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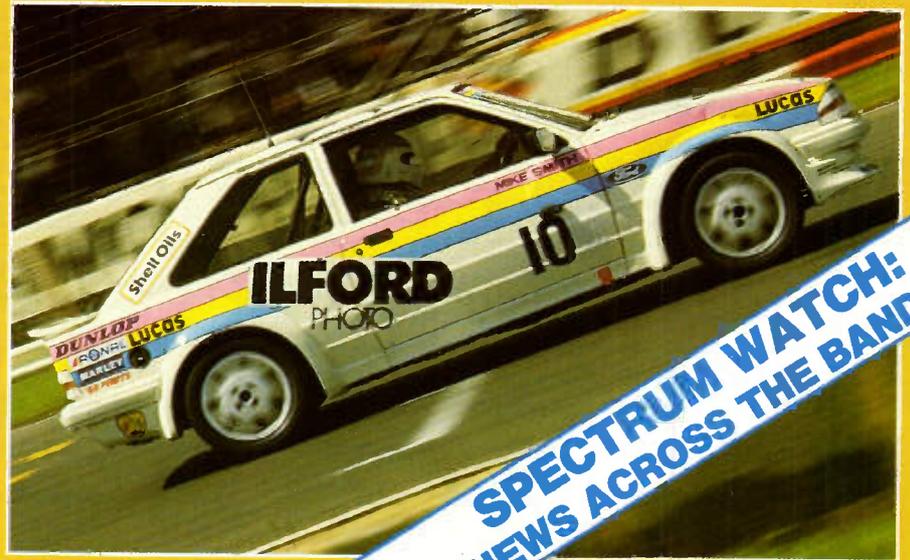
**METEOSAT:
SO WHO NEEDS
THE WEATHERMEN?**

**AERIALS:
SIMPLE ARRAY
MODELLING**

**POWER SUPPLIES:
THE LOW-DOWN ON
METERING**

**MOBILE RADIO:
PMR AT A
BREAKNECK PACE**

**DATA FILE:
LAST OF THE
555 TIMERS!**



**SPECTRUM WATCH:
NEWS ACROSS THE BANDS**

**ILFORD
PHOTO**

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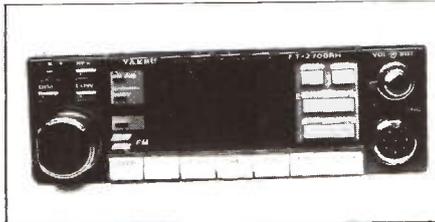


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FT757GX

- ★ 100 Watt multimode ★ AM, FM, CW, SSB
- ★ Gen coverage RX ★ Computer compatible
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ALL BAND
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15 FM/CW V15F	£39.50



Raycom Limited



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Probably the most versatile
Antenna ever designed

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This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon. The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and is capable of being used on both vhf and uhf in both horizontal and vertical polarization modes, both portable and mobile. The antenna has the facility of being used as both omni-directional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna can therefore be used in a variety of applications on frequencies between 140-450 mhz. Colinear elements £4.75.

* SEE THE REVIEWS * or SAE LEAFLETS

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This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of synthesizer chip, the unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10 mtr amateur band. See other ads for more information. Over 300 sold in 2 months! Complete radios available & other kits.

ANNOUNCING THE SUPER YAESU FT757GX — MOD BOARD UNIT from Raycom

- The modification serves two major purposes
- (1) to improve VFO tuning and eliminate 'TUNING GLITCH'
- (2) to increase tuning speed from 5khz per dial revolution to 50khz per dial revolution (selectable on the 500khz step switch)
- UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. Instant fitting service available. Phone now.

£1000.00 instant credit available
for licensed amateurs. Details upon
request. Call now!

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PMR (Business) radio equipment.

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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.

Cover Photographs

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Bottom - So what's this got to do with radio or electronics? (no, it's not the new Sinclair C5). See page 51

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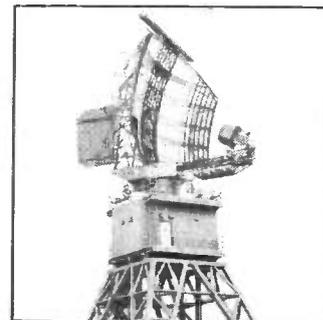
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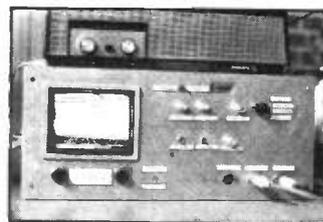
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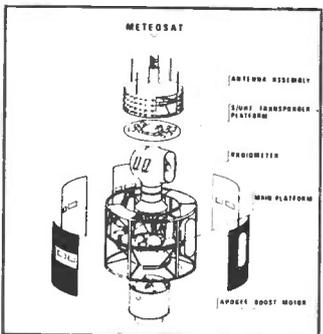
Telefunken radar at Gatwick



Hans across the sea - p45



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Anatomy of a satellite - p34

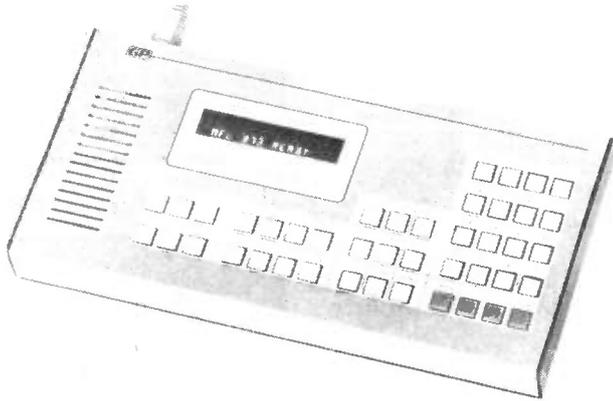


A TV DXer's shack - p48

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



MICRO FAULT LOCATOR

The GP Electronics MFL373 micro fault locator, available from Electronic Brokers, is designed for low cost and efficient microsystem testing.

The MFL373's basic system is a Z80A central processing unit, a 16Kbyte ROM containing the operating program and a 2Kbyte RAM parameter

store. Control is via the hexadecimal and dedicated function keys along with the alphanumeric display.

The instrument functions on the basis of logical progression through a sequence of test commands, making automatic comparisons against known good information and stopping when an incorrect response is received. Con-

nection to the system under test is via a micropod, of which a choice is available to meet most requirements.

Features include a high speed cassette interface for fast, reliable storage of the system memory map and test parameters; serial input/output keys for communication with a development system or computer; and a Centronics printer interface for data dumps and fault report.

The MFL373 also has a range of powerful stimulus functions which allow any combination of bits on the address or data bus to be toggled for fault tracing with the synchronous probe and a set of stimulus keys which, when used in conjunction with the synchronous probe, enable faults to be identified in peripheral devices.

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



OPTICAL POWER METER

Thorn EMI Instruments is breaking into the fibre-optics market with the launch of its new Megger optical power meter. This new compact hand-held meter is the first in a range of products for use in fibre-optic test and measurement applications to be introduced by the company.

NEW COUNTER

A new model, the TF600, has been added to the Thandar counter range. It has a frequency range of 5Hz to 600MHz and a selling price of £132.50 + VAT.

The range now includes 4 counters: the TF600; the TF200, 200MHz LCD with time average period, £175 + VAT; the PFM200A hand-held, 20Hz to 200MHz with 5 gating times

and a sensitivity of 10mV, at a price of £75.50 + VAT; and the TF040 LCD, 40MHz with totalise facility at £120.00 + VAT.

This range is complemented and extended by two optional prescalers: the TP600 (600MHz) and TP1000 (1GHz).

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



RF MEASUREMENT

Fieldtech Heathrow Limited has announced the Coaxial Dynamics range of RF power meters, loads and couplers. Several models of wattmeters and RF loads are available, covering power ranges from 0.1 watt to 50,000 watts.

The units can be used for occasional testing, or for permanent installations. Each wattmeter accepts any

of a wide range of plug-in measuring elements (called 'SLUGS') for specific power levels and frequency ranges. The measuring elements simply plug into a short section of coaxial line and the tested values can be clearly displayed on the wattmeters or on Coaxial Dynamic's 'Expediter' digital power computer.

These wattmeters may be used with most standard 'SLUGS' now in the field or

with Coaxial's own bi-directional elements.

The Coaxial bi-directional element is capable of detecting both forward and reflected power, depending on which direction the element is rotated.

*Fieldtech Heathrow Ltd,
Huntavia House,
420 Bath Road,
Longford,
Middlesex UB7 0LL.
Tel: (01) 897 6446.*



Designated OTP510, the new meter is designed to measure the light emerging from an optical fibre of up to 1mm diameter. Readings are given directly in dBm and displayed on an LCD read-out.

The OTP510 can be used to determine the attenuation, splice and connector loss in an optical fibre link by measuring signal levels at either end or at various intermediate points. It is suitable for testing optical fibre cables used in computer installations, industrial process controls, high voltage monitoring circuits and local area networks.

The meter is optimised for wavelengths of 850nm, but with the use of a conversion graph, results may be obtained for other wavelengths in the range of 400nm to 1000nm.

This instrument will be available through Thorn EMI Instruments' distributor network.

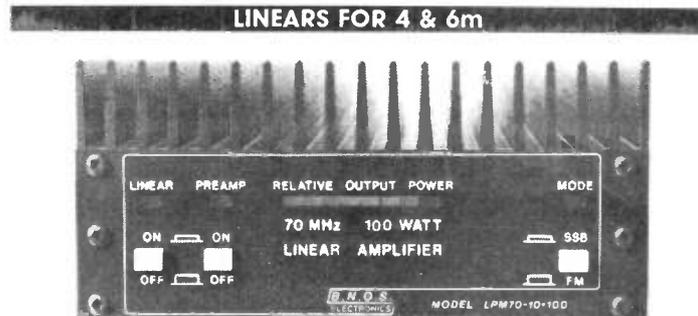
*Thorn EMI Instruments Ltd,
Archcliffe Road,
Dover,
Kent CT17 9EN.
Tel: (0304) 202620.*



MM Microwave Ltd, the Yorkshire based radar and communications sub-systems specialists, have entered the consumer satellite market with ASTRID. ASTRID is a complete and ready to use satellite receiving system with built-in decoder, enabling signals to be received and data displayed on home computers.

In operation, ASTRID receives all the data transmitted by the UoSAT satellites and automatically records it on a standard cassette tape recorder.

Information being transmitted by the satellites includes: news bulletins; satellite status; experimental data; messages on the electronic mail-



BNOS Electronics Ltd have announced the introduction of 100 watt linear amplifiers for the amateur 4 and 6 metre bands.

In the company's LPM Series format, these models join their 2m and 70cm cousins as the LPM70-10-100

and the LPM50-10-100. The usual BNOS bargraph power meter, low noise pre-amplifier and RF VOX/PTT switching facilities are built in, as is the BNOS overdrive protection feature. The mobile mount is supplied as standard.

The specifications are as follows: the frequency band for the LPM70 is 70 to 72MHz and for the LPM50 is 50 to 54MHz. Input power for both models is 10W recommended, 15W maximum and 500mW minimum. Output power is 100W rms ± 0.5 dB. Power requirements are 13.8V dc, 14A $\pm 15\%$ and insertion loss is 1.5dB ± 0.5 dB. There is an Rx pre-amp gain of typically 12dB and the Rx noise factor is better than 1.5dB. The amps sell at £172.50 each.

*BNOS Electronics Ltd,
Bigods Hall,
Great Dunmow,
Essex CM6 3BE.
Tel: (0371) 4677.*



Tratec, the Dutch satellite company, has introduced a new type of low noise downconverter, the EDC-752, for the 10.95-11.70GHz band. Surface mounted devices (SMD) technology has been used so that stable operation and long lifetime guarantees smooth operation in all circumstances.

Over a temperature range from -30 to $+60$ degrees centigrade all relevant specifications show only a slight

deviation, eg local frequency stability ± 1.5 MHz, gain ± 1 dB maximum, but most of all input VSWR 1.5 maximum and noise figure variation 2.2dB typical (2.5dB maximum).

In association with Leaming Industries, Tratec have also brought out a satellite stereo processor for stereo reception of satellite programmes like Music Box and Sky Channel.



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In association with Leaming Industries, Tratec have also brought out a satellite stereo processor for stereo reception of satellite programmes like Music Box and Sky Channel.

The stereo processor is designed for application in cable TV systems. It demodulates two subcarriers, multiplexes them into standard stereo format and modulates the stereo signal into a channel in the FM band.

*Tratec BV,
PO Box 385,
3900 AJ Veenendaal,
Holland.*

ASTRID is priced at £144.

*MM Microwave Ltd,
Satellite Group,
Thornton Road
Industrial Estate,
Pickering, North Yorkshire.
Tel: (0751) 75455.*

SATELLITE TERMINAL

Wave Devices Ltd, of Covent Garden, London have announced the introduction of the ASAT-1214 small aperture satellite communications terminal for use in business and industrial applications. The terminal is manufactured by Avantek, the microwave specialist of Cali-

fornia, USA.

The two-way terminal is designed primarily for voice and data transmission and is easily installable. It can transmit and receive at rates from 9.6kbps to 1.544Mbps, and features an antenna as small as 1.2 metres in diameter and less than 5 feet in height. With integrated electronics, it transmits up to 10 watts in the Ku frequency band between 14.0 and 14.5GHz and receives between 11.7 and 12.2GHz.

*Wave Devices Ltd,
9 Betterton Street,
London WC2H 9BF.
Tel: (01) 240 7052.*

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Versatile waveform generator with sine, triangular and square wave outputs. On board mains PSU 41-01302 27.00

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Single board 40W per channel stereo amplifier 41-01301 38.00

STEREO VU METER
5 LED per channel stereo VU meter for use with stereo amplifiers 41-01401 12.65

5W AUDIO AMP
A very compact audio output stage for use in a wide range of equipment 41-01406 4.60

UNIVERSAL AMP
A universal audio pre-amp with a gain of 10 41-01604 6.85

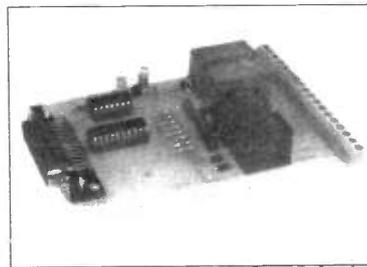
MONO REVERBERATION UNIT
Single channel, spring line reverb unit to add echo effects to tape recording etc. 41-01602 11.30

10MHz DFM
8 Digit LED digital frequency meter and period measurement 41-01500 54.10

50MHz PRESCALER
Extend the range of the 10MHz DFM to 50MHz 41-01501 8.55

1-5MHz PRE AMP
Low frequency pre-amp and waveform shaper for the 10MHz DFM 41-01502 5.13

1-30V 1mA-2A PSU
Adjustable 1-30V Power supply with pre-settable current limit from 1mA-2A 41-01600 37.46

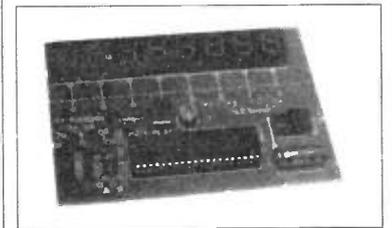


Centronics Interface

5-12V 1A PSU
Adjustable PSU from 5-12V with current protection, 1 amp max output 41-01504 6.45

1-30V 1.5A PSU
1-30 volt adjustable PSU with protected output up to 1.5 Amps 41-01402 10.45

3 DIGIT LED DVM
DVM to read up to 99.9 volts or configured as an ammeter to read up to 9.99 amps 41-01403 18.00



10MHz DFM

INFRA RED LINK
Single channel IR Link with relay output 41-01300 9.60

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Thermistor based temperature sensor with relay output 41-01303 6.20

LOCOMOTIVE SOUND GENERATOR
Realistic steam sound and whistle for model railways 41-01304 9.20

LAMP DIMMER
Control lamps and drill speed 41-01305 5.70

WATER LEVEL ALARM
Alarm to indicate high water level or flooding 41-01601 2.70

3 NOTE CHIME
Doorbell chime with adjustable tones 41-01503 7.00

2M PRE AMP
Miniature low-noise MOSFET pre-amp for the 2m amateur band 41-01307 4.13

2M CONVERTER
Low noise 144MHz-28MHz amateur band converter 41-01306 19.26

2M POWER AMP
20W - 10dB gain - power amplifier for the 2m band. Automatic TX switch over, RX pre-amp, robust construction 41-01404 37.39

70cm PRE AMP
Low noise, miniature pre-amp for the 70cm amateur band 41-01506 4.78

70cm CONVERTER
70cm to 144MHz low noise converter featuring pre-aligned helical filter, schottky diode mixer and low noise transistors 41-01405 23.50

70cm PA
10W Power amp to boost the output of handheld and portable 70cm transceivers 41-01505 38.00

CRYSTAL CALIBRATOR
Crystal reference calibrator for alignment of receivers, outputs at 4.2, 1MHz, 100.50 AND 10KHz 41-00801 5.18

CB NOISE SQUELCH
Improves to mute performance of the majority of CB rigs 41-01605 5.94

CENTRONICS INTERFACE
Connect your personal computer to the outside world via the Centronics printer output 41-01406 22.50

To: Cirkit Holdings PLC, Park Lane, Broxbourne, Hertfordshire. EN10 7NQ.
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DATA & PRICES

Type	V(nom)	Capacity	Stock No.	1-9	10-49
AA	1.2V	500mAh	01-12004	0.80	0.74
C	1.2V	1.2AH	01-12024	2.35	1.99
D	1.2V	1.2AH	01-12044	2.00	2.00
PP3	8.4V	110mAh	01-84054	3.70	3.50

CH/4/50

To recharge up to 4 AA size NiCads. Size: 112 x 71 x 37mm 01-00409 4.95

CH8/RX

Will recharge AA, C, D and PP3 size cells with automatic voltage selection. Will recharge following combinations: 4xD, 4xAA, 4xC, 2xPP3, 2xD + 2xC, 2xD + 2xAA, 2xD + 1xPP3, 2xC + 2xAA, 2xC + 1xPP3, 2xAA + 1xPP3. Charge rate: 11mA for PP3, 45mA for AA size, 120mA for C and D size, for 16 hrs. Power: 240V 50Hz. Output Voltage: 2.9V for AA, C and D size, 11.0V for PP3 size. Weight: 0.475kg. Size: 199 x 109 x 55mm. 01-02204 10.45

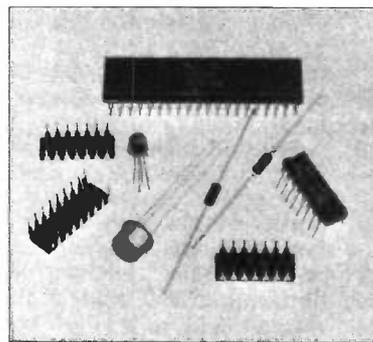


HT320

High quality, high specification meter at a reasonable price. In addition to the usual ranges, facilities are provided for measuring transistor parameters such as I_{ceo} and H_{fe}. Meter movement fully protected against overloads. 3-colour mirrored scale in robust case. Supplied complete with comprehensive instructions, test leads, transistor test leads and batteries (2 x HP-7, 1 x PP3).
DC Volts: 0.1V, 0.5V, 2.5V, 10V, 50V, 250V, 1kV (20kΩ/V). AC Volts: 10V, 50V, 250V, 1kV (18kΩ/V).
DC current: 50μA, 2.5mA, 25mA, 250mA.
Resistance: 2k, 20k, 2M, 20MΩ. AF Output: -10dB to +22dB for 10VAC (0dB/0.775V, 600Ω). Leakage (I_{ceo}) 15μA, 15mA, 150mA. H_{fe}: 0-1000 (Lc/Tb). Weight: 410gms. 56-83201 17.00

RF Generator LSG17

A stable wide-range generator for the hobbyist, service technician, schools, colleges, etc. Frequency range: A/100kHz-300kHz, B/300kHz to 1MHz (Harmonics 96-450MHz) C/1MHz-3.5MHz, D/3.0MHz-11MHz, E/10MHz-35MHz, F/32MHz-150MHz. Accuracy: ±1.5%. Output greater than 100mV (no load). Ext. xtal osc for 1 to 15MHz crystal. Power required: AC100, 115 or 230V 3VA. Size & Weight: 150(H) x 238(W) x 130(D)mm, 2.5Kg approx. 56-90017 115.00



Linear ICs

		Stock No.	Price
LF351	Bi-FET op amp	61-03510	0.49
LF353	Dual version of LF351	61-03530	0.81
LM380N	1W AF power amp	61-00380	1.45
LM381	Stereo pre-amp IC	61-00381	3.27
NE544	14 pin DIL servo driver IC	61-00544	2.20
NE555N	Multi-purpose low cost timer	61-05550	0.45
uA741CN	DIL low cost op-amp	61-07411	0.42
TDA1062	RF oscillator and mixer system for 1-200MHz	61-01062	1.95
TDA1083	Portable radio AM/FM audio in one IC	61-01083	1.95
HA1388	18W PA from 14V	61-01388	4.10
MC1496P	Double balanced mixer/modulator	61-01496	1.25
TDA2002	8W into 2 ohms power amp	61-02002	1.25
ULN2283	1W max 3-12V power amp	61-02283	1.00
CA3089	FM IF amp, detector, mute, AFC, AGC system	61-03089	3.88
CA3130E	BIMOS op amp	61-31300	0.80
CA3140E	BIMOS version of 741	61-31400	0.46
MC3359	Low current dual conversion NBFM IF and det	61-03859	2.95
LM3900	Quad norton amp	61-39000	1.20
LM3909N	8-pin DIL LED flasher	61-39090	1.15
KB4412	Two balanced mixers IF amp with AGC for AM/SSB	61-04412	2.73
ICM7555	Low power CMOS version of 555 timer	61-75550	1.24
HA11225	Low noise FM IF	61-11225	1.45
HA12017	83dB S/N phono preamp 0.001% THD	61-12017	0.80
MC14412	300 baud MODEM controller (Euro/US specs)	61-14412	6.85

Selected Lines

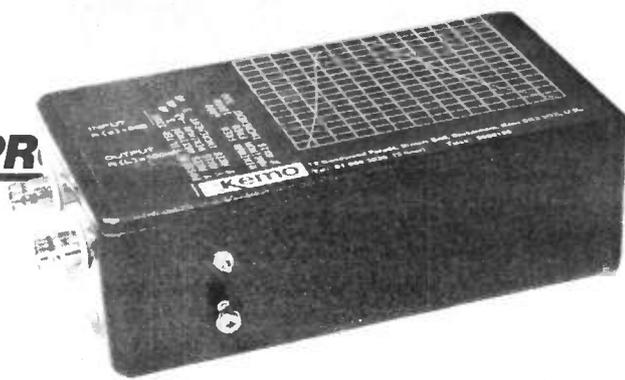
PB2720	80dB Piezo Buzzer	43-27201	0.55
10M15A	10.7 Filter	20-10152	2.10
10M08AA	10.695 Filter	20-11152	3.49
FC177	LCD Freq. Meter	39-17700	25.46
CM161	Min LCD Clock	40-80161	12.20
BBC to Centronics Cable		03-10019	7.25
Dragon to Centronics Connect Cable		03-10017	7.25
C12 Computer Cassette Tape		21-00012	0.55
8x0.3"	IC socket	28-00800	0.12
14x0.3"	IC socket	28-14000	0.13
16x0.3"	IC socket	28-16000	0.13
6V	KUIT-A Relay	46-80000	0.62
9V	KUIT-A Relay	46-80001	0.62
12V	KUIT-A Relay	46-80002	0.62
CX120P	COAX Relay	46-90120	11.96
CX520D	COAX Relay	46-90520	32.00
CX540D	COAX Relay (BNC)	46-90540	32.00

Books

Beginners Guide to Amateur Radio	02-11262	4.50
Beginners Guide to Electronics	02-04134	4.50
Active Filter Cookbook	02-21168	12.70
CMOS Cookbook	02-21398	12.95
TTL Cookbook	02-10358	11.00
Design of Op-amp Circuits with experiments	02-21537	9.30
Practical Design of Digital Circuits	02-11831	10.45
Electronic Projects for Home Security	02-05351	3.80
Electronic Telephone Projects	02-21618	7.60
55 Timer Applications Sourcebook	02-21538	6.40
Electronics Pocket Book	02-21309	7.50
More Electronic Projects in the Home	02-21307	3.80
The Radio Amateurs Question and Answer Reference Manual	02-02157	5.95
Basic Programming on the BBC Microcomputer	02-06640	5.95
Using Microprocessors and Microcomputers: The 6800 Family	02-98728	11.05
Z-80 Microcomputer Design Projects	02-21682	12.70
Z8000 Microprocessor: A Design Handbook	02-37345	16.10
Simple Amateur Band Aerials - BP125	02-00161	1.95
Simple Indoor & Window Aerials - BP136	02-00166	1.75
Simple Tropical and MW Band Aerials	02-00170	1.75
How to get your Electronic Projects Working	02-00179	1.95



68000: Principles and Programming	02-21853	12.70
8085A Cookbook	02-21697	13.55
Handbook of Electronic Tables Formulas	02-21532	11.00
Television Eng. Pocket Book 7th Ed.	02-21313	8.95
Popular Electronic Circuits	02-00175	1.95
Semiconductor Data Book 11th Edition	02-04797	9.00

PR

CUSTOM FILTERS

Kemo (Filters) Ltd offers a design and manufacturing service for custom specified filters with a frequency of up to approximately 1MHz.

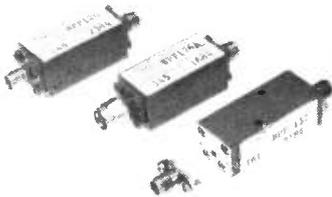
The custom service is available for both elliptic and polynomial filter shapes. Options include a choice of passband and stopband points, and a variety of terminations and sizes. Kemo can also provide special

requirements such as pulse response and time delay.

The filters are supplied either in encapsulated modules or boxed in standard die-cast containers. Custom packaging is available for quantity orders.

*Kemo (Filters) Ltd,
9-12 Goodwood Parade,
Elmers End,
Beckenham,
Kent BR3 3QZ.
Tel: (01) 658 3838.*

COMBLINE FILTERS



Time Microwave, based in Santa Clara, California, has introduced a new series of combline bandpass filters.

The passband frequency ranges from 4.0 to 8.0GHz, 5.0 to 8.0GHz, 8.0 to 12.0GHz, and 12.0 to 18.0GHz.

The model BPF172 features a VSWR of 2.0:1 maximum, insertion loss of 1.0dB maximum, and rejection of 30dB minimum at dc to 3.4GHz and at 9.2 to 18.1GHz. The BPF172 has SMA male and female connectors and is 2.44 x 0.70 x 0.70 inches excluding connectors.

Filter models BPF176, 177 and 178 feature VSWR of 1.5:1 maximum, and all SMA female connectors.

The stopband rejection for the model BPF176 is 50dB minimum at dc to 4.0GHz and at 16.0 to 18.5GHz. Model BPF177 has a stopband rejection of 50dB minimum at dc to 6.0GHz and at 24.0 to 26.5GHz; and the model BPF178's rejection is 50dB minimum at dc to 3.0GHz and at 10.0 to 15.0GHz.

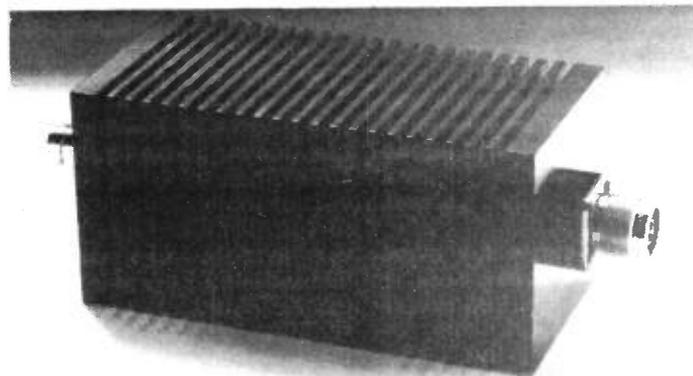
*Time Microwave,
398 Martin Avenue,
Santa Clara,
CA95050, USA.*

ATTENUATORS

Tony Chapman Electronics Limited are the sole distributors in the UK for a comprehensive range of HF attenuators manufactured by JFW Industries Inc of Indiana.

The 50FH series of high power attenuators offers power levels of up to 100 watts with standard attenuation values of between 3-30dB operation, in most models to 2,000MHz. These are suitable for VHF/UHF and microwave applications where high power levels need to be attenuated for measurement purposes. An accuracy of ± 0.3 dB and a choice of N-BNC or TNC connectors makes these attenuators ideal for extending the range of thermistor type power meters.

Designed for IF signal processing and general instrumentation, model 50P-076 provides up to 127dB in 1dB steps controlled via 12V dc with attenuation steps 1-2-4-8-16-32 and 64 sections.



CD CLEANING SYSTEM

The world launch of the new Bib CD cleaner was made by Bib on their display booth at the summer CES in Chicago at the beginning of June and is now available on the European market.

The compact disc is extremely durable, but nevertheless sound reproduction will deteriorate if there is a build up of dust, dirt or contaminants which will affect the optical system of the CD player. Therefore leading CD manufacturers recommend that compact discs are cleaned regularly.

The correct way to clean a compact disc is at 90° to the circular pattern and this can be effectively achieved with the use of the new Bib CD cleaner following the simple instructions provided.

The unit comprises a specially moulded tray on which the compact disc is placed. A bottle of cleaning fluid is housed in the cleaning unit and is easily removed for application. The base of the cleaner has a row of soft bristles to clear away dust, followed by a felt cleaning pad and behind this is a



chamois leather to finally dry and polish the record. A stiff brush is also provided to remove contaminants from the cleaning surfaces of the cleaner after use. The cleaning unit fits into the tray housing for dust free storage.

This cleaner is available from all Bib main distributors at a recommended retail price of £9.98 inc VAT.

*Bib Audio/Video Products
Kelsey House,
Wood Lane End,
Hemel Hempstead,
Herts HP2 4RQ.
Tel: (0442) 61291.*

BBC SOFTWARE

ICS Electronics Ltd have announced a new program for the BBC Model B computer which allows data or Teletext compatible colour graphics images to be sent over the air to other similarly equipped computers.

ASCII Communications program version 1 is a data communication program for radio amateurs. It allows ASCII data to be sent over the air to other amateurs. This data can be from the keyboard or from previously stored files.

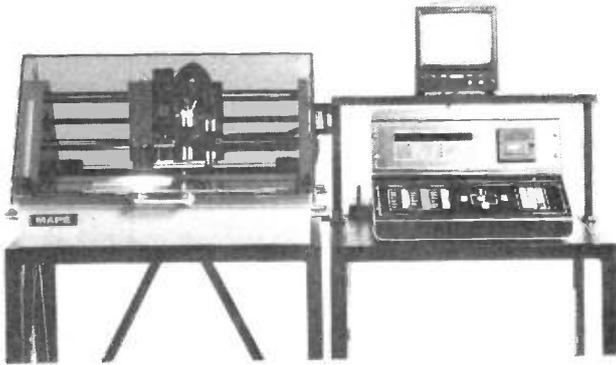
The radio transceiver can either be interfaced directly to the cassette port of the BBC or via the ICS Electronics' RM-1 radio modem.

Available on EPROM with comprehensive documentation, the ASCOM-1 software is priced at £39.00 plus £1.00 postage and packing.

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

PRODUCT NEWS

PCB DRILLING MACHINE



A single-spindle drilling and routing machine for PCB manufacture is available from Leeds based Instagraphics Products Limited. Designated the CNC-100R, the unit is easy to operate and its low cost makes it suitable for those manufacturers wishing to add automation to their drilling facilities.

An on-board CCTV system allows easy programming so that untrained personnel can quickly learn how to operate the system. The user-friendly

program is based on two digit codes to eliminate extensive typing in of program commands. Full edit facilities are incorporated such as data correct, data step and data add so that if a mistake is made during programming this can be easily corrected. In addition all programs can be stored on a digital mini cassette and a buffered memory allows permanent retention of data even with the mains power off.

The system can be inter-

FLAT-TOP LAMPS

The new 2mm flat-top LED lamp family from Hewlett-Packard combines flush-panel mounting with a wide viewing angle and uniform light output.

The broad product selection includes standard brightness, high brightness and integrated resistor lamps in yellow, green and high efficiency red (HER). Also available are low current versions in HER and yellow.

The company expects to market the product in the telecommunications, portable equipment, portable

instrumentation and other markets where flush-panel mounting, space constraints and bright, uniform light are major considerations.

The new lamp family's viewing angle, measured as two times the off-axis angle at which the luminous intensity is half that of the centre-line, is a wide 140 degrees.

By employing a special manufacturing process, HP achieves a uniform light output for the new lamps. The process avoids rings around the lamp top and hot spots above the diode.

The cylindrical lamp top measures 2mm in diameter by 2mm in length, saving space in crowded front panel applications. The flat surface of the lamp mounts flush with the surface of a display board, eliminating protrusions and gaps.

The standard lamp has a typical luminous intensity of 1.5 to 2.0mcd at 10mA.

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

to most CAD systems either directly or via a paper tape puncher/reader. This facility saves time by eliminating an additional programming step. In addition the target on the monitor is produced optically rather than electronically, thus minimising distortion and improving programming accuracy.

Instagraphics Products Ltd,
Ashfield Industrial Estate,
Low Hall Road,
Horsforth,
Leeds LS18 4EF.
Tel: (0602) 474261.

SOLDER KIT

Indium Corporation of America has introduced a surface mounting solder cream research kit.

Designed specifically for the production, design, or manufacturing engineer working with surface-mount technology, the kit features three alloys chosen for their popularity and usefulness in the surface mounting of electronic devices.

The kit contains 400g samples of each alloy, allowing experimentation with screening, stencilling and dispensing procedures on a range of alloys with differing viscosities and metal percentage. The creams can be made with either RA or RMA fluxes. Cream thinner is also included.

Indium has also released a Surface Mounting Technical Bulletin which provides more information on solder creams for surface mounting applications.

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

ELECTROLYTIC CAPACITORS

A new range of general purpose aluminium electrolytic capacitors for PCB mounting, announced by Iskra, offers a comprehensive selection of standard capacitance values from 10+10 to 4 x 47000µF, with a tolerance of -10 to +50%.

Designed for use with vol-



MOTOR CONTROLLER

Motorola have announced the MC33030, a new monolithic dc servo motor controller/driver that contains all the active functions necessary for a complete closed loop system. It is suitable for bidirectional drive of fractional horsepower motors in applications where precise position sensing is required.

The MC33030 will replace at least eight integrated circuits along with half a dozen transistors if all features are utilised in a system design.

Applications may include sophisticated yet low cost robotic systems, airflow dampers and regulators, solar or light trackers, antenna rotors and hobbyist/toy uses. Although this device is primarily intended for dc servo applications, it can be used as a pulsewidth modulator motor speed controller.

The MC33030P is specified over an automotive/industrial temperature range of -40°C to +85°C.

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

tages up to 450V, the new EEA2231-4 capacitor range is mainly intended for use in radio and TV equipment, and industrial acoustical measurement and control applications. All models are surge-proof, and have a polarity etched anode. Insulating sleeves can be supplied on request. In all cases the PCB-mounting pins on the base of the capacitors are spaced to mate with holes on a 2.5mm grid.

Iskra Ltd,
Redlands,
Cousdon,
Surrey CR3 2HT.
Tel: (01) 668 7141.



WOOD & DOUGLAS

1250 DC50 DOWNCONVERTER - THE MARKET LEADER

as reviewed in this issue

SPECIFICATION:

Input frequency range: 1240-1325 MHz
Intermediate frequency: 50 MHz nominal
Local oscillator injection: 1190-1325 MHz
Conversion gain: >25 dB; 30 dB typical
First RF stage: MGF 1100 Gs As FET
Mixer type: Discrete Schottky ring

Post mixer processing: SL560C amplifier
Operating voltage: 11.5-14.0 Volts
Operating current: 80 mA nominal
Internal stabilisation: 8.5V; 5.5V rails
External connections: AFC input
Supply input
Tuning voltage input
8.5V rail
output

RF connections: BNC

★NEW PRODUCT FOR FM TV★

VP/D1 PRE-ENPHAFIS/D-ENPHAFIS (CCIR)

Improve your video quality with this low cost add-on board. Maybe wired for transmit or receive use. Includes amplification to compensate for attenuation of CCIR network.

SCT2 TRANSMIT SOUND MODULATOR

Generates FM sound sub-carrier which is then combined with composite video to drive UFM01. Requires 350 mV RMS AF input. Specify 5.5 MHz or 6.0 MHz.

SCR2 RECEIVER SOUND DEMODULATOR

Takes FM sub-carrier from VIDIF board and provides 2 squelched audio output, 600 ohm and 8.0 ohm, independently adjustable, specify 5.5 MHz or 6.0 MHz.

Package Prices		Kit
1. 500mW TV Transmit	(70FM05T4 + TVM1 + BPF433)	40.00
2. 500mW TV Transceiver	(As 1 above plus TVUP2 + PSI 433)	65.00
3. 10W TV Transmit	(As 1 above plus 70FM10 + BD335)	75.00
4. 10W TV Transceiver	(As 2 above plus 70FM10 + BD335)	100.00
5. 70cms 500mW FM Transceiver	(70 T4 + 70 R5 + SSR)	80.00
6. 70cms 10W FM Transceiver	(As 5 above plus 70FM10)	115.00
7. 2M Linear/Pre-amp 10W	(144PA4/S + 144LIN10B)	45.00
8. 2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25B)	48.00
9. 70cms Synthesised 10W Transceiver	(R5+SY+AX+MOD+SSR+70FM10)	165.00
10. 2M Synthesised 10W Transceiver	(R5+SY+SY+ZT+SSR+144FM10A)	125.00
11. 2M Crystal Controlled 10W Transceiver	(R5+T3+BPF+144FM10+SSR)	95.00
12. 70cms Linear/Pre-amp	(70LIN10+70PA2/S)	47.00
13. 24cms FMTV Receive, video out (Kit)	(VIDIF, 1250C50 Boxed)	105.00
14. 24cms FMTV Receive, video out (Ass)	(VIDIF, 1250C50 Boxed)	120.00
15. 24cms FMTV Receive, Ch 36 out (Kit)	(VIDIF, TVMOD1, 1250C50 Boxed)	110.00
16. 24cms FMTV Receive, Ch 36 out (Ass)	(VIDIF, TVMOD1, 1250C50 Boxed)	126.00
17. 24cms FMTV Transmitter (Kit)	(UFM01, 70LIN3/LTD, 70FM10, WDV400/1200 Boxed)	140.00
18. 24cms FMTV Transmitter (Ass)	(UFM01, 70LIN3/LTD, 70FM10, WDV400/1200 Boxed)	170.00

AM TV Products	CODE	ASSEMBLED	KIT
Receiver Converter (Ch 36 Output)	TVUP2	28.75	23.95
Pattern Generator (Mains PSU)	TVPG1	48.50	39.40
TV Modulator (For Transmission)	TVM1	10.35	6.05
Ch 36 Modulator (For TV Injection)	TVMDD1	10.15	5.75

FM TV MODULES			
50mW 42MHz Source (Video Input)	UFM01	30.10	22.75
50MHz i.f. Processor	VIDIF	58.20	40.90
Varactor Multiplier (Boxed)	WDV400/1200	63.95	-
1250MHz Downconverter (50MHz i.f.) (Boxed)	1250DC50	69.95	-
1250MHz Masthead Pre-amplifier	1250PA2/S	T.B.C.	-
Transmit Sound Modulator	SCT-2	8.00	-
Receive Sound De-Modulator	SCR-2	11.75	-
Pre-emphasised/D-emphasised (CCIR)	VP/D1	T.B.C.	-

Details of these and other new products are included in our 1985 catalogue. This will be posted to you on receipt of an A5 stamped addressed envelope. Kits are usually available by return of post but please allow 28 days for any unforeseen shortages. Place your order by post or by telephone using your credit card. Please include £1.00 to cover order handling and postage.

Our products are kits or assembled kits consisting of circuit board and all components to mount on the board. We do not include external hardware such as boxes, connectors etc.

If your purchase does not work when assembled then apart from being surprised we will offer to service the module for a small charge depending on the complexity of the project. So please remember . . .

ANYONE CAN SELL A KIT . . . REPUTATION SELLS OURS

UNIT3, YOUNGS INDUSTRIAL ESTATE
ALDERMASTON, READING RG7 4PQ

TEL: (073 56) 71444.

TX: 846630



new from Kontakt

VIDEO HI-FI aerosol spray

Sophisticated techniques in the audio and video fields means new dimensions of hearing and seeing. The perfect picture and clear sound can today be achieved through a minimum of maintenance. **VIDEO HI-FI** functions without mechanical contact, on the contrary, the dirt is removed by spraying. It does not encrust. For the complete range of micro electronics and high technology, **VIDEO HI-FI** represents the most progressive cleaning agent on the market. It is backed by the knowhow of the leading manufacturer of electronic sprays in Europe. For details of **VIDEO HI-FI** and full range of **KONTAKT** aerosol sprays write or telephone:

SPECIAL PRODUCTS DISTRIBUTORS LTD
25-29 High Street, Leatherhead KT22 8AB
Telephone: 0372-377773

AUDIO MODULES AT THE LOWEST PRICES

Now Distributed by Riscomp

POWER AMPLIFIERS

AL 1030 (AL30) - Low cost general purpose 10W 8ohm module, supply voltage range 18-30V



£3.85 + VAT

AL 1540 - At 15W/8ohm medium power module incorporating over-load protection. Operating voltage range 20-40V.



£4.15 + VAT

AL 2550 (AL60) - Compact 25W 8ohm module for domestic applications with a distortion figure of .06%, operating voltage range 28-50V.



£4.95 + VAT

AL 5070 (AL120) - Top class 50W 8ohm module with self-contained heat sink and built-in protection circuitry, produces really 1st class sound with a distortion level at an incredible .02%.



£12.45 + VAT

AL 12580 (AL250) - A rugged top of the range module providing output powers of up to 125W into 4ohms which employs 4 heavy duty output transistors to ensure a stable and reliable performance. Currently used in disco units, public address systems, juke boxes and even domestic Hi-Fi.



£14.70 + VAT

PRE-AMPLIFIERS & MIXERS

PA 207 - A quality stereo pre-amplifier and tone control unit suitable for driving any of the above amplifiers. Operates from a supply rail of 40-70V.



£13.95 + VAT

MM 100 - 3 input mixer featuring individual level controls, master volume, treble & base controls, with inputs for microphone, magnetic pick-up and tape or second pick-up (selectable). Operates from 45-70V.



£12.40 + VAT

MM 200 - As MM 100 except inputs are for 2 guitar + microphone £12.40 + VAT

POWER SUPPLY

SPM90/45/55/65 - A stabiliser module available in 3 voltages, 45 55 & 65V providing a stabilised output of up to 2A and providing a superior performance especially with the higher power audio modules. (Requires an appropriate transformer + reservoir capacitor).



£6.85 + VAT

★ All modules supplied with a comprehensive Data Sheet. ★

Order by post, order by 'phone
Add 15% V.A.T. to all prices
U.K. orders add 70p post & packing
Export orders - post & packing at cost

RISCOMP LIMITED

51 POPPY ROAD,
PRINCES RISBOROUGH,
BUCKS
Tel: (084 44) 6326

NEWS DESK



Chinese contract

Plessey Radio Systems of West Leigh, Havant, Hants has secured a contract worth £500,000 to supply the People's Republic of China with

remotely controllable modular HF receiving systems.

The equipment will be used to monitor international news broadcasts. The deal was signed after extensive technical evaluation and working field trials in China. Great emphasis was placed on the performance, reliability and maintainability of the system and these requirements were satisfied by the basic design, modularity and a built-in test capability in the PRS2282 receiver.

The system incorporates the latest HF equipment including receivers (PRS2282), antenna switching and distribution matrix (PRS2230), FSK demodulator (PRS183A) and computer remote control (PRS2287).

Quartz from GEC

A process for the growth of commercial-size, high purity, low defect single quartz crystals has been developed by GEC Research Limited at Wembley.

Crystals of the order of 100mm in ruling section can be grown which have a total metallic impurity of less than 1ppm and an aluminium content of ~0.01ppm. Dislocation contents can be held below 10 lines per cm².

High performance devices incorporating high purity quartz have been fabricated; further such devices are to be made available commercially from GEC.

Radio Research

Radio Research is a new company designed to be a specialist information agency and components supplier.

With the aid of the company's propagation prediction bureau the radio enthusiast has new scope for his or her short wave activities, more accurate prediction of the best times and frequencies for contacts all over the world being possible.

Radio Research also offers a range of components and accessories, many of the components being specialised items aimed at the radio and electronics designer.

The company can provide the following: propagation summaries, consisting of a collection of MUF graphs giving predictions to every major area of the world from your location; location data, a computer printout showing details of distance, bearing, elevation, etc for every world location; MW scales, a printout of UK MW local radio stations in the form of a radio tuning dial.

All enquiries, including an SAE, should go to: *Radio Research, PO Box 44, Swansea SA1 1LA.*

Code of conduct

As a result of the rapid expansion in the number of mobile radio phones, the Institute of Sales and Marketing Management has recommended that a code of conduct be introduced to ensure their safe use whilst driving, and that office based staff be trained in their use (*most drivers being bad enough as it is - your pedestrian Ed.*)

Under the heading of 'Keep Your Mind On Your Driving' and equally important 'Keep Your Hands On The Wheel', the monthly journal *Sales & Marketing Management* comments as follows:

'So far there is no legislation specifically covering the use of car telephones.

However, answering a parliamentary question on this point, Lynda Chalker, Minister of Transport, replied that anyone intending to make a call using a cellular telephone would be well advised to pull into the side of the road first.

'Confirming that this was the Minister's advice, a spokesman for the Ministry of Transport also reminded us that under the existing provisions of the Road Traffic Act, motorists can be prosecuted for 'Driving without due care and attention', which might, perhaps, be alleged to have occurred if the driver had been seen holding a car telephone in one hand.'

Both the RAC and the AA motoring organisations recommend that their members pull up before making a telephone call.

If receiving a call whilst in motion, the Institute of Sales and Marketing Management strongly advise that the driver should call back - stop first and talk later. The overriding considerations of road safety cannot be ignored.

New dealers

Ant Products, manufacturers of the Silver 70 and Tiger range of amateur radio antennas, have announced the appointment of three major product distributors in the Lincolnshire and Midlands areas.

In the Lincolnshire area J Birkett, of The Strait, Lincoln has been appointed. In Nottingham the new distributor is Castle Electronics, of 40 Burnside Road, West Bridgeford, and in Birmingham the place to head for is Ward Electronics, of Bromford Lane, Ward End.

The three dealers all carry substantial stocks of Tiger antennas including the new two metre collinear.

As a special offer a power divider/splitter unit will be supplied free of charge to the purchasers of a pair of Tiger LY9, LY10 and LY13 two metre band yagi antennas.

A catalogue containing detailed information of the Ant Products Tiger and Silver

70 range of antennas can be obtained by sending 50p to cover postage to: *Ant Products (REW), All Saints Industrial Estate, Baghill Lane, Pontefract, West Yorkshire WF8 2HA. Tel: (0977) 85274.*

Price reduction

As a result of introducing UK manufacture, Global Specialties have been able to reduce the prices of their Data Directors - in some cases by as much as 25%.

The Global range of Data Directors comprises three models - the 236, the 308L and the 324L - designed to allow quick interconnection.

The new prices are £99.95 for the Model 236, £69.95 for the Model 308L, and £79.95 for the Model 324L. All prices are exclusive of VAT, P&P.

Further information is available from: *Global Specialties Corporation, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ.*

Cellular equipment

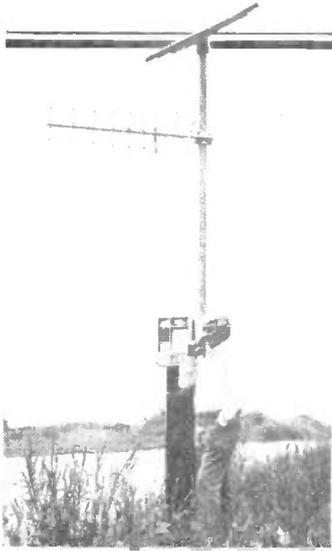
The first cellular telephone equipment made in the United Kingdom is now in use on the Vodafone network.

Production of transportable Vodafones is under way at Racal Seaton Limited, Devon. The Vodafones are being made under licence from Mobira in Finland and are being delivered to Racal-Vodac Limited.

Base station equipment, including transmitter power amplifiers and sophisticated voice channel subsystems, is being assembled at Racal Carlton Limited, Nottinghamshire.



Base station equipment



Alpine phones

This winter chalets at Swiss skiing resorts, hitherto beyond the reach of modern telecommunications, will be linked to the outside world via a solar-powered rural radio link from Plessey.

Because it needs no lines by wire of any kind, the solar-powered phone is able to operate among the Alpine peaks. It was originally developed for use in remote and primitive Third World

areas, but the Swiss have been the first to appreciate its advantages.

The Swiss Post, Telegraph and Telephone Authority (PTT) has placed an initial order worth £100,000 with Plessey Radio Systems of West Leigh, Havant, Hants through Roschi Telecoms AG of Berne, Switzerland. Chalets at fashionable resorts will be connected to the Swiss public telephone network. In addition to meeting the social needs of visitors, the new telephones will provide an emergency service for the Alpine Touring Club.

The systems were planned to be installed in the Swiss Alps before the end of September, when the winter sets in and further work is impossible above the snow line.

Engineers with Plessey Radio Systems have developed a special interface to provide total compatibility between 1500MHz radio and the Swiss PTT international network for tariff billing and signalling.

Video+

Videophiles are certain to be interested in a device soon to be launched by Mastervision, a subsidiary of computer games distributors Mastertronic.

Called Video+, the unit is essentially a low power transmitter which plugs into a video cassette recorder to allow viewing of tapes on a TV anywhere within approximately 45ft. It is to be packaged with a splitter to allow the household's main TV to remain connected to the VCR.

Video+ is entirely of UK design and manufacture, and judging by the prototype is a rugged and compact unit (imagine a large black brick!). Controls consist of only power on/off and a gain control (with LED indication of signal strength). According to the manufacturers there are no problems with interference either to, or caused by, the Video+. Power consumption is less than 5 watts.

With a retail price of around £150 this is a considerably cheaper method of providing a video facility throughout the



house than the wired systems currently being used (some people, it seems, have money to burn). A logical development would be a two-way capacity to allow remote control of the tape deck through the Video+, although there are no firm plans for this.

Considerable interest has been shown in the Video+ by those who have seen it (or so I'm told by Mastervision's sales manager!), and it would appear to have applications beyond the domestic environment, at shows and conferences for instance. If it catches on I foresee a whole new 'DXing' hobby, as people eavesdrop on their neighbour's videos (and some people watch some very interesting films!).

High tech in Surrey

Down in deepest Surrey, land of the Wild Stockbroker (aka the Greater Pinstriped Moneygrabber) and the untameable Vicious Banker (genus *Maximus Cashius*) there are stirrings which should bring a little cheer to any Men of Ideas surviving within the boundaries of this wilderness of post-industrial Britain.

The Grand Metropolitan Innovation Development Centre, plans for which were outlined in last December's *News Desk*, has now been completed. Your Editor recently managed to escape the office (*lucky beggar - Ed Asst*) in order to take a look around the centre and talk to Dr George Christie, Managing Director of Grand Metropolitan Biotechnology and a most engaging character of obvious talent and enthusiasm.

The centre is part of the Surrey Research Park, a project which originated at the nearby University of Surrey (home of Dr Martin Sweeting's UoSAT project). The

Grand Met building is the first to be completed, and its aim is to encourage the establishment of new businesses in the high tech field. It came about after Dr Christie spent considerable time talking to various interested parties, including a number of universities, about just what is needed to develop the numerous ideas produced at our centres of learning. Our education system isn't geared to the commercial exploitation of such ideas.

The centre houses 16 units of 600 square feet each, with gas, electricity, water, two phone lines (through a switchboard) and a computer line. There are centralised word processing and secretarial facilities and a computer room for data storage, as well as showers, a canteen and a small conference room. The resources of The Surrey Network for Industrial Collaboration are available to occupiers of the Grand Met centre, which includes the university's computing and library services, prototype manufacture at the university's

engineering departments, introductions to academic staff, etc.

Potential Clive Sinclair's submit their ideas to Dr Christie (in outline only until an agreement of confidentiality is signed), who then interviews likely candidates. Those who do not already have financial backing can be advised as to the possibilities for raising capital, although there is little likelihood of Grand Met putting up any such capital themselves

(well, they did pay for the centre!). There is a patent agent kept on retainer.

There is a prize on offer every year of £10,000 plus a very pretty trophy (damn good paper weight!) for the best idea. Of the various ideas submitted so far, several are approaching the stage at which their originators will be setting up shop at the centre, so before long we should be seeing some healthy production in Surrey to help the balance of trade.





Transportable Earth station

ERA wins antenna contract

ERA Technology Ltd, of Leatherhead in Surrey, has been awarded a major contract to design and supply earth station antenna sub-systems for use in civil satellite communications.

Two 3.5 metre diameter dual-offset antennas will be supplied to British Aerospace for subsequent integration and delivery to the European Space Agency. These high efficiency, low sidelobe, transportable antennas, operating in the 12/13/14GHz frequency bands will be used

with the Olympus satellite, currently being built by British Aerospace.

The satellite is due for launch in 1987 and the antenna systems, known as TDS-4, will be utilised for experiments and demonstrations in Europe in the field of specialised services. The design is such that these earth station antennas could be operated world-wide.

RIS review completed

More resources will be devoted to dealing with 'the pollution of the radio spec-

trum' by people who operate without a licence and those who abuse their licence.

This is one of the 128 separate recommendations made during the review of the Radio Investigation Service (RIS) recently completed by the Department of Trade and Industry.

The Radio Investigation Service will switch its resources towards enforcement and carry out a phased withdrawal from the time-consuming effort put into dealing with domestic TV and radio reception problems. A comprehensive booklet has been published to enable people to carry out simple and safe diagnosis of their domestic TV or radio reception problems.

Among the decisions announced by Geoffrey Pattie, Minister of State for Industry and Information Technology, was a £21 call-out charge to be paid before the RIS will visit to diagnose the cause of domestic TV or

radio reception problems. Business and service users will also be charged a commercial rate for advice from the RIS.

Demonstration Software

First Software, of Basingstoke, Hants, have developed a new concept in the supply of blank discs. Known as DemoView, the discs are formatted and contain full demonstration versions of popular packages. They enable the end user to run the demonstrations and evaluate a package without having a dealer 'breathing down his neck'.

The discs will become available to end users in boxes of ten through dealer outlets, and will contain the following demonstration software: Dollars and Sense, Quicknet, DBM 2, Spotlight, Wordstar 2000, and Volkswriter De Luxe. Once the demonstrations have been run the discs can be erased and used in the normal way.

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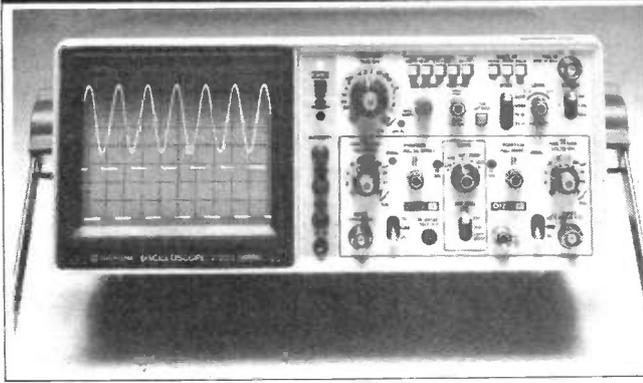
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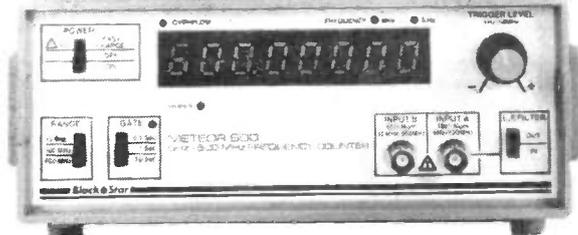
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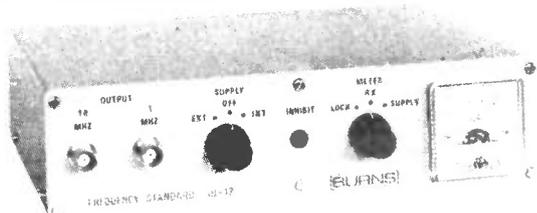
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One of the products we shall be seeing quite a bit of during this year's pre-Christmas sales hype is the eight millimetre video camera. After agreeing last year on standards, the companies concerned (approximately 120 of them) are now marketing their products. All they need to do now is persuade Joe Public to buy.

The main advantage of the 8mm format is, of course, its compactness. A tape cassette giving 1½ hours playing time (or 3 hours in 'LP' mode) is of comparable dimensions to an ordinary audio cassette. The tape itself is 8mm wide, hence the name, and only 13 microns thick (10 micron tape is also available). The quality of the results does not suffer from the smaller size, since although the writing speed is slower than with the larger ½ inch format now in widespread use, the metal particle tape (rather than ferric oxide) gives a greater recording density.

The compactness of the tape is reflected in the size of the equipment in which it is used. The latest such equipment to be announced, receiving its official launch at the Berlin Audio and Video Fair, is the Canon EM-V1 (or 'Canovision 8') camcorder. This combined camera and recorder weighs less than five pounds.

After recording with the EM-V1 the tape is viewed either through the viewfinder or by plugging the unit into a TV. This is one of a number of design options available: equipment from other manufacturers includes camcorders which are 'docked' in a 'mother' unit for playback, this mother unit also incorporating a tuner and timer to give the system a range of features comparable with current ½ inch equipment.

The VM-E1's main selling point, given that its other features are roughly comparable to the competition's 8mm machines, is its autofocus. This is an infra-red system based on the proven Canon Sureshot still camera, and works by transmitting an IR beam through the lens to be reflected from the subject and received through a window to one side. The range is calculated by triangulation. A useful addition is a 'one-shot' autofocus: once focussed the setting is 'frozen' so that it isn't thrown off by, for instance, someone passing in front of the camera.

The heart of the beast

At the heart of the VM-E1 is a ½ inch 4.5MHz Saticon tube of 65mm in length, with a directly heated cathode to give a warm-up time of less than two seconds. Canon chose a tube rather than a charge coupled device (CCD) to obtain the best natural colour balance while maintaining a low light performance more than adequate for domestic use.

The lens is equipped with a 6x power zoom, which also has a macro setting to allow focussing on objects as close as 4mm.

For recording the VM-E1 uses a helical scan system like that of ½ inch video, with two video heads in a head drum of 40mm in diameter. Unlike ½ inch video,

8mm VIDEO

We take a look at one of the latest products in this new market

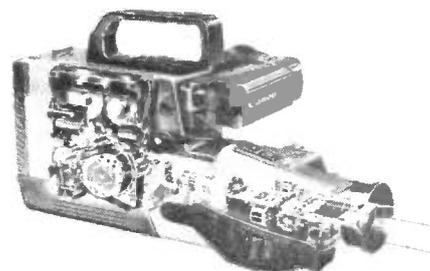


however, audio is recorded in FM using rotary heads. The audio signal is frequency multiplexed with the video signal for recording (½ inch video uses a fixed head recording on an edge track). Together with the full-band compression-expansion noise reduction this makes for a sound signal of very good quality, especially when compared to camcorders of the VHS or Beta format.

The standards finalised for 8mm video also allow for PCM (pulse code modulation) recording of audio, which will mean high quality stereo.

Because of the thinness of the tape, loading and drive mechanisms for 8mm need to be very accurate. To help in this respect, the head drum, capstan, supply and take-up reels all use lightweight direct drive motors controlled by a microprocessor.

recorded entertainment software, but anyone thinking of investing in 8mm video will no doubt spare a lot of thought for the outlay required: somewhere in the region of £1,200. REW



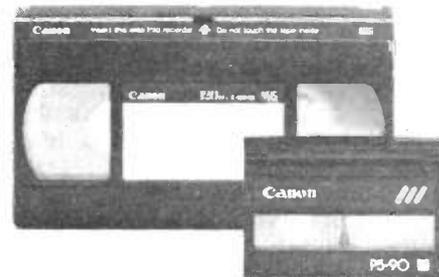
The bolt-on bits

The camera has a range of accessories available. As well as such built-in facilities as synchronised fade and automatic white balance there are lens attachments, battery packs, a remote control unit and a character generator. The character generator can store up to ten title pages using characters of four sizes, mixed upper and lower case, and these titles can be properly scrolled. One of the pages incorporates the date, which once set the unit 'remembers', and has a stop-watch function.

The 8mm format is incompatible with earlier more established systems, so there is no question of add-on adaptors to allow playback of 8mm tapes on, say, VHS machines. However, duplication onto tapes of another format is as simple as plugging two machines together.

Canon are only one of the big names to have launched an 8mm camcorder, with Kodak and Polaroid, for instance, both competitors in this market. Unlike Canon these companies do not manufacture their own equipment, instead using Matsushita and Toshiba respectively.

Whether or not there is a significant market for another video system is uncertain. While the companies concerned are obviously thinking of a high tech replacement for the old 8mm home movie camera, the PR people are talking confidently of taking a share of the replacement market as people with old VHS or Beta machines replace them (isn't it funny how PR people *always* talk confidently?). This latter market will depend upon the availability of pre-

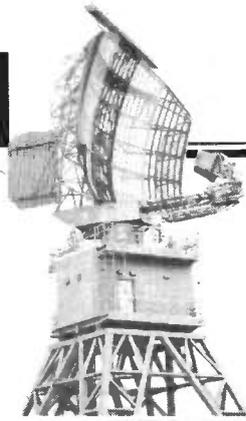


8mm cassette and VHS. Dinky, isn't it?



The character generator

SPECTRUM WATCH



NIGEL CAWTHORNE G3TXF

Arabsat is soon to join the growing number of operational regional satellite systems around the globe. In Europe we have the ECS birds which carry communications and cable head-end TV broadcasting signals. Earlier this year two further regional satellites were launched by the European launcher Ariane from Kourou in French Guiana, South America.

Ariane flight 12, which lifted off on 8 February 1985, put two satellites into orbit. Both were regional satellites destined to serve different parts of the world, Brasilsat and Arabsat.

Brasilsat has been undergoing tests over the past few months and is now carrying both telephone communications and television broadcasting to all parts of Brazil. Remote rural communities which were previously unable to receive TV programmes can now install a small ground station for feeding a TV signal from the satellite into a low powered local transmitter for broadcasting to the surrounding area.

Whereas Brasilsat is serving just one country, Arabsat will be serving 22 countries. It was back in 1967 that the Ministers of Information from 22 Arab states decided to initiate a study into the feasibility of an Arab communication network. Nearly two decades later this project has resulted in the launching of

two 'Arabsat' satellites. The second Arabsat satellite was launched by the Shuttle on 17 June. The two Arabsat birds, which are positioned in geostationary orbit 36,000km over the equator at 19° and 26° east, will carry communications and TV signals between countries as far apart as Mauritania on the west coast of Africa and Bahrain in the Persian Gulf.

Keeping control

The Arabsat control centres are in Tunis and Riyadh. From these NEC-built control stations, command signals are fed to the satellites. Eventually there will be a network of local Earth stations covering all 22 of the participating states. Local Earth stations will normally be located at the capital cities and will be using 13m diameter antennas.

Marconi is currently installing an Earth station at Sana'a in the Yemen Arab Republic using an antenna similar to that being used in the London docklands. As well as the antenna, Marconi is also installing the 6GHz transmitting equipment (for feeding signals up to the satellite) and the 4GHz receiving equipment. Another UK company, Cable & Wireless, is responsible for the civil works and the no-break power supplies. The Sana'a Earth station is expected to come on-air by the end of September, in

time for the Yemen Arab Republic's National Day.

Over on the west coast of Africa, other stations are being installed to work into the new Arabsat network. In Mauritania two Earth stations are being installed by the French company Telspace: one will be in the capital Nouakchott and the other will be in the northern port of Nouadhibou. Mauritania is one of the few countries in the world which you cannot dial direct on the telephone. Communications are still handled by HF radio. The advent of satellite communications will have a major impact on the country's communications and broadcasting infrastructure.

On board the two Arabsat satellites there are 26 transponders. Of these, 25 are working in C-band (6GHz uplink and 4GHz downlink) and one transponder has an S-band (2500-2690MHz) downlink. The S-band transponder will be used for a pan-Arabian community TV service, which will be receivable in most areas with an antenna of about 3m diameter. The S-band amplifier consists of two dedicated 50W TWTs, and the transmitting antenna is a slotted array on the Earth-facing panel of the spacecraft. Arabsat will thus be bringing TV signals to many remote parts of the Arab world that have not so far been able to receive a regular TV service from terrestrial TV transmitter networks.

The organisers of Arabsat are planning to use the community channel for a multinational cultural and educational programme. The first two-way test TV signals to be transmitted through Arabsat were originated in Tunis and Djibouti. The first tests took place in June.

The first two Arabsat satellites are now in orbit. A third is being built and will be kept on the ground as a stand-by. The lead company in the satellite building consortium is Aerospatiale of France. The installation of the local Earth stations is under way in several countries, and Arabsat is now close to becoming a fully operational system.

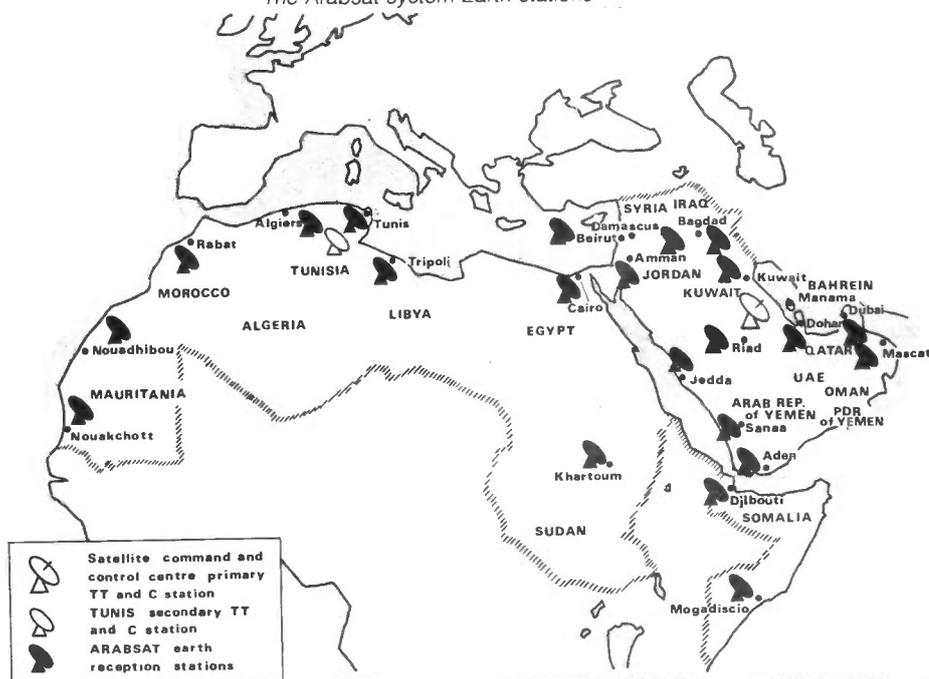
Giotto

At 11.23 hours on 2 July 1985, Giotto, the European Space Agency (ESA) probe intended to encounter Halley's Comet, was successfully launched into geostationary transfer orbit by an Ariane-1 launcher.

The Giotto space probe is expected to encounter Halley's Comet at 500km from its nucleus, having travelled some 700,000,000km to keep the rendezvous. The 1985/86 reappearance of Halley's Comet is a once in a lifetime opportunity for scientists to study it, as well as being the first opportunity for man to send spacecraft to observe it from close by and to carry out measurements in the cometary atmosphere.

The ESA Giotto is not the only space probe going out to have a look at Halley's

The Arabsat system Earth stations



Comet. The Russians launched two spacecraft (Vega 1 and Vega 2) in December 1984 which will fly by the comet on 6 and 9 March 1986 at a distance of 10,000km from the nucleus.

The Japanese have sent Sakigake (launched on 8 January 1985) and plan a second, Planet-A, for 14 August 1985. Sakigake will fly by the comet at a distance of 7,000,000km, whereas Planet-A will approach much closer at 200,000km.

NASA plans to redirect its International Cometary Observer (OCO), currently on its way to encounter another comet. The US probe will not get nearer than 32,000,000km.

All four space agencies (US, Russian, Japanese and European) have co-operated closely during the preparation of these unique missions and will continue to do so through the coming months.

The Giotto encounter with Halley's Comet is planned to take place around midnight GMT on 13 March, 1986. ESA do not expect the spacecraft to survive beyond the point of closest approach.

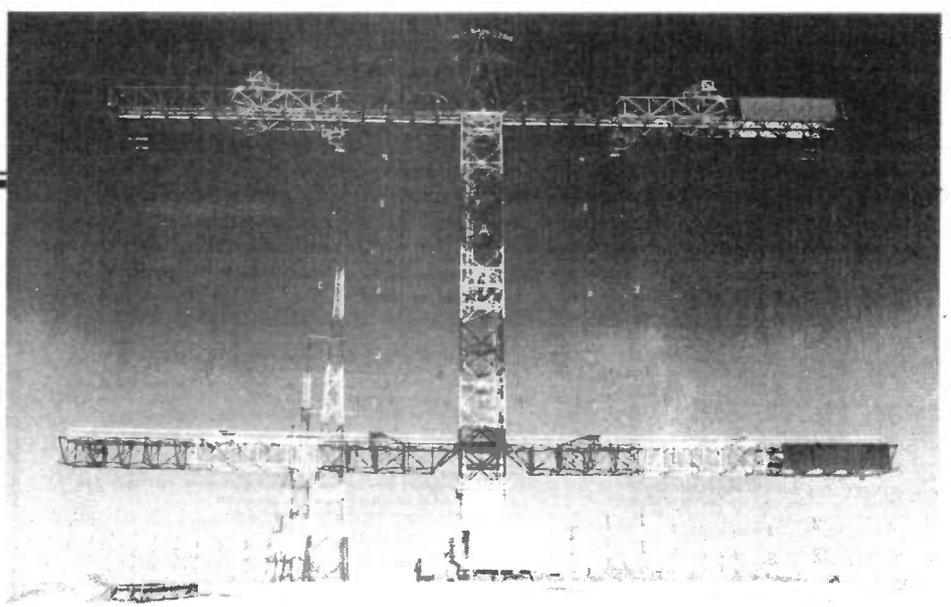
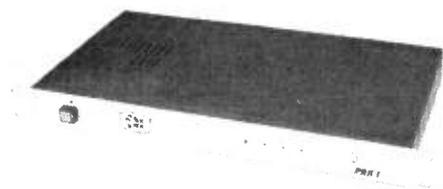
Cable '85

Back on Earth, the cable industry is still trying to find its feet! Down by the sea at Brighton in July the 1985 satellite and cable TV exhibition and conference brought together around 50 companies, 300 conference delegates and attracted some 4,000 visitors.

Satellite and cable TV covers a wide range of technologies, which is itself one of the industry's major problems. Cable and satellite is not just one industry, but is the meeting point of several. At one end there is DBS with its possibilities of new wider bandwidth services, and at the other there are existing cable networks and domestic receivers using relatively narrow bandwidths. Added to these are the new interactive services which will enable the subscriber to do shopping, banking and other tasks directly from his armchair!

A key component in any interactive cable network is the switch. The switch not only feeds the selected programmes to subscribers but is also a crucial part of the cable network's administrative system. It decides who can view what (in accordance with the subscription being paid) and plays an important role in billing. Return feeds for interactive services also have to pass through the switch.

SAT-TEL's SMATV receiver, at Cable '85



Every amateur's dream! A rotatable curtain array for SW supplied by Thompson-CSF

At Cable '85 there were switches on show from GEC McMichael, British Cable Services (formerly Rediffusion's cable division), Thorn-EMI and Cabletime.

The GEC McMichael switch is being supplied as part of a £13.5M project for Clyde Cable. In the GEC switch the two domestic feeds, at 40MHz and 56MHz, are up-converted to UHF within the home.

A different approach is used in the newly launched System 8 switch from British Cable Services. Here the TV feed to the household set is directly at UHF, requiring the minimum of active equipment in the subscriber's home. The BCS switch is going into the Guildford cable area.

Thorn-EMI's new switches are being installed in Swindon (see *R&EW* December '84). The Thorn-EMI switch operates at base-band and can handle up to 100 cable TV subscribers. In Swindon it is expected that about 612 switches will eventually be installed to service 53,000 homes.

Cabletime were showing their 16-way switched star equipment, which has recently been installed at a trial site in Cheltenham.

The overall impression from Cable '85 was that the cable TV industry is now in a brighter mood than it has been of recent times, but perhaps that was just the effect of the sunshine and the beach!

Submarine communications

Communicating with nuclear submarines on active service several hundred feet below the surface of the ocean has always presented a challenge to communication specialists. According to a report in the *New Scientist*, two new ELF stations are soon to be put into service in the US. In the UK the Admiralty has made proposals for the construction of an ELF station in Scotland.

The VLF band (3kHz to 30kHz) is commonly used for communications with submarines, but even here the penetration below the surface is only minimal. The receive antenna has to be no more than a few metres below the surface. ELF (30Hz to 3kHz) is the only part of the radio

spectrum that is capable of penetrating the ocean to any depth. However, operating at ELF does have its problems! At 100Hz the wavelength is 3,000km. Classical 'ray theory' for the propagation of radio waves at these low frequencies is no longer valid.

The US project consists of two sites. At one site there is an antenna 45km long (or some 28 miles!) and at the other site 150km away there is an even bigger antenna 90km long.

Because the effective electrical length of these massive antennas is very short (even a 90km antenna at 100Hz is only 0.03λ) the radiation efficiency is also very low indeed. Even with several hundred kilowatts of RF from the transmitters, the radiated power is only a handful of watts. However, it is claimed that world-wide coverage can be achieved at ELF with just a few watts of radiated power.

The other problem at ELF is data rate. In a reported experiment, ELF signals from a US station were received on board a submarine submerged off Naples using a data rate of 0.03 bits per second! This is the equivalent of about one CW 'dot' every minute! Maybe ELF is the answer for those who have trouble getting up to 12wpm for their Morse test!

Paris congestion

26 October promises to be a grumpy day for Parisians! At 11pm on 25 October the French PTT will be changing all the telephone numbers in Paris and the surrounding area. Paris numbers, just like London numbers, have a (1) prefix and a seven digit number.

However, at the appointed hour in October all Paris numbers will be adding an extra digit in front of the number to become an eight digit number. The extra digit will be either a 3, 4 or 6 depending on the Department.

The introduction of France's new 'Radiocom 2000' service is being delayed until after the Paris number changeover. The opening of the multi-purpose (car telephone and private network) Radiocom 2000 is expected to be announced for the areas around Paris and Nantes before the end of 1985. **REW**

BAKERS DOZEN PARCELS

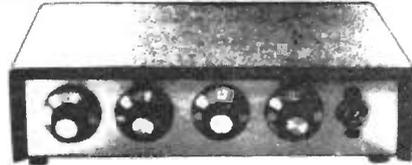
All the parcels listed below are brand new components. Price per parcel is £1.00, but if you order 12 you get one extra free.

- 1 - 5 13 amp ring main junction boxes
- 2 - 5 13 amp ring main spur boxes
- 3 - 25 13 amp fuses for ring mains
- 4 - 5 surface mounting switches suitable insulated for mains voltage
- 5 - 3 flush electrical switches intermediate type, will also replace 1 or 2 way switches
- 6 - 5 in flex line switches
- 7 - 4 in flex line switches with neons
- 8 - 2 80 watt brass cased elements
- 9 - 2 mains transformers with 6v 1/2 secondaries
- 10 - 2 mains transformers with 12v 1/2 secondaries
- 11 - 1 extension speaker cabinet for 6 1/2" speaker
- 12 - 5 octal bases for relays or valves
- 13 - 12 glass reed switches
- 14 - 4 OCP 70 photo transistors
- 15 - 25 assorted germanium transistors OC45 etc
- 16 - 4 tape heads, 2 record, 2 erase
- 17 - 2 ultra sonic transmitter and 2 ditto receivers
- 18 - 2 15000 mfd computer grade electrolytics
- 19 - 2 light dependent resistors similar ORP12
- 20 - 5 diff micro switches
- 21 - 2 mains interference suppressors
- 22 - 2 25 watt crossover units
- 23 - 1 40 watt 3 way crossover unit
- 24 - 250 various screws and self tappers
- 25 - 1 of each wafer switches - 6p 2 way; 4p 3 way; 2p 6 way; 1p 12 way
- 26 - 2 tape deck counters
- 27 - 1 6 digit counter 12v
- 28 - 1 6 digit counter mains voltage
- 29 - 1 BOAC in flight stereo unit (second hand)
- 30 - 2 Nicad battery chargers
- 31 - 1 key switch with key
- 32 - 2 humidity switches
- 33 - 2 aerosol cans of ICI Dry Lubricant
- 34 - 96 x 1 metre lengths colour-coded connecting wires
- 35 - 4 battery operated model motors
- 36 - 2 air spaced 2 gang tuning condensers
- 37 - 2 solid dielectric 2 gang tuning condensers
- 38 - 10 compression trimmers
- 39 - Long and Medium wave tuner kit
- 40 - 4 x 465 KC IF transformers
- 41 - 8 Rocker Switches 10 amp Mains SPST
- 42 - 6 Rocker Switches 10 amp Mains SPDT
- 43 - 5 Rocker Switches 10 amp SP DT Centre Off
- 44 - 4 Rocker Switches 10 amp DPDT
- 45 - 1 24 hour time switch mains operated - (s.h.)
- 46 - 1 6 hour clockwork timeswitch
- 47 - 2 lever switches 4 pole changeover up and ditto down
- 48 - 2 6v operated reed switch relays
- 49 - 10 neon valves - make good night lights
- 50 - 2 x 12v DC or 24V AC 400 relays
- 51 - 1 x 12v 2C 0 very sensitive relay
- 52 - 1 x 12v 4C 0 relay
- 53 - 2 mains operated relays 3 x 8 amp changeovers (secondhand)
- 54 - 10 rows of 32 gold plated IC sockets (total 320 sockets)
- 55 - 1 locking mechanism with 2 keys
- 56 - Miniature Unisector with circuit for electric jigsaw puzzle
- 57 - 5 Dolts: House switches
- 58 - 2 telephone hand sets incorporating ear piece and mike (p)
- 59 - 2 flat solenoids - ideal to make current transformer etc
- 60 - 5 ferrite rods 4" x 5/16" diameter aerials
- 61 - 4 ferrite slab aerials with L & M wave coils
- 62 - 4 200 earpieces
- 63 - 1 Mullard Thyristor trigger and modules
- 64 - 10 assorted knobs 1/2 spindles
- 65 - 5 different thermostats, mainly bi-metal
- 66 - Magnetic brake - stops rotation instantly
- 67 - Low pressure 3 level switch
- 68 - Heavy duty 4 pole contactor - 24v coil
- 69 - 2 25 watt pots 8 ohm
- 70 - 2 25 watt pots 1000 ohm
- 71 - 5 wire wound pots - 18, 33, 50, and 100 ohm
- 72 - 1 1250 watt dimmer Ultra ref SE20
- 73 - 4 3 watt wire wound pots 50 ohm
- 74 - 50 1/3 watt carbon film resistors food spread 10 values
- 75 - 20 2 watt carbon resistors 10 values
- 76 - 30 1 watt carbon resistors 15 diff values
- 77 - 1 time reminder adjustable 1-60 mins
- 78 - 5.5 amp stud rectifier 400V
- 79 - 4 2a bridge rectifiers 400V
- 80 - 2 10a bridge rectifiers 30V
- 81 - 2 30a panel mounting slydiok fuses
- 82 - 4 porcelain fuse holders and fuses
- 83 - 1 fluorescent choke - your choice - 15, 20, 30, 40 or 65 watt
- 84 - 10 1 mains voltage suppressor condensers
- 85 - 1 mains shaded pole motor 3/4" stack
- 86 - 2 5" ali fan blades fit 1/2" shaft
- 87 - 2 3" plastic fan blades fit 1/2" shaft
- 88 - Mains motor suitable for above blades
- 89 - 1 mains motor with gear box 1 rev per 24 hours
- 90 - 1 mains motor with gear box 1 rev per 12 hours
- 91 - 2 mains motor with gear box 16 rpm
- 92 - 4 fluorescent starters suit 4 - 80 w tubes
- 93 - 4 11 pin moulded bases for relays
- 94 - 5 B7G valve bases
- 95 - 4 skirted B9A valve bases
- 96 - 1 thermostat for fridge
- 97 - 1 infra red fire element 1000 watts
- 98 - 1 motorised stud switch (SH)
- 99 - 5 assorted ferrite shapes
- 100 - 3 ferrite magnets
- 101 - 1 2 1/2 hours delay switch
- 102 - 1 9v mains power supply unit
- 103 - 1 6v mains power supply unit
- 104 - 1 4 1/2v mains power supply unit
- 105 - 1 5 pin flex plug and panel socket
- 106 - 1 12v vibrating reed bladeless
- 107 - 5" speaker size radio cabinet with handle
- 108 - 5 different multi way push switches
- 109 - 10 1/2" spindle type volume controls
- 110 - 10 slider type volume controls
- 111 - 2 musical boxes (less keys)
- 112 - 1 heating pad 200 watts
- 113 - 1 fm front end with tuning condenser
- 114 - 1 w amplifier Mullard 1172

With most items quantity buyers get good discounts and save on postage costs.

EX-G.P.O. TELEPHONES	
Black heavy type	£5.50
Lightweight 746 type	£7.50
EX-G.P.O. plug	£1.00
EX-G.P.O. socket	£1.00

SOUND TO LIGHT UNIT



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

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

4/5A BATTERY CHARGER Transformer and rectifier £3.95 & £1 post, 3 kits £12.

WALL MOUNTING ROOM THERMOSTAT

By Danfoss has a really pretty two tone grey case with circular white scale and dial. Setting temperature from 0 - 30 c - 13 amp 250v contacts. Price £4.60. - 10 for £40.

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

PRESTEL UNITS

These are brand new and we understand tested, came with manufacturer's guarantee now void as the manufacturer no longer trades.

These originally sold for over £150. We offer them complete, except for 7 plug in i.c.'s and price is only £14.96 (less than the value of the modern included).

STABILISED POWER SUPPLY (Mains Input)

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

25A ELECTRICAL PROGRAMMER

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

THIS MONTH'S SNIP

TOP OF THE POPS LIGHTING
if you use our disco switch **ONLY £6.90**

These have 12 x 10 amp changeover switches each rated at 10 amps so a whole street could easily be lit with one. Switches adjustable and could be set to give a running light, random flashes, etc. etc. 230 volts main operation. Brand new, made by Honeywell. Offered at approximately one third of cost.

COMPUTER DESKS

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

50 THINGS YOU CAN MAKE

Things you can make include Multi range meter, Low ohms tester, A.C. amps meter, Alarm clock, Soldering iron minder, Two way telephone, Memory jogger, Live line tester, Continuity checker, etc. etc., and you will still have hundreds of parts for future projects. Our 10Kg parcel contains not less than 1,000 items - panel meters, timers, thermal trips, relays, switches, motors, drills, taps, and dies, tools, thermostats, coils, condensers, resistors, neons, earphone/microphones, nicad charger, power unit, 90% are unused components.

YOURS FOR ONLY £11.50 plus £3.00 post.

REVERSIBLE MOTOR WITH CONTROL GEAR

Made by the famous Framco Company this is a very robust motor size approximately 7 1/2" long, 3 1/2" dia, 3/8" shaft Tremendously powerful motor, almost impossible to stop. Ideal for operating air curtains, sliding doors, ventilators etc., even garage doors if adequately counter-balanced. We offer the motor complete with control gear as follows:

- 1 Framco motor with gear box
- 1 manual reversing & on/off switch
- 1 push to start switch
- 2 limit stop switches
- 1 circuit diag. of connections

£19.50 plus postage £2.50

J. BULL (Electrical) Ltd.

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

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders over £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & Barclay orders accepted day or night. Haywards Heath (0444) 454593. Bulk orders: phone for quote. Shop open 9.00 - 5.30, Mon to Fri, not Saturday.



Ex-Electricity Board. Guaranteed 12 months.

VENNER TIME SWITCH

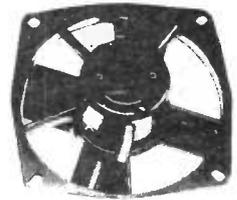
Mains operated with 20 amp switch, one on and one off per 24 hrs, repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95, without case, metal case - £2.95, adaptor kit to convert this into a normal 24hr. time switch but with the added advantage of up to 12 on/off per 24 hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

EXTRACTOR FANS - MAINS OPERATED

- Woods extractor.
- 5" - £5.75, Post £1.25.
- 6" - £6.95, Post £1.25.
- 5" Planair extractor £6.50, Post £1.25.
- 4" x 4" Muffin 115v. £4.50, 230v. £5.75, Post 75p.

All the above ex-computer, those below are unused.

- 4" x 4" £8.50, Post 75p.
- 9" American made £11.50, post £2.00.
- Tangential Blower 10x3 air outlet, dual speed £4.60, Post £1.50.



TANGENTIAL BLOW HEATER

by British Solartron, as used in best blow heaters.

3Kw £6.95 complete with 'cold' half and 'full' heat switch, safety cut out and connection diagram.



Please add post £1.50 for 1 or 3 for £2. Still available: £4.95 + £1.50 post. or have 3 for £16 p **2.5 Kw KIT**

ROCKER SWITCHES

Standard size fit 11.5 x 28 mm cut out. Single pole on/off - 15p each 1000 for £75. Single pole changeover 20p each - 1000 for £100. Single pole changeover with centre off - 25p each - 1000 for £125. Single pole on/off with neon - 36p - 1000 for £180.

ROCKER SWITCH DP/DT

15 amp 250 volts suitable for motor reversing etc. - 46p - 100 for £34.50, 1000 for £230.

MICRO SWITCHES

V3 type all 250 10 amp SpST 20p 1000 - £100 Spdt 30p 1000 - £150, very low tongue Spdt 40p 1000 for £200.

The AMSTRAD Stereo Tuner.

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

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

Some of the features are: long wave band 115 - 170 KHz, medium wave band 525 - 1650 KHz, FM band 87 - 108 MHz, mono, stereo & AFC switchable, fully assembled and fully aligned. Full wiring up data showing you how to connect to amplifier or headphones and details of suitable FM aerial (note ferrite rod aerial is included for medium and long wave bands. All made up on very compact board

Offered at a fraction of its cost:

only £4.95



MINIATURE WAFER SWITCHES

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

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3 1/2" long by 3" dia. They have a good length of 1/4" spindle - Price £3.45. Ditto, but double ended £4.25.



MAINS MOTORS

We have very large stocks of motors from 2 watts to 1/2 hp. Most at a price well below cost, let us know your requirements.

IONISER KIT

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

£11.95 plus £2.00 post.

OTHER POPULAR PROJECTS

R C Bridge Kit	£9.95
3 Channel Sound to Light - with fully prepared metal case	£14.95
Big Ear, listen through walls	£9.50
Silent sentinel Ultra Sonic Transmitter and receiver	£9.50
Car Light 'left on' alarm	£3.50
Secret switch - fools friends and enemies alike	£1.95
3 - 30v Variable Power Supply	£13.80
2 Short & Medium wave Crystal Radio	£3.99
3v to 16v Mains Power Supply Kit	£1.95
Radio stethoscope - fault finding aid	£4.80
Mug stop - emits piercing squawk	£2.50
Morse Trainer - complete with key	£2.99
Drill control kit	£3.95
Interrupted beam kit	£2.50
Transmitter surveillance kit	£2.30
Radio Mike	£6.90
F M receiver kit - for surveillance or normal F M	£3.50
Insulation Tester - electronic megger	£7.95
Battery shaver or fluorescent from 12v	£6.90
Matchbox Radio - receives Medium Wave	£2.95
40 watt amp - hifi 20Hz - 20kHz	£9.50
115 Watt Amplifier 5Hz 25kHz	£13.50
Refresh supply for 115 watt amps	£8.50

CONSTRUCTING POWER SUPPLIES

ROGER ALBAN GW3SPA CONTINUES HIS SERIES ON PSU CONSTRUCTION

On examining a few meters, I found that some of them did not have any indication as to their internal resistance. From a practical point of view, this information is not essential. Choose a large value variable resistor such as $1M\Omega$ and place it in series with the meter. Set the variable resistor to its maximum value and connect a test meter set to the voltage range across the meter and potentiometer. With the power supply that you have built connect the output terminals across the test meter. Turn the power supply on and adjust the output voltage with the aid of the test meter to its maximum required terminal voltage.

For example, say you have built a power supply to operate at a terminal voltage of 13.8 volts. Adjust the output to, say, 15 volts and then adjust the variable resistor until the unknown meter reads fsd. Switch off the power supply and with the test meter measure the resistance value of the variable resistor. The value measured will be the value of the multiplier resistor required.

The multiplier can consist of a small preset variable resistor or a solid carbon resistor. If the required value is not a common one, a resistor can be altered to obtain the required value. This is achieved by selecting a solid carbon rod resistor whose value is just below the required value: using a small Swiss file, file across the body of the resistor taking the place of the potentiometer until the meter reads the required fsd.

When selecting an ammeter to be used as a voltmeter it is wise to select an instrument that has the lowest possible maximum current to give fsd. For example, should you select an ammeter with an fsd of, say, 100mA, then irrespective of the value of the multiplier needed to achieve fsd at maximum terminal voltage of the power supply, the voltmeter will always draw 100mA from your power supply at fsd.

The ammeter

The majority of ammeters, whether found in the junk box or seen on a trade stall, have an fsd measured in microamperes or milliamperes. For the power supply builder, who normally requires

the ammeter to read load currents which will possibly be measured in amps, the ammeter must be connected in series with the load and the unwanted load current will have to bypass the meter by means of a resistor in parallel with it. This parallel resistor is known as a shunt.

Shunt value

To calculate the value of the shunt we need to examine *Figure 23*. Here we see the shunt resistor R_s in parallel with the ammeter. The load current I_L passing through terminal A is split into two separate currents. I_1 passes through the shunt resistor, and I_2 passes through the ammeter. At terminal B the two currents recombine to form the load current I_L . Therefore:

$$I_L = I_1 + I_2$$

Note that the voltage dropped across the shunt is also developed across the ammeter. It is necessary to select a suitable value of shunt resistor such that the maximum value of I_2 achieves fsd of the ammeter. The voltage drop across R_s can be written as:

$$V = R_s (I_L - I_2)$$

and the voltage across the ammeter is $V = I_2 \times r$. As already explained the voltage across the shunt resistor is the

same as the voltage across the ammeter. Therefore:

$$I_s \times r = R_s (I_L - I_2)$$

from which, dividing both sides of the equation by $(I_L - I_2)$ we obtain:

$$R_s = \frac{r \times I_s}{(I_L - I_2)}$$

where R_s is the value of the shunt resistor, r is the internal resistance of the ammeter, I_L is the maximum load current to be read by the ammeter, and I_2 is the fsd current for the ammeter.

For example, I have obtained a meter which reads fsd for 1 milliamp, and the meter is required to measure the load current of a 10 amp power supply. The internal resistance of the meter is quoted as being 90 ohms. The value of shunt resistance to achieve an fsd of 10 amps will be:

$$R_s = \frac{90 \times 0.001}{(10 - 0.001)}$$

$$= \frac{0.09}{9.999}$$

$$= 0.009 \text{ ohms}$$

From a practical point of view it would be difficult to accurately construct a resistor of such small value within the shack. However, there is a solution at hand. Assuming that the shack test meter is reasonably accurate, it can be used in series with the ammeter to determine the correct value of shunt resistor to obtain an accurate fsd. The test meter is connected in series with the ammeter and a dummy load as shown in the test circuit of *Figure 24*.

The author did not have a suitable dummy load and had to construct one using components from the junk box and bits and pieces found around the house. I found some old half watt solid carbon rod resistors and soldered them onto a tag board. The number of resistors connected in parallel determines the maximum load current. I was unable to find any high wattage resistors and therefore was forced to resort to the dummy load shown in *Figure 25*. To keep the half watt resistors reasonably cool, the tag strip

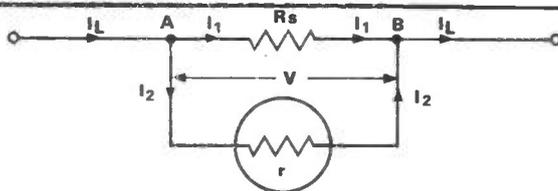


Fig 23 An ammeter with shunt resistor

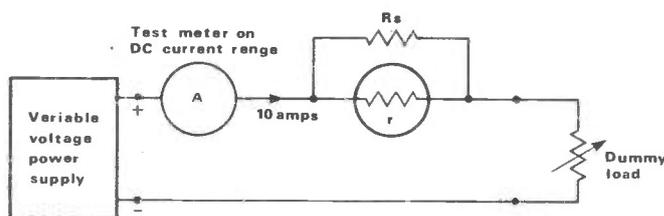


Fig 24 Test circuit to calibrate ammeter

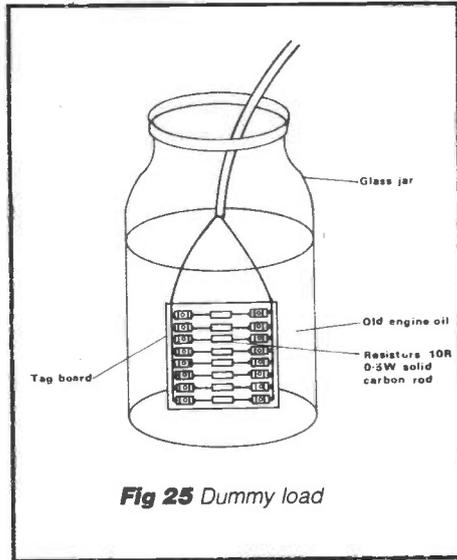


Fig 25 Dummy load

containing resistors was immersed in old engine oil inside a discarded glass pickled onion jar.

A 20mm length of wire is connected across the ammeter as the shunt resistor. The power supply is switched on and the terminal voltage adjusted until a reading is obtained on the ammeter. If the ammeter reading is higher than the test meter reading, then the length of wire used as a shunt is shortened by a small length until the ammeter and test meters indicate the same reading. If initially the ammeter reading is lower than the test meter reading, a longer piece of wire will need to be connected across the ammeter.

When the initial calibration has been achieved it is wise to check that the fsd reading of the ammeter is also correct by either altering the terminal voltage of the power supply or value of the dummy load or a combination of both to obtain full load current.

Protection devices

The enemy of the power supply is a short circuit load, which results in excessive load current: this can destroy the pass transistors and damage the rectifying diodes. The enemy of the load is excessive voltage, which is caused by either damage to the pass transistors or the voltage regulating integrated circuit, where the high unregulated dc voltage finds its way across the output terminals of the power supply.

If one is constructing a fixed voltage power supply it is wise to design it such that the magnitude of the unregulated voltage is just sufficient to maintain voltage regulation, so that should the unregulated voltage find its way onto the output terminals of the supply, its magnitude will hopefully not damage or destroy the load. It is also possible to protect the power supply against a short circuit at the terminals by limiting the load current.

Over-voltage protection

The most popular method of protecting the load against over-voltage is to provide a thyristor across the output terminals which will provide a short circuit at the terminals if a condition of over-voltage is detected. This is known as providing crowbar protection. When the thyristor becomes short circuit it blows the power supply fuse.

A typical circuit is shown in Figure 26. The value of the trip voltage is determined by the 500 ohm linear potentiometer. The Zener diode limits the minimum tripping voltage to the value of the Zener and also protects against unwanted voltage transients. The 100 ohm resistor and the 1µF capacitor form a low-pass filter to help prevent unnecessary firing of the thyristor from occasional variations in the load. The 0.01µF capacitor provides additional protection against voltage transients.

The disadvantage of this circuit is that on every occasion that the thyristor fires, a fuse is blown and possibly the pass transistor is damaged. In addition, nuisance tripping can still occur as a result of rapid changes in load current, which causes voltage transients.

Motorola have an integrated circuit, type MC3423P, which has an in-built precision reference voltage which is compared against the terminal voltage to determine the firing of the thyristor. Figure 27 shows a circuit incorporating this IC. The 1 kilohm linear potentiometer sets the value of the tripping voltage on pin 2. Pin 8 (via a 2.2 ohm resistor) fires

the thyristor. The 2.2 ohm resistor limits the output current from pin 8. It is interesting to note that the thyristor has been inserted on the unregulated side of the power supply to prevent the pass transistor Tr1 being damaged when the thyristor fires and blows the fuse FS1.

Possible damage

This brings me to another interesting point. The average firing time of the crowbar is a few microseconds. In that time interval there is a possibility that the load could be damaged, a case of closing the stable doors after the horse has bolted. Certainly, the fuse will take a longer time to blow, hence the reason for placing the thyristor on the unregulated side of the supply to prevent damage occurring to the pass transistor.

In the past few years, many articles have been written on the virtues of using thyristors in crowbar protection circuits. Questions have been asked concerning the speed of operation and the protection this circuit offers to the power supply and load. The main disadvantage is that a fuse is blown on every occasion that the circuit is activated.

I have considered all these points and have decided to discard the thyristor circuit in favour of a simple relay which will disconnect the load when over-voltage is detected. The circuits illustrated in Figure 26 and Figure 27 can be modified to incorporate a relay. Figure 28 shows the modified circuit based on the circuit illustrated in Figure 26.

The sensing voltage is developed

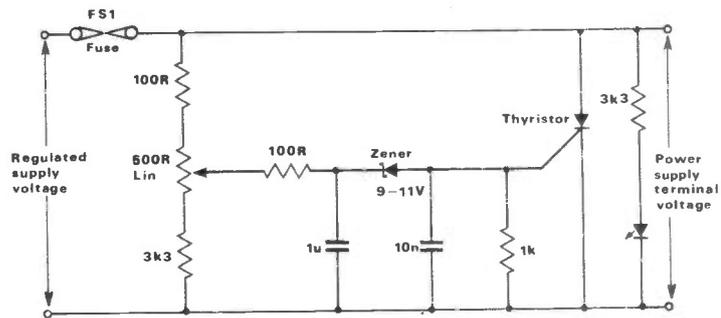


Fig 26 Typical crowbar circuit

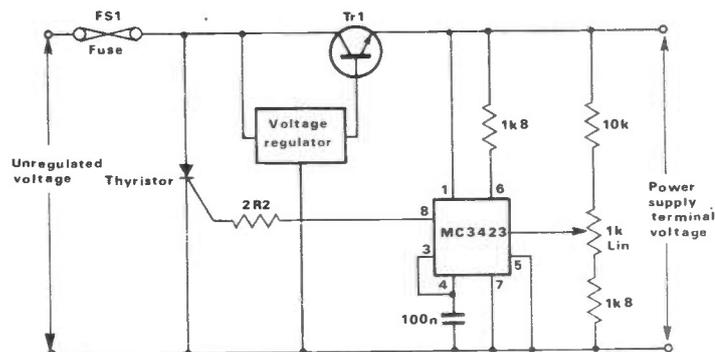


Fig 27 Motorola MC3423P over-voltage protection circuit

across the 10 kilohm potentiometer. Assuming the minimum emitter/base voltage of Tr1 for it to conduct is 0.6 volts, with the Zener diodes the minimum voltage to operate the relay will be $0.6 + 4.7 = 5.3V$. The 1 kilohm resistor and $0.1\mu F$ capacitor form a low-pass filter to prevent nuisance firing of the relay, the 1kilohm resistor also limiting the base current of the transistor. The relay is taken to the positive side of the unregulated supply to increase the speed of operation of the relay at low regulated voltages.

Take care!

The minimum operating voltage of the relay is approximately 5.3 volts, and can be further reduced by reducing the voltage rating of the Zener diode. Care must be taken not to use a Zener diode with too low a voltage rating otherwise nuisance activating of the relay will occur as a result of transients.

Under normal conditions the relay is de-energised and the relay contacts RLA/1 remain closed. The relay found in the junk box had contacts not rated at 10 amps. However, the contacts are only operated when an over-voltage condition occurs. It is recommended that the voltage trip should be set off-load to

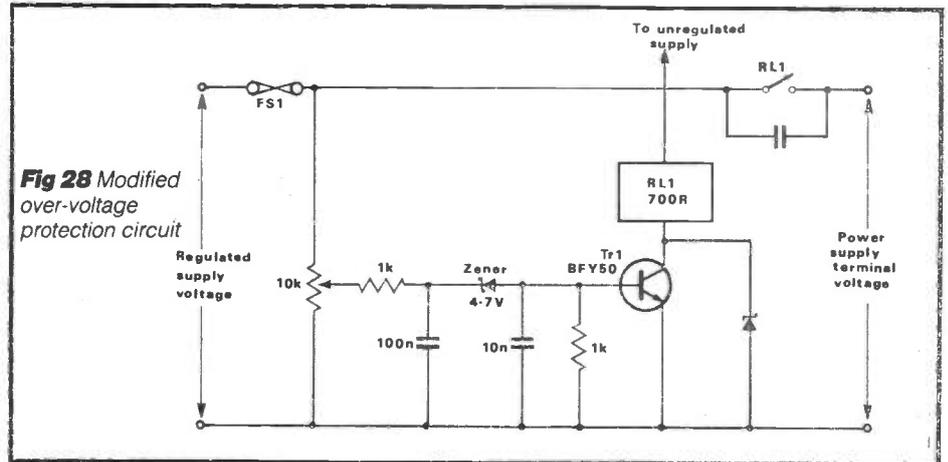


Fig 28 Modified over-voltage protection circuit

avoid the relay contacts having to switch a high current load. A $0.1\mu F$ capacitor is placed across the relay contact RLA/1 as a spark quench.

It is useful if you have a spare contact on the relay to provide some external indication that the relay has operated. A light emitting diode can provide an indication on the front panel.

A diode has been placed across the transistor Tr1 to prevent the transistor being damaged by the high voltage generated by the inductance of the relay

when the relay is de-energised. In practice this circuit has been used on a fixed voltage power supply delivering a terminal voltage of 13.8V. The 10 kilohm potentiometer has been replaced by a preset and the tripping value set to 15V. The circuit has been tested on a cheap CB set acting as a dummy load when the pass transistor emitter has been deliberately connected to the collector. I am pleased to report that the set survived.

Next month this theme continues with current limiting.



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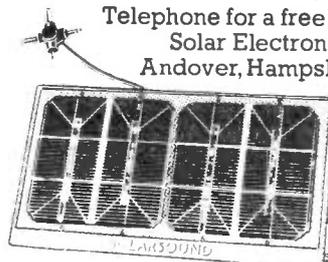
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AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Several very interesting meetings have been going on in London recently which should further the prospects for amateur radio satellites in the near future.

The Microelectronics Educational Programme (MEP) is funded by the Education Department of England, Wales and Northern Ireland and is administered by the Council for Education Technology for the United Kingdom. Their immediate programme is to encourage the use of satellites in education and their first meeting, held in May last at the Institute of Physics, London, was entitled 'Satellites in Education'.

(Note: Since Arthur wrote this, the Government has announced a cut in the MEP's budget from £5M to £2.2M, a return, no doubt, to Victorian values).

Nineteen people were invited to attend, representing schools, colleges of further education, universities, suppliers of satellite equipment for schools etc, and representatives of such bodies as AMSAT-UK.

From earlier meetings and enquiries it had been established that there was sufficient interest in the subject to justify forming a national group of those involved in the use of satellites in schools. The meeting in May confirmed that there was a need for the various groups to be more aware of each other's work and for the provision of an effective information service for schools, and that a single strong group would be better able to attract funds for development and supportive work.

At the May meeting an initial National Co-ordinating Committee was selected and various members agreed to undertake certain tasks. It was felt that all interests would best be served by structuring the activities at two levels: firstly with a wide representative National Committee and secondly with two special interest groups, viz, one for UoSAT and the other for meteorological satellites.

The committee decided that their first actions should be devoted to producing information for use in schools, giving help and information to teachers thinking of becoming involved in satellite activities, producing an information sheet explaining the purpose and structure of the group, and providing resource

packs for schools. Other issues considered were the need for the evaluation of available materials and how to seek funding in a co-ordinated way for the longer term activities.

RTTY speeds

As we have mentioned in these notes on occasions in the past, there has been controversy over the speed at which amateur radio teleprinting (RTTY) should be officially standardised ever since the mode became operative in this country. When RTTY first started in Britain some 25 years or more ago, the only machines available were surplus Type 3 Creed teleprinters. These worked at a speed of 50 bauds. When the mode became established, RTTY QSOs between amateurs in this country and those overseas began to take place, particularly with the USA where the mode was already quite popular. Unfortunately the teleprinters in the USA worked at a speed of 45 bauds, so their equipment was not compatible with ours. A right royal battle ensued as to which speed should be used, and in the end it was agreed that we should adopt the American speed and modify our machines to make them work on the American speed of 45 bauds.

However, since those early days an international agreement has been made by the professionals to use 50 bauds as the International Standard for Telex. This has now come into general use, which means that surplus teleprinters, which are still the main source of machines for amateur use, are mostly for 50 bauds.

Over the years, moves have been made by a number of RTTY enthusiasts to get the 45 baud speed changed to 50 bauds as the 'standard' amateur radio RTTY speed. The controversy was introduced into the Region 1 IARU Conference at Brighton in 1981. On that occasion it was agreed that whilst the IARU would not recommend making the change immediately, every endeavour should be made to encourage the change from 45 to 50 bauds. The matter was raised again at the recent IARU Conference in Sicily, when again the 50 baud rate was confirmed as that preferred. However, in spite of such official recommendations, 45 bauds continues to be widely used, particularly for international QSOs.

50MHz - new allocation

As those readers who are interested in amateur radio affairs will already know, the Minister of State for Industry and Technology announced on 28 June last that the radio frequency band of 50 to 50.5MHz was to be allocated to the UK Radio Amateur Service.

The RSGB has been negotiating with the UK Licensing Authorities for some years for an allocation in this band, and it is good to see that they have at last been successful. The experimental allocation recently given has shown the potential of this band for both local and DX working, and it has become apparent that radio amateurs could make good use of this allocation. The UK is the first country in IARU Region 1 to get an allocation in this band. Regions 2 and 3, ie North and South America, Australasia and Southern Asia, already have such an allocation, which is 50 to 54MHz. The terms of the allocation and the starting date have yet to be announced.

In view of the fact that several European countries are still using Band I for broadcasting, attention will have to be paid to the conditions under which UK amateurs can use 50MHz. The RSGB has already started discussions with the DTI on these points and it is hoped that amateur activity can begin later this year.

It will be interesting to see what use is made of this band. So far, the experimentalists who have been devoting their attention to it have been primarily interested in propagation studies. These have needed pretty elaborate aerial arrays, good receiving equipment with pre-amplifiers, and so on.

Not understood

The 50MHz band is a most interesting one, with several different types of propagation operating in ways which are not fully understood. In an article by Mike Bosch ZS2FM, published in the April/May 1985 issue of *Radio ZS* and entitled 'Aiming for Optimum Performance on 50MHz', some experimental work is described with a view to overcoming the insensitivity of the average commercial six metre rig. One interesting result reported was that signals unreadable on SSB due to very noisy conditions could be retrieved on FM by increasing the RF pre-amplification up to a point just before limiting occurs. The

level has to be determined experimentally and results in the FM receiver becoming hypersensitive to weak signals.

The author points out that solid-state devices have been designed for a given range of frequencies and should therefore be selected for the band desired. He gives a list of such devices with their noise figures which are suitable for 50MHz operation.

There is thus a good deal of useful experimental work still to be done in numerous aspects of 50MHz work. The writer was licensed in the days when we had an allocation in the 56MHz region, and can well remember the excitement when a QSO was made with an Italian station on a band which had previously given only local QSOs. Up until then one had no idea that this frequency would provide long distance communication.

As was said on the GB2RS News Bulletin recently: 'Just to whet the appetite, the 50MHz beacon at Headquarters, GB3NHQ, was heard in the USA on 23 June in the States of Washington and Maine, and during the very early hours of 3 July a number of UK 50 MHz permit holders had contacts with stations in the north-east USA. Amongst them, G3OSS had a contact with

WA10UB with a 5 and 9 report sent and with W2CAP/1 on CW with reports of 5-4-9 being sent and 4-4-9 being received.' The propagation mechanism producing this opening is not known but is a sample of things to come!

No doubt there will be some who will want to use 50MHz solely for less sophisticated local communication. Let's hope things will be arranged so that both outlooks can be satisfied.

Successful SSTV

Most readers will know that the Challenger space shuttle got away eventually, and they may have seen from the coverage on TV that Dr Tony England WOORE was able to carry out some amateur radio contacts with Earth stations and also do some SSTV experiments with them. The latter proved to be particularly successful when the shuttle was within range of this country.

Viewers will have seen the RSGB's HQ station and some of the SSTV results. Besides the contacts with RSGB HQ, WOORE had contacts with a school radio club and several amateurs. Mention must be made of Rod Clews G3CDK, of Wallington, Surrey, who went to great lengths to plan for the event. His efforts were deservedly successful. Among



SSTV pic from Challenger of Tony England WOORE, received on 145.550 on 3 August

others who received SSTV was Terry Weatherley G3WDL, one of our contributors. Terry lives close to your scribe, and I am most grateful to him for the SSTV photo of WOORE reproduced here. This was recorded and reproduced by Terry on his own equipment and we must extend our congratulations to him for such successful results.

Signals from the shuttle were excellent at times, both speech and SSTV signals reaching strengths of S8 to 9. Your scribe got good quality and entirely intelligible speech on several orbits. So another chapter of successful 'high tech' activity has now to be added to the achievements of radio amateurs. 

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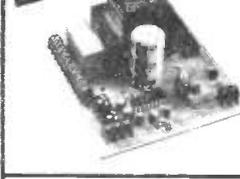
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AC126	0.45	BC182BL	0.10	BD242	0.65
AC127	0.20	BC183	0.10	BD246	0.75
AC128	0.25	BC183L	0.09	BD376	0.32
AC141	0.32	BC184BL	0.09	BD410	0.65
AC141K	0.30	BC204	0.10	BD434	0.65
AC142	0.34	BC207B	0.13	BD437	0.75
AC176	0.22	BC212	0.09	BD458	0.75
AC178K	0.31	BC212L	0.09	BD530	0.90
AC187	0.25	BC212LA	0.09	BD538	0.65
AC187K	0.25	BC213	0.09	BD597	0.95
AC198	0.25	BC213L	0.09	BD701	1.25
AC198K	0.31	BC214	0.09	BD702	1.25
AD142	0.79	BC214C	0.09	BD707	0.90
AD143	0.82	BC214L	0.09	BDX32	1.80
AD149	0.70	BC237B	0.09	BF115	0.55
AD161	0.39	BC238	0.09	BF119	0.55
AD182	0.39	BC239	0.12	BF127	0.39
AD182/01	0.90	BC251A	0.12	BF154	0.20
AF106	0.35	BC252A	0.18	BF158	0.22
AF114	1.95	BC256	0.25	BF160	0.27
AF121	0.85	BC256A	0.39	BF167	0.27
AF124	0.65	BC284	0.30	BF173	0.22
AF125	0.35	BC300	0.30	BF175	0.25
AF126	0.32	BC301	0.30	BF178	0.25
AF127	0.65	BC303	0.25	BF179	0.24
AF139	0.40	BC307B	0.29	BF180	0.29
AF150	0.80	BC327	0.10	BF181	0.29
AF178	0.80	BC328	0.10	BF182	0.29
AF239	0.42	BC337	0.10	BF183	0.29
AU106	4.50	BC338	0.09	BF184	0.28
AU107	3.50	BC347A	0.13	BF185	0.28
AU110	3.50	BC461	0.35	BF191	0.11
AU102	2.95	BC478	0.28	BF195	0.11
BC107A	0.11	BC527	0.20	BF196	0.11
BC107B	0.11	BC547	0.10	BF197	0.11
BC108	0.10	BC548	0.10	BF198	0.16
BC108A	0.11	BC549A	0.10	BF199	0.14
BC108B	0.12	BC550	0.14	BF200	0.40
BC109	0.10	BC557	0.08	BF201	0.18
BC109B	0.12	BC557B	0.08	BF245	0.10
BC109C	0.12	BC558	0.10	BF254	0.28
BC114A	0.09	BC639/10	0.30	BF259	0.28
BC115A	0.18	BD173A	1.80	BF271	0.28
BC117	0.19	BD115	0.30	BF273	0.18
BC119	0.24	BD124P	0.89	BF336	0.32
BC125	0.25	BD131	0.42	BF337	0.32
BC139	0.20	BD132	0.42	BF338	0.32
BC140	0.21	BD133	0.40	BF355	0.37
BC141	0.25	BD135	0.30	BF362	0.36
BC142	0.24	BD138	0.30	BF363	0.36
BC143	0.24	BD137	0.32	BF371	0.25
BC147A	0.12	BD139	0.30	BF394	0.19
BC147B	0.12	BD139	0.32	BF422	0.23
BC148A	0.09	BD140	0.30	BF423	0.23
BC148B	0.09	BD144	1.10	BF457	0.32
BC149	0.09	BD150C	0.29	BF458	0.36
BC153	0.30	BD159	0.85	BF467	0.55
BC157	0.12	BD160	1.80	BF495	0.25
BC158	0.09	BD178	0.72	BF497	0.25
BC159	0.09	BD182	0.70	BF499	0.25
BC161	0.28	BD201	0.85	BF499	0.25
BC170B	0.18	BD202	0.65	BF499	0.25
BC171A	0.10	BD203	0.78	BF499	0.25
BC171B	0.10	BD204	0.70	BF499	0.25
BC172	0.10	BD222	0.48	BF499	0.25
BC172B	0.10	BD223	0.59	BF499	0.25
BC172C	0.10	BD224	0.48	BF499	0.25
BC173B	0.10	BD232	0.38	BF499	0.25
BC174	0.09	BD233	0.38	BF499	0.25
BC174A	0.09	BD234	0.38	BF499	0.25
BC177	0.18	BD236	0.45	BF499	0.25
BC178	0.18	BD237	0.40	BF499	0.25

TBA720A	2.45	TD2581	2.95
TBA750Q	2.85	TD2582	2.95
TBA800	2.85	TD2593	2.95
TBA810A	1.85	TD2600	2.95
TBA810P	1.85	TD2610	2.95
TBA820M	0.75	TD2611A	3.95
TBA820Q	1.45	TD2640	3.95
TBA890	2.85	TD2680A	2.75
TBA920	1.95	TD2690	2.45
TBA950/2X		TD2700	2.95
		TD4600	2.50
		TD4950S	3.15
		TD4350	3.95
		TD4990	1.95
		TEA1009	3.95
		UPC598	2.95
		UPC575C2	
		UPC1025H	
		UPC1028H	
		UPC1029H	
		UPC1156H	
		UPC1158H	
		UPC1167C2	
		UPC1181H	
		UPC1182H	
		UPC1182H	
		UPC1191V	
		UPC1350C	
		UPC1353C	
		UPC1365C	
		UPC2002H	

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

A1865/20	68.00	D14-173GH	65.00	M19-103W	65.00	M50-120GV	65.00
AW36.11	28.00	D14-181GH/98	65.00	M21-103GH	65.00	M50-120LC	65.00
CME822W	19.00	D14-181GM	65.00	M23-112GM	65.00	M51-120W	75.00
CME1428GH	45.00	D14-181GM50	65.00	M23-112GW	65.00	S68B	45.00
CME1428W	39.00	D14-182GH	65.00	M23-112L2G	65.00	SE4-D/P-7	45.00
CME1523W	39.00	D14-200BE	65.00	M24-120L2G	65.00	SE42B/P31AL	55.00
CME1431GH	39.00	D14-200GA/50	65.00	M24-120LC	65.00	SE42B/P31	55.00
CME1431W	39.00	D14-200GM	75.00	M24-120W/AR	65.00	SE5F/P31	55.00
CME2024W	45.00	D14-210GH/50	75.00	M24-120W/AR	65.00	T937	65.00
CME2325W	45.00	D14-310W	110.00	M28-12GH	65.00	T948N	65.00
CME3128W	45.00	D14-340GH/KM	65.00	M28-131G	65.00	T948H	65.00
CME3132GH	45.00	D14-340CA	45.00	M28-133GR	65.00	V4150LC	65.00
CME3150W	45.00	D16-100GH	65.00	M28-131GR	65.00	V5004GR	65.00
CME3150W	45.00	D16-100GH/85	65.00	M28-133GR	65.00	V5004LD	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-101GH	65.00	V5001GH	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V5007DP31	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6008GH	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6034WA	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V604CL	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V604J	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6052GR	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6054P31	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6064CL	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6069GH	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V6070P31	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V7016A	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V7035A	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V7037GH	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V8004GR	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V806GH	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V801A	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	V81C39A	11.80
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	2BP1	9.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	3BP1	11.80
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	M38-103GR	11.80
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	M38-120W	65.00
CME3150W	45.00	D16-100GH/97	65.00	M31-182GR	65.00	M38-120WA	65.00
CME3150W</							

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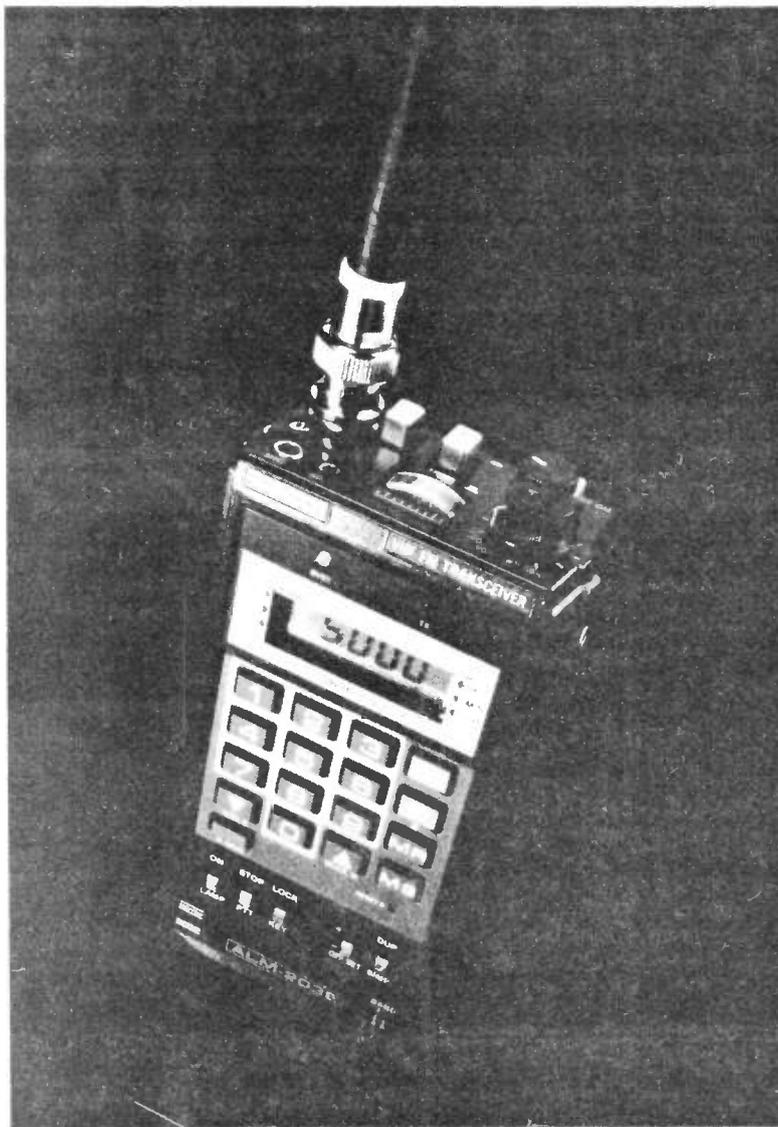
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A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714 24.80	EBC91 0.80	EL500 1.40	M8190 4.80
A1998 11.50	EB91 0.80	EL504 1.40	M8195 4.80
A2087 11.50	EBF80 0.65	EL509 5.25	M8196 4.80
A2134 14.95	EBF83 0.65	EL519 5.25	M8204 4.80
A2293 8.50	EBF85 0.95	EL802 3.95	M8223 4.80
A2425 29.50	EBF89 0.70	EL821 8.50	M8224 4.80
A2599 37.50	EBF93 0.95	EL822 12.95	M8225 3.50
A2792 27.50	EBL1 2.50	EM1 9.00	ME1401 29.50
A2900 11.50	EBL21 2.00	EM4 9.00	ME1402 29.50
A3042 24.00	EC52 0.75	EM80 0.70	ME1501 14.00
A3293 24.00	EC70 1.75	EM81 0.70	MH4 3.50
AC77H1 4.00	EC81 7.95	EM84 1.85	MHLD6 4.00
ACT22 57.75	EC86 1.00	EM85 3.95	ML4 4.50
AG/S2 PEN 0.50	EC88 1.00	EN32 18.50	MU14 3.50
AH221 39.00	EC90 1.10	EN91 1.50	N37 12.50
AH238 39.00	EC91 5.50	EN92 4.50	N78 9.55
AL50 5.00	EC92 1.95	ESU150 14.95	OA2 0.85
AN1 14.00	EC93 1.80	ESU872 25.00	OA2WA 0.85
ARP12 0.70	EC95 7.00	EY51 0.90	OB2 2.50
ARP34 1.25	EC97 1.10	EY81 2.35	OB2WA 2.50
ARP35 2.00	EC157 439.50	EY83 1.50	OC2 2.50
AZ11 4.50	EC8010 12.00	EY84 1.85	OC3 1.70
BL63 2.00	EC832 2.00	EY85/87 1.50	OC3 1.70
BS450 67.00	EC33 3.50	EY86 0.55	OC3 1.70
BS810 55.00	EC35 3.50	EY91 5.50	OC4 1.00
BS814 55.00	EC38 1.15	EY900A 1.50	OM5B 3.00
CIK 10.00	EC81 Special	EY802 0.70	OM6 1.75
CSJA 39.50	quality 1.95	E240 0.75	ORP43 2.50
CSA 9.00	EC82 0.65	E241 2.15	ORP50 3.95
C1112G 70.00	EC82 Mul	E280 0.75	PA1 2.50
C1108 65.00	lard 1.50	E281 0.75	PAB30 0.50
C1134 32.00	EC82	E290 1.50	PC86 0.75
C1148A 115.00	Phillips 1.95	E291 1.50	PC88 0.75
C1150/1	EC83 5.95	F6364 2.50	PC89 0.75
C1534 32.00	mar 1.35	F4W4/800 0.95	PC92 3.95
CCA 2.75	EC83	G55/1K 9.00	PC97 1.10
CC3L 0.80	Phillips 1.95	G10M/2M 5.00	PC98 1.10
CL33 3.00	EC84 0.80	G232 Mullard 0.90	PC99 1.10
CV Nos Prices on request	EC85 0.75	G240/2D 3.95	PC99 1.10
D3a 29.50	EC88 0.95	GC10B 17.50	PC99 1.10
D63 1.20	EC91 2.00	GC10C/4E 17.50	PC99 1.10
DA41 22.50	EC180 0.72	GC12/4B 17.50	PC99 1.10
DA42 17.50	EC189 1.95	G240/2D 3.95	PC99 1.10
DA90 4.50	EC205 3.50	GC10B 17.50	PC99 1.10
DA100 125.00	EC208 3.95	GC10C/4E 17.50	PC99 1.10
DAF91 0.45	EC209 0.80	GC12/4B 17.50	PC99 1.10
DAF91 0.70	EC220 12.00	GC10B 17.50	PC99 1.10
DAF96 1.00	ECF80 1.15	GC10C/4E 17.50	PC99 1.10
DAF97 1.75	ECF82 1.15	GC12/4B 17.50	PC99 1.10
DC90 1.20	ECF83 1.15	GC10B 17.50	PC99 1.10
DCX4-1000 12.00	ECF200 1.85	GC10C/4E 17.50	PC99 1.10
DCX4-5000 25.00	ECF201 1.85	GC12/4B 17.50	PC99 1.10
DET16 25.50	ECF801 0.85	GC10B 17.50	PC99 1.10
DET18 25.50	ECF805 2.50	GC10C/4E 17.50	PC99 1.10
DET23 25.50	ECF806 10.25	GC12/4B 17.50	PC99 1.10
DET24 36.00	ECF807 10.25	GC10B 17.50	PC99 1.10
DET25 22.00	ECF808 1.00	GC10C/4E 17.50	PC99 1.10
DF91 0.70	ECF809 1.25	GC12/4B 17.50	PC99 1.10
DF92 0.60	ECF810 1.25	GC10B 17.50	PC99 1.10
DF96 0.65	ECF811 1.25	GC10C/4E 17.50	PC99 1.10
DF97 1.00	ECF812 1.25	GC12/4B 17.50	PC99 1.10
DH83 1.00	ECF813 1.25	GC10B 17.50	PC99 1.10
DH77 0.90	ECF814 1.25	GC10C/4E 17.50	PC99 1.10
DH79 0.55	ECF815 1.25	GC12/4B 17.50	PC99 1.10
DH149 0.90	ECF816 1.25	GC10B 17.50	PC99 1.10
DK91 0.50	ECF817 1.25	GC10C/4E 17.50	PC99 1.10
DK92 1.20	ECF818 1.25	GC12/4B 17.50	PC99 1.10
DL35 2.50	ECF819 1.25	GC10B 17.50	PC99 1.10
DL70 1.00	ECF820 1.25	GC10C/4E 17.50	PC99 1.10
DL73 2.50	ECF821 1.25	GC12/4B 17.50	PC99 1.10
DL73 2.50	ECF822 1.25	GC10B 17.50	PC99 1.10
DL91 1.50	ECF823 1.25	GC10C/4E 17.50	PC99 1.10
DL92 0.95	ECF824 1.25	GC12/4B 17.50	PC99 1.10
DL93 1.10	ECF825 1.25	GC10B 17.50	PC99 1.10
DL94 2.50	ECF826 1.25	GC10C/4E 17.50	PC99 1.10
DL95 2.50	ECF827 1.25	GC12/4B 17.50	PC99 1.10
DL96 2.50	ECF828 1.25	GC10B 17.50	PC99 1.10
DL97 2.50	ECF829 1.25	GC10C/4E 17.50	PC99 1.10
DL98 2.50	ECF830 1.25	GC12/4B 17.50	PC99 1.10
DM70 1.95	ECF831 1.25	GC10B 17.50	PC99 1.10
DM180 2.75	ECF832 1.25	GC10C/4E 17.50	PC99 1.10
DV51 1.50	ECF833 1.25	GC12/4B 17.50	PC99 1.10
DV56/87 0.65	ECF834 1.25	GC10B 17.50	PC99 1.10
DV802 0.65	ECF835 1.25	GC10C/4E 17.50	PC99 1.10
DY807 11.00	ECF836 1.25	GC12/4B 17.50	PC99 1.10
E80F 18.50	ECF837 1.25	GC10B 17.50	PC99 1.10
E81CC 3.15	ECF838 1.25	GC10C/4E 17.50	PC99 1.10
E81L 12.00	ECF839 1.25	GC12/4B 17.50	PC99 1.10
E82CC 3.50	ECF840 1.25	GC10B 17.50	PC99 1.10
E83CC 3.50	ECF841 1.25	GC10C/4E 17.50	PC99 1.10
E83F 5.50	ECF842 1.25	GC12/4B 17.50	PC99 1.10
E86C 9.50	ECF843 1.25	GC10B 17.50	PC99 1.10
E86C 7.95	ECF844 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF845 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF846 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF847 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF848 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF849 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF850 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF851 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF852 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF853 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF854 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF855 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF856 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF857 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF858 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF859 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF860 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF861 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF862 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF863 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF864 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF865 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF866 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF867 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF868 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF869 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF870 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF871 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF872 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF873 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF874 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF875 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF876 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF877 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF878 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF879 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF880 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF881 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF882 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF883 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF884 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF885 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF886 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF887 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF888 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF889 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF890 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF891 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF892 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF893 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF894 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF895 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF896 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF897 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF898 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF899 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF900 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF901 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF902 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF903 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF904 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF905 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF906 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF907 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF908 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF909 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF910 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF911 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF912 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF913 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF914 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF915 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF916 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF917 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF918 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF919 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF920 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF921 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF922 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF923 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF924 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF925 1.25	GC10C/4E 17.50	PC99 1.10
E86CC 3.50	ECF926 1.25	GC12/4B 17.50	PC99 1.10
E86CC 3.50	ECF927 1.25	GC10B 17.50	PC99 1.10
E86CC 3.50	ECF928 1.25	GC10C/4E 17.50	PC99 1.10
E8			

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Sensors are gaining importance today because of their ability to give microprocessors senses that we humans take for granted. After all, a thinking machine is of little use without some form of interface to the 'real world'. However, this new-found importance is not solely due to the omnipresent micro. Sensor technology is itself improving and diversifying. One interesting example is a new miniature opto-sensor introduced by Hakuto.

The main feature of the new device is that it is sensitive to ultraviolet radiation, and totally insensitive to visible and infra-red. While the human eye is not aware of ultraviolet (UV) light, UV has important chemical and biological properties.

Discovered at the start of the nineteenth century—just after infra-red—through its blackening effect on silver chloride, the term UV is used to describe that part of the electromagnetic spectrum which lies between the visible and X-ray regions. The generic term UV is used for radiation with wavelengths from 4 to 400 nanometres (nm). This large range is split into the 'near', 'far', and 'extreme' (or 'vacuum') section as the wavelength shortens.

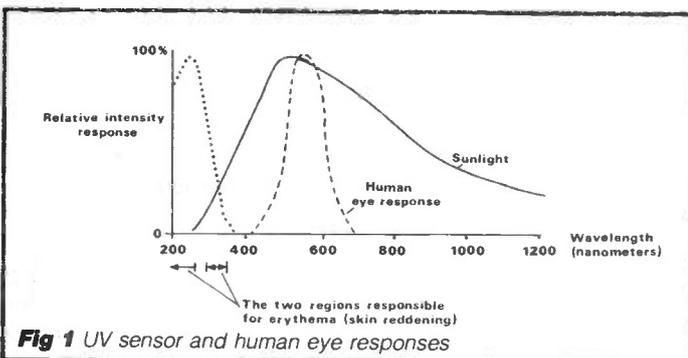
Sources

There are many sources of UV, the most obvious being the sun. Electric arcs (man-made and natural), sunlamps for tanning, rare gas discharge tubes, and germicidal lamps all emit UV in varying intensity. Incandescent objects also emit UV, the amount being dependent upon their temperature. *Table 1* shows the percentage (of the total energy) which is given off as UV with a wavelength shorter than 400nm as a function of the object's temperature.

Most UV encountered is near the long wavelength limit, because the Earth's atmosphere blocks the shorter wavelength (and biologically dangerous)

Table 1 Black-body radiation of UV

Percentage of energy emitted as UV ($\lambda < 400\text{nm}$) for black bodies	
Temperature/ K	%
2000	0.002
3000	0.07
4000	2.0
5000	7.0
6000	14.0
8000	33.0



THE HAKUTO R1755 ULTRAVIOLET SENSOR

James Dick describes an interesting new opto-sensor

radiation. However, this blocking effect is very altitude-dependent; by a height of 3000m, for example, the intensity is up five-fold compared to that at sea-level.

Applications

As mentioned previously, incandescent objects emit a certain amount of UV. Sensors can be used as flame detectors because the heated particles in flames emit UV, so checking on UV intensity can be used as a method of monitoring flames in industrial processes or as the basis of fire alarm systems.

In considering a UV sensor as part of a fire detection system, it is worthwhile remembering that smoke, rather than flames, may be the major hazard in many sites; a UV sensor may be of most use in areas where the environment precludes the use of conventional smoke detectors.

Despite the pilgrimages by tourists to sun-drenched lands, UV does have biological hazards. Although solar UV is largely blocked in the atmosphere, sufficient amounts reach sea-level to penetrate up to 1mm into the skin, where it causes erythema—a UV-induced reddening—and tanning. This reddening, which is often the precursor to sunburn, is caused by two spectral regions: light with a wavelength of between 320 and 280nm and that with a wavelength shorter than 260nm. *Figure 1* shows where they lie in the distribution of sunlight. The typical sensitivity of the human eye and this UV sensor are also marked. Hence, the sensor may be used as an aid for preventing sunburn.

Using the sensor

Physically, the sensor is a very small evacuated glass cylinder nearly 30mm long with a diameter of around 3mm. The caesium-telluride cathode is the photo-sensitive element which detects the UV while being insensitive to visible and

infra-red radiation.

The currents passed by the device are very small—quoted as a few milliamps per watt of UV incident on the cathode area. A bright UV source (sun, electric arc, or high-temperature flame) might result in the maximum photo-current of 1 microamp being approached.

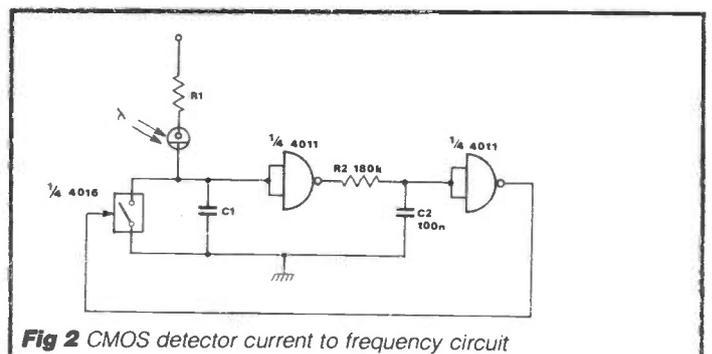
Because the detector's current is so small there are problems when it has to be measured. The large dynamic range of the sensor (100dB) also has to be matched to the measuring system. One very simple method of accommodating the dynamic range is to convert the current (passed by the detector) into a frequency, since frequency is easily measured with a high degree of precision. The very small currents present dictate that MosFET devices are used to minimise loading, and these are available as simple CMOS logic ICs.

Figure 2 shows a very simple yet sensitive circuit. From switch-on, the current flowing through the sensor charges C, so that the input voltage on NAND gate 1 rises. When this passes the notional logic threshold the output of 1 changes and, after a delay caused by R₂-C₂, gate 2 causes the CMOS switch to close and discharge C₁. Hence, a simple relaxation oscillator is formed. R₁ prevents damage to the sensor.

The circuit is very sensitive and can have its pulse output tailored by changing the value of C₁. *Table 2* details the various count rates obtained according to illumination. REV

Table 2 Count rates under various conditions

Condition	Count rate (Hz)
darkness	0.3
overcast sky	10
bright sun at low altitude	20
bright sun	35 – 60



A PERFORMANCE MONITOR FOR MODEL AERIALS

P Moore outlines an aerial design aid, complete with BBC computer program, developed by C Bradshaw and M Kersey

The design of aerial arrays has always been either a rather complex matter involving much theory, or has relied on experience and a lot of luck in a 'cut and see' approach. The theoretical design process was enhanced by the article of F Houghton (G3VZM) and C A Swift (R&EW, January 1985). This article aims to add yet another design tool.

The principle

Once a prototype aerial system has been designed the next step is to build it and see if it is as satisfactory as the designer hopes. This can be rather expensive on a full size system if your sums are wrong. To overcome this problem we decided to construct a system that would allow model aerials to be tested.

If the frequency of operation is increased then the physical size of the aerial system will be decreased. Consequently, by choosing a suitable frequency an aerial system may be constructed that is small enough to test in the laboratory. An excellent choice of frequency, if a suitable source is available, is 10GHz. This will allow models to be made from tinned copper wire.

The BBC Basic program

```

10REM      Program : RADAR.
20REM      Written by : C.BRADSHAW
30REM      (C) C.BRADSHAW 1984
40REM
50REM <SHIFT> exits from program.
60REM Typing 'LOAD' when asked for
70REM description will load a file.
80REM Following only have effect
90REM when points are being plotted.
100REM P .. Dump display to printer
110REM S .. Save points
120
130
140CLS:INPUT"DESCRIPTION OF SYSTEM "SY#
150MODE4
160*KEY10 O:IMRUN:M
170IF ?&FFFE=164 THEN ?&226=255 ELSE *FX220
180VDU29,640;512;
190VDU23;8202;0;0;0;
200S%=5
210DIM L(100,11),K%(100)
220PROCgridinit
230PROCgrid
240IF SY#="LOAD" PROCload:RUN
250
260FORQ%=1 TO 10
270PROCzerodegs
280PRINTTAB(37,1);Q%
290PRINTTAB(0,1);"Sampling"
300FORA%=0 TO 90
310TIME=0
320REPEAT UNTIL TIME>=3.1
330L(A%,Q%)=ADVAL(1)/5
340IF INKEY(-1) THEN 640
350NEXT
360PRINTTAB(0,1);SPC 8
370PROCdisplay
380NEXT
390PROCaverage
400CLS
410GOTO260
420
430DEFFPROCzerodegs
440REPEAT
450A%=ADVAL(0) AND 3
460UNTIL A%=0
470ENDPROC
480
490DEFFPROCdisplay
500PR%=0;SV%=0
510PRINT TAB(0,0)SY#;SPC(20)
520FORA%=0 TO 360 STEP 4
530X%=COS(RAD(A%))*L(A%/4,Q%)
540Y%=SIN(RAD(A%))*L(A%/4,Q%)
550PLOT69,X%*S%,Y%*S%
560IF INKEY(-56) THEN PR%=1
570IF INKEY(-82) THEN SV%=1
580IF INKEY(-1) THEN 640
590NEXT
600IF PR% THEN PROCdump
610IF SV% THEN PROCsave
620ENDPROC
630
640*FX15,0
650IF ?&FFFE=164 THEN ?&226=0 ELSE *FX220,27
660END
670
680DEFFPROCaverage
690PR%=0
700FORA%=0 TO 90
710FORQ%=1 TO 10
720K%(A%)=K%(A%)+L(A%,Q%)
730NEXT Q%
740K%(A%)=K%(A%)/10
750NEXT A%
760CLS
770PROCgrid
780PRINTTAB(0,0);" Average
790MOVE% (0),0
800FORA%=4 TO 360 STEP4
810X%=COS(RAD(A%))*K%(A%/4)
820Y%=SIN(RAD(A%))*K%(A%/4)
830PLOT69,X%*S%,Y%*S%
840IF INKEY(-56) THEN PR%=1
850NEXT
860IF PR% PROCdump
870*FX15,0
880=INKEY(500)
890 IF GET
900
910DEFFPROCdump
920 *SCDUMP
930ENDPROC
940
950DEFFPROCgrid
960GCLO,1
970FORR%=45 TO 450 STEP45
980MOVE%0
990FORA%=0 TO 36
1000X1%=R%*X1(A%)
1010Y1%=R%*Y1(A%)
1020DRAWX1%,Y1%
1030NEXT,
1040MOVE-640,0;DRAW640,0;MOVE0,-550;DRAW0,550
1050GCLO,3
1060ENDPROC
1070
1080DEFFPROCgridinit
1090DIMX1(36),Y1(36)
1100FORA%=0 TO 360 STEP10
1110X1(A%/10)=COS(RAD(A%))
1120Y1(A%/10)=SIN(RAD(A%))
1130NEXT
1140ENDPROC
1150
1160DEFFPROCsave
1170INPUTTAB(0,0)"FILENAME?"T#
1180*OFT1,0
1190X=OPENOUT(T#)
1200PRINTEX,SY#
1210FORQ%=1 TO 10
1220FORA%=0 TO 90
1230PRINTEX,L(a%,q%)
1240NEXT,
1250CLOSEX
1260ENDPROC
1270
1280DEFFPROCload
1290INPUTTAB(0,0)"FILENAME?"T#
1300*OFT1,0
1310X=OPENUP(T#)
1320INFUTEX,SY#
1330Q%=0
1340REPEAT
1350Q%=Q%+1
1360FORA%=0 TO 90
1370INFUTEX,L(a%,Q%)
1380NEXT
1390PROCdisplay
1400UNTIL EOF EX
1410CLOSEX
1420PRINT"Press any key":IF GET
1430ENDPROC

```

NOTE: readers may like to substitute their own screen dump routine at line 920. The call in this listing works with a WATFORD system

The monitor consists of a fixed aerial and a rotating aerial. It does not matter whether the transmitter or the receiver rotates, since the reciprocity theorem states that an aerial works equally well in both directions. However, the aerial under test *must* be mounted on the turntable.

The microcomputer is used to sample the field strength at regular intervals and plot a radiation pattern.

The practice

We chose a transmitting frequency of 1GHz (30cm wavelength). Our source was battery operated and terminated in coaxial cable, and we mounted this onto the turntable since this arrangement removed the need for slip rings and brushes.

Calibration of the orientation of the turntable is crucial to accurate recording of data. Two methods are possible...

1. Use a system that rotates at constant speed and recalibrate every time the zero degrees point passes. A timing loop in the program is then required to calculate the time taken to rotate through 10° (this is the increment between data samples). This method has the advantage of being cheap and easy, but is less precise.

2. Use a slotted wheel to strobe the computer every 10°. This will require phototransistors or opto-couplers and is quite a lot more expensive. It is, however, more precise.

We chose system 1, and used a lever type microswitch fixed to the base of a record deck. This was triggered by an actuator fixed to the turntable. The motor and gearing inside the record deck gave a constant rate of rotation and so reduced any angular errors produced by this method.

The microswitch is connected between pins 2(0V) and 10(IO1) on the analogue port of a BBC microcomputer. This input is read into ADVAL (0) and provides initiation of the timing loop.

The receiving aerial is a simple dipole mounted broadside-on to the turntable. The signals produced by this are connected, after rectification, to pins 8(AGND) and 15(CH0) of the analogue port and are read into ADVAL (1).

The program

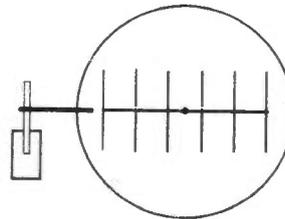
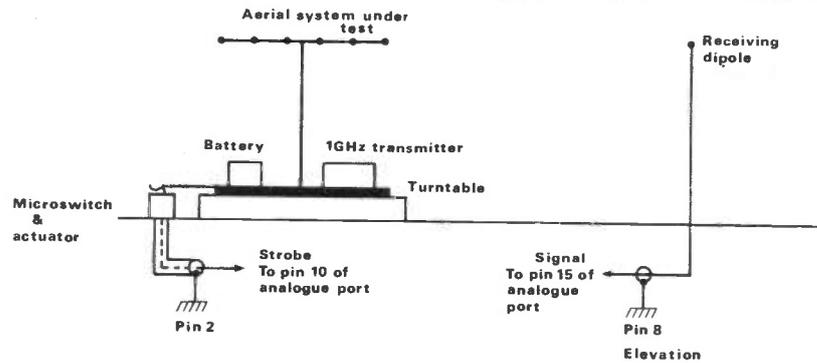
This is constructed in a number of parts.

1. Data gathering and display

On reception of the initiating strobe a timer is started (line 270). This times out after one complete revolution of the turntable (16rpm). During this time, data is gathered 36 times at equal intervals (10°). The raw data is scaled (line 330) and plotted on a polar grid. This happens ten times.

2. Averaging

Having completed and plotted ten samples the average signal strength is



Details of the system

computed and displayed.

3. Dumping and saving

The facility exists to save the data on disc and/or dump the data onto a printer.

Each of the above parts is described by REM statements in the program listing.

Comments and conclusions

The system as described worked well and consistently. It is up to individual constructors to decide on things like precision of strobing and scale frequency, since these decisions will probably depend upon the equipment and facilities that are available.

We made no attempt to reduce the effects of reflections, and these may be identified in the radiation patterns. Nor did we provide a flat groundplane. This seems to have had little effect as the radiation patterns are about the shape we expected. For detailed design work

we would however recommend a number of modifications...

1. The second method of turntable calibration, strobing, should be used to reduce errors in angle measurement.

2. The simple dipole that was used as a receiving aerial should be changed to a lower beamwidth array to increase the precision of the sampling.

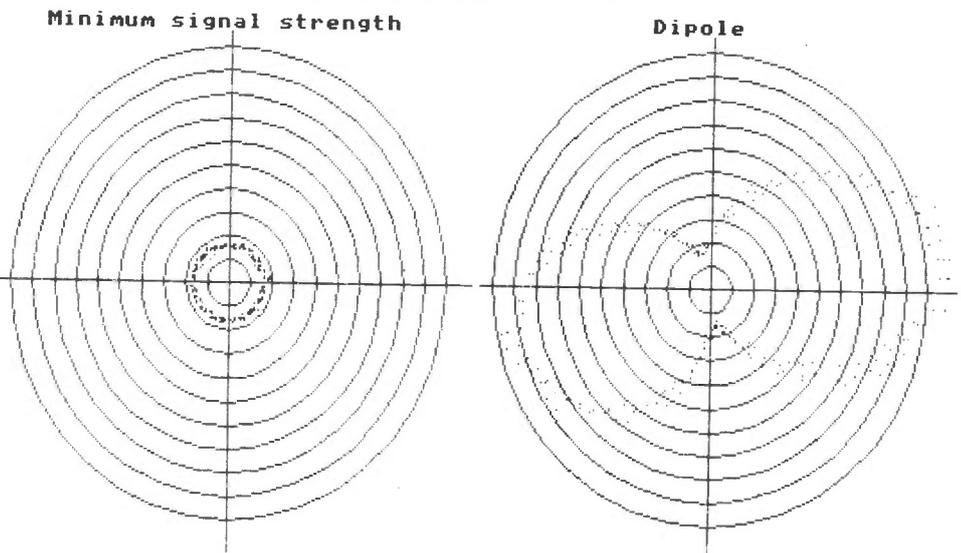
3. A groundplane should be used. This could take the form of a scale model (in the appropriate materials) of the proposed aerial site.

Acknowledgements

The work done to produce this article was carried out by Messrs C Bradshaw and M Kersey in the laboratories of the Harlington Upper School, Bedfordshire. I am also most grateful to Mr J Slater for his recent help.

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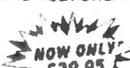
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From the day in 1959 on which Sputnik 1 first circled the Earth radiating its 20 and 40MHz signals, amateur radio enthusiasts have been fascinated by satellites.

In the intervening years the Oscar and RS series satellites have provided many DX QSOs for the amateur radio community, but a small yet growing fraternity are also interested in another series – the meteorological satellites.

These fall into two main categories: low level orbiting (such as the NOAA series) and geostationary.

The geostationary satellite serving Europe and Africa is Meteosat, which is located over the equator on the 0° meridian. This is one of five satellites equispaced around the equator. Of these, the one positioned over South America and another over the Pacific Ocean have been provided by the USA, the one over the Indian Ocean by the USSR, the one over New Guinea by Japan and one, Meteosat, just south of Ghana, by Europe.

Meteosat has been designed to carry out three main missions: image production, data collection and information dissemination. The first of these involves the scanning, at half-hourly intervals, of the Earth's surface and cloud masses within the coverage area in three spectral bands.

Secondly, Meteosat collects information gathered by automatic or semi-automatic stations (called data collection platforms), or by other satellites in low polar orbit, the purpose being to gather information obtained locally to supplement that obtained as part of the main mission.

The third function is to disseminate the cloud cover images and the meteorological data derived from these images, this being to ensure that the largest possible number of users have access to the data

produced by Meteosat and the data collection platforms.

The spacecraft

Meteosat is spin stabilised at 100rpm on an axis perpendicular to the orbital plane. It is of cylindrical shape, 3.2m high and 2.1m in diameter. At launch the mass was nearly 700Kg, this including the apogee motor and the securing devices.

The design is relatively simple, involving the use of a double structure. The primary structure bears, in addition to the mechanical loads, a main platform carrying the support equipment. The upper platform carries the aeriels and most of the communications equipment. The secondary structure supports the six solar panels and the heat shields.

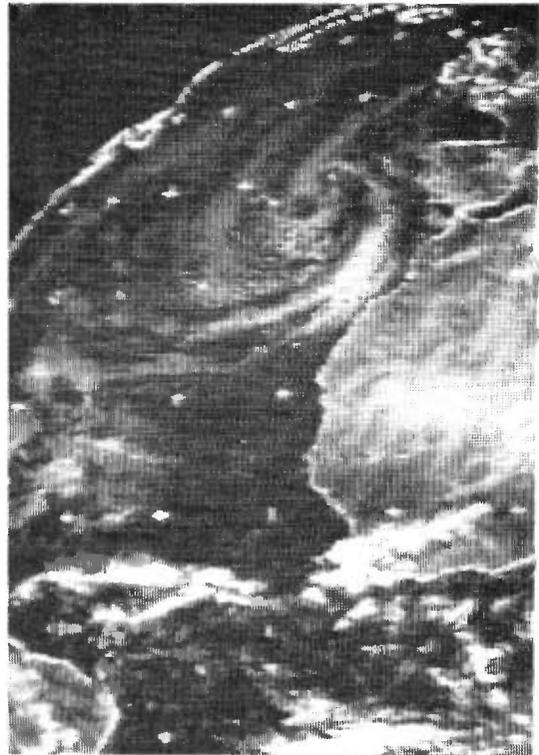
In order to achieve the design task, the payload consists of a high resolution radiometer and a data transmission system.

The radiometer is an electro-optical instrument whose main element is a 40cm aperture Ritchey-Chretien telescope. This can, over a period of 25 minutes, produce two simultaneous images of the Earth's surface, one in the visible and the other in the thermal infra-red regions of the spectrum. An infra-red water vapour channel is also available.

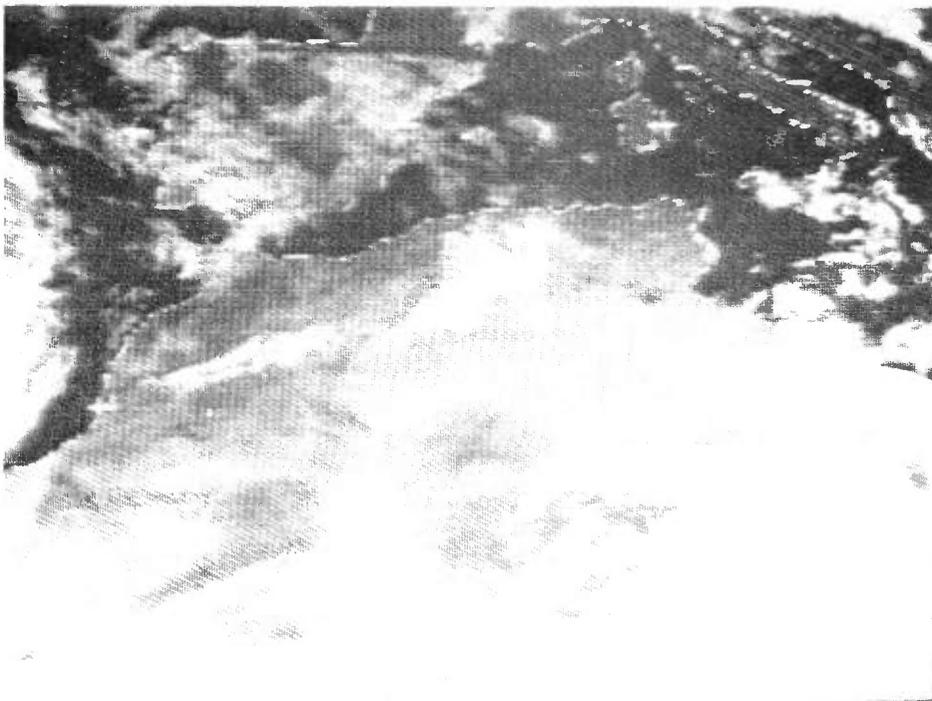
Tracking and processing

The Data Acquisition, Telecommand and Tracking Station (DATTS) is situated at Michelstadt near to the European Space Operations Centre (ESOC) at Darmstadt in the Federal Republic of Germany. This facility is responsible for the reception of the radiometric, attitude and housekeeping data from the satellite. In addition it transmits the meteorological data or images and the telecommands, and finally, in association with a land-based transponder,

METE



Brian Kendal G3C
McDermott G6MLO
and reception of th



Southern Europe and North Africa

determines the position of the satellite by use of ranging techniques.

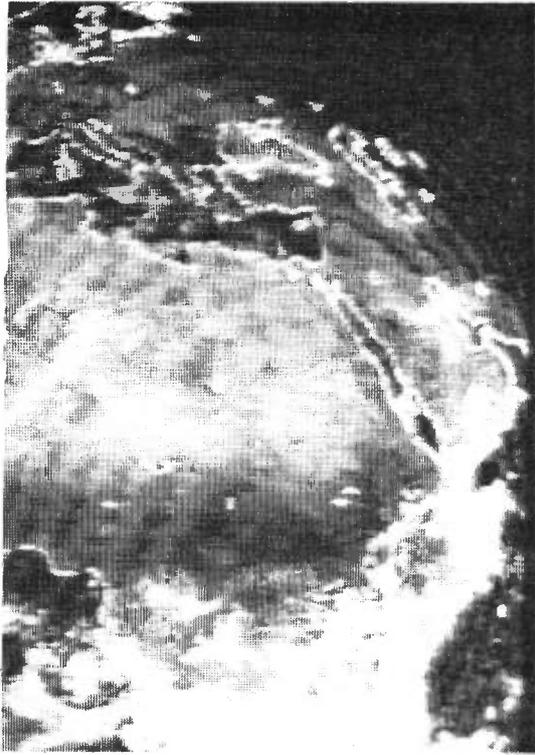
The operational management of the system is the responsibility of the Meteosat Operations Control Centre (MOCC). This involves monitoring the operation and performance of all elements within the system including performing the orbit and attitude restitution calculations.

Signal processing and the production of the images is the task of the Data Referencing and Conditioning Centre (DRCC) and from the processed data, the Meteorological Information Extraction Centre (MIEC) extracts the specifically meteorological data such as wind fields, sea temperature charts and cloud system analyses.

The latter three centres, MOCC, DRCC and MIEC, are actually utilisation consoles connected with the Meteosat Ground Computer System (MGCS), a computer unit located at ESOC and linked with DATTS by a high speed terrestrial circuit.

From its geostationary position in orbit the satellite observes the cloud cover of the Earth, producing two images in 25 minutes. The first of these is of visible radiation and is composed of 5,000 lines

OSAT



ADU and Maurice outline the operation of this weather satellite

each of 5,000 image points and achieving a resolution of 2.5Km at the Earth's surface.

The second, in the infra-red spectrum, comprises 2,500 lines, each with 2,500 image points giving a 5Km resolution. When received on the ground these images are of sufficiently high resolution for immediate use, but for more precise definition, and for the data to be compatible with international APT (Automatic Picture Transmission) or WEFAX (Weather Facsimile) standards, the raw image must be processed on the ground and then re-transmitted to the satellite for relay to the weather stations.

The radiometer

The radiometer consists of a main optical unit and some additional electronic packages mounted on the satellite equipment platform. The main outward feature distinguishing the European radiometer from similar equipment developed in the United States is the absence of a scanning mirror as the first element in the optical chain.

To avoid the need for this, the Meteosat design scans the primary telescope. This consists of a Ritchey-Chretien primary and secondary mirror

mounted with a small 45° on-axis mirror in a Conde-Cassegrain arrangement. By use of this system the telescope may be scanned about a plane which nominally lies in the satellite's, and hence the Earth's, equatorial plane whilst still maintaining the subsequent relay optics, detectors, etc in a fixed position with respect to the satellite.

On exiting the telescope, the optical axis is folded by a series of small flat mirrors to arrive at either the optical detectors or via a lens system to the infra-red detectors.

To maintain the necessary optical quality over a wide range of temperatures and in the presence of significant thermal gradients, the mirrors are fabricated from a low expansion material from which material in excess of structural requirements is removed by ultrasonic drilling and grinding processes.

In normal use the frame (vertical) scan of the image is generated by rotating the telescope through $\pm 9^\circ$ in 2,500 steps, one per spacecraft revolution. As the telescope is rigidly fixed in the other plane, the linescan is developed by the rotation of the satellite.

The optically collected visible and infra-red earth signals are converted into analogue electrical signals by five detectors; two visible and three infra-red. The two visible detectors are located in the focal plane of the primary telescope, both being fabricated on a single silicon chip. This ensures the homogeneity of performance required for good image quality as each detector generates alternate lines of the high resolution image.

Whilst the visible detectors operate at ambient temperatures, the three infra-red detectors (ie a redundant pair for thermal infra-red and a single element for atmospheric water vapour images)

must be cooled to less than 95K (-178°C). These are therefore insulated in a second stage, or cold patch, of a passive cooling system which uses what is effectively a black body radiator mounted at one end of, and thermally insulated from, the spacecraft.

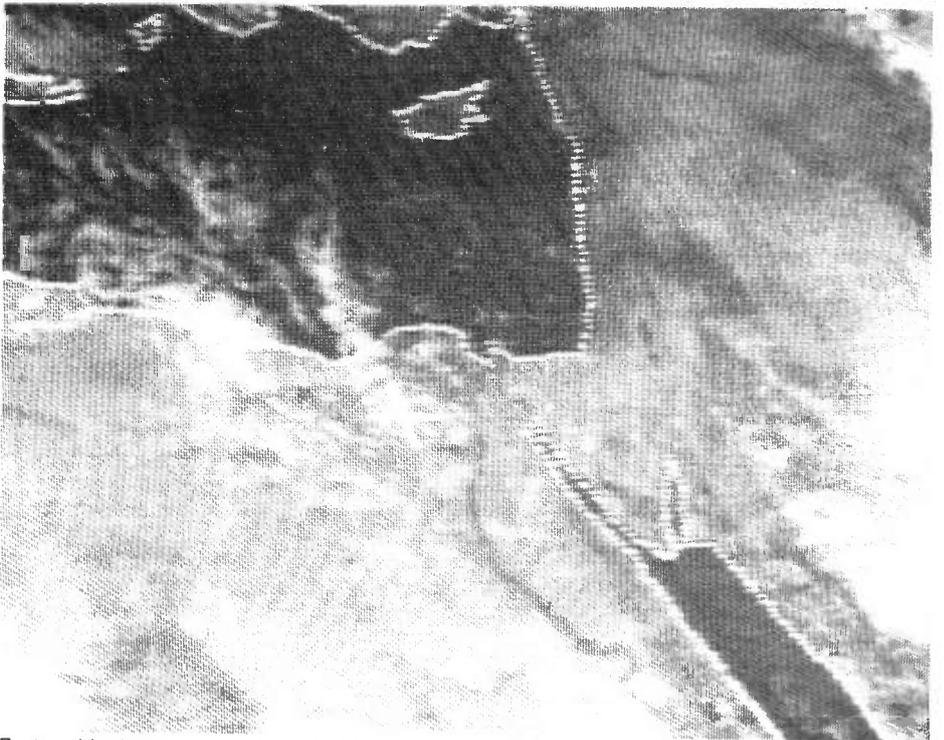
Even this is insufficient to completely remove the sun's influence on detector temperature the whole year round. Active heating is therefore employed to keep the detector operating temperature constant and stabilise the otherwise temperature-variable spectral-sensitivity characteristics.

In-flight IR calibration

A further facility of the main unit is that of in-flight infra-red calibration with an associated black body reference source. This mechanism permits three calibration conditions: detector self-viewing, detector sun viewing and detector black body viewing. Viewing operations, the moon, space background and selected Earth regions can also be used for referencing, but this is due to the inherent flexibility of the equipment rather than any special on-board equipment.

The synchronisation sub-system of the imaging system generates all the dating and control signals. This system is controlled by a crystal oscillator operating on 5.3MHz, which is reset by a sun (or Earth) sensor for each orbital revolution of the satellite. From this the synchronisation of the radiometer scanning, the de-spun aerial and the transmission of data to Earth is achieved.

The analogue data from the radiometer is converted into digital signals at high velocity by image processing units, and a memory circuit provides temporary storage in order that the data can be transmitted at a slower continuous rate.



Eastern Mediterranean and the Red Sea

METEOSAT

Telecommunications

The main telecommunications sub-system is responsible for the transmission to Earth of the data produced by the imaging system and the re-transmission of the processed images to the various user stations, either in digital form for higher resolution images, or in analogue form compatible with APT or WEFAX formats.

Links between the satellite and ground stations operate on S-band, except those between the spacecraft and data collection platforms which operate on UHF, in which case the satellite is operating as a UHF/S-band repeater.

Separate aeriels are used for S-band transmission and reception. The signals are radiated from a directional electronically de-spun aerial which has a gain of approximately 13dB. This comprises an array of 128 dipoles arranged in 32 rows of 4 on a cylindrical structure which is fed from a switching matrix. This energises the 5 appropriate rows of dipoles at any time in synchronism with the satellite rotation.

For reception a 2.5dB gain toroidal pattern aerial is used, with a further aerial of the same type provided as a back-up to the transmission arrays. Each of these consists of a slotted waveguide array with linear polarisation. They are placed side-by-side within a cylindrical

honeycomb radome. UHF links are achieved by a further toroidal array of unity gain consisting of four half-wave dipoles etched on a microwave plastic cylinder.

During the stationing phase, VHF is used for telemetry and command. The aerial for this comprises four monopoles fed by signals of equal amplitude in phase quadrature.

History

Meteosat 1 was launched on Wednesday 23 November 1977 by an American Delta 2914 rocket and was boosted into geostationary orbit by its apogee motor a few hours later. The spacecraft was then permitted to drift until it reached its permanent position over the Gulf of Guinea on 7 December. Over the succeeding months a series of further operations, including the calibration of the radiometer detectors, were carried out before it became fully operational in May 1978.

As is so often the case, however, after a short period of success disaster struck and the imaging equipment failed. This necessitated the launch of a second satellite, Meteosat 2, which was identical to its predecessor. This too had a chequered history for it suffered many failures, this time however to the data collection circuitry. For some time now, therefore, parts of both satellites have been used – the data collection facilities of Meteosat 1 in conjunction with the imaging of Meteosat 2. This will not continue for much longer, however, for Meteosat 1 has now exhausted its fuel supply and is slowly drifting from its allotted position. It is estimated that by mid-1985 this drift will have taken it to a position where it is unusable for data collection purposes.

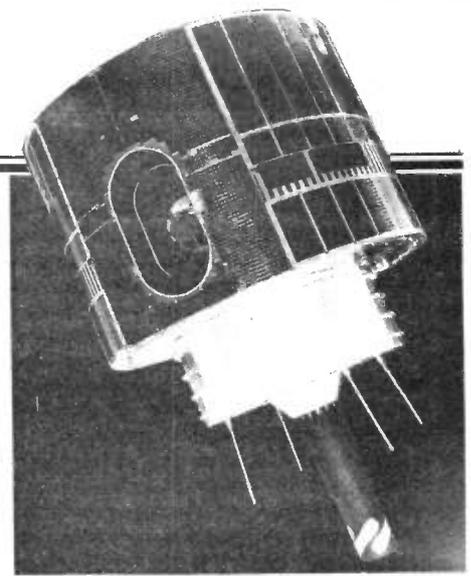
Receiving the images

Although due to the distance from Earth and the scanning method in use the whole Earth is continuously viewed by the satellite, the images received by the user are vastly different, for on normal reception channels the satellite is operating as a repeater, relaying only sections of the whole Earth picture. These have been processed at the ground facility, have coastlines and reference markers added and are radiated to a published schedule.

By radiating only a segment of the Earth at any one time greater detail is visible on the monitor, and some equipment, such as that supplied by Microwave Modules Ltd from which these photographs were taken, have the facility for a further magnification.

The Microwave Modules equipment

Although costing in the region of £2000, this equipment is by far the least expensive on the market. Operation is relatively simple yet the image quality



Pic courtesy of Marconi

received on the monitor is excellent, both in the normal and magnified modes.

The equipment comprises a VHF receiver, a digital storage module, a monitor, an aerial system, a down-converter and an aerial head pre-amplifier.

The aerial is a 25dB gain parabolic array with consequent narrow beamwidth. However, as Meteosat is geostationary it maintains a constant position in the sky, and in consequence once the aerial has been correctly aligned it requires no further adjustment.

The signal received is fed first to the GaAsFET aerial head amplifier, in order to overcome subsequent feeder losses, and then to the down-converter which changes the 1690MHz signal frequency to the 137 VHF satellite band. At this frequency the signal enters the VHF receiver.

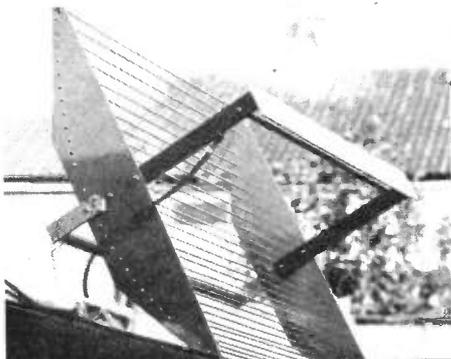
The VHF receiver supplied is manufactured by UKW Technic of West Germany and consists of a standard design crystal-controlled VHF receiver with six switched frequencies between 137 and 137.850MHz.

Fine tuning control is available over ± 10 KHz in order to compensate for doppler effects. An internal monitor speaker is fitted with volume and muting controls for operator convenience. The panel meter may be switched to give either signal strength or tuning indications.

The audio output from the receiver is fed to the digital storage module which provides the necessary signal processing in order to drive the high resolution video monitor. Alternatively, this unit may be driven by a recording made on a normal domestic cassette recorder.

Receiving other satellites

The five geostationary meteorological satellites are augmented by a number of others in low level polar orbit such as the NOAA series. These use the same signal format as Meteosat and consequently, if a suitable aerial is connected directly to the VHF receiver, may be received when above the horizon. Frequently, however, these signals are not particularly strong and a 137MHz pre-amp is desirable. 



G6MLO's 25dB gain aerial system

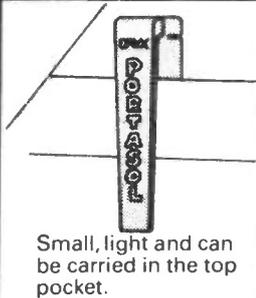


The receiver, digital storage module and monitor

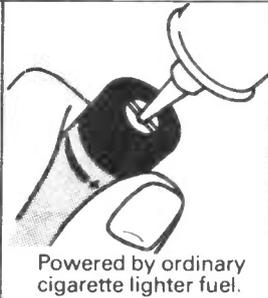
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ORYX – market leaders in soldering irons and accessories introduce the revolutionary PORTASOL. This new approach to catalytic soldering iron technology is truly

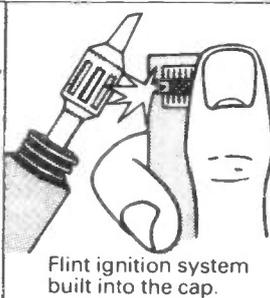
pocket portable (173 mm) and independent of any external energy source. PORTASOL is powered by ordinary cigarette fuel and one filling lasts for 60 minutes continuous use.



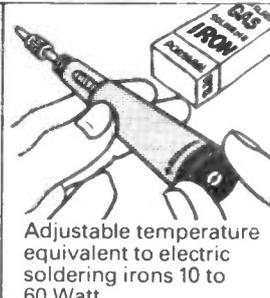
Small, light and can be carried in the top pocket.



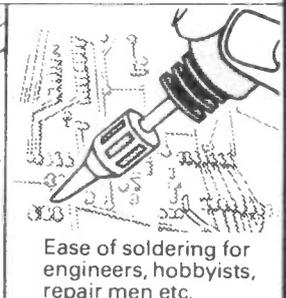
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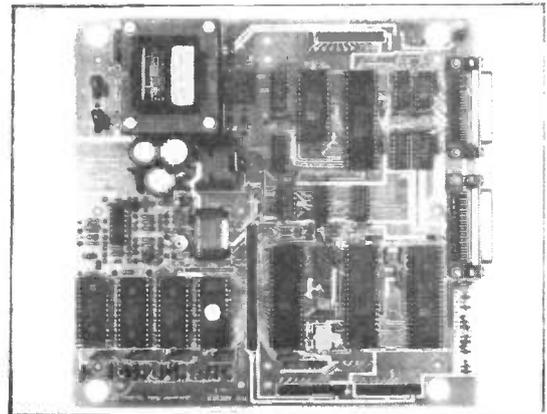
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BC547/8/9	-8p	BD135,136	-25p	BSX20	-15p
BC557/8/9	-8p	BD137,138,139	-25p	2N2926	-7p
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100/50 - 12p, 100/100 - 14p, 220/16 - 8p, 220/25, 220/50	10p
470/16, 470/25 - 11p, 470/35 - 12p, 470/40 - 15p, 1000/16	15p
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DATA FILE . . .

Ray Marston presents a variety of useful circuits in this concluding part of his '555' mini-series

In the last three editions of *Data File* we have explained the basic operating principles of the ubiquitous '555' timer IC, and have taken an in-depth look at ways of using the device in a wide variety of monostable pulse-generator and astable squarewave generator applications, etc. In the present edition of 'The File' we conclude our investigation of the 555 by presenting a miscellany of useful application circuits, and by introducing the 7555 CMOS version of the device. We start off, however, by looking at ways of using the IC as a triggered 'sawtooth' generator.

Sawtooth generators

The 555 can be made to generate a triggered non-linear (exponential) sawtooth waveform by connecting it as shown in *Figure 1*. Here, the circuit is wired as a modified monostable multivibrator that is triggered by an external squarewave via Tr1 and C2, etc. Note, however, that the conventional pin 3 output of the IC is ignored in this circuit, and that the sawtooth output waveform is actually taken from across the C4 'timer' capacitor via buffer transistors Tr2-Tr3 and pot RV2.

The action of the *Figure 1* circuit is such that the C4 voltage (and thus the output voltage) is normally zero volts, but each time the circuit is triggered C4 charges exponentially via R5 and RV1 to $\frac{2}{3}V_{CC}$, at which point the monostable period terminates and the C4 voltage returns abruptly to zero. The period of the sawtooth waveform can be varied over the range $9\mu\text{s}$ to 1.2 seconds by using the C4 values indicated in the table. The maximum usable repetition frequency of the circuit is approximately 100kHz.

Note that the *Figure 1* circuit must be triggered via rectangular input waveforms with fairly short rise and fall times. The sawtooth period is variable over a decade range via RV1, and the amplitude of the output waveform is fully variable via RV2.

The basic *Figure 1* circuit can be made to produce a triggered linear sawtooth or 'ramp' waveform by charging C4 via a constant-current generator, as shown in the circuit of *Figure 2*. Here, Tr1 is used as the constant current generator, and the output waveform is taken from across C4 via Tr2 and RV2.

When a capacitor is charged via a constant-current generator, the capacitor voltage rises at a linear and predictable rate that can be expressed as:

$$\text{volts per second} = I/C$$

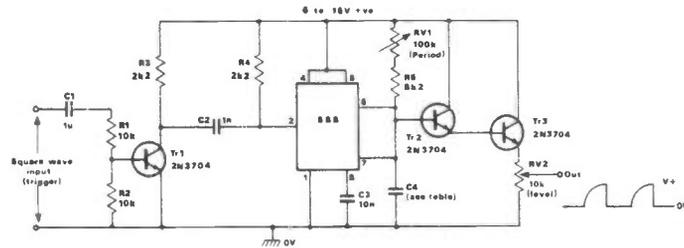
where I is expressed in amps and C is expressed in farads. Using more practical quantities, alternative expressions for the rate of voltage rise are:

$$\text{volts per } \mu\text{s} = \text{amps}/\mu\text{F}$$

or

$$\text{volts per ms} = \text{mA}/\mu\text{F}$$

Note that the rate of rise of the voltage



C4 value	Sawtooth period range
10 μF	90ms - 1.2sec
1 μF	9ms - 120ms
100nF	900 μs - 12ms
10nF	90 μs - 1.2ms
1nF	9 μs - 120 μs

Fig 1 Triggered sawtooth generator

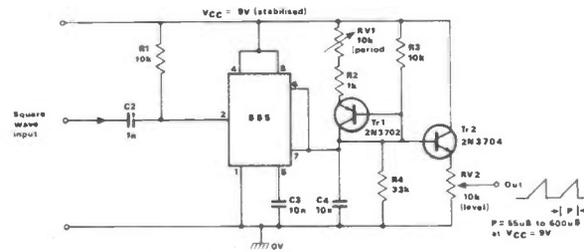


Fig 2 Linear sawtooth or 'ramp' waveform generator

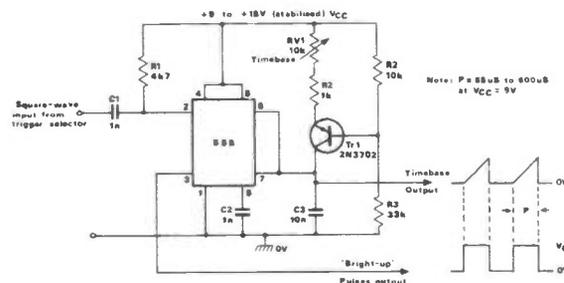


Fig 3 Oscilloscope timebase generator circuit

can be increased by increasing the charging current or by decreasing the value of capacitance.

In the *Figure 2* circuit the charging current can be varied over the approximate range $90\mu\text{A}$ to 1mA via RV1, thus giving rates of rise on the 10nF timing capacitor of 9V/ms to 100V/ms respectively. Now, remembering that each monostable cycle of the 555 terminates at the point where the C4 voltage reaches $\frac{2}{3}V_{CC}$, and assuming that a 9 volt supply is used (giving a $\frac{2}{3}V_{CC}$ value of 6V), it can be seen that the sawtooth cycles of the circuit have periods variable from $666\mu\text{s}$ ($= 6/9\text{ms}$) to $60\mu\text{s}$ ($= 6/100\text{ms}$) respectively. Periods can be increased beyond these values by increasing the C4 value, or vice versa. Note when using this circuit that its

supply rail must be stabilised if stable timing periods are to be obtained.

Figure 3 shows how the above circuit can be modified for use as an oscilloscope timebase generator. The circuit is triggered by squarewaves derived from external waveforms via a suitable 'trigger' selector circuit, and the ramp output waveform is fed to the 'X' plates of the 'scope via a suitable amplifier stage; the pin 3 output of the 555 provides bright-up pulses to the 'Z' axis of the 'scope tube.

Note that the minimum useful ramp period that can be obtained from the above circuit (using a 1nF capacitor in the C3 position) is about $5\mu\text{s}$, which, when expanded to give full deflection on a ten-division 'scope screen, gives a maximum timebase speed of $0.5\mu\text{s}$ per division. This 'timebase' circuit gives

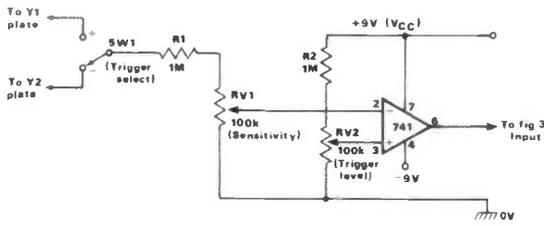


Fig 4 Trigger selection circuit for use with Figure 3

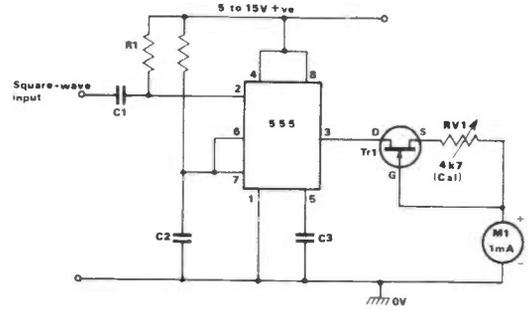


Fig 7 Alternative version of the analogue frequency meter

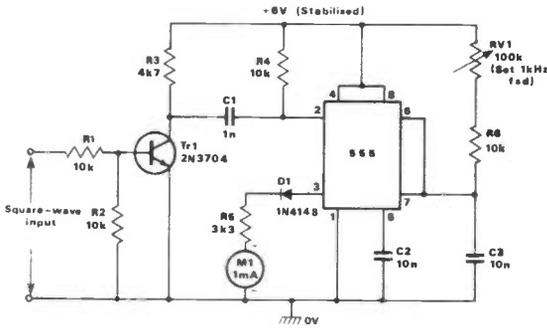


Fig 5 Simple 1kHz linear-scale analogue frequency meter

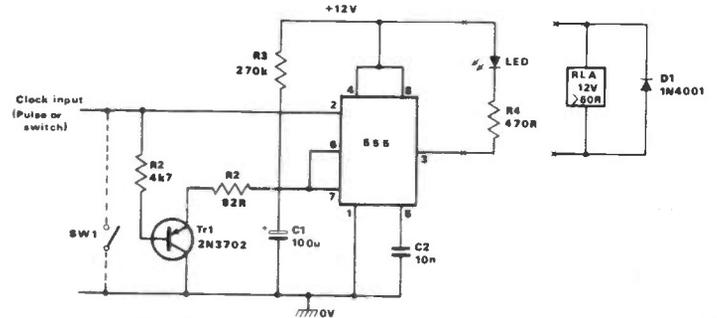


Fig 8 Event-failure alarm with LED or relay output

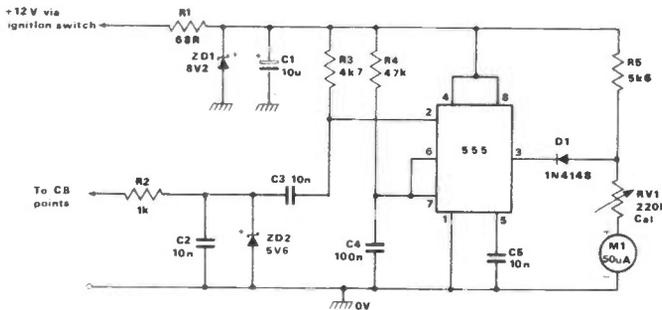


Fig 6 Car/motorcycle tachometer circuit

excellent signal synchronisation at trigger frequencies up to about 150kHz: at trigger frequencies greater than this, the input trigger signals should be divided down via a single or multi-decade frequency divider. Using this technique the timebase can be used to view input signals up to many MHz.

Figure 4 shows a simple but versatile 'trigger' selector circuit that can be used with the above circuit. This comprises a 741 op-amp (or similar) voltage comparator circuit, which has a reference voltage fed to its non-inverting input terminal via the RV2 'trigger level' control pot, with the signal voltage fed to its inverting terminal via SW1-R1 and the RV1 'sensitivity' pot: SW1 enables either in-phase or anti-phase input signals to be selected from the 'Y' driving amplifier, thus enabling either '+' or '-' trigger modes to be selected. The output of the Figure 4 circuit is coupled directly to the C1 input of Figure 3.

Figure 5 shows how the 555 IC can be wired to make a linear-scale analogue frequency meter that has a full-scale

sensitivity of 1kHz. The circuit is powered from a regulated 6V supply, and needs a pulse or squarewave input-driving signal with a peak to peak amplitude of 2 volts or greater. Transistor Tr1 amplifies this input signal to a level suitable for triggering the 555 monostable stage, and the pin 3 output signal of the monostable is fed to 1mA fsd moving coil meter M1 via multiplier resistor R5 and offset-cancelling diode D1. The circuit operates as follows.

Each time the monostable is triggered it generates a pulse of fixed duration and amplitude. If we assume that each generated pulse has a peak amplitude of 6V and a period of 1ms, and that the generator is triggered at an input frequency of 500Hz, it can be seen that the pulse is high (at 6V) for 500ms in each 1000ms total period, and that the mean value of output voltage measured over this total period is $500\text{ms}/1000\text{ms} \times 6\text{V} = 3\text{V}$, or 50% of 6V.

Similarly, if the input frequency is 250Hz the pulse is high for 250ms in each 1000ms total period, so the mean output

voltage equals $250\text{ms}/1000\text{ms} \times 6\text{V} = 1.5\text{V}$, or 25% of 6V. Thus the mean value of output voltage of the pulse generator, measured over a reasonable total number of pulses, is directly proportional to the generator's repetition frequency.

'Mean' reading instruments

Normal moving coil meters are 'mean' reading instruments, and in the Figure 5 circuit a 1mA fsd moving coil meter is wired in series with 'multiplier' resistor R5, which sets the meter sensitivity at about 3V4 fsd, and is connected to read the mean output value of the pulse generator. This meter thus gives a reading that is directly proportional to the input frequency, and therefore the circuit acts as a linear-scale analogue frequency meter.

With the component values shown the circuit is intended to read fsd at 1kHz. To set up the circuit initially, simply feed a 1kHz squarewave signal to its input, and then adjust RV1 (which controls the pulse length) to give full-scale reading on the meter.

The full-scale frequency of the above circuit can be varied from about 100Hz to 100kHz by suitable choice of the C3 value. The circuit can be used to read frequencies up to tens of MHz by feeding the input signals to the monostable circuit via a single or multi-decade digital divider, thereby reducing the input frequencies to values that can be read by the monostable circuit.

Figure 6 shows how the above circuit can be modified for use as an analogue tachometer (rpm meter) for use in cars or motorcycles. Here, the circuit is powered by a regulated 8V2 supply

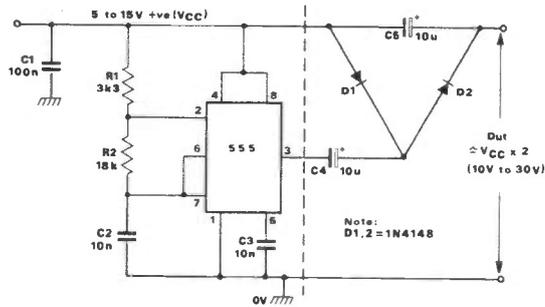


Fig 9 dc voltage-doubler circuit

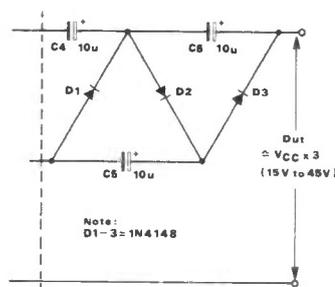


Fig 10 dc voltage-tripler circuit

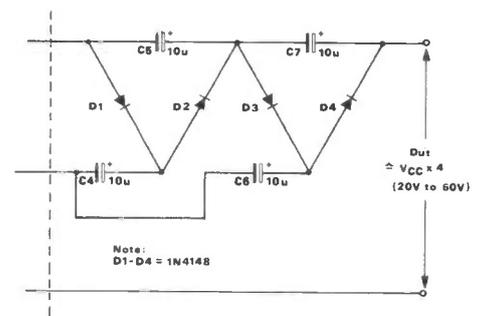


Fig 11 dc voltage-quadrupler circuit

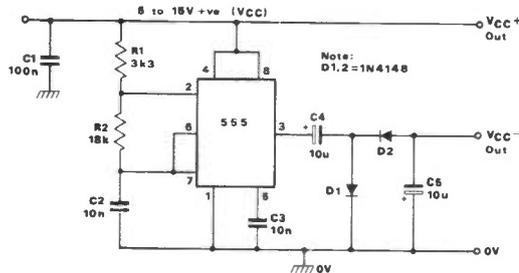


Fig 12 dc negative-voltage generator

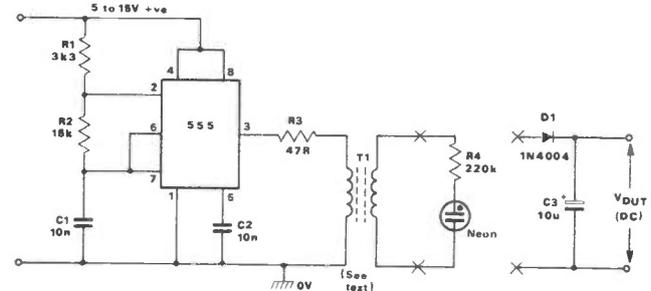


Fig 13 Neon lamp driver or 'high voltage' generator

derived from the vehicle's battery via R1-ZD1-C1 and the ignition switch, and the monostable is triggered by the vehicle's contact breaker (cb) points via the R2-C2-ZD2 waveform-conditioning network. A 50µA fsd moving coil meter is used as the rpm indicator, and is activated from the 555 output (pin 3) via D1.

The circuit action is such that current is applied to the meter via R5-RV1 and the IC supply line when the IC output is high, but the current is reduced to near zero (via D1) when the 555 output is low.

Constant pulse amplitude

The *Figures 5 and 6* circuits both use regulated supply lines to ensure a constant pulse amplitude and hence a consistent reading accuracy in the moving coil meter. Note, however, that this meter is actually a current-indicating device, but that in both of these circuits it is used in the 'voltage indicating' mode with the aid of suitable 'multiplier' resistors (RV1-R6 in *Figure 5*, RV1-R5 in *Figure 6*).

Figure 7 shows (in basic form) an alternative way of making an analogue frequency meter, without the use of either a 'multiplier' resistor or a regulated power supply. In this case, the output (pin 3) of the 555 is fed to the moving coil meter via JFET transistor Tr1, which is wired as a constant-current generator (via RV1) and thus feeds a fixed-amplitude pulse into the meter irrespective of variations in the supply line voltage.

Figure 8 shows how the 555 IC can be used as the basis of an event-failure alarm or 'missing-pulse' detector, which closes a relay or illuminates an LED if a

normally recurrent event fails to take place.

The circuit theory is fairly simple. The IC is wired as a normal monostable pulse generator, except that Tr1 is wired across timing capacitor C1 and has its base taken to 'trigger' pin 2 of the IC via R1. The trigger pin is fed with a series of brief pulse or switch-derived clock input signals from the monitored event, and the values of R3 and C1 are selected so that the natural monostable period of the IC is slightly longer than the repetition period of the clock input signals.

Thus each time a brief clock pulse arrives C1 is rapidly discharged via Tr1, and simultaneously a monostable timing period is initiated via pin 2 of the IC, thus forcing output pin 3 high. Before each monostable period can terminate naturally, however, a new clock pulse arrives and initiates a new timing period, so the pin 3 output terminal remains high so long as clock input pulses continue to arrive within the prescribed limits.

Should a clock pulse be missed or its period exceed the preset limits,

however, the monostable period will terminate naturally, and under this condition pin 3 of the IC will go low and drive the relay or LED on. The circuit thus functions as an event-failure alarm or missing-pulse detector. With the component values shown, the monostable has a natural period of about 30 seconds; this period can be varied via R3 or C1 to satisfy specific needs.

Voltage converters

The 555 IC can readily be used to convert an existing dc voltage into a dc voltage of greater value or of reversed polarity, or to convert a dc voltage into an ac one. *Figures 9 to 14* show various circuits of these types.

Figure 9 shows how the 555 can be used as a dc voltage doubler, which generates a dc output voltage that has a value roughly double that of the 555 supply-line voltage. Here, the 555 is wired as a free-running astable multi-vibrator or squarewave generator which operates at a frequency of about 3kHz (determined by the R1-R2-C2 values) and

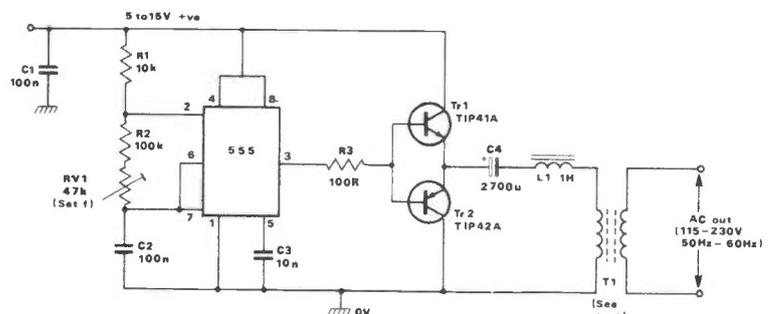


Fig 14 dc-to-ac converter

Parameter	ICM 7555	Bipolar 555
Power supply range	2V0 to 18V	4V5 to 16V
Supply current at $V_{CC} = 15V$	0.1mA	10mA
Output current, max	100mA	200mA
Power dissipation, max	200mW	600mW
Peak supply current transient	10mA	400mA
Timing accuracy, drift with V_{CC}	1%/V	0.1%/V
Input current, trigger	0.01nA	100nA
Input current, threshold	0.01nA	500nA
Input current, reset	0.02nA	100µA
Output rise and fall times	40ns	100ns
Minimum trigger-pulse width	90ns	20ns

Fig 15 Comparative performance

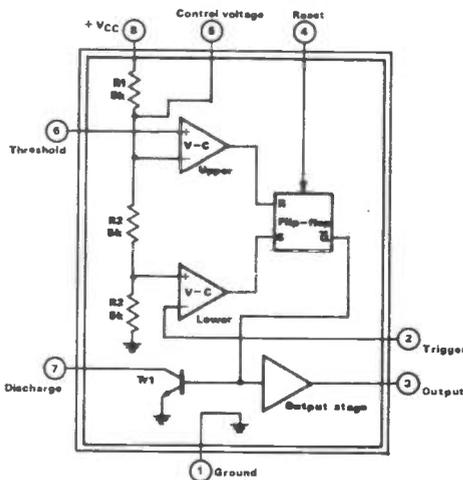


Fig 16 Internal circuit of the bipolar 555 IC

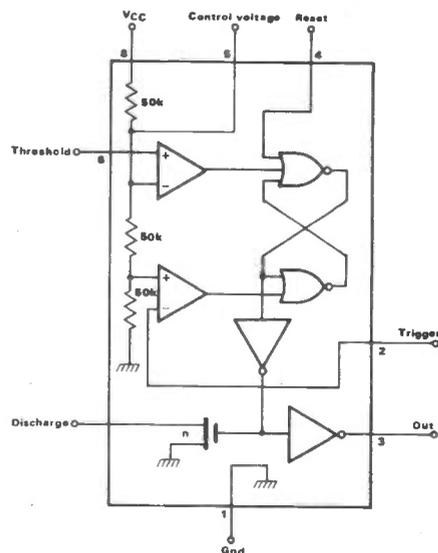


Fig 17 Internal circuit of the CMOS 7555 IC

has its output fed into the C4-D1-C5-D2 capacitor-diode voltage doubler network, which produces the $2 \times V_{CC}$ output voltage. Note that supply-line capacitor C1 is used to prevent the 3kHz output of the 555 from feeding back into the IC, and C3 is used to further enhance circuit stability.

The Figure 9 circuit can be used with any dc supply in the range 5 to 15 volts, and since it provides a 'voltage doubler' action can thus provide outputs in the

approximate range 10 to 30 volts. Greater output voltages can be obtained by adding more 'multiplier' stages to the circuit. Figure 10, for example, shows how to make a dc voltage tripler, which can provide outputs in the range 15 to 45 volts, and Figure 11 shows a dc voltage quadrupler, which provides outputs in the range 20 to 60 volts.

A particularly useful type of 555 'converter' circuit is the dc negative-voltage generator, which produces an output voltage that is virtually equal in amplitude but opposite in polarity to that of the IC supply line. This type of circuit can be used to provide a 'split-supply' output for powering op-amps, etc, from a single-ended power supply. Figure 12 shows an example of such a circuit, which (like Figure 9) operates as a 3kHz astable that drives a voltage doubler (C4-D1-C5-D2) output stage.

dc to ac converter

Another useful type of voltage converter circuit is that which changes a dc supply voltage into an isolated (transformer-coupled) ac output voltage. This ac voltage may be used as it stands, or may be converted back into a dc voltage (usually at a fairly high value) via a simple rectifier-filter network. Figures 13 and 14 show (in basic form) two such circuits.

The Figure 13 circuit can be used for driving a neon lamp or generating a low-current high value (up to a few hundred volts) dc voltage from a low value (5 to 15V) dc voltage supply. Here, the 555 is simply wired as a 3kHz astable and has its squarewave output fed to the input of transformer T1 via R3. T1 is a small audio transformer, and has a turns ratio sufficient to give the desired output voltage, eg with a 10V supply and a 1:20 T1 turns ratio the transformer will give an unloaded ac output of 200 volts peak. This ac voltage can be converted to dc via a half-wave rectifier and filter capacitor, as shown.

Finally, the Figure 14 dc-to-ac converter circuit produces an ac output at mains line frequency and voltage. The 555 is wired as a low frequency astable (adjustable over the 50Hz to 60Hz range via RV1) that feeds its power-booster (via Tr1-Tr2) output into the 'input' of reverse-connected filament transformer T1, which has the desired 'step-up' turns ratio. C4 and L1 act as a filter that ensures that the power signal feeding into the

transformer is essentially a sine wave.

A CMOS 555

The standard 555 timer IC is a very popular and versatile device, but suffers from a few significant defects. It cannot, for example, be used with supply voltages that are significantly less than 5V. Also, it typically draws a fairly hefty 10mA of quiescent supply current when operating from a 15V supply, making the device quite unsuitable for use in many battery powered applications.

Worst of all, the device draws a massive 400mA 'spike' of current from the supply as its output makes the transition from one state to the other. This spike lasts for only a fraction of a microsecond, but in that time radiates a 'noise' burst that is often sufficient to play havoc with any digital circuit close to the 555 or powered from the same supply lines.

Fortunately there is a CMOS version of the 555 available which suffers from none of these snags. This CMOS version is manufactured by Intersil, and is known as the ICM7555 or, more simply, as the '7555'. This device can be used with any supply voltage in the range 2V to 18V, and typically draws a quiescent current of only 100µA from a 15 volt supply. It draws a peak 'spike' current of only 10mA when its output is transitioning, and thus does not create radiation problems. Also, the required threshold, reset, and trigger currents of the CMOS device are several orders of magnitude down on the bipolar version, enabling timing resistors (for example) to be given values of hundreds of megohms.

Figure 15 shows a 'rationalised' comparative summary of the characteristics of the standard bipolar and the CMOS versions of the 555 IC. Note, on the debit side, that the CMOS version has inferior drift-with-voltage accuracy characteristics, output current-drive and power dissipation capabilities, and pulse-triggering characteristics.

Figures 16 and 17 show, for comparison purposes, the simplified internal circuits of the bipolar and CMOS versions of the IC. Note particularly the great differences in the relative values of the voltage divider chains that are used.

The CMOS device can be used as a direct plug-in replacement in all the bipolar 555 circuits that have been shown in the present series of articles. Note, however, that (for reasons of cost) the CMOS device should really only be used in battery powered applications where current economy is important, or in low voltage (below 5V) applications where a bipolar 555 cannot be used, or in complex multi-IC digital circuits where 'radiation' problems might otherwise occur. In all other cases, the inexpensive bipolar version of the 555 should be used.

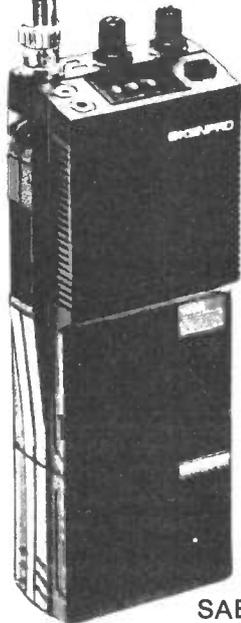
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ATV



ON THE AIR

Andy Emmerson G8PTH puts you in the picture

A couple of months back I took a look at the pleasures and perils of buying a secondhand camera – one of you wrote in asking for further info on a particular model of Shibaden camera. Being a helpful sort of chap I try to pass on anything I have, and in fact I was familiar with that camera.

I am not a source of circuit diagrams on all cameras, though – I wish I was! – and if you are not sure about poking about in a strange camera unaided, it might be better not to buy. Having said that, most rally bargains are a safe bet if they look well cared for.

Funny prices

Talking of rallies, I tend to visit quite a lot of these, just like Hugh Allison G3XSE, who writes the rally bargain column in *Amateur Radio*. It's funny really, as I see Hugh at most of these events and seldom is he not buying something! There were indeed plenty of good buys in the video field this year, with cameras selling for as little as £25 with lens. Needless to say, these were not the marked prices, but you have to be prepared to haggle a bit.

Other video items, such as switchers, were over-priced: some Sony monochrome effects generators were selling at £45 a pair early in the season but £40 each later on. The more pricey equipment tends to remain unsold and travels around from one rally to another: one camera I saw in April turned up so many times it became like an old friend, and in the end I just had to buy it – but not at the asking price!

New goodies

The Woburn rally is where Wood & Douglas unveil new products, and this year they had three new items for ATVerS. All three will appeal mainly to 24cm operators and come as ready-assembled modules. Although intended for use with other W&D equipment, they can also be adapted to work in other systems.

The first item is a sound subcarrier generator for a transmitter. It connects in the video line and is available in both 5.5 and 6.0MHz versions – how sensible!

Partnering it is a sound board for the VIDIF receiver, also available in 5.5 and 6.0MHz versions. This sound board has another long-desired feature, on-board squelch, and provides both loudspeaker and line outputs, so you can now feed the received audio into your VCR, receiver-monitor or hi-fi system. The squelch is not 100 per cent, but mutes 'inter-station' hiss to an acceptably low level. Volume is adjusted by on-board presets: you may wish to bring these out as front-panel controls.

The third item can be used both in transmitters and receivers, being a pre-emphasis/de-emphasis unit – you connect links to make it one or the other. It follows the preferred CCIR curves (published in the last issue of *CQ-TV*) and has an adjustable gain amplifier built in. I have put one in my receiver and find it makes a big difference, enabling me to see fine detail which was previously unreadable.

All of these units are moderately priced and highly recommended: watch out for a 24cm preamplifier from Wood & Douglas soon.

G9 video

This year sees the 30th anniversary of video from G9AED, a callsign that was once very familiar to TV enthusiasts. If the G9 callsign does not strike you as an amateur one you're right, since the G9 series is reserved for test and develop-

ment licences issued to experimental stations. Generally these transmissions are for industrial purposes and not intended for public reception, but G9AED was an exception – it even issued QSL cards for reception reports!

G9AED was the creation of Belling and Lee Ltd and was in fact a mobile transmitter operating in Band 3. Independent television started in Britain in 1955, but prior to the commencement of regular programmes dealers and viewers needed a source of test signals for aerial and receiver alignment. Belling and Lee were at that time a major manufacturer of TV aerials, and had the excellent idea of taking a pilot transmitter to the eventual main transmitter sites. While the 'proper' aerial mast was being constructed at each location G9AED was already putting out low-power signals from its own 85ft tower, 40 hours a week.

G9AED was provided as a service to the TV industry and was recognised as such – the IBA later purchased the van. The transmitter van itself was well equipped (it was even on the phone) and put out two signals, generated from monoscopes. One was a special test card with calibrations enabling the distance of obstructions causing 'ghosts' to be calculated. The other picture was a caption announcing that new transmissions would start soon on Band 3 – 'make sure your aerial and receiver are ready'. So this was really Britain's first TV commercial.

Although G9AED was really intended for TV dealers and aerial installers, many TV enthusiasts also used it for testing their homebrew converters, which took the Band 3 signal and transposed it to an unused channel in Band 1. A 'Belling-Lee' mobile research unit also used the signal for plotting propagation and coverage of the radiated signal.

More unscheduled video

Non-broadcast television crops up elsewhere on the bands, too. Between March 1958 and May 1959 the Marconi company was investigating troposcatter links for trans-horizon propagation. A 200 mile path was chosen between Start Point (Cornwall) and Galleywood (Essex), near the Marconi works in Chelmsford. The aim of the experiment was to direct a 10kW signal up into the



troposphere, 1800 metres above the horizon and attempt to pick up some of the scattered signal at the receiving end.

In the event they were successful for 99 per cent of the time. The frequency used was 858MHz and the callsign allocated was G9AHR. FM television was one of the several modes used: it would be fascinating to try this sort of power on 24cm. On the other hand, considering that only so-so pictures were received and that 30ft diameter dish antennas were necessary, perhaps we don't do so badly with

our ATV equipment!

Reception of unscheduled transmissions is of course not permitted with a broadcast receiving or amateur licence, although a couple of years back ATVers around Southend in Essex had little choice in the matter! A very boring picture appeared on 70cm: it was an interior view which got darker and darker as daylight faded.

A novelty at first, it soon became a nuisance since it blocked other ATV activities. Eventually the Radio Interfer-

ence Service was called in and the transmissions were traced to the local police. Apparently they had uncovered a large cache of stolen property, too much to store in the 'nick' and it had to be stored elsewhere. To deter pilferers a video surveillance system was put in, which just happened to use 70cm. Nowadays a more discreet band is used for this kind of activity, around 1680MHz. The higher frequency and the use of FM transmission probably deters casual viewers rather successfully!

Teutonic TV!

G8PTH visits Germany for their 1985 national ATV convention

Not many people have the luck (or stamina?) to attend two national ATV conventions in the space of three weeks, but that was the fate this year of your roving ambassadors Trevor Brown G8CJS and myself. For the second year running the German ATV club, AGAF, extended an invitation to visit their event, and we naturally took up their offer.

Vive la difference!

Like our event it is basically a one day (Sunday) event, though many people meet up the night before for a social get-together. Visitors are from all over Germany plus a healthy Dutch contingent, but sadly no representation from other European countries. An all-day lecture programme is laid on, with three talks before lunch and three afterwards. Subjects covered this year included awards and diplomas, FM-ATV, antenna coupling and satellite TV.

In addition yours truly had to earn his keep and give a talk 'zur aktuellen Situation des Amateurfunk-Fernsehens in Grossbritannien' (on the current state of ATV in the UK). The Worthing and Dunstable repeater demo tapes helped illustrate this theme, even if the commentaries were not understood by many of the audience. The reception was favourable, anyway.

All the proceedings were televised (going out live on the local TV repeater) and recorded on tape. This year the BATC was presented with edited tapes of last year's proceedings, so presumably next year I shall relive my attempts at 'O' level German! The cameras (nearly all colour) picked up the speakers and the audio-visual exhibits: an army of amateurs manned the cameras and cascaded Sony camera switchers (which had been modified to give wipes).

Perhaps the most impressive – and most significant – exhibit was a repeater control timer. Because of the higher amateur activity level in Germany there

is more pressure on 70cm than here. Peaceful coexistence between TVers and Oscar enthusiasts has been difficult to achieve hitherto, and there was strong pressure to shift all ATV operation off 70cm to higher frequencies.

As many of the TV repeaters have 70cm outputs there is a conflict, probably more theoretical than actual, but to avoid the grief the AGAF has devised a clever timer which switches off the repeaters during AMSAT Mode L. The plan is to equip each repeater with one of these marvels. The timer itself consists of three simple devices: a receiver for DCF77 (a standard time transmitter like our Rugby affair) with a ferrite rod aerial (cost about £60), a ZX-81 computer and 16K RAM (£25), and an interface consisting of a Z80 PIO and two TTL chips (£7).

Radar problems

Given that 70cm is well populated you might think this would lead to considerable activity at 24cm, and indeed there is, mainly through repeaters. We spent a fascinating evening at the home of AGAF leader DC6MR and witnessed typical ATV, German-style. We rapidly saw that the level of radar interference is, however, generally much worse than in most parts of the UK (up to 30dB stronger than the ATV signals) and thus 24cm is not the total solution. Hopefully this is not entirely a foretaste of conditions to come in the UK.

Incidentally, commercial ATV equipment is most uncommon in Germany and nearly everybody builds their own transmitter to the DC6MR or DJ4LB designs – our remarks about the 'difficult' DJ4LB transmitter were met with surprise, so perhaps German amateurs do belong to a master race after all!

Another example of the different approach is with regard to omni-directional aerials for repeaters (23 and 13cm). The Alford Slot is unknown there: instead they use either the 'nesting box' or 'butterfly' designs. The former is a piece of slotted waveguide: square profile aluminium has 16 vertical slits back and front and this gives omni-directional coverage with horizontal polarisation and excellent matching. This antenna is pretty large at 13cm, even larger at 23, where the butterfly design is

used. This is more familiar as the Super Turnstile, popular in the USA.

European working group for ATV

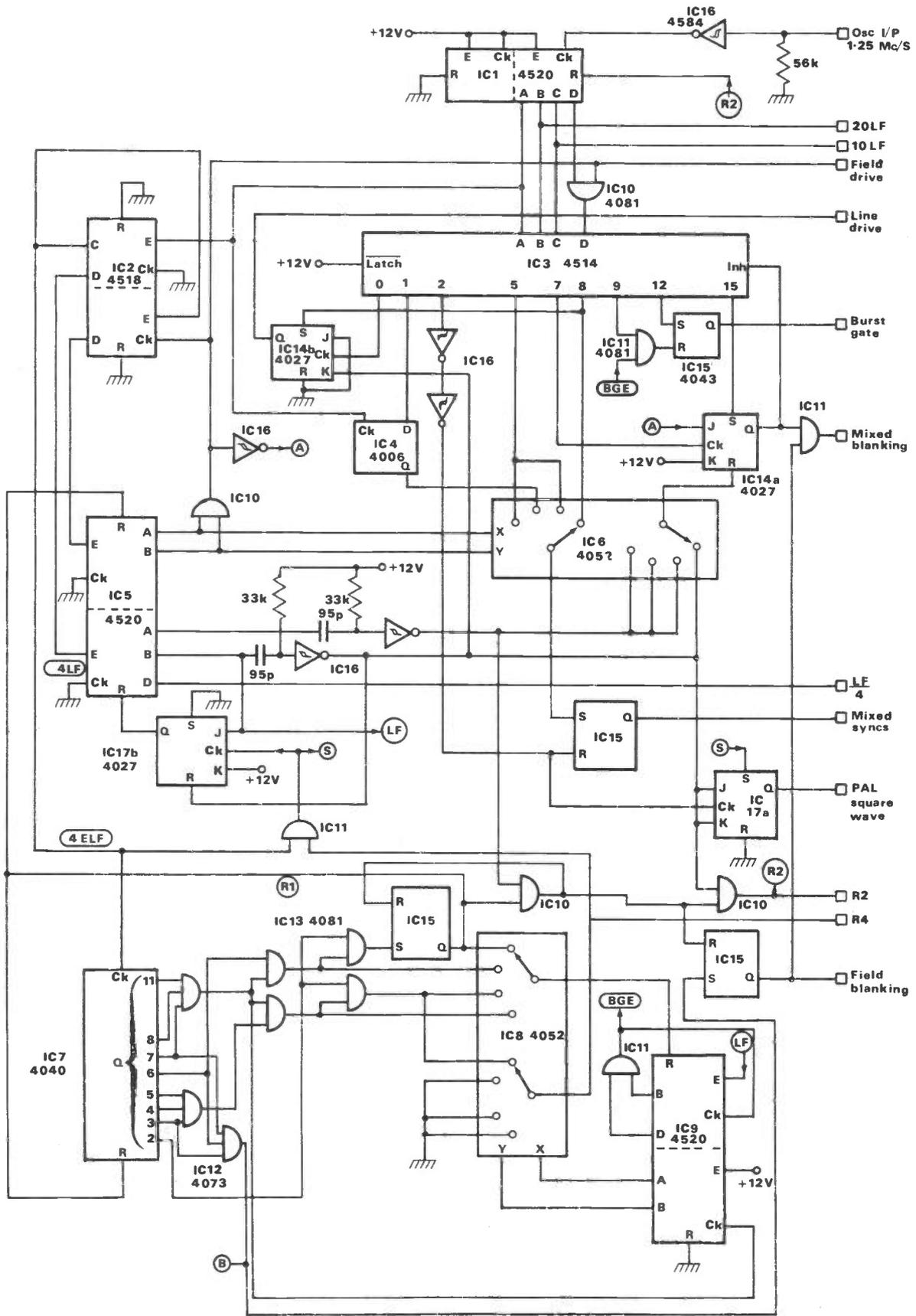
The AGM part of the convention followed the lectures in the late afternoon, where the main topic was the threat to ATV on 70cm. ATV was apparently not allowed on 70cm in the Scandinavian countries, and there was no representation anyway. In Belgium it looked likely that 430-434MHz was to be ceded to Syledis and narrow-band modes moved up to 434, which looked ominous for ATV. There was no ATV organisation in Belgium, nor in France, and only a sub-group of VERON in Holland, so what hope was there of protecting ATV interests in those countries? Only Germany and the UK had ATV user groups, so what was to be done?

Obviously any action must be within the existing organisational framework, so it was decided to set up a European ATV Working Group. This would link (initially) the BATC, AGAF and VERON, with a view to contacting each national radio club and influencing and educating the IARU VHF committee. Within the working group we would collate all papers on bandplans, contests and licence regulations and also brief our national representative on the VHF committee. A noble and worthwhile aim and we shall see how it progresses.

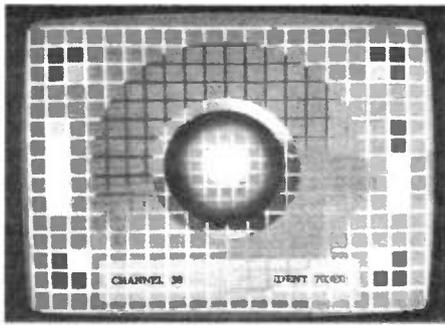
All too soon we had to return, after thanking our hosts for their generous hospitality. This time we extracted a promise that the German Top-Team (that's German for committee) would come over to our convention next year, so we shall then have the opportunity to repay their kindness.



Fig 1 the SPG circuit diagram



DX-TV RECEPTION REPORTS



Compiled by Keith Hamer and Garry Smith

The overall verdict for June 1985 is that it appears to have been a 'record-breaker'. Sporadic-E activity was well and truly with us practically every day throughout the month, with many openings continuing through to the following day. Conditions certainly whetted the appetites of beginners to DX-TV, with enthusiasts sampling a wide variety of exotic and usually rare broadcast TV stations.

Signals were not merely confined to the European area. There were at least three definite sightings of DX from the Middle East and Africa. So, which were the outstanding days for reception? That's a difficult question to answer. The authors' choice would be, without doubt, the 21st and 22nd when several 'exotic' stations appeared.

The first few days of June had the added bonus of tropospheric DX, with transmissions from Norway, Sweden and Denmark filling the bands. All in all, it was a very busy and satisfying month indeed.

Sporadic-E round-up

Most of the reports sent in this month indicate that DX-TV reception from the Middle East was attainable on at least five days, namely the 1st, 3rd, 5th, 20th and 21st. An Iranian channel E2 transmitter was received in the UK on the 1st during the mid-morning period. The FuBK test card was being radiated at the time. This included a large digital clock superimposed in the lower left-hand portion of the screen. Fortunately the clock provided positive identification, as it was 4½ hours ahead of British time.

Possible reception from the same transmitter was noted on the 21st in Derby and East Anglia, but programmes were being aired at the time thus making definite identification impossible. The programme material was certainly Arabic and the signal quality was typical multi-hop sporadic-E with a characteristic smearing effect. Reception took place from 1240BST onwards.

At 1245 on channel E3 an English cartoon was in progress complete with Arabic subtitling. This reception came as no surprise here in Derby following the E2 Arabic signals. It was immediately logged as emanating from the Jordanian outlet at Suweilih. However, doubts crept in when the same cartoon was noticed on channel E4, again with Arabic subtitles. As far as we are aware JTV-

Jordan do not operate on E4 so we can only assume that reception was from the Hassake transmitter in Syria!

Ray Davies in East Anglia noted a similar pattern of reception on channels E2, E3 and E4, and it apparently lasted for much of the afternoon. Unfortunately, positive identification was impossible due to a lack of clock or programme captions.

Arabic reception

The Arabic reception on channel E2 has posed something of a mystery. The only transmissions available on that channel originate in Dubai and Iran, the latter being closer to the UK. An unconfirmed report of reception from the United Arab Emirates and Nigeria (NTV) has arrived and it would appear that a caption showing the NTV globe symbol appeared during an opening from the south. We have no precise dates or details but there have been instances in the past of similar DX taking place.

Signals from the Canary Islands (TVE) managed to penetrate the DX-TV haven of Leeds on the 10th. The service is operated by Television Española and is sent from the mainland via satellite. Opening captions are inserted locally and the colour GTE test card carries a black band across the lower part of the screen, thus deleting the clock and transmitter inserts radiated from Madrid. An alternative test pattern consisting of a colour bar pattern with a black central band is transmitted with the identification 'RTVE IZANA 3'.

Iceland on channels E3 and E4 has been a regular visitor this month. RUV was noted in Derby on the 10th and 17th with the PM5544 test card going on to the clock caption and announcer at 2025BST. The test card identification cannot be missed. It reads 'RUV ISLAND' in large letters.

It's always worthwhile checking the bands during the early hours, especially if conditions have been good while most TV services have been closing down for the night. On the 14th RAI (Italy) were showing boxing until well after midnight. A spot check on the band at 0230 produced the NCT chess-board from the pirate Italian station with literally dozens of private Italian FM radio links.

A caption which caused a little head scratching was seen on the 9th at approximately 1944 on channel E4. It consisted of two overlapping circles with

the letters 'MTV' below. Don't be fooled. It's not Hungary but YLE-Finland with the adverts!

Multi-standard DX-TV receiver

Tony Harris of Fareham in Hampshire has written to say how enthusiastic he is about a new receiver purchased for general caravan and DX use. It is a 10 inch colour TV/monitor made in France by the electronics giant, Thomson. The model number is TF 2502 PI. The set features remote control facilities and is designed to operate on 12/24V dc or 220/240V ac. PLL search tuning and memory are two further features.

Of more importance to DX-TV enthusiasts is its multi-standard capabilities. It will cover Bands I/III and UHF. PAL or SECAM colour transmissions can be resolved and the set will operate in Western Europe on systems B, G and I (5.5MHz and 6.0MHz intercarrier sound systems). It does not cover the Eastern European systems D and K (6.5MHz intercarrier sound). For DX-TV purposes it would resolve the vision but not the sound. The receiver will, however, resolve the French system L. The different standards can be set on any of the programme buttons and electronically stored. A SCART Euroconnector is included.

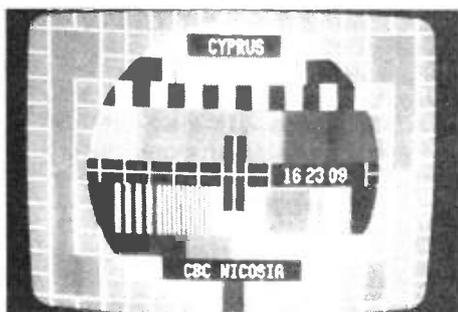
A brochure is available from the following UK distributor: *Heron Electronics Limited, 1st Floor, Lawford House, 429 Harrow Road, London W10 4RE. Tel: (01) 968 4488.* Tony purchased his from: *A1 Hampshire Video Centre, Stubbington Green, Fareham, Hampshire.*

Reception reports

Mark Dent of Leeds has logged every receivable European country in Band I this season using only a dipole fed into a D-100 DX-TV converter and a standard TV receiver. NCT, the Italian pirate station at Udine, was observed using the chess-board pattern on channel IA on the 2nd, 3rd, 4th, 6th and 14th. A couple of 'exotics' rained down on Leeds with the Canary Islands appearing on channel E3 on the 10th and Greece (EPT, channel E3) on the 4th. Mark saw Greek signals twice during the morning.

Using an 88-element Jaybeam group B array various countries were noted thanks to improved tropospheric conditions. Signals from Belgium, France, West Germany, East Germany, Sweden and the Netherlands were resolved. On June 4th a low-power (500W) channel E45 relay station of RTBF-2 (French language 2nd network in Belgium) came through along with many other transmissions from the Low Countries.

The 16th was a 'Sunday to remember', according to Simon Hamer of New Radnor in Powys. Most Central European countries were present and a check through Bands I and II revealed Rumania on channels R2, R3 and even R4! The



PM5544 test card from Cyprus

latter channel's vision frequency is 85.25MHz. Czechoslovakia was also resolved on this channel. Signals from RTS in Albania feature no less than three times in his log. The results in Band II have tempted Simon to keep a watchful eye on Band III for any sporadic-E activity. So far he's been out of luck but it is always a good idea to check this band during extremely intense openings.

Apart from watching virtually the whole of Europe, Harold Brodribb (St Leonards-on-Sea) has been listening in with his veteran 1944 WD set, an RL85. The Italian FM radio links came through loud and clear. Eastern-bloc FM stations were also received between 66MHz and 72MHz. During openings to Italy, cordless telephone conversations could be monitored, 'spaghetti-style' of course!

On the 27th something rather interesting was noted by Harold. Norway appeared on channels E2, E3 and E4 from Melhus, Gamlem and Bremanger. A check on a map revealed these transmitters to be in a straight line from his location. On the 28th a similar phenomenon occurred with the NRK transmitters at Gulen, Bagn and Kongsberg.

DX-TV logs for June

This month we are featuring the very impressive reception log which has been sent in from **R&EW** reader William Maries, of Studley in Warwickshire. As William comments, most European countries have been received during June via a combination of tropospheric and sporadic-E activity.

1/6/85: NRK (Norway) on test with the PM5534 test card carrying the 'MELHUS' transmitter identification on channel E2 at 1148BST; TVE (Spain) on E3 with coverage of parliamentary proceedings. Also noted was the Spanish news programme called 'TELEDIARIO' at 1400; TSS (Russia) with a current affairs programme at 1746 on R1; RAI (Italy) on channel IA at 1900BST with the news programme identified by the logo 'TG1' (Telegiornale 1); NOS-1 (Netherlands) noted via improved trop conditions with programmes mainly from the VARA organisation from the channel E4 outlet at Lopik; Canal Plus (France) noted during the evening via trop on F5.

2/6/85: RAI on channels IA and IB with the PM5544 test card and 'RAI 1'

identification until 0855. Programmes from Italy were received at various times during the day. CST (Czechoslovakia) with programmes from 0942BST on channel R1; TVE on E2, E3 and E4 with programmes including the anti-pirate 'TVE' identification in the corner of the picture; NOS-1 on E4 with the 'PTT-NED.1' PM5544 test card; NRK seen briefly at 1654 with the clock caption on E3; MTV (Hungary) on R2 at 1740 with commercials identified by the caption 'TV REKLAM'; commercials were noted at 1822 on E3 from JRT in Yugoslavia. The identification letters 'EPP' are shown between each advert.

3/6/85: TSS on channel R1 with programmes at 0704 while on R2 the Russian test card was received; RAI on IA and IB with programmes.

4/6/85: TSS on R1 and R2 at 0748 with the current affairs programme called 'Hoboctn'; RAI with sample pages from their teletext service known as 'Televideo', noted in colour on channels IA and IB; TVE with the colour GTE test card and 'tve tve1' identification. Regional test patterns were also noted, including the electronic test card with 'GAMONITEIRO 3' identification; CST with a news programme during the morning; RTP (Portugal) with programmes on E2 followed at 1330 by the FuBK test card; JRT on channel E3 with two PM5534 test cards, one carrying the 'JRT BGRD' identification from the studios in Belgrade, the other with 'JRT LJNA' from Ljubljana. Reception was occasionally in colour (PAL); SR/SVT (Sweden) received during the evening on channels E2, E3 and E4; MTV at 1004 on R1 with sample teletext pages.

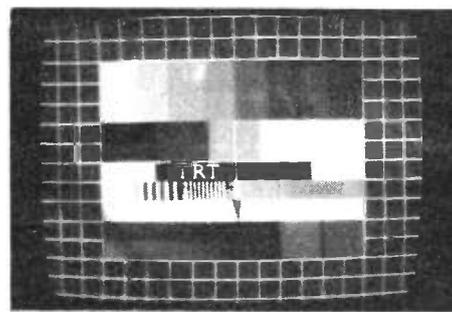
5/6/85: Slightly less activity noted, with signals from RAI, JRT, TSS and MTV, the latter with a clock caption on R2 at 1900BST.

6/6/85: The old Russian '0249' monoscopic test card was received on R1 at 0907; ORF (Austria) on channel E2a with the PM5544 and 'ORF FS1' identification; MTV with teletext and programmes on R1 and R2; RAI with teletext pages at 1008 on IA; the Swiss FuBK test card was seen at 1024 from the channel E2 Bantiger transmitter with the identification '+PTT SRG1'; TVE on E2 at 1156 with a bullfight. The 2nd network (TVE-2) was noted on E2 with the test card at 1625; CST on R1 with the 'RS-KH' electronic test card at 1208BST.

7/6/85: Very little activity noted with only TSS, TVE and NRK with the 'STEIGEN' PM5534 test card at 1525.

9/6/85: RAI on IA and IB with cartoons, a religious programme and a news bulletin called 'TG1 FLASH'; TSS with programmes on R1 and R2; MTV on R1 with programmes during the evening; NOS-1 on test at 1255 from Lopik on E4 received via meteor shower; TVR from Rumania with a news programme on channel R2.

12/6/85: RUV from Iceland with the



Turkish FuBK test card used by TRT

PM5544 test card during the afternoon on channel E3. The identification is 'RUV ISLAND'; SR/SVT received on E2 and E4 with the 'TV1 SVERIGE' PM5534 test card; DDR:F (East Germany) with the test card followed by progs at 0725 on channel E4; ORF on E2a with the PM5544 pattern; CST on R2 with the FuBK and 'BRATISLAVA' PM5544 test cards; MTV received on R1 with a multi-burst frequency gratings pattern and the PM5544 test card with the inscription 'MTV-1 BUDAPEST'; RAI on IA with programmes; JRT with a news programme from Zagreb on E4.

14/6/85: Apart from Italy, Russia, Spain, Czechoslovakia, Austria and Norway, reception also included Poland (TVP) with their version of the PM5544 on R1 (this has a darker background) and RUV with an announcer on E3 speaking in sign language. The news programme ('FRETTIR') was also received from Iceland.

16/6/85: Signals were received from nine countries including programmes from the ARD channel E2 transmitter at Grnnten in West Germany.

18/6/85: TSS on test during the morning with programmes later. Test patterns noted include the colour electronic type, the monochrome '0249' monoscopic test card which has been used by TSS for about 20 years, and a colour bar pattern with the identification 'EESTII TV TALLINN' from Estonia. TSS signals were seen on channels R1, R2 and in Band II on R3; the Finnish FuBK test card was noted on E4 with the inscription 'YLE TV1'; SR/SVT received on E2, E3 and E4 with the 'TV1 SVERIGE' PM5544; TVE on test with the colour GTE test card without the usual 'tve1' ident at the bottom. The regional 'LA MUELA 3' test card was also seen on E3; RAI with the PM5544 and teletext pages on IA; TVP with programmes on R1, R2 and R3 at various times throughout the day; CST at 1130 on R1 with the 'RS-KH' electronic test card; TVE-2 on E2 with the test card; RTP on E3 with the FuBK test card which included 'RTP-PORTO' identification.

20/6/85: TSS on R1 and R2 with a concert during the early morning; TVP with the PM5544 test card for much of the day on R1 and R2; RAI with programmes at 1836 on channel IA; CST on R1 and R2 with a film which finished at 1020. This was followed by a programme called 'DISPE-

DX-TV RECEPTION REPORTS

CINK TV'; Swedish clock caption from SR/SVT at 1827 on E4; NRK with the 'STEIGEN' PM5534 test card on E2; ORF received on E2a with a 'Tom and Jerry' cartoon; MTV on test at 1500 with the multi-burst pattern on R2; JRT radiating the PM5544 pattern which carried the identification 'RTV 1 LJUBLJANA'; a caption received on channel E2 at 1627 remains a mystery. The identification was thought to have been 'TVZ PAUZA' although it may have been 'TV2 PAUZA'. Does anyone have any ideas?

21/6/85: A number of countries were received including Sweden, Russia, Czechoslovakia, Portugal, Poland, Hungary, Spain, the Netherlands and Austria, the latter with the old Telefunken TO5 monoscopic test card with the identification 'ORF FS1'.

Test card news

The old Russian test card known as the '0249' seems to be back in fashion after a year or so of apparent obscurity. It has caused some excitement, especially amongst newcomers to DX-TV, since most of us now accept the familiar electronically generated patterns.

The other Russian test card, known as the '0167' (this number is sometimes present towards the top) has been noted

using the identification 'LAATPC'. Kevin Jackson has seen this twice on channel R2. It has been translated as meaning a camp or commune, such as in a university.

The central cross has been absent from the Norwegian PM5534 test card on several occasions. Kevin noticed this on the 4th during a trop opening on channel E11. The identification at the time was the national one, namely 'NORGE NRK'. This is usually radiated a few minutes prior to the start of programmes.

Another pattern which caused concern appeared on June 28th from 1250BST on channel E2. It was a standard FuBK pattern from West Germany, presumably from the Götterborner Höhe outlet operated by Saarländischer Rundfunk. The identification seemed to read 'SR SAAR' and some form of digital clock was incorporated inside the lower right-hand portion of the centre circle. The normal identification on this test card is 'SAARL RUND'. This was last seen on June 14th.

Service information

Norway: A daily regional programme is now radiated by NRK between 1745 and 1755 local time. It's called 'NRK Sorlandet' and comes from studios in Kristiansand. The programme is broadcast from

transmitters at Greipstad (channel E2), Hovdefjell (E7), and Lyngdal (E9) plus their associated relay stations.

Finland: Several transmitters are due to come into service with the Finnish PTT for Swedish minorities along the west coast. These Finnish transmitters will radiate programmes from the Swedish 1st Network.

The first outlet is scheduled for the Aaland Islands and will operate on channel E28 with 20kW ERP. The second will come into service next year and will be located at Pyhävuori.

Sweden: The regional programme of SR/SVT TV-2 will be radiated between 1915 and 1930 local time during the Autumn. Previously it was aired from 1845 until 1900.

West Germany: Two new transmitters have come into service. Ibbenbüren on E5 radiates WDR-3 programmes with 1kW ERP while Radio Bremen (RB-1) is now broadcast from Bremerhaven on E45 with 30kW.

New identification has been noted on one of the West German FuBK test cards, namely 'K22K45' instead of 'K22K5'.

Service information this month was kindly supplied by Gösta van der Linden (Rotterdam, Netherlands) and Alexander Wiese (Munich, West Germany). 

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An opportunity arose during the summer to take a look at one of the less familiar applications of professional mobile radio (PMR). The invitation came from Ilford Photo, producers (surprise, surprise) of photographic film, who sponsor the BBC Radio One DJ Mike Smith driving a Ford RS1600 Turbo. It seems he cannot get away from radio even in his leisure pursuits, since the Ilford team use two-way PMR equipment to keep in touch with their driver.

The use of radio communication is common amongst major works rally teams and endurance racers, but until Ilford used it during a recent 24 hour event at Snetterton it was not in use for production saloon car racing. Apparently the Porsche endurance racers, in a typically efficient and scientific manner, use data transmission from their cars to monitor the state of the various nuts and bolts.

The equipment in use with the Ilford team was supplied by the Midlands Radiotelephone Centre based in Sea-grave, near Loughborough, who tailored the various elements to suit require-

Where's that bloody car? Note the PTT switch clipped to team manager Stuart's shirt



ments. Operation is simplex on the PMR VHF FM high band (VHF PMR is in three bands, low, mid and high. There are further PMR allocations at UHF).

In the pits, the team manager and key personnel (in this case, me!) carry Maxon CGX-051N high power hand-helds. These are modified to interface with a Peltor in-line PTT switch and an ear defender headset (Peltor are specialists in rally intercom equipment). The headset uses a special noise compensated microphone, since the pits during a race get bloody noisy!

The Maxon hand-held is a four channel unit, with a channel spacing of 12.5kHz. It will operate over the range 148-174MHz with an RF output of 5 watts.

The car equipment consists of a Burndept/Dymar Lynx M2010 VHF FM mobile, again modified for Peltor mic and headset, these being fitted in the driver's helmet with the PTT button on the steering column. This transceiver can put out 20-25W of RF, although for this application the transmit power is reduced to 5W. The transmitter incorporates a voice operated gain adjusting circuit (VOGAD), with a noise mute circuit in the receive section.

The transceiver is bolted directly to the floor of the car behind the seats, without even the benefit of rubber mounts. Despite this there have been no problems with reliability.

The 1/4-wave external aerial is bolted firmly to the roof of the vehicle - would you trust a mag mount at these speeds?

It would be possible to use a VOX circuit to save the driver the distraction of reaching for a PTT button, but when I suggested this to Mike Smith he said he

was quite happy with the present arrangement. Since the equipment is at its most useful when something goes wrong it is probably just as well that the pit team cannot hear everything the driver says (obscenities are most definitely a breach of the licence conditions!).

This particular event, a Uniroyal Production Saloon Car Championship race of only 15 laps, was not the sort of occasion for which this equipment is ideal, it being suited to somewhat longer races. Even so, the potential of two-way communication was indicated when the car developed a mechanical problem during practice. Mike Smith was able to outline the symptoms as they showed themselves, with communication at all times clear as a bell despite the incredible racket all around. The pit team was thus forewarned as the car pulled in.

The problem turned out to be in the fuel feed, and unfortunately recurred during the race. However, this was not before Mike Smith had shown himself to be a pretty fast mover as well as a fast talker, and by God that car shifts! **REW**

Not the most comfortable position!



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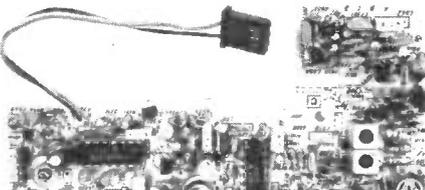
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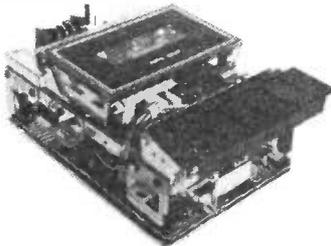
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MEDIUM WAVE



DXING

by Steve Whitt

October will be with us soon, and with it longer nights and better MW-DX. So this month I'll be looking at the problem of how to identify those elusive DX signals.

Who goes there?

Let us suppose that you've just heard an unfamiliar station for the first time that you wish to identify. How do you go about it? Well there are a number of pointers which can be very good clues to a station's identity, the simplest of which is merely a clear station announcement in English. However, such a positive ID will often be unavailable for a number of reasons, such as poor reception conditions, irregular announcements and unfamiliar languages. Nevertheless, even in these circumstances it is possible to get a good idea of the station's identity by doing a bit of detective work. However, unless a positive ID is heard one cannot be 100% certain.

Since the vast majority of MW stations throughout the world operate on assigned channels (9kHz apart in Europe, Africa and Asia, and 10kHz apart in the Americas), it is possible to consult references such as the *World Radio TV Handbook* to see which stations are operating on any particular frequency. To make best use of this facility it is obvious that a radio needs either an accurate dial or a frequency counter. Unfortunately, even the best listings will have omissions, particularly of new or clandestine transmissions, and therefore other indicators of a station's identity are needed.

Direction finding an unidentified signal can rapidly reveal its bearing from the receiver and thus possible transmitter locations. Many MW-DXers use loop aerials and these can have excellent directional properties, but it should be remembered that a basic loop aerial is bi-directional and that a bearing ambiguity of 180 degrees can exist. For example, it is not possible to discriminate between stations in central Europe and those in the eastern USA. More sophisticated aerials based on cardioid array principles can overcome this uncertainty.

The European DXer is bound to encounter a very wide range of lan-

guages on the MW band compared with, for example, his counterpart located in the USA. Thus the majority of stations heard will be using languages other than English. This is no problem if you are an accomplished linguist, but for the majority of DXers a basic ability to recognise languages by their sound is a desirable skill. For example, with practice the DXer will be able to distinguish Spanish from Portuguese, essential for Latin American DX, and with further practice it is possible to detect the differences between the European and Latin American dialects.

Language recognition

One good way to appreciate different languages is to listen to the major European broadcasters and make tape recordings as reference material for comparison with unidentified broadcasts. Another aid to language recognition is the Voice of America programmes, heard either on short wave or on 1197kHz after midnight. At the start of each programme sector (on the hour or half-hour) an announcement is made in English identifying the language of the following programme. In particular listening to VOA can provide a good insight into the languages of Eastern Europe.

In addition to these aids towards station identification there are still some other programming features that could help. Most stations in Europe, the Middle East, Africa and Asia identify themselves by announcing their station name and location. On the other hand domestic stations in North America, Australasia and the Pacific identify by using a unique

callsign made up of a combination of letters and numbers, of which the first one or two letters denote the nationality of the station in accordance with the international system of prefixes.

To complicate matters, most Latin American stations use a callsign (often not frequently announced) as well as a station name or slogan. In addition, many stations (especially international broadcasters) use interval signals generally consisting of short musical phrases repeated frequently for one or two minutes before sign-on and between programmes to help listeners identify and locate the station on their receivers.

With these tips and general DXing experience, it should be possible for the DXer to make a tentative station identification or at least to narrow down the possibilities, and if the prospects look good it will probably be a good idea to stay tuned until some form of positive identification is heard.

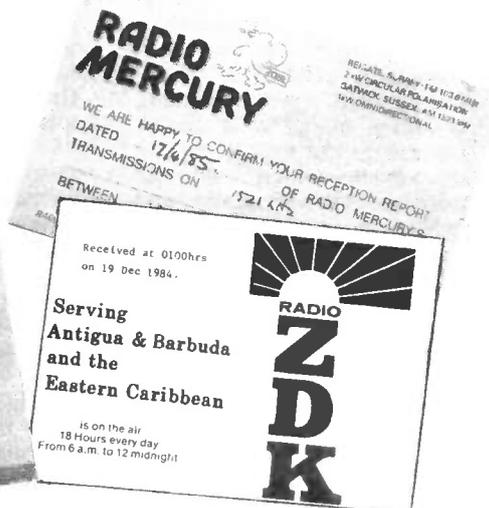
Starting point

A couple of months ago I introduced the subject of QSL cards from MW stations, but due to limited space it was impossible to include any illustrative examples. Therefore this month I am including some interesting cards received earlier this year.

DX file

MW-DX has encountered its usual summer lull in activity, even though propagation conditions have been quite reasonable. In fact, stations such as CJYQ (930kHz) and VOXM (590kHz) in Newfoundland and R Globo (1220kHz) in Brazil have been reported as being fairly regular by a number of listeners. These stations are usually good indicators of favourable propagation conditions and are worth checking for to avoid wasting time looking for non-existent DX on a 'dead' band.

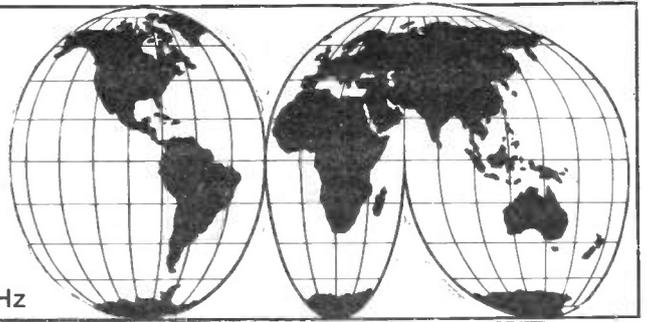
As you read this MW conditions should be on the up, so keep your ears open for the DX and do remember to write to me c/o R&EW with your loggings and MW tips and any related queries. Good listening and 73s till next month. 



SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

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



Having reviewed some of the African stations on the 60 metre band, continuation is made here by surveying the 90 metre allocation. As in the previous review, the higher powered transmitters will firstly be brought to the attention of interested readers, this being followed by the listing of lesser rated stations – these usually being the most difficult to receive.

Some considerations

Prior to commencing operations on the 90 metre band and in order to avoid disappointment, one should realise that the more usual short length of aerial wire or a 'whip' aerial used together with a receiver exhibiting a wide passband will be of no avail. Operating over the **3200** to **3400** (90 metre band) frequencies is a far more difficult proposition than that of the 60 metre band (**4750** to **5060**). There is far more utility QRM (ute QRM in DXers' jargon) to cope with, necessitating a very selective communications receiver to deal with such interference if any hope of even a moderate success is to be achieved.

Moreover, it is helpful if a bandpass tuning arrangement is included in the receiver's facilities. A notch filter would be another useful device, and a variable selectivity control an absolute luxury. The writer usually operates over the 90 metre band with the selectivity set at 1.2kHz, which although cutting out the sidebands and therefore resulting in poor audio quality does allow the DX to come filtering through the surrounding QRM. Switching to a passband of 2.4kHz makes life difficult, switching to 4.8kHz makes it impossible!

The aerial

In addition to the above, one really requires an aerial suitable for operations on the

90 metre band. One such array would be that SWL favourite, an inverted-L or long wire aerial. The aerial 'top' and down-lead should ideally be 142ft (approx), or 43.28 metres, representing a half-wave at the middle-band frequency of 3.3MHz.

Few SWLs can manage to erect an array in this day and age of microscopic garden lengths, although some could manage by the expedient of running the wire around the garden periphery. Provided no angle is greater than 90°, this arrangement would be suitable. An ATU (aerial tuning unit) would also be of use in obtaining the maximum possible efficiency from the aerial array.

Failing the above, perhaps a quarter-wave at 3.3MHz could be erected. The total length of 'top' and down-lead would be 71ft, or approximately 21.5 metres.

90 metre band Africans

Our African safari commences by logging what is probably the easiest of them all. The Mediterranean-bordered country of Libya has a transmitter in Tripoli which is scheduled on the air from 1745 to 0430 on **3200**. Programmes are in Arabic, the power being unknown but obviously highly rated. As a first exercise the Voice of the Greater Arab Homeland, Tripoli is an obvious choice.

On **3230** from May to September inclusive is the RSA (Radio South Africa) Johannesburg transmitter operating with a power of 250kW in English from 0300 to 0426 and in Portuguese from 1900 to 1056.

Another South African seasonal schedule is that of Johannesburg on **3320**. With a power of 100kW, Johannesburg is on the air from March to May inclusive, being timed from 0350 (Saturday from 0430) to 0510 on weekdays and daily from 1635 to 2200. All programmes are in Afrikaans.

SABC (South African Broadcasting Corporation) Johannesburg is on **3250**, being scheduled through the year as follows – Radio 5 from 0300 to 0545 and from 1530 to 2200, the all night service Radio Orion from 2200 to 0300 with a power of 100kW.

As would be expected, these three South Africans are often in the SWL press.

Attention is next focussed on two Namibian transmitters. Both are located in the capital Windhoek and have a power of 100kW. SWABC (South West Africa Broadcasting Corporation) Windhoek is on the air on **3270** using local vernaculars from 1615 to 2200 and from 0358 to 0515. The Radio Orion all night service is radiated from 2200 to 0400.

SWABC Windhoek on **3295** is in Afrikaans, English and German from 0400 to 0615 and from 1515 to 2200, with the all night service (Radio Orion) being from 2200 to 0400.

On **3380** is the 100kW MBC Blantyre, Malawi transmitters operating in Chichewa and English from May to September from 0235 to 1110 and from 1300 to 2210. From September

to May 0253 to 0530 and from 1750 to 2215. Listen for the newscasts in English at 1800 and at 2000 on weekdays.

ZBC Gweru (formerly Gwelo) in Zimbabwe radiates the Radio 1 service in English from 0325 (Sunday from 0400) to 0615 and from 1500 to 2100 (Sunday only from 2200 to 2230) except on Monday, Wednesday and Friday when from 1900 to 1925 there is a Voice of Namibia programme in English and Afrikaans. The Radio 3 programme is transmitted from Sunday to Thursday inclusive from 2100 to 2200. The power is 100kW except from 0545 to 0615 when it is reduced to 20kW, the frequency throughout is **3396**.

The 50kW Nigerian FRCN (Federal Radio Corporation of Nigeria) Lagos broadcasts the Channel 1 Home Service in English and vernaculars from 0430 to 1000 and from 1700 to 2310. The station identification is 'Radio Nigeria', the frequency **3326**.

In the next issue a continuation will be made by listing some of the lesser powered transmitters operating on the 90 metre band from the African continent.

AROUND THE DIAL

With this page open and the magazine placed on the operating desk, align the receiver to the frequencies shown and at the times indicated – you may then log some of the stations mentioned here.

World – was the reason for temporary absence. The schedule of this 100kW transmitter is from 0425 to 0800 and from 1645 to 2200. There is a transmission in English from 1830 to 1900.

AFRICA

Cameroon

Radio Diffusion Nationale, Garoua on **5010** at 1928, OM with a talk in French. This station, at least according to my observations, had been off the air for some time. Many attempts to hear Garoua during April, May and the early part of June failed to produce any results. Probably a transmitter breakdown and the difficulty of obtaining spares – so common in the Third

Botswana

Radio Botswana, Gaborone on **3356** at 1928, some European classical music being radiated by the recently installed 50kW transmitter which replaced the old 10kW equipment. Radio Botswana is on the air in English and SeTswana from 0400 to 0630 and from 1400 to 2100.

Central African Republic

Bangui on **5035** at 1956, YL with some songs complete with the fast rhythmic music

of the region then OM with announcements in French. Bangui is the capital city of the republic and is a port on the Ubangi river. This station is on the air from 0430 to 0700 and from 1630 to 2300 at 100kW. It identifies as 'Radio Centrafrique' and the frequency can vary from **5032** to **5035**.

Congo Republic

Brazzaville on **15190** at 1910, YL with a song in French, some accordion music in the French style then OM with the station identification at 1915. This was a transmission in the National Network which is on this channel from 1100 to 0100 (Sunday until 2300) and irregularly from 0400 through to 0100. The power is 50kW.

Kenya

The Voice of Kenya, Nairobi on **4885** at 1958, OM with a song in a vernacular with percussion and local instrumental music as backing then YL with announcements and sign-off without the National Anthem at 2004. This 5kW transmitter radiates programmes in the Coastal and North Eastern Service from 0250 to 0630 and from 1330 to 2020 – at least according to the schedule!

Niger

Niamey on **3260** at 1950, OM with a talk in one of the seven vernaculars of the country. The schedule is from 0530 to 0700 (Sunday until 0900) and from 1700 (Saturday and Sunday from 1630) to 2200 (Saturday until 2300). This 4kW transmitter carries programmes in the Home Service 1. Niamey, the capital town of the republic, is one of the termini – the other is Zinder – of the trans-Sahara motor routes.

Zimbabwe

ZBC Gweru on **3396** at 1941, a programme of classical piano music and OM with announcements in English. This was a Radio 1 transmission which is in English throughout most of the schedule, which is from 0325 (Sunday from 0400) to 0615 and from 1500 to 2100 (Friday and Saturday until 2200). The power is 20/100kW (20kW from 0545 to 0615, 100kW at other

times). On Monday, Wednesday and Friday a Voice of Namibia programme is radiated from 1900 to 1925 in English and Afrikaans. Radio 3 programmes in English are transmitted from 2100 to 2200 Sunday until Thursday inclusive.

THE AMERICAS

Bolivia

Radio Nueva America, La Paz on a measured **4797** at 0044, YLs with a discussion in Spanish followed by some Bolivian pipe music then YL with songs in Spanish. This 1kW station operates from 1000 to 1310 (irregularly to 1830) and from 2200 (irregularly from 2000) to 0400. Sunday from 1030 through to 2245 variable to 2300. La Paz is the *de facto* capital and is the seat of government, the legal capital being Sucre.

Colombia

Ondas del Meta, Villavicencio on a measured **4885.5** at 0309, OM with an excited sports commentary in Spanish. Ondas del Meta is on the air from 1000 (but this can vary from 0900) through to 0500 (varying to 0330) but sometimes around the clock. The frequency can vary slightly and the power is 5kW.

Ecuador

HCJB Quito on **3220** at 0411, YL with a hymn then OM with a religious talk in Spanish. This 10kW transmitter is on the air with programmes in Quechua from 0900 to 1300 and from 2130 to 0200 and in Spanish from 0200 to 0500.

Peru

Radio Tropical, Tarapoto on **4935** at 0315, OM with announcements then the station identification in Spanish followed by OM with a sad and slow song. Radio Tropical operates at 1kW from 0900 to 0500, the sign-off being variable around the latter time.

USA

WINB Red Lion, Pennsylvania on **15185** at 2040, OM with a religious talk in English being transmitted to Western Europe, the Mediterranean and North Africa. Transmissions in some languages of these regions are on this channel from 2000 to 2245, the power being 50kW.

ASIA

China

Radio Beijing on **6550** at 1445, YL with a song and announcements during the Cambodian programme, scheduled from 1400 to 1500.

India

All India Radio, Delhi on **15265** at 1921, OM and YL with a duet in Hindi during a transmission of the General Overseas Service in English from 1800 to 2000 directed to East Africa.

Iraq

Baghdad on **11750** at 1855, OMs with songs and Arabic-style music in the Home Service Voice of the Masses programme which may be heard on this channel from 0530 to 1300 and from 1630 to 2330. OM with the station identification at 1900 in Arabic then chimes for 2300 local time.

Vietnam

Hanoi on **15010** at 1314, OM and YL with the French transmission for South-East Asia, timed from 1300 to 1330.

EUROPE

Czechoslovakia

Prague on **15205** at 1540, YL with a newscast followed by the station identification in an English programme for Africa, Europe, the Far East and southern Asia, timed from 1530 to 1625.

PUBLICATIONS

Listeners' Services Catalogue

This 4-page publication lists and describes the contents of the twelve pamphlets currently available to short wave listeners. These printed data sheets are provided by Radio Nederland in order to assist the SWL in obtaining a greater understanding and enjoyment of the hobby.

The pamphlets are entitled: (1) *Receiver Shopping List*, (2) *Booklist*, (3) *Asian Advice*, (4) *Infodutch*, (5) *Infodutch Software*, (6) *Give Your Antenna Some Air*, (7) *Writing Useful Reception Reports*, (8) *Latin American DXing*, (9) *DXing Indonesia*, (10) *Medium Wave What Now?*, (11) *Satellites For the Short Wave Listener* and (12) *This is DXing*. Additionally, a number of receiver

reviews are available.

The Listener Services Catalogue is available free upon request to Radio Nederland Wereldomroep, Media Network, PO Box 222, 1200JG Hilversum, The Netherlands.

Receiver shopping list

Receiver Shopping List, edition 8 is also available from the above address free of charge. This publication is a mine of information concerning various short wave receivers, and would be of particular interest to those now considering the purchase of new equipment. This guide should be studied by the SWL and DXer alike.

CLANDESTINE

Voice of the Libyan People on **11975** at 1947, Arabic music then OM with a talk in Arabic, an orchestral flourish followed by OM with some slogans, another flourish and suddenly off at 2010. This one previously operated on **15040** and was silent for a couple of weeks but has now emerged on **11975**.

NOW LOG THIS

Radio Jesus del Gran Poder, Quito, Ecuador on **5050** at 0025, OM with a religious talk in Spanish followed by another OM with announcements including two mentions of Quito and identification, then YL and a congregation with some hymns. This 5kW station operates from 1000 to 1600 and from 2200 to a variable 0100 but has been reported operating as late – or as early – as 0900.

NOW HEAR THESE

Radio Inca, Lima, Peru on a measured **4762.3** at 0415, OM with the station identification in Spanish prior to a programme of local folk music. At 1kW this one is on or near this channel around the clock, but sometimes from 0900 to 0500.

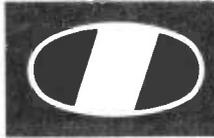
Radio Madre de Dios, Puerto Maldonado, Peru on **4950** at 0130, OM with a political speech in Spanish with mentions of America Latina and the Peruvian President. At 5kW the schedule is from 1100 to a variable 0200 (sometimes 0230). The frequency can vary at times to **4951**.

REW

Thanet EI



ICOM



ICOM

IC-735, The Complete HF Radio



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

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

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

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

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



IC-3200E Dual-band

A new exciting set is the ICOM IC-3200E FM Dual-band transceiver (144-430/440 MHz)

The IC-3200E employs a function key for low-priority operations to simplify the front panel. LCD display is easy to read in bright places, showing frequency, VFO A/B, memory channel duplex mode and S/R/F meter information.

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



Contact us regarding 50MHz equipment for new issued band!

Thanet ICOM Thanet ICOM

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

Refreshes the parts...

An aerial rig and tent was installed in August 1,500 feet up a Galway mountainside for a Heineken-sponsored attempt to set a new world record for long-distance radio contact.

It looked as though the bad summer had sunk plans by the West Kent Amateur Radio Society to contact North America and make the first ever direct transatlantic QSO on the 2m band. The idea was to bounce the signal through the ridge of high pressure which normally develops over the Atlantic in August. But with the wintry weather pattern the outlook for the bid looked bleak.

However, at the time of going to press, the group planned to go ahead with the expedition, with a little assistance from the giant liner QE II. The ship agreed to act as a floating radio link between the British team and the American enthusiasts trying to find their signals.

Four stacked and bayed long Yagi antennas were used. Modes of operation were CW, SSB, Amtor, and HF talk-back was set up to assist

the attempt. Transmission was round the clock from 19-30 August.

RRD fact sheet

The DTI are currently producing a five page fact sheet on how the RRD functions. It will also go into some detail on the future of amateur radio and how the Post Office at Chesterfield issues licences.

Copies will be available some time in the next few months from the RRD at Waterloo Bridge House, Waterloo Bridge Road, London. Tel: (01) 275 3263/3323.

The document was apparently inspired by some pertinent questions raised by Ian Abel of Yorkshire. The RSGB are not involved in this project.

Ian Abel G3ZHI also sent us the following letter on a possibly worrying aspect of the RRD:

'I am very disturbed at the high turn-over of staff in the Radio Regulatory Division.

'It would appear that civil servants spend less than one year in the RRD before moving on. Apparently this is common civil service practice.

'Amateur radio is given low priority, after all "it's only a hobby". It is obvious, therefore, that the RSGB, consisting of people who have been in amateur radio for over 60 years, must exert undue influence on the DTI officials that they meet with.

'The Government should run amateur radio matters, not the RSGB. After all, it is the Government who collects the £12 licence fee'.

Insurance shock

We recently had a letter from Mr R Robinson, of West Yorkshire, who has spotted an item in his local paper, *The Yorkshire Post*, which he thinks might be of interest to readers.

The item recounts how a motorist's insurance policy became invalid after he installed a CB radio in his car, due to a clause in his policy specifically excluding the use of a vehicle with a two-way radio. This led to the motorist being prosecuted and fined £80 for driving without insurance!

According to the man's solicitor, he believed he was adequately insured, having been advised by the insurance broker that the exclusion clause referred only to taxi radios.

This unfortunate incident has brought to light a situation which mobile operators should be wary of. Check that your insurance policy has no similar exclusion clauses.

AR on Shuttle Columbia

It is reported in the UoSAT Bulletin, no. 137, that two German radio amateurs may be operating an amateur radio station aboard shuttle flight 61A during October. Dr Ernst Medderschmid DG2KM and DR Reinhard Furrer DD6CF will be on board Columbia for the Spacelab-D1 operation, and hope to engage in cross-band, Oscar transponder-type operation.

The equipment is capable of four 2m and eight 70cm channels. Automatic logging equipment is planned for recording all received calls when the astronauts are busy with other Spacelab duties. The package will also have a 1 watt 70cm beacon for

determining when the shuttle is within your communications range.

The equipment is apparently designed for cross-band rather than in-band operation.

AMSAT meeting

The AMSAT Annual Meeting and Space Symposium 1985 has now been firmly scheduled for 9 November in the Denver Boulder area of the USA.

More than two hundred people are expected at this year's meeting.

Clever Trevor

Trevor Morgan GW4OXB, who readers will know from his regular *Short Wave Listener* column in *Amateur Radio* magazine and as the organiser of the *Amateur Radio Prefix Award* scheme, is at it again!

He has recently proposed the idea of organising a listener's award with the aim of raising money for Bob Geldof's Ethiopian appeal.

The White Fang Fellowship's JOTA SWL Contest Awards, intended to encourage SWL activity during the organisation's annual jamboree, will charge an entry fee of two IRCs in the UK and 4 IRCs overseas. All IRCs in excess of those used to send contest certificates to the contestants will be donated to the Live Aid appeal.

Any clubs or individuals who can offer assistance of any kind with the running of this scheme should contact Trevor at the address below.

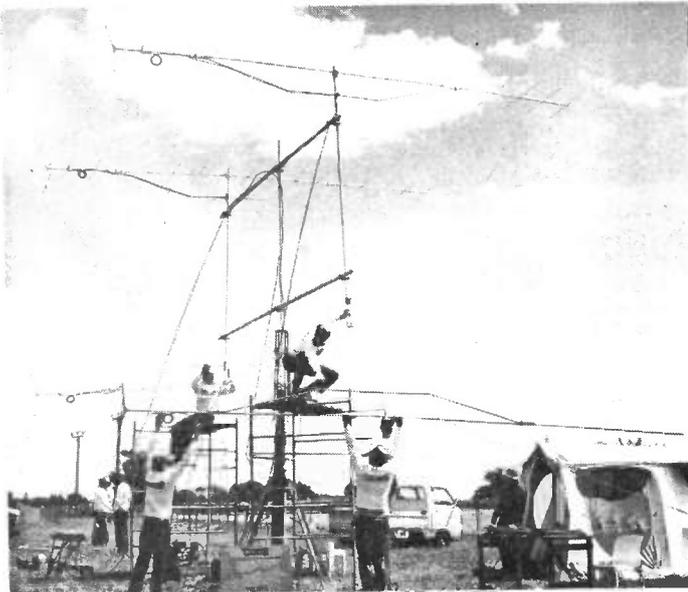
Full details of the contest rules are available from: *Trevor Morgan, 1 Jersey Street, Hafod, Swansea SA1 2HF.*

It's all Greek to me...

Younger readers might be interested in a letter we have received from a Greek reader, 16 year old Minos Tsaouses.

He would like to hear from young people of around his age to exchange views and ideas about electronics, as well as circuits, diagrams, kits and magazines. He is very interested in the practical side of the hobby.

Write to: *Minos Tsaouses, 8 Constandinoupoleos Street, GR-62100 Serres, Greece.*



Datacom

The British Amateur Radio Teleprinter Group (BARTG) has published the summer 1985 issue of its magazine, *Datacom*. It consists of 120 pages of news, views and technical articles on all aspects of RTTY, Amtor, Packet Radio and FAX.

Special features include full technical and constructional details of the ST5C terminal unit and of a unit to convert from a parallel Centronics interface to serial RS232.

There are suggestions for circuits and ideas for audio notch filters, sidetone monitoring of RTTY transmissions, driving teleprinters on low voltage, improving efficiency in RTTY transmitters, etc.

In this issue the results of BARTG's survey on the use of RTTY on 45.45 and 50 bauds are published. BARTG believes that this will be of particular interest to RTTY repeater builders, emergency network planners and DX operators.

Datacom gives details of how Amtor can be used through the Oscar 10 satellite, as well as Packet Radio news, and information on the new TNC2 Terminal Node Controller.

Datacom is published quarterly and supplied free to members. Send an SAE for details to: Mrs P Beedie GW6MOJ, 'Fynnonlas', Salem, Llandeil, Dyfed, Wales SA19 6EW. Tel: (0558) 822286.

SPRAT

We recently received the latest issue of *SPRAT*, the journal of the G-QRP Club, (which, incidentally, is edited by the Rev George Dobbs G3RJV, who is a regular contributor to our sister magazine *Amateur Radio* with his *Beginner's Workshop* feature).

The club is now going strong in its tenth year. Readers interested in low power communication will find it worthwhile joining the club, if only to receive this very useful little journal. This edition contains an account of this year's RSGB Convention, which was held at the NEC in Birmingham, an article on the construction of a QSK trans-

ceiver for 80m CW, a review of the Micron 6 band QRP transmitter kit, and lots more besides.

For more information contact: Alan Lake G4DVW, 7 Middleton Close, Nuthall, Nottingham NG16 1BX.

IRTS Yearbook

The Irish Radio Transmitters Society has published an annual EI callbook for the last several years and the idea has been expanded this year to include not only up-to-date listings of callsigns, but also reference information about the IRTS in 1985.

This year therefore the booklet is being referred to as the *IRTS Yearbook* and the intention is to keep members informed of the society's progress. Ideas and suggestions for inclusion in the 1986 yearbook will be welcomed.

The booklet has a very interesting introduction, of special interest for newcomers to the hobby. It explores the ideas and concepts behind amateur radio, how amateurs contribute in scientific research and how the hobby is organised internationally.

The yearbook also outlines how to become a radio amateur, with specific reference to Irish amateurs, and why, of course, hams in Ireland should join the IRTS.

Detailed information is included about the society itself - its history, awards, officers, the QSL service and the rules which members must abide by.

The IRTS Amateur Radio Yearbook 1985 is available at £2.00 from: *Irish Radio Transmitters Society, PO Box 462, Dublin 9, Eire.*

Welsh convention

This year's Welsh Amateur Radio Convention will be held at the usual venue - Oakdale Community College, Blackwood, Gwent on Sunday 6 October 1985. Doors will be open at 10.00am and the official opening will be at 11.00am by Mrs J Heathershaw G4CHH, President of the RSGB.

The programme will include lectures entitled, 'The 5th Generation of Transverters' by Chris Bartram G4DGU of muTek, 'Oscar 10 Video' by

NOTES FROM THE PAST

Little vision

In recent years there has been a widespread belief that the appeal of TV would become so powerful that sound radio would inevitably be superseded, except for the few without the means or those without access to the programmes.

Conversely, there are signs that many viewers are reverting back to their former listening habits once the flush of novelty wears off. After a few months even the less discriminating viewer tends to look-in only when the programmes *might* interest him or there is nothing particularly attractive on sound radio.

Disregarding the sports events and the purely spectacular items, vision adds little to the sound. Often it actually detracts from it. As a viewer since the early days I must admit that I have found few TV entertainment programmes which have given me so much pleasure as many of the sound programmes have. In fact, I can hardly remember getting a good laugh out of TV, and only too often find myself acutely embarrassed by TV artists trying to be funny. On sound radio, nonsensicality can be twisted by one's imagination into readily acceptable situations which become even funnier as they pass into absurdity. Comic adventures are not the only form of entertainment more amusing on sound only. Many plays and talks take on a vivid reality, creating scenes in the listener's imagination infinitely better than anything that can be put on in the TV studio.

Just lately we have had some outstanding steam radio programmes - perhaps inspired by the competition of TV. They have certainly made me wonder if TV comedy, in particular, has any future. It certainly has little past.

Rivalry

Many older listeners will recall something of the liveliness and enthusiasm which the pioneers of broadcasting infused into the early programmes. Often the material was poor, the timing faulty and the announcements facetious, but it certainly had an atmosphere and air of mutually friendly enjoyment.

Something of the same spirit re-appeared at the beginning of regular television in 1936. Gerald Cock, who was then running it, realised his new baby needed presentation with a friendly approach, and together with a small band of enthusiasts managed to infect viewers with something of the very real pleasure they derived from what they were doing. You could almost feel that you were participating in it, and not merely allowed to watch it.

Werner Hass DJ5KQ, and also an HF DX feature and a film for newcomers. Morse test facilities will also be available. Applicants should contact Mr G Williams, BTI Radio Station, Worston Lane, High-bridge, Somerset TA9 3JY.

There will be £300 in cash raffle prizes, the usual trade stands, a bring-and-buy and an RSGB stand. Admission is £1.50 at the door.

Further details can be obtained from: *R B Davies GW3KYA, 16 Vancouver Drive, Penmaen, Blackwood, Gwent NP2 0UQ. Tel: (0495) 225825.*

One world

A special event station, GB4OWW, is being organised as part of the Marlborough Brandt Group One World Week festivities. This event is just one of a number of activities arranged for the group's fête, to be held on 25/26 October.

It is hoped to contact stations in the Gambia (the Marlborough Group has a link

with one of the villages there), on HF, 2m SSB, FM and 432MHz, conditions permitting. Special QSL cards will be available for all contacts.

The venue is St John's School, Stedman Building, Marlborough, Wiltshire.

RAE help needed

Many members of the Radio Amateur Invalid and Blind Club (RAIBC) would like to take the RAE, but because of health or transport problems cannot attend a college course and would therefore like somebody to give them some instruction at home.

You do not have to be highly qualified, just willing to give a little time to help sort out queries etc. If you would like to help contact: *Cathy Clark G1GQJ, 9 Conigre, Chinnor, Oxon OX9 4JY.*

Construction contest

The Bury Radio Society is holding its 'Club Construction Contest' on Tuesday 8 October. It will be judged by

Rev George Dobbs G3RJV (who writes the 'Beginner's Workshop' feature in our sister publication, *Amateur Radio*) who will also be giving a talk on QRP operation. G3RJV is editor of *SPRAT*, the journal of the G-QRP Club.

The Bury Radio Society holds its main meetings on the second Tuesday of each month at the Mosses Centre, Cecil Street, Bury. Newcomers should contact: *Honorary Secretary, Brian Tyldesley G4TBT, 4 Colne Road, Burnley.*

Radio rummage

The South Bristol Amateur Radio Club (G4WAW) is holding its first 'radio rummage' on Sunday 27 October. As the name suggests, the emphasis will be on bring and buy, surplus user equipment and parts.

There will be radio displays, (SBARC radio shack), a Raynet stand, film shows, a Wild West 'shoot-out' and various refreshments. Talk-in

will be on S22 and SU8 and the entrance fee will be 50p.

Enquiries for this event should be made to Mike Ward G1LDJ (organiser). Tel: (0272) 667179.

The club meets at 7.30pm every Wednesday at: *The Whitchurch Folk House, East Dundry, Whitchurch, Bristol, Avon BS14 0LN.*

TV repeater

The Cambridgeshire Repeater Group has news of GB3PV, the proposed 1296MHz TV repeater for the Cambridge area.

Apparently the receiver has been completed and tested, and work is now progressing on the transmitter and micro-processor logic. A feature will be electronically generated text in addition to the test card, which will give information on the repeater and possibly local news such as club meetings, etc. 1kW ERP is hoped for.

The proposal has been sent to the RSGB for approval.



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LATEST LITERATURE

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COST-EFFECTIVE ELECTRONIC CONSTRUCTION

by John Watson

This is another volume in the Electronics Projects Series, and like *Projects for the Car and Garage* (see August's *Latest Literature*) is a revised edition of the original.

The book is intended to show how to get the best value for money out of electronics projects by thoughtful and not overly complex design. This aim is pursued by detailing a series of projects, from an automatic porch light, through a drill-speed controller, xenon strobe, etc, to a computer I/O port and a model radio control system.

Full details are given for all the projects, including PCB patterns for some of them (although they can all be built on Veroboard). One of the appendices includes all the parts lists (the others covering component suppliers and device specifications).

The author states that the circuits 'are all designs that seem to me to be the simplest, or cheapest, way of performing a particular task'. There is certainly no denying that they meet the cost-effective criterion more than adequately, but the description of each is a little short when it comes to an outline of the design philosophy. It would have been nice if the author had given us a little insight into the thought processes involved in selecting the most cost-effective approach from the alternatives available.

The text is comprehensive in all other respects, with plenty of practical advice, and written in a clear and straightforward style. The diagrams are equally easy to follow.

The book makes pretty good reading, and there is a lot to be learned from it if you're not as lazy as me (ie everything needs spelling out

and explaining in words of one syllable). And my favourite project? Well, before long friends and neighbours will find themselves being zapped by a ray gun (do I hear cries of second childhood?).

MacMillan Education Ltd,
£5.95. ISBN 0 333 37222 0

MICROCOMPUTER INTERFACING

By M D Beer

This book is aimed primarily at first and second year computer science undergraduates (but don't let that put you off!), the author being a lecturer in a university computer science department. It outlines the use of a computer in communications, data logging and control, and benefits from Martin Beer's background in that it gives a good basic grounding in the subject.

There are a number of BASIC programs given, all of which are for the BBC computer (there is a chapter on input and output for the BBC). The form of each program is also described so that the reader can appreciate the approach taken to the problem. One of the appendices gives brief details of converting to other microcomputers.

The emphasis throughout the book is on software rather than hardware, and the examples given are described comprehensively. Such areas as traffic lights, slide projector and motor control are covered (with a whole chapter as a case study of model railway control), as well as graphical input devices (joystick, graphics tablet and lightpen) and robotics with a turtle.

At the end of each chapter there are a number of problems to be worked through by the reader, much the best way of ingraining the imparted knowledge (and one which could usefully be applied to

more hobby-orientated books).

Bearing in mind the fact that the style and approach of this book might not appeal to those more used to texts intended for purely domestic consumption, it does give a pretty good grounding in the subjects covered (despite occasional minor inconsistencies).

Collins Professional and
Technical Books, £8.95. ISBN
0 00 383034 9

RADIOTELETYPE PRESS BROADCASTS

Second edition, by Michiel Schaay

In order to find the frequencies and times of transmissions the new second edition of Michiel Schaay's book, *Radioteletype Press Broadcasts*, will prove to be of great help. Not only are hundreds of transmissions listed, but a chapter is devoted to each of the forty-five most interesting press agencies, giving a detailed insight to how they operate. This provides a much better understanding of the bulletins being received.

A total of 63 agencies are covered, among them Associated Press, Prensa Latina, TASS, Press Trust of India, AFP, ANSA, and some more unusual ones such as Bakhtar News Agency from Afghanistan, Service de Presse Kampuchea and a clandestine station, Kwacha Unita Press from Angola.

The second part of the book has a listing of transmissions for each hour and half hour, plus cross references.

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Evans Air Publications

These publications are of particular interest to the aircraft enthusiast who listens on HF, VHF, or UHF using

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En Route Supplements, which are issued for four areas - The British Isles and North Atlantic, Northern Europe, European Mediterranean, Africa and Southern Asia, including the Middle East - contain detailed information on all military (RAF, RN, army, USAF) and civilian airfields including UHF, VHF and HF communications frequencies. Military and civilian air traffic and rescue services are also listed with communications details.

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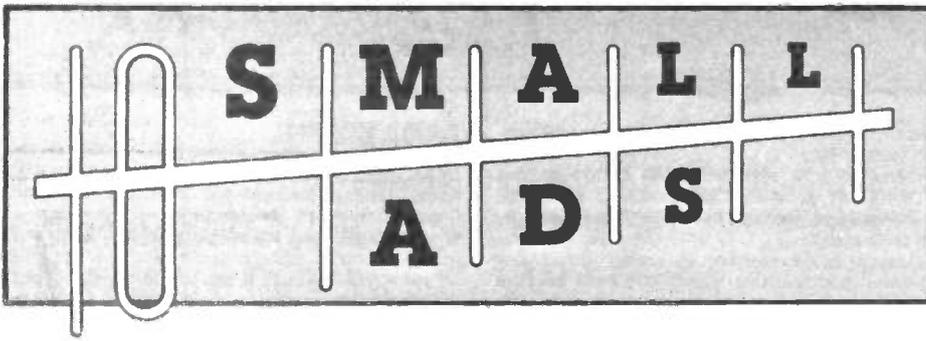
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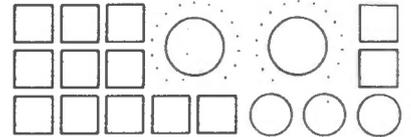
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297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS	Covers: Bleed: Facing Matter:	Outside back cover 20% extra, inside covers 10% extra 10% extra [Bleed area = 307 x 220] 15% extra
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DEADLINES		*Dates affected by public holidays			
issue	colour & mono proof ad	mono no proof and small ad	mono artwork	on sale thurs	
Nov 85	12 Sep 85	18 Sep 85	20 Sep 85	10 Oct 85	
Dec 85	17 Oct 85	23 Oct 85	25 Oct 85	14 Nov 85	
Jan 86	14 Nov 85	20 Nov 85	22 Nov 85	12 Dec 85	
Feb 86	9 Dec 85*	13 Dec 85*	17 Dec 85*	9 Jan 85	

CONDITIONS & INFORMATION	
<p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p>	<p>If series rate contract is cancelled the advertiser will be liable to pay the unearned series discount already taken.</p> <p>COPY Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.</p>

Printed — web-offset.
PAYMENT
Above rates exclude VAT.
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by publication date.

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

CONDITIONS
10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only.

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

Ads accepted subject to our standard conditions, available on request.

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NEW SPEAKER SYSTEM

Epicure Products Inc (EPI), a subsidiary of the US Penril Corporation, has announced its new Stat 450 electrostatic speaker system.

The Stat 450 is suited to reproduction of digital sound, the current state-of-the art in musical recording. The Stat 450 is a 'hybrid' speaker system that has three electrostatic mid-range/tweeter panels and a 10 inch bass driver. The bass driver's cone is made from EPI's bilayer material, such as is used in the company's popular Time/Energy series of speakers.

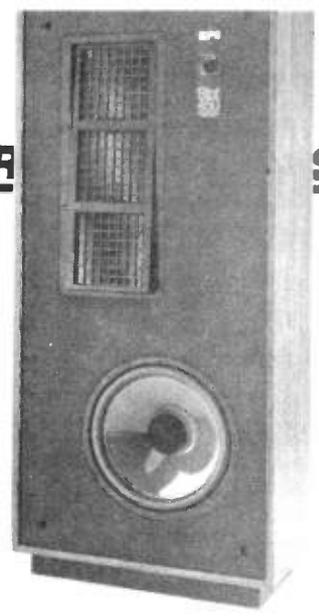
These electrostatic panels

use an extremely light plastic diaphragm to generate sound. The diaphragm is suspended between two specially designed wire-wound frames. A high voltage, low current charge is applied to the windings to establish a balanced electrostatic field. The charge is supplied by a power module that plugs into a standard electrical outlet and a dc-to-dc voltage step-up circuit that is built into each speaker cabinet. When the musical signal from the system's amplifier is applied to the windings, the balance of the electrostatic field shifts, causing the diaphragm to move back and forth,

thereby generating sound.

The benefit of this type of driver is that the force that moves the diaphragm is evenly applied over its entire surface. This prevents diaphragm 'break-up' that would cause distortion. Because the diaphragm is so light, and because the force driving it is a fully controlled 'push-pull' type of force, the electrostatic panels have exceptional transient response.

Since the Stat 450 uses three electrostatic panels, with a total of almost 60 square inches of sound radiating surface, high power levels are easily handled.



*Epicure Products Inc,
25 Hale Street,
Newburyport,
Massachusetts 01950,
USA.*

DISC DRIVE

RCS Computer Services are now offering a low cost fully packaged disc drive for the BBC microcomputer.

At £66 (including VAT) users who have suffered with cumbersome and sometimes unreliable data cassette recorders can now afford to upgrade their systems.

The unit is based on the well-proven Olivetti 5¼ inch drive, giving 100K capacity on a 40-track format. It comes complete with utility disc, manual and all cables ready for operation with any BBC microcomputer fitted with

Acorn DFS or compatible disc interface. For users without a disc interface fitted into their micros, RCS is offering a special package price of £165 including VAT to upgrade a Model B microcomputer and supply a disc drive (plus £7.00 postage and packing for return of the micro).

*Leeway Data Products Ltd,
Enterprise House,
Central Way,
North Feltham
Trading Estate,
Feltham,
Middlesex TW14 0RX.
Tel: (01) 844 2044.*

ELECTRONIC ATU

The compact HF3B receiver antenna tuning unit from Evans Electronics is designed to give improved RF selectivity, reducing front end overload and cross-modulation, particularly common in modern HF receivers. It enables the receiver to be operated without the use of input attenuation and consequent reduction of sensitivity. Image signal rejection is considerably improved.

The electronic tuning circuitry is powered by a 9V PP3 battery and consumes only 10µA. This new ATU design approach eliminates the need for large expensive components and results in a very compact unit at a modest price.

The tuner is for use with 50 or 75 ohm coaxial fed antennas, including active antennas, and also for random length wire antennas. Off resonance rejection is 20dB or better.

Frequency coverage is 3 to 30MHz, but the unit will tune to below 2MHz with a slight reduction in efficiency. The HF3B dimensions (mm) are 111W x 71D x 48H.

The price at £28.00 includes all necessary connectors, battery, instructions and postage and packing.

*Evans Electronics
11 Hill View,
Bryn-y-Baal,
Mold,
Clwyd CH7 6SL.
Tel: (0352) 55826.*

INTERFACE KIT

The popular Centronics parallel interface for dot matrix and daisy wheel printers can be used with the ZX Spectrum, using an easy-to-assemble interface kit available from Electronics and Computer Workshop Ltd.

The Centronics interface kit - K2614 - is one of a series of I/O expansions that enable Spectrum owners to expand their machines to communicate with the outside world, plugging in to a standard interface motherboard, the K2615. With the Centronics kit, the printer can be plugged directly into a standard 2 x 18 way socket and non-standard parallel printers can also be controlled provided that they have a Ready or Busy TTL-level output.

The manual includes a USR routine for simple program listing and a BASIC hex

loader program to simplify the entering of the machine code. The Centronics interface card kit costs £31.98 and the ZX Spectrum motherboard costs £26.84.

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

POWER SUPPLY CLEANER

Many computers, as readers will know, are sensitive to 'dirty' power supplies. The RF interference every time the washing machine goes into top spin is destined to zap another invoice file!

Tony Firshman Services recognised the need for a low-cost plug to clean a power supply and hit on the idea of fitting the compo-

nents inside an adaptor. This not only makes for a neat package but means that the plug can be swapped or used for more than one computer (with an adaptor).

There are three elements in the design: 1) a capacitive filter for the 1-30MHz range; 2) an inductive element for RF frequencies to around 130MHz; 3) a transient suppressor to cut mains spike

voltages above 600V.

This 'computer cleaner' is priced at £14.00 inclusive. A similar device based on a 4-way socket and trailing lead is also available for £24.00. Both devices can be obtained by mail order.

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

