsletter, published by the only UK club dedicated to MW & LW radio, contains all the latest news, views, reception tips and feature articles. For a free sample issue and full subscription details please send a large SAE to: Medium Wave Circle (Secretary), 69 Alderley Way, Cramlington, Northumberland NE23 9UQ

■ Video camera, Shibaden, fully gen, lockable to extsynch, c/w integral mains PSU and Lense (b/w), £70 ono Tel: (031 660) 5768

■ Hundreds of radio and TV valves (new and seconds) all guaranteed. Also service sheets and manuals. Send SAE for details. Mr FD Brown, 6 Ryan Close, Ferndown, Dorset BH22 9TP

■ Complete shack clearance! Unrepeatable bargains! 25 years accumulation of radio and electronics stock for sale because of complete change of hobby. Lowest possible prices! Everything from valves to computers; from components to complete working projects. Books, mag's, serv sheets, cir diag's. Rare, unusual, obsolete parts and components. Vero boards, PC boards new and used. PSUs transformers, transistors, ICs, speakers, sold irons. Spare parts for radio, hi fi, tape recs, examples: 350 valves, new and used, many types, mixed, all tested, all for £35. Own-built single keyboard, portable electronic organ. Built-in rhythm gen and amp, many features, perfect, as new, for less than I paid for the components, £110. Own-built rhythm generator, complete, vg wkg ord £35. B&O Beogram 1000 stereo record deck, Beomaster 900 stereo tuner/amp and B&O bookshelf speakers, excel cond and wkg ord, £125. Too many items to make a list, so please send your list of what you need with SAE or your phone no to Mr Z Edes, 23 Valencia Way, Andover, Hants SP10 1JG. Tel: Andover 58343 evenings and weekends

■ Drake TR7, AUX7, DR7, SP7, SP75, 7073, 7077, SP75, FA7, FA7 service manual, heavy duty full cycle PSU, transistor PA, general coverage 0-30MHz NB7, decent filters, excellent American transceiver, £850. Sony ICF2001D, £225. Bargain AOR2002, £350. Bargain CBM 64&4, joystick, games, unwanted hence swap for 2mtr transceiver, any old rubbish considered, or £90 ono. 5 watts per channel stereo amp, £10. PSU inc, ideal Walkman amp. Demo's 31c Anerley Park, London SE20. Write

■ Electronic organ, JEN Allegro 361/S, two 44 key keyboards, 8 rhythms, 7 preset voices and synthy section, automatic accompaniment, Leslie, vibrato, reverb, two 30 watt RMS internal amplifiers, internally mounted 12 inch, 8 inch and 3 inch speakers. Walnut finish cabinet with lockable roll-top, bench seat. All as new, £450. Buyer to collect or arrange and pay for delivery. R Middleton, 49 Wolsey Road, Stafford ST16 3XW

■ Eddystone 770R receiver, 19 to 165MHz in six bands, £100. KW Vespa Tx, £30. RTTY V-type tuning indicator, £10. Tel: (0608) 811102

■ Reel to reel T/Rs, Grundig TK140, Philips, N4308 4 track, working vintage Bush radio DAC90A, not working, complete, offers. Edwards, 2 Beach Road, Burton Bradstock, Dorset DT6 4RF. Tel: (0308) 897 625

■ Heathkit RA-1, clean but needs alignment, has S meter mod to facia, £12. Heathkit Q-mult, £8. Heathkit S99 valve stereo amp (heavy!), £10. Will exchange for skywave forth ROM, with manual for ZX81. Tel: Mike, Stoke-on-Trent 262190, after 6pm please

■ Digital multi-meter, Philips 2521, £200. Glayzer, 27 Albert Road, Southport, Merseyside. Tel: (0704) 31153

■ Eddystone 1001, 550kHz - 30MHz, 10 xtal positions, good cond. Sell or exchange for signal gen or good quality dip meter, etc. C Reynolds, 12 Berry Road, Scalloway, Shetland. Tel: (0595) 88429

■ FDK750E 2mtr multi-mode, 1/10W, scan hand

mic, plus 10 ele J/beam long yagi, £240. Trio 7930 2 mtr FM 5/25W mobile/base, scan hand mic, plus MC55 mobile safety boom mic, £250. May swap either for FRG7700 or similar, WHY? Tel: Bridgnorth 3790 (Shropshire)

■ Four Pye Amio VHF transceivers, good condition, £25 each. Robert, Coventry. Tel: (0203) 77186

■ Surplus receivers etc, available to best offer, but must collect. Marconi Atalanta type 2207C, covers 15kHz to 28MHz in 10 bands, good working order. Eddystone 770R, AM/FM, 19 to 165MHz, working but shows its age in its looks. Eddystone 730/4 GC receiver, needs restringing of dial, otherwise OK and a good performer. Amstrad EX330 amp, plus EX303 tuner, plus 7070 tape deck, plus JVC JL-A15 gram deck, all in stock. Sold as one item and note amp requires new output trannies. Alan Thompson, 16 Ena Avenue, Neath, West Glamorgan. Tel: (0639) 4040

■ Advance E2 signal generator, 100kHz-100MHz, £40. 625 line TV cross-hatch generator, £10. 405 line TV alignment generator (7-70 MHz wobulator), offers please. EHT probe to convert meter to read up to 30kV, £10. Can arrange delivery if required. Tony Howard, Bedford. Tel: (0234) 68559, work hours

■ Yaesu FT-one, all filters, FM, non-volatile memory, £900 ono. MDI mic, £40. MHI mic, £10. FTV107R transverter, and 2m & 70cms units, £300, (will split). FTV707R, frame only, £25. FF501DX low-pass filter, £18. TR10 7200G, £40. Tokyo HL45U, 45 watt, 70cms and preamp, £90. Toyot 435 SWR power, £30. Datong auto woodpecker blanker, £45. FL3 filter, £80. Welz SP10X, £13. SP380, £30. Scarab MPTU, £40. MBA TOR C-64 cartridge, £50. 500 watt 1GHz dummy load, £50. 70cms & 2m band-pass filters. 50 watt 2m linear & preamp. SEM tranzmatch & ezi-tune, 600MHz divide by 10 prescaler, used heliex. M Fincher, 27 Albert Street, Tring. Tel: 6752

■ MuTek GD1F, 107UB, 10GHz Gunn diode board, £46. Solfan 10GHz Gunn head unit, £12. Jaybeam D15/23, 23cms yagi, (new) £46, Rank Xerox 400, tele copier and paper, £26. Tokyo Hy-power 2m linear, HL82V, 10W in, 80W out, £110. FT290/790, CSC-1A case (new), £3.50. MET 432-17X crossed 70cms yagi (new), £36. Yaesu FP80A PSU (matches 480 or 780), and 36. Paul G4XHF Tel: (0293) 515201

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■ Brother BP-30 colour graphic writer, excellent condition, still boxed and complete with graphics manual, cost new £165, used only four times, £85 ono. Have also Agfa Diamator 1500 35mm slide projector, fair condition with 85mm high resolution lens, £48 ono. Please telephone Tadley (07356) 4111 exts 6176 or 6551 between 0800 and 1600 hrs Mon to Fri. Ask for Nick

■ Drake TR7, DR7, SP7, AUX7, RV7, four filters, NB7, RF clipper, base mic, fist mic, everything except for PSU, £700. PSU if required, complete, recent overhaul, £900, offers. AOR2002, £350. Sony ICF2001D, £250, new, hardly used. Commodore C16+4 64K computer, cassette, 11 Ace games, joystick, cost £110, newish £70. Will accept Trio dual bander for TR7 but must be multimode. No rubbish. Mrs Fordham, 31C Anerley Park, London SE20

■ SX64 Commodore portable. Built-in disc drive and colour monitor. Purchased 1986, £395, sorry no offers but might p/ex ham gear. Also EPROM copier, ITT. Blows 10 at a time, and auto verify, £75. Olivetti photocopier A3, A4, bargain, £450 or swap ham gear. G4JKP not QTHR. Russ, 79 Highcroft Ave, Oadby, Leicestershire. Tel: (0533) 715160 day or evening

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Dec 86	16 Oct 86	22 Oct 86	24 Oct 86	13 Nov 86	

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AMPLIFIERS

DC9

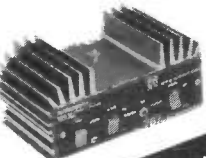
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SA5040	£3.50	BU 105/04	£1.00	
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SA5050	£3.50	BU 124	50p	
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SA5660	£1.00	BU 205	£1.00	
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SN7472N	£1.00	T6054	40p	
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SN76018	£1.00	ZTX 109k	5p	
SN76023N	£1.50	ZNX 213	10p	
SN76033	£1.50	ZTX 141	10p	
SN76033	£1.50	ZTX 342	10p	
		ZTX 384	10p	
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MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	8p
BYX 36/600	35p
BYX 38/300	25p
BYX 49/600R	75p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 71/350	20p
BYX 71/600	50p
BYX 72/300	20p
BYX 36/600	50p
BYV 95B	10p
BYV 95C	12p
BYZ 106	10p
BPW 45	10p
BYW 562/A1000v G11	5p
BZU 15/24	54p
BZV 93c75	50p
BZV 15/18	30p
BZV 15/30	30p
BZW 70c6v2	15p
BZY 78 3v	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC456	10p
BC458	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BCX31	25p
BCX32/36 pair	75p
BCX32	10p
BD116	25p
BD124	50p
BD124 (metal)	10p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD176	25p
BD182	£1.00
BD202	70p
BD203	60p
BD204	60p
BD221	60p
BD222	60p
BD228	60p
BD226	20p
BD233	30p
BD235	30p
BD239	15p
BD243c	30p
BD250	30p
BD250a	30p
BD252	30p
BD253B	30p
BD331	50p
BD332	20p
BD373D	30p
BD416	25p
BD433	25p
BD434	25p
BD437	25p
BD439	30p
BF501	50p
BF503	50p
BF585	30p
BF587	30p
BF589	15p
BF592	7p
BF593	15p
BF594	15p
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BF599	25p
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BF611	25p
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