AUGUST 1986 £1·10

Practical Wireless

The Radio Magazine

NEW SERIES
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INSIDE - SPECIAL OFFER Black Star's New 1·5 GHz Frequency Counter

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THE SOUTH-WEST'S LARGEST AMATEUR RADIO STOCKIST

Trio

TS940S	9 Band TX General Cov RX	1795.00	
TS930S	9 Band TX General Cov RX	1395.00	(—)
TS440	**NEW** 9 Band TX General Cov RX	950.00	(—)
TS830S	160-10m Transceiver 9 Bands	898.00	(—)
AT230	All Band ATU/Power Meter	170.65	(2.00)
SP230	External Speaker Unit	51.43	(1.50)
TS530SP	160m-10m Transceiver	779.79	(—)
TS430S	160m-10m Transceiver	750.00	(—)
PS430	Matching Power Supply	139.01	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	13.56	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
SP120	Base Station External Speaker	33.33	(1.50)
MC50	Dual Impedance Desk Microphone	39.56	(1.50)
MC35S	Fist Microphone 50K ohm IMP	18.65	(1.00)
LF30A	HF Low Pass Filter 1kW	27.70	(1.00)
TR7930	2M FM Mobile	365.60	(—)
TR9130	2M Multimode	544.73	(—)
TW4000A	2M/70cm mobile	395.00	(—)
TM201A	2M 25W mobile	296.09	(—)
TM401A	7cms FM 12W	350.91	(—)
TH21E	2M Mini-Handhelds	189.30	(—)
TH41E	70cm Mini-Handhelds	220.95	(—)
TM211E	2M FM Mobiles	398.00	(—)
TM411E	70cm FM Mobiles	466.18	(—)
TS711E	2M Base Stations	770.74	(—)
TS811E	70cm Base Stations	895.00	(—)
TR3600	70cm Handheld	324.36	(—)
TR2600	New 2M FM Synthesised Handheld	299.00	(—)
ST2	Base Stand	66.11	(1.50)
SC4	Soft Case	16.95	(1.00)
SMC25	Speaker Mike	19.78	(1.00)
PB25	Spare Battery Pack	32.20	(1.00)
MS1	Mobile Stand	38.41	(1.00)
R2000	Synthesiser 200KHz-30MHz Receiver	518.73	(—)
HS5	Deluxe Headphones	29.39	(1.00)
SP40	Mobile External Speaker	18.08	(1.00)
TL922	160/10M 2kW Linear	1265.00	(7.00)
TS780	2M/70cm M/M Transceiver	998.00	(5.00)
TS670	6, 10, 15, 40M 10W M/M Transceiver	774.13	(5.00)
TR9300	6M M/M Transceiver	590.49	(5.00)
TR751	**NEW** 2M 25W Multimode	544.00	(—)

Linear Amps

TOKYO HI POWER			
HL 160V	2m, 10W in, 160W out	244.52	(2.00)
HL 82V	2m, 10W in, 85W out	144.50	(2.00)
HL 110V	2m, 10W in, 110W out	249.00	(2.00)
HL 35V	2m, 3W in, 30W out	76.00	(2.00)
HL 20U	70cms, 3W in, 20W out	122.50	(2.00)
MICROWAVE MODULES			
MML144/30-LS	inc preamp (1/3 w i/p)	94.30	(2.00)
MML144/50-S	inc preamp, switchable	106.95	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	159.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML144/200S	inc preamp (3/10/25 i/p)	334.65	(2.50)
MML432/30L	inc preamp (1/3w i/p)	169.05	(2.00)
MML432/50	inc preamp (10w i/p)	149.50	(2.00)
MML432/100	linear (10w i/p)	334.65	(2.50)
B.N.O.S.			
LPM 144-1-100	2m, 1W in, 100W out, preamp	197.50	(2.50)
LPM 144-3-100	2m, 3W in, 100W out, preamp	197.50	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	175.00	(2.50)
LPM 144-25-160	2m, 25W in, 160W out, preamp	255.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	295.00	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	295.00	(2.50)
LP 144-3-50	2MN 50W out, preamp	125.00	(2.50)
LP 144-10-50	2M 10W in, preamp	125.00	(2.50)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	235.00	(2.50)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	235.00	(2.50)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00	(2.50)
LPM 432-10-100	70cm, 10W in, 100W out, preamp	335.00	(2.50)

SWR/PWR Meters

HANSEN			
FS50VP	50-150MHz 20/200 Interval PEP/SWR	106.70	(1.50)
FS300V	50-150MHz 20/200 PWR/SWR	53.50	(1.50)
FS300H	1.8-60MHz 20/200/10W	53.50	(1.50)
FS210	1.8-150MHz 20/200 Auto SWR	63.50	(1.50)
W720	140-430MHz 20/200W	41.50	(1.50)
WELZ			
SP10X	1.8-150MHz PWR/SWR	36.50	(1.50)
SP122	1.8-60MHz PWR/SWR/PEP	85.00	(1.50)
SP220	1.8-200MHz PWR/SWR/PEP	59.99	(1.50)
SP225	1.8-200MHz PWR/SWR/PEP	109.95	(1.50)
SP420	140-525MHz PWR/SWR/PEP	71.00	(1.50)
SP425	140-525MHz PWR/SWR/PEP	109.95	(1.50)
SP825		165.00	(1.50)
TOYO			
T430	144/432 120 W	52.50	(1.00)
T435	144/432 200 W	58.00	(1.50)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(2.50)
SX200	VHF/UHF Scanner	325.00	(2.50)
SX400	VHF/UHF Continuous Coverage	625.00	(2.50)
AOR2002	VHF/UHF Continuous Coverage	435.00	(2.50)

Icom Products

IC751	HF Transceiver	P.O.A.	(—)
IC745	HF Transceiver	P.O.A.	(—)
IC735	New HF Transceiver	P.O.A.	(—)
PS15	P.S. Unit	149.50	(4.00)
PS30	Systems p.s.u. 25A	343.85	(—)
SM6	Base microphone for 751/745	39.10	(1.00)
IC505	50MHz multi-mode portable	489.00	(—)
IC290D	2m 25w M/Mode	519.00	(—)
IC271E	2m 25w M/Mode Base Stn.	779.00	(—)
IC271H	100W version of above	979.00	(—)
IC27E	25W FM mobile	399.00	(—)
IC47E	25w 70cm FM mobile	595.00	(—)
ICBU1	B/U Supply for 25/45/290	31.05	(1.00)
ICR71	General Coverage Receiver	789.00	(—)
IC02E	2m H/Held	299.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	79.35	(2.00)
IC4E	70cm H/Held	285.00	(—)
IC04E	70cm handheld	299.00	(—)
BC35	Base Charger	67.85	(1.00)
HM9	Speaker mic	20.70	(1.00)
LC3	Carry Case	6.90	(1.00)
ICBP3	Std Battery Pack	28.75	(1.00)
BP5	High Power Battery Pack	58.65	(1.00)
CP1	Car Charging Lead	6.90	(1.00)
DC1	12v Adaptor	17.25	(1.00)
R7000	VHF/UHF Scanning Receiver	899.00	(—)
IC3200	2M/70cm Mobile Transceiver	529.00	(—)

Mutek Products

SLNA 50	50MHz Switched preamp	49.50	(1.50)
SLNA 144s	144MHz Low noise switched preamp	41.95	(1.50)
SLNA 145sb	Preamp intended for 290	31.90	(1.50)
GLNA 432e	70cm Mast head preamp	159.90	(2.50)
RPCB 144ub	Front end FT221/225	84.90	(1.50)
RPCB 251ub	Front end IC251/211	89.90	(1.50)
BBBA 500u	20-500MHz Preamp	34.90	(1.50)
GFBA 144e	2m Mast head preamp	149.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	94.90	(1.50)
TVHF 230c	2M-FM Transverter	299.90	(5.00)
LBPF 144v	Bandpass Filter	24.90	(1.50)
LBPF 432u	Bandpass Filter	24.90	(1.50)
TVVF 50c	6M Transverter	209.90	(2.50)
GLNA 433e	70cm Pre-amp	89.90	(2.50)
TVVF 144a	2M Transverter	249.90	(2.50)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	34.90	(1.50)
FL2	Multi-mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	36.00	(1.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
DC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

Tono 550	Reader	329.00	(2.50)
MICROWAVE MODULES			
MM2001	RTTY to TV converter	189.00	(2.00)
MM4001KB	RTTY term with keyboard	299.00	(2.00)
BENCHER			
BY1	Squeeze Key, Black base	67.42	(2.00)
BY2	Squeeze Key, Chrome base	76.97	(2.00)
HI-MOUND MORSE KEYS			
HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	27.60	(1.50)
HK710	Up down keyer	39.95	(2.00)
HK802	Up down solid brass	86.30	(2.00)
HK803	Up down solid brass	82.65	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)
KENPRO			
KP100	Squeeze CMOS 230/13.8v	89.00	(2.50)
KP200	Memory 4096 Multi Channel	179.00	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1759.00	(—)
SP980	Speaker	86.09	(2.00)
FT757GX	HF Transceiver	879.00	(—)
FC757	Auto A.T.U.	318.00	(2.00)
FP757HD	Heavy Duty PSU	199.00	(2.00)
FP757GX	Switched Mode PSU	199.00	(2.00)
FT290	2m M/Mode Port/Transceiver	369.00	(—)
FT290	With Mutek front end fitted	399.00	(—)
FT690	6M M/M Portable Transceiver	289.00	(—)
FL2010	Linear Amplifier	79.00	(1.00)
MMB11	Mobile Bracket	33.00	(1.00)
NC11	Charger	10.00	(1.00)
CSC1	Carrying Case	6.50	(1.00)
YHA15	2m Helical	7.50	(1.00)
YHA44D	70cm ½wave	10.95	(1.00)
YM49	Speaker Mike	19.00	(1.00)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	225.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	265.00	(—)
FT703R	70cm H/Held	255.00	(—)
FT709R	70cm H/Held	285.00	(—)
FT270R	2m 25W F.M.	359.00	(—)
FT270RH	2m 45W F.M.	399.00	(—)
FT2700R	2m/70cm/25W/25W	499.00	(—)
FRG 9600	60-905MHz Scanning RX	465.00	(—)
MMB10	Mobile Bracket	8.50	(1.00)
NC9C	Charger	9.60	(1.00)
PA3	Car Adaptor/Charger	18.00	(1.00)
FNB2	Spare Battery Pack	25.00	(1.00)
YM24A	Speaker Mike	27.00	(1.00)
FT726R	2m Base Station	899.00	(—)
430/726	70cm Module for above	255.00	(2.50)
FRG8800	HF Receiver	575.00	(—)
FRV8800	Convertor 118-175 for above	90.00	(1.50)
FRT7700RX	A.T.U.	53.50	(1.50)
MH1B8	Hand 600 8pin mic	17.50	(1.00)
MD1B8	Desk 600 8pin mic	75.00	(1.00)
MF1A3B	Boom mobile mic	23.00	(1.00)
YH77	Lightweight phones	17.50	(1.00)
YH55	Padded phones	17.50	(1.00)
YH1	L/weight Mobile H/set-Boom mic	17.00	(1.00)
SB1	PTT Switch Box 208/708	18.50	(1.00)
SB2	PTT Switch Box 290/790	16.00	(1.00)
SB10	PTT Switch Box 270/2700	18.50	(1.00)
QTR24D	World Time Clock	39.00	(1.00)
FF501DX	Low Pass Filter	33.00	(1.00)

Power Supplies

DRAE			BNOS		
4 amp	40.50	(2.00)	6 amp	69.00	(2.50)
6 amp	63.00	(2.50)	12 amp	115.00	(3.00)
12 amp	86.50	(3.00)	25 amp	169.00	(4.00)
24 amp	125.00	(4.00)	40 amp	345.00	(4.00)

SMC			
RU120406	4 amp Power Supply	14.95	(2.35)

Aerial Rotators

FU200	Light Duty	59.00	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	119.00	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	147.95	(2.50)
KR600RC	8 core Heavy Duty	199.00	(2.50)
HAM1V	8 core Heavier Duty	379.00	(4.00)
T2X	8 core Very Heavy Duty	P.O.A.	(—)

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	26.50	(1.00)
Welz	2 way 'n' Skts	46.50	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)
Kenpro KP21N2	way Switch	24.15	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.50	(1.00)
T100	100W Dummy load	38.00	(1.00)
T200	200W Dummy load	56.00	(1.50)
CT20A	20W Dummy Load PL259	14.25	(1.00)
CT20N	20W Dummy Load N. Plugs	22.50	(1.00)
CT530	300W Dummy Load	82.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)
TOKYO HI-POWER			
HC200	10-80 HF Tuner	115.00	(2.00)
HC400	10-160 HF Tuner	199.00	(3.00)
CAP CO.			
AERIAL TUNERS			
SPC300	1kW PEP	188.00	(3.00)
SPC3000	3kW PEP	275.00	(4.00)

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Practical Wireless
The Radio Magazine

AUGUST 1986 VOL 62 NO. 8 ISSUE 953

THIS MONTH

THIS MONTH'S COVER

A Residual Current Circuit Breaker (RCCB) from the WYLEX range, manufactured by George H. Scholes PLC of Wythenshawe, Manchester.

We are sorry that Part 2 of *Getting Started, the Practical Way* has had to be held over this month for technical reasons

NEXT MONTH

50MHz and ERP Part 1

Power in dBW

50MHz Receive Converter

On sale August 7

Regular Features

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PLEASE NOTE OUR NEW ADDRESS
▶▶▶▶▶▶▶▶▶

Editorial and Advertisement Offices:
Practical Wireless
Enefco House
The Quay
Poole, Dorset BH15 1PP

☎ Poole (0202) 678558
Prestel 202671191

Editor Geoff Arnold T.Eng(CEI) FSERT G3GSR
Assistant Editor Dick Ganderton C.Eng. MIERE G8VFH
Art Editor Steve Hunt
Technical Features Editor Elaine Richards G4LFM
Technical Projects Sub-Editor Richard Ayley G6AKC
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In the North East,
the shop manager is Hank, G3ASM, the address, 56 North Road, Darlington,
telephone 0325 486121.

In Cambridge,
the shop manager is Tony, G4NBS, the address, 162 High Street, Chesterton, Cambridge,
telephone 0223 311230.

In Cardiff,
the shop manager is Carl, GW0CAB, the address, c/o South Wales Carpets, Clifton Street, Cardiff,
telephone 0222 464154.

In London,
the shop manager is Andy, G4DHQ, the address, 223/225 Field End Road, Eastcote, Middlesex,
telephone 01-429 3256.

In Bournemouth,
the shop manager is Colin, G3XAS, the address, 27 Gillam Road, Northbourne, Bournemouth,
telephone 0202 577760.

Although not a shop, there is a source of good advice on the South Coast, John, G3JYG. His address is Abbotsley, 14 Grovelands Road, Hailsham, East Sussex. An evening or weekend call will put you in touch with him. His telephone number is 0323 848077.

LOWE ELECTRONICS SHOPS are open from 9.00 am to 5.30 pm, Tuesday to Friday and from 9.00 am to 5.00 pm on Saturday. Shop lunch hours vary and are timed to suit local conditions. For exact details please telephone the shop manager.

AR2002 receiver.

Frequency range of the AR2002 is from 25 to 550 and from 800 to 1300 MHz. Modes of operation are wide band FM, narrow band FM and AM. The receiver has 20 memories, memory scan and a search mode which checks frequencies between user designated limits.

The receiver has a push button keypad for easy frequency entry and operation.

A front panel knob allows the listener to quickly step up or down in either 5, 12.5 or 25 kHz steps from the frequency initially chosen.

The AR2002 has a front panel LED bar "S" meter.

There is a front panel 3.5 mm jack socket for headphone use.

A socket for the optional RS232 interface (RC PACK) is provided on the rear panel. The RC PACK consists of an 8 bit CPU with its own ROM and RAM and with your own computer acting as a dumb terminal many additional operating facilities become available. Of course, if you want to write your own programs using the RC PACK as an interface then "the sky's the limit".

AR2002 ..... **£435.00 inc VAT,** carriage £7.00
RC PACK ..... **£221.00 inc VAT,** carriage £7.00

data equipment.

CD600 . . . . . RTTY, CW, ASCII, TOR, AMTOR decoder, output for UHF television, monitor and printer, can also be used as morse tutor ..... **£188.19 inc VAT,** carriage £7.00

CD670 . . . . . A higher specification RTTY, CW, ASCII, TOR, AMTOR decoder complete with liquid crystal dot matric display, variable RTTY shift, normal/reverse mode switch, outputs for TV, monitor and printer and can also be used as morse tutor ..... **£286.73 inc VAT,** carriage £7.00

CD660 . . . . . Similar to the CD670 but without the built-in display ..... **£231.79 inc VAT,** carriage £7.00

DAIWA meters.

CN410M . . . 3.5 to 150 MHz, forward 15/150 W, reflected 5/50 W, SO239 connectors ..... **£53.28 inc VAT,** carriage £1.50

CN460M . . . 140 to 450 MHz, forward 15/150 W, reflected 5/50 W, SO239 connectors ..... **£57.73 inc VAT,** carriage £1.50

NS448 with remote head . . . 900 to 1300 MHz, forward 5/20 W, reflected 1.6/6.6 W, N type connections ..... **£75.00 inc VAT,** carriage £2.50

NS660P with switchable meter reading (average, normal PEP and hold PEP) and provision for optional remote head (U66V), 1.8 to 150 MHz, forward 15/150/1500 W, SO239 connectors ..... **£99.50 inc VAT,** carriage £2.50

U66V remote head, 140/525 MHz, max 300 W, N type connectors ..... **£48.00 inc VAT,** carriage £1.50

SC20 extension cable for U66V, approx 20 metres long **£25.85 inc VAT,** carriage £1.50

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send £1 for complete mail order catalogue.

top of the range, the TRIO TS940S.

Top of the range, the TS940S has every operating feature that the discerning HF operator needs. Amateur bands from 160 to 10 metres plus a general coverage receiver tuning from 150 kHz to 30 MHz. Modes of operation are USB, LSB, CW, AM, FSK and FM. Forty memory channels, each effectively a separate VFO and easy keyboard frequency entry make operation and ownership of the TRIO TS940S a pleasure.

TS940S ..... £1795.00 inc VAT, carriage £7.00

for today's crowded bands, the TRIO TS930S.

Much has been said and written about the TS930S and it now has a place high in the affection of radio amateurs. Modes of operation are USB, LSB, CW, AM and FSK. Providing full coverage of the amateur bands from 160 to 10 metres and including a general coverage receiver tuning from 150 kHz to 30 MHz, the TRIO TS930S is the ideal rig for today's crowded bands.

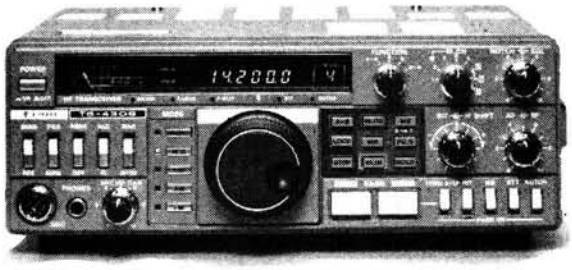
TS930S ..... £1395.00 inc VAT, carriage £7.00

the NEW TRIO TS440S.

A step forward in compact HF equipment, the TS440S covers the amateur bands from 160 to 10 metres and is also a general coverage receiver tuning from 100 kHz to 30 MHz. It has keyboard frequency entry, full and semi break-in on CW, one hundred memories and provision for fitting an internal ATU. Modes of operation are USB, LSB, AM, FM and AFSK.

TS440S ..... £950.00 inc VAT, carriage £7.00

compact performance, the TRIO TS430S.



A compact HF transceiver suitable for mobile or portable operation, yet having all the facilities necessary for effective radio communication. The TS430S covers the amateur bands from 160 to 10 metres and is a general coverage receiver tuning from 150 kHz to 30 MHz. Modes of operation are USB, LSB, CW, AM with FM optional.

TS430S ..... £750.00 inc VAT, carriage £7.00

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JUST BARGAINS Why 'just', because all the items offered below are genuine. S.M.C. are the largest amateur company in Europe and are therefore able to buy at the best prices to provide you with the best bargains and support. S.M.C. the first and only Company who offers both 2-year guarantee and free finance of Yaesu equipment, supports this offer with £100,000 of spares and service engineers. We have more spares and back-up than most amateur companies' total stocks. Buy direct and be content that you have the back-up of the U.K's largest (and one of Europes leading) companies.

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MBM48/70 mult 14dBd	£40.83
MBM88/70 mult 16.3	£55.78
8X7/70 crossed 10dBd	£48.24
12X7/70 crossed 12dBd	£59.28
CR2/23cm cn ref 613.5	£43.70

ICOM

ICV751 HF tcvr	£1399.00
IC745 tcvr	£989.00
IC735 HF tcvr	£899.00
PS35 PSU	£182.85
PS15 PSU	£149.50
PS55 PSU	£185.15
SM6	£39.10
ICR71 Receiver	£789.00
IC271E 2m base	£779.00
IC471E 70cm base	£889.00
Higher power units available	
IC290D All-mode	£519.00
IC27E 2m FM	£399.00
IC47E 70cm FM	£495.00
IC2E 2m	£199.00
IC02E 2m	£299.00
IC04E 70cm	£299.00
BP3 Ni-cad pack	£28.75
LC3 Case	£6.90
LC11 Case	£8.05

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MML144/50S	£106.95
MML144/100S	£149.95
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MML432/50	£149.95
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MMT144/28R	£236.90
MMC435/600	£35.65
MMC50/28S	£35.65
MMC432/28S	£39.90
MMC432/144S	£39.90
MMK1296/144	£129.95

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ELEMENT ONLY, BASE EXTRA

370F 4m 2dB 1/4	£18.50
20W 2m 1/4	£3.00
2NE 2m 5/8 3dB 1/4	£9.00
78F 2m 7/8 4.5dB	£18.60
78B 2m 7/8 ball mt	£18.60
78SF 2m 7/8 short whip	£18.60
88F 2m 5.2	£24.10
258 70cm 5.5dB 1/4	£29.37
268E 70cm 6dB 1/4	£29.37
358 70cm 6.3dB 1/4	£33.70
70N2DX 2m/70 2.7/5.1	£25.90
2N6M 50/144	£10.47
72SM 2S 2m/70cm	£9.20
38F 2m mobile ele	£10.50
HS770 144/432 duplex	£21.30
GCCA Gutter 4m cble	£12.65
SOCA 4m cable + PL259	£6.90
SOCAL 6m cable + PL259	£7.20
SOCALLR 4m long reach	£8.60
TMCAS trunk mount 6m	£11.75
TMCA H.D. trunk mt	£16.10
SOMM magnetic mt 4m	£12.45
SOWM adj wing mount	£6.00
GCD gutter d/l adj	£6.45
BSD bumper strap	£11.50
HS88BK bumper mt ext	£23.35
CARRIAGE EXTRA £2	
BASES FREE WITH ELEMENTS	

OSCAR BASE ANTENNAS

GDX1 Discone 80-480	£51.00
GDX2 Discone 50-480	£64.00
GDXA Discone 100-440	£43.00
VHFL Discone Rx only 65-520	£21.00
GP23 2m vrt 7.8dB 1/4	£51.00
GP144W 2m vrt 6.4dB 1/4	£35.00
GPV144DX 2m vrt s/s 6.4dB 1/4	£46.00
GPV5S 2m vrt h.duty 64 dB 1/4	£37.00
GP2M grnd plane 3.4	£24.00
SQ144 SWS quad vert	£68.00
GP432X 70cm vrt 13.4	£38.00
GP714 70cm vrt 10dBi	£90.00
70N2V 2m/70cm2.8/5.7	£40.00
HS770 144/70 duplxr	£21.30
LT606 log 50-500MHz	£163.00
OSCAR CARRIAGE PAID	

MET ANTENNAS

432158 40cm 5 ele.	£16.95
432/17X 70cm crossed	£49.17
432/17T 70cm 15dB	£32.20
144/19T 70cm 14.2dBd	£55.88
50/5 6M 5 ele.	£59.90
CARRIAGE EXTRA £2.65	

JVL QUADLOOP

144-16QL 2m 16dBd	£
144-26QL 2m 18.5dBd	£
432-19QL 70cm 16.5	£45.00
432-27QL 70cm 18.5	£65.00
1296-26QL 23cm 18.5	£49.00
1296-47QL 23cm 22	£79.00
2320-44QL 13cm 21	£49.00
CARRIAGE EXTRA £2.50	

BNOS

25Amp P.S.U.	£149.00
40Amp P.S.U.	£296.00
2M 3/50 no pre-amp	£108.00
2M 10/50W no pre-amp	£108.00
2M 1/100W	£181.00
2M 3/100	£181.00
2M 10/100	£157.00
2M 25/160	£217.00
70cm 3/50	£235.00
70cm 10/50	£195.00
70cm 10/100	£335.00

COAX CABLE

LDF250R	£3.68/M
LDF450R	£4.43/M
UR4350R	£31p/M
UR7650R	£32p/M
UR6750R	£69p/M
UR7075R	£32p/M
UR3975R	£56p/M
UR5775R	£71p/M
CARRIAGE £1 UP TO 20 MTRS	
£2.50 OVER 20 MTRS	

COAX CONNECTORS

UHF COAX PLUGS:	
PL259 UR67/RG8	£0.66
PL259P UR67 push fit	£0.93
UR175 reducer 50	£0.18
UR176 reducer 75	£0.18
PL259R reducer 50	£0.77
PL259A de luxe UR67	£3.25
PL259B de luxe UR43/76	£2.58
PL259E L angle 5mm	£1.05
PL259M metric	£0.88
UHF COAX SOCKETS:	
SO239F 4 hole fix	£0.66
SO239F100 de luxe	£1.71
SO239T 2 hole fix	£0.62
SO239NI nut inner	£0.75
SO239NO nut outer	£0.75
SO239E free angle SM	£1.38
PL258 back/B female	£1.05
PL274 back/B chassis	£1.50
PL/PL back/B male	£1.71
M359 elbow m/f	£1.60
M358 T2F/1M	£1.92
M358AF T3F	£2.15
M458 3F/1M	£3.14
N PLUGS 50 OHMS:	
UG536 small	£2.31
UG21 large	£2.27
N SOCKETS 50 OHMS:	
UG58 4 hole	£1.51
NSNI nut inner	£1.63
UG1052 free small	£2.42
UG23 free large	£1.94
N ADAPTORS:	
UG107 T2F/1M	£4.39
UG28 T3F	£3.80
UG57 double male	£3.52
UG29 double female	£2.58
UG27 elbow f/m	£2.81
INTERSERIES CONNECTORS:	
UG255 uhfs-bncp	£2.04
UG273 uhfp-bncS	£2.04
UG146 uhfs-'N'P	£3.14
UG83 uhfs 'N'S	£3.14
SO/NF uhfs 'N'S	£3.14
UG201 'N'-bncS	£3.80
UG349 'N'-bncP	£3.80
UG606 'N'S-bncS	£3.30
POST AND PACKING 65p	

MORSE KEYS

HK703 straight key	£29.35
HK704 straight key	£19.95
HK706 straight key	£19.35
HK707 straight key	£18.25
HK710 straight key	£39.95
HK808 straight key	£58.65
HK711 knee key	£34.50
HK802 straight key	£86.30
HK803 straight key	£82.65
HK804 straight key	£78.25
MHK831 st & squeeze	£189.00
BK100 mech. bug	£31.00
MK701 single paddle	£28.50
MK702 single paddle	£29.95
MK703 squeeze	£31.00
MK705 squeeze	£27.60
MK706 squeeze	£25.30
POST & PACKING £1.50	

MORSE TUTORS

Datong D70 go anywhere battery powered	£56.65
M/M Morse talker	£115.00
M/M Morse Caller	£169.00

TELO MASTS

TELESCOPIC 10ft SECTIONS, GUYED

MAST ONLY

30ft	£43.00	carr £5.00
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There will never be a better time. We will not be able to repeat these prices with new stocks.

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18V 10-80m tppd coil	£51.00
103BA 3 el 10m Yagi	£102.00
105BA 5 el 10m Yagi	£223.00
153BA 3 el 15m Yagi	£138.00
203BA 3 el 20m Yagi	£263.00
204BA 4 el 20m Yagi	£425.00
205BA 5 el 20m Yagi	£500.00
DB10-15 3 el 10-15m	£213.00
TH3JR 3 el 10-20m	£303.00
TH2Mk3 3 el 10-20	£283.00
EX14 5 el 10-20m	£506.00
QK710 40M kit Ex14	£145.00
TH5MK2 5 el 10-20m	£555.00
TH7DXX 7 el 10-20m	£759.00
392S Mod kit TH6-7	£255.00
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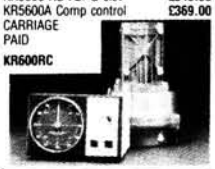
ROTATORS

S.M.C. search the world for only the best rotators. We are pleased to advise the most suitable for your installation.

FU200 Offset	£59.00
KR250 Small bell	£69.00
KR400 Popular bell	£119.00
KR400RC D/L bell	£147.95
KR600RC MD bell	£199.00
AR40 CDE bell	£115.00
CD45 HD bell	£189.95
HAM1V VHD bell	£379.00
KR500 Elevation	£139.95
KR5400 Az. & elev	£240.00
KR5400A Comp. control	£285.00
KR5600 HD Az. & elev	£349.00
KR5600A Comp control	£369.00
CARRIAGE PAID	



KR600RC

COAX SWITCHES

S2U 2way vhf	£11.95
S2N 2way 'N'	£19.45
KP21N 2way 'N'	£27.60
AN2 2way slide	£4.60
AN3 3way slide	£5.00
POST AND PACKING £1.65	

COAX RELAYS

CX120A Cable Entry	£16.90
CX520D 3 'N'	£46.00
CX540D 3 BNC	£46.00
CX600N 3 'N'	£46.00
CX600NJ 4 'N'	£68.00
ALL P&P £1.50	

NEW TRIBANDERS

BUY THE NEW MK.III DB4, TB3, TB2, TB1 WITH S/S FITTINGS FIRST FROM SMC.

DB4 £115 TB3 £250
TB2 £170 TB1 £85

FREE DELIVERY!

DUE TO SPECIAL PURCHASE WE HAVE MARK IIs AT SPECIAL PRICES — PHONE NOW!

POWER METERS

HANSEN + S.M.C.

IN LINE POWER/SWR BRIDGES P.E.P., AVERAGE 1.8-440MHz

The Hansen range covers 30 quality models with top-of-the-line the FS710. This is a flat frequency response, peak envelope power and average in-line wattmeter with many novel features. Notable being the 'power independent' SWR scale – no forward power calibration knob, just direct reading SWR.

FS710V	50-150MHz	15/150W	Pep	£107.80
FS50HP	1.8-60MHz	20/200/2000W	Pep	£106.70
FS50VP	50-150MHz	20/200W	Pep	£106.70
FS500H	1.8-60MHz	20/200/2000W	Pep	£81.95
FS500V	50-150MHz	20/200W	Pep	£81.95
FS300V	50-150MHz	20/200W		£53.50
FS601M	1.8-30MHz	20/200W	Pep	£62.15
FS603M	430-440MHz	5/20W	Pep	£62.15
FS210	1.8-150MHz	20/200W	Auto/SWR	£65.50
FS301M	2-30MHz	20/200W		£42.25
FS301MH	2-30MHz	200/2000W		£42.25
FS711H	2-30MHz	20/200W	Head/Display	£43.65
FS711V	50-150MHz	20/200W	Head/Display	£43.65
FS711U	430-440MHz	5/20W	Head/Display	£43.65
FS5E	3.5-150MHz	20/200/1000W	HF	£42.75
FS5S	1.8-150MHz	20/200/2000W	HF	£42.75
SWR3E	3.5-150MHz	20/200/1000W	HF	£28.75
SWR50B	3.5-150MHz	Twin Meter		£30.50
FS20DL	3-150MHz	1/10W		£43.65
FS20D	3-150MHz	5/20W		£43.65

JD

JD110	1.5-150MHz	10/100W	£16.50

SMC

S3-30L	Mini (CB style)		£9.20
T3-170L	3.5-170MHz	Relative	Twin Meter £17.25

T3-170L

FS500

CARRIAGE PAID POST

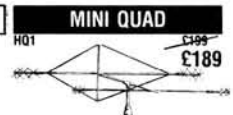
WALL BRACKETS

QUALITY GALVANISED

W12"	£8.75	p&p £2.95
W18"	£11.17	p&p £3.75
W21"	£12.07	p&p £3.75
W24"	£13.88	p&p £3.75

MINI QUAD

HQ1 ~~£199~~ £189



6-20M 12ft ele
Boom only 4.5ft
Carriage £4.00
or G4MH mini beam
only **£88.50** carr £4.50

FREE FINANCE
On many regular priced items SMC offers Free Finance (on invoice balances over £120). 20% down and the balance over 6 months or 50% down and the balance over a year. You pay no more than the cash price! **details on eligible items on request.**

SMC SERVICE
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Securicor 'B' Service contract at £5.00
Biggest stockist of amateur equipment.
Same day despatch possible.

GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-five years of professional experience.
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BARCLAYCARD VISA

AGENTS
JOHN DOYLE, TRANSWORLD COMMS, NEATH (0639) 52374 DAY (0639) 2942 EVE **JACK McVICAR, SCOTCOMMS, EDINBURGH 031 657 2430**

TWO FOR THE ROAD.

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

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

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

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

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

→» Rx Range 138-174 MHz.«←

IC-290D/490E Mobiles

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

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

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

British TELECOM Approved Dealer for Mobile Phone Division
Cellnet

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ICOM

Total coverage..100kHz to 2GHz!

IC-R7000.

The R71E now has a team-mate – the IC-R7000. With these matching receivers it is now possible to tune from 100KHz-2GHz.

The IC-R7000 covers Aircraft, Marine, FM Broadcast, Amateur Radio, Television and weather satellite bands. The IC-R7000 incorporates FM wide/FM narrow, AM, USB and LSB modes of operation with six tuning speeds:- 0.1, 1.0, 5, 10, 12.5, and 25KHz. Frequency coverage 25-1000MHz and 1025-2000MHz (25-1000MHz and 1260-1300MHz guaranteed specification). With the IC-R7000 you have normal tuning capability with the front panel tuning knob or for quick tuning of a desired frequency by using the front panel key-pad. A total of 99 memory channels are available for storage of received frequencies and operating mode. Memory channels can be called up by pressing the memory switch then rotating the memory channel knob or by direct keyboard entry.

These receivers are available seperately but together would make a superb listening station for the shortwave listener or licensed amateur.

A sophisticated scanning system provides instant access to specific frequency ranges. By depressing the Auto M switch, the IC-R7000 automatically memorises frequencies that are in use whilst in the scan mode and can be recalled later. The scanning speed is adjustable and the scanning system includes memory selected frequency ranges or priority channels. All functions including memory channel readout are clearly shown on a dual-colour fluorescent display with dimmer switch. Other features include dial-lock, noise blanker, S-meter and attenuator.

Options include: RC12 infra red controller, EX310 voice synthesizer, SP3 and SP7 external loudspeakers, HP1 headphones and the ICOM AH-7000 super wideband discone antenna.

The IC-R71E is a general coverage receiver 100KHz-30MHz featuring direct keyboard frequency entry and infra-red remote controller (optional). SSB, AM, CW, RTTY and FM (optional) modes of operation. With 32 programmable memory channels, twin VFO's scanning systems, selectable AGC, noise blanker, pass band tuning and a deep notch filter. Keyboard frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency is altered without changing the main tuning control. Options include: EX257 FM unit, RC11 infra-red controller, CK70 D.C. adaptor for 12 volt operation, CW filter options and a high stability crystal filter, SP3 and SP7 external loudspeakers, EX310 voice synthesizer, HP1 headphones.

Computer Control These receivers can be connected to a computer terminal via a suitable interface.
JT602 Serial Interface for IC-R7000.
JT603 Parallel Interface for IC-R71E (IC-R7000).
The ICOM IC-R71E requires the IC-EX309 interface connector

IC-R71E.

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ICOM

IC-751A, The New ICOM HF Flagship.

ICOM are proud to launch their new flagship. The IC-751 was good, the new IC-751A is even better, with a general coverage receiver from 100KHz-30MHz, it is a full featured all mode solid state transceiver that covers all the WARC bands. The IC-751A has an excellent 105dB dynamic range and features pass band tuning, a 9MHz notch filter, adjustable AGC, noise blanker, RIT and XIT. A receiver pre-amp provides additional sensitivity when required. On C.W. the electronic keyer is standard, QSK rated up to 40 w.p.m. The FL32A 9MHz/500Hz CW filter is fitted and CW sidetone on RX and TX modes. On SSB the new FL80 2.4KHz high shape factor filter is fitted.

A high reliability transmitter full 100% duty cycle designed for SSB, CW, AM, FM, RTTY and AMTOR, with a high performance compressor for better audio clarity. With 32 memory channels and twin VFO's scanning of frequency and memories is possible from the transceiver or the HM36 supplied.

The IC-751A is supplied for 12 volt operation but can be used with either an internal or external A.C. power supply. It is fully compatible with ICOM auto units such as the IC-2KL linear amplifier and the AT500/100 antenna tuners.

Options available: PS35 internal AC power supply, PS15 external power supply, EX310 voice synthesizer, EX309 microprocessor interface connector, SM8 and SM10 desk mics, SP3 and SP7 external speakers and GC5 world clock.

The SM10 desk top microphone consists of an electret condenser microphone element with a compressor amplifier plus tunable equaliser for maximum control of the audio characteristics of your transmitted signal. The SM10 is highly sensitive and produces clean crisp audio.

SM10 Desk mic.

ICOM HF Filter selection guide:

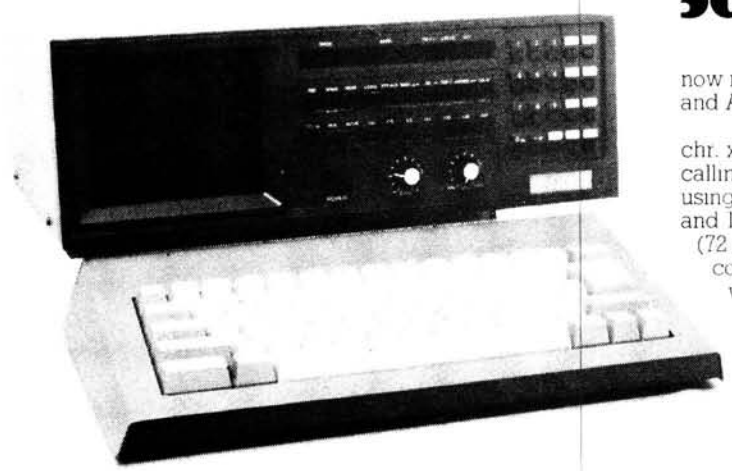
Transceiver	Mode	Desired Filter Bandwidth	Optional 455KHz Filter Selection (1st Choice)	Optional 9MHz Filter Selection	Special Notes
IC-751A	CW	500Hz	FL-52A	FL-32*	Must remove FL-32 filter to install FL-63 or FL-33.
	CW	250Hz	FL-53A	FL-63	Signal loss with FL-63 is 4dB less than FL-32.
	AM	5.2KHz	–	FL-33	PBT control is not effective when FL-33 is selected.
IC-745	CW	500Hz	FL-52A	FL-45	Add FL-52A before adding FL-45.
	CW	250Hz	FL-53A	FL-54	Add FL-53A before adding FL-54.
	SSB	2.4KHz	FL-44A	–	High skirt selectivity SSB filter. Replaces standard ceramic filter.
IC-735	CW	500Hz	–	FL-32	
	CW	250Hz	–	FL-63	Signal loss with FL-63 is 4dB less than FL-32.

* FL-32 is factory installed in IC-751A.

TONO

RTTY Morse and Amtor.

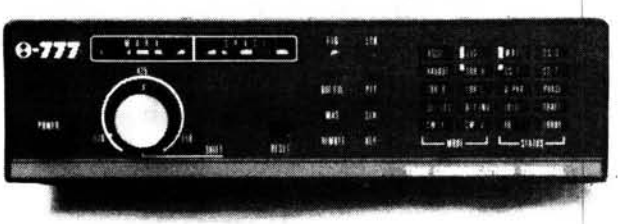
Short wave listeners and amateurs are able to take more interest in other modes of transmission than speech with the range of decoders and senders available. As well as amateur transmissions there is an abundance of news and other interesting broadcasts which can be read using these terminals. As U.K. importers of Tono products we can offer you a complete send and receive system with memories and built in displays or outputs for a high definition VDU.



5000E, Sender/decoder.

From the famous TONO stable comes the new THETA-5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASC11.

Features include - 5" high resolution monitor displaying 400 chr. x 16 lines x 2 pages, ARQ/FEC, time clock. Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTl level), 3 shifts (170, 425 and 850Hz) and two tones (2125 and 1275Hz); manual or automatic TX/RX. Battery back-up memory (72 chars x 7 channels and 24 chars x 5 channels); type ahead correctable buffer memory; Morse code 5-100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A,B, and L – the list goes on and on... Power requirements by the way are AC mains or 13.8v DC.



777, Computer interface.

The Theta-777 is an advanced code converter designed with Tono's computer technology. The unit automatically sends/receives morse code (CW), baudot code (RTTY), ASC11 (RTTY) and Amtor (ARQ/FEC/SEL-FEC). The built in RS232 and TTC level interface enables you to use in combination with most computers. Morse code transmitting speed set at any rate between 5-100 wpm, with autotracking on receive. For baudot and ASC11 codes 12-300 bauds when using RTTY modem and 12-600 bauds when using TTL levels. The send and receive switching of a transceiver is done automatically with the computer control. The buffer memory can store the message as written from the keyboard instead of sending them immediately. The stored message can then be sent by keyboard command. A transceiver without FSK function can transmit RTTY mode by using the high stability crystal controlled modulator controlled by the computer.

We also stock the Tono range of VHF/UHF linear amplifiers with GaAs pre-amp. For further details of Tono equipment contact Thanet Electronics Limited.

Telephone us free-of-charge on:

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Mon-Fri 09.00-13.00 and 1400-17.30

This is strictly a helpline for obtaining information about or ordering ICOM equipment. We regret this service cannot be used by dealers or for repair enquiries and parts orders. Thank you.

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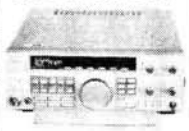

£1,000

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+ OPTIONAL FRV8800 CONVERTOR
GEN. COV.

DRESSLER ARA 500 ACTIVE ANTENNA

50MHz to 1300MHz
Gain 17dB Typical

TECHNICAL SPECIFICATIONS FOR ARA 500

Gain	17dB Typical (14-17dB)
Frequency Range	50-1300MHz
Noise Figure	1dB at 50-180MHz 1.5dB below 300MHz 2.0dB below 350MHz 2.7dB below 400MHz 3.0dB below 500MHz 3.8dB below 650MHz

£110.00

Operation is possible up to 1300MHz with gain of 10dB

Noise 4-6dB

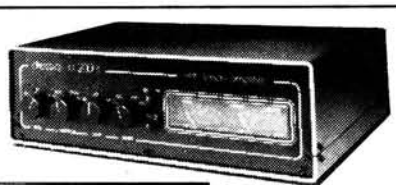
Intercept Point 3rd Order: +18dbm at Input

PRE-AMPS – NEW MODELS

MODEL	FREQ.	NOISE	GAIN	POWER	PRICE
EVV1296S	1.25-1.3GHz	0.7-0.9	16-19dB	100W	£149
EVV1296C	1.25-1.3GHz	0.9-1.2	16-18dB	100W	£129
EVV1296	1.25-1.3GHz	1.9-2.1	14-17dB	100W	£110
EVV700	430-440MHz	0.5-0.9	15-18dB	500W PEP	£99
EVV2000FB	144-146	0.6-0.9	16-18dB	1000KW PEP	£99
EVV200FB	144-146	0.6-0.9	16-18dB	700W PEP	£89
EVV2000GAAS	144-146	0.6-0.8	16-18dB	1KW PEP	£99
EVV200GAAS	144-146	0.6-1	16-18dB	700W PEP	£89
EV2GAAS	144-146	0.6-0.9	15-18dB	100W PEP	£66
VV INTERFACE FOR ABOVE PRE-AMPS					£23

RECEIVE PRE-AMPS

MODEL	FREQUENCY	NOISE	GAIN	PRICE
EWPA 560	50-600-1GHz		16.5dB-1dB	£69
IP3 order	+18dBM			
ERPA 1296	1.25-1.30	0.8	17-18dB	£77
ERPA 435	430-440	0.5	15-18dB	£69
ERPA 144	144-146	0.7	16-18dB	£69

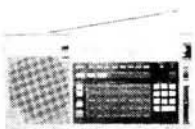


LINEARS

D200	2 MTR 500W SSB	£749
D200S	2 MTR 750W SSB	£879
D70	70 CMS 550W SSB	£899

SONY AR2001 RECEIVER

76MHz-108MHz
116-136MHz
150kHz-30MHz
AIRCRAFT FM
AM SSB 32 MEMORIES
EXCELLENT VALUE
INC: PSU, CARRY STRAP.



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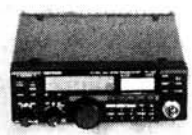

P.O.A.

£385

dressler – ara 30 – active antenna

200 kHz . . . 40 MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glass fibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £110. See Review in August Issue p.15

MUTEK SPECIALISTS — MET & JAYBEAM ANTENNAS

WHAT MAKES THIS DECODER WORTH £1500?

To be able to answer that question it is necessary to appreciate the different parameters that have to be determined when attempting to decode an RTTY signal. Valuable time can be wasted setting the speed, shift and phase but the AFR series of decoders determines all of these automatically – within 5 seconds of tuning in the station!
The **POCOM** is the first **RTTY** reception device to become available on the consumer market that automatically synchronizes to the incoming signal without the operator having to select the baud rates and phase (normal/reverse). One press of the AUTO button is all that is needed. However, the **POCOM** does not offer ease of operation at the expense of quality. Inside the AFR there is a novel quadrature detector that is of the same type as is used in professional equipment and the demodulator is capable of accepting all offsets between **50** and **1000Hz.** Additionally, most rates up to **300** bauds can be decoded (including the **200** baud ASCII press service).
The linear modulator uses an unusual tuning indicator in the form of a 16 bar l.e.d. display. The indicated value shown on this display is derived from the actual frequency deviation and tuning the receiver is incredibly simple, far easier than the old-fashioned two blinking l.e.d. method that has been common up until now. Even using an oscilloscope would not make the tuning any easier.
Naturally the **POCOM** is microprocessor controlled and this allows the use of extremely high sampling rates (**1600** times a second) in order to guarantee a secure evaluation of the receive data characters, even under disturbed propagation conditions.
As well as **BAUDOT** and **ASCII**, the **POCOM** is capable of decoding MORSE CODE, TOR and **ARQ/FEC (SITOR, AMTOR, SPECTOR)** and can even cope with the special **FEC** codes that are used by various international government departments.
In the **ARQ/FEC** modes there is a steady automatic post synchronization in order to prevent running time shifts which can cause received character error.
As the **POCOM** is microprocessor controlled, future developments can be easily incorporated by simply replacing the **EPROM.**
The **POCOM** is so easy to use that it is ideal for shortwave listeners and radio amateurs as well as commercial users such as Press Agencies, Embassies, ship and boat owners and so on.
The standard **POCOM AFR 2010** decoder is available for just **£533:84.**

The POCOM AFR 2010 is ready to go in its standard form, but for the specialist user who may want to decode some of the more unusual signals that are to be found, a range of expansion boards is available. These just plug into the 2010 and turn it into what must be the most versatile decoder on the market.

	AFR-2010
RTTY Baudot CCITT No. 1 Standard 45/50/57/75/100/150/200 Baud	OPTION
RTTY Baudot CCITT No. 2 Standard 45/50/57/75/100/150/200 Baud	YES
RTTY Baudot CCITT No. 1 Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
RTTY Baudot CCITT No. 2 Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
RTTY Baudot CCITT No. 1 Bit-Inversion, Variable 30-250 Baud, Accuracy 1/1000 Baid	OPTION
RTTY Baudot CCITT No. 2 Bit-Inversion, Variable 30-250 Baud, Accuracy 1/1000 Baid	OPTION
RTTY 8 Channel 200 Baud Press Service (SID, KNA, etc.)	YES
NEW RTTY CODE 8 Channel 200 (300 Baud) Press Service (DPA, VWD, etc.)	OPTION
RTTY ASCII CCITT No. 5 Standard 110/150/200/300 Baud	YES
RTTY ASCII CCITT No. 5 Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
RTTY Baudot Synchron-Printer, Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
RTTY Baudot Mode 32, Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
RTTY Autospec, Variable 30-250 Baud, Accuracy 1/1000 Baud	OPTION
MORSE (CW) 15-250 Characters Per Minute (CPM)	YES
TOR (SITOR/SPECTOR/AMTOR, ARQ-FEC according to CCIR 476-2), 100 Baud	YES
ARQ Multi Channel (Time Div. Multiplex, Moore) 2 Sub-channels 86, 96, 100 Baud	OPTION
ARQ Multi Channel (Time Div. Multiplex, Moore) 4 Sub-channels 172, 192, 200 Baud	OPTION
ARQ Multi Channel (TDM) Mode PLEX 2 Sub-channels 86, 96, 100 Baud	OPTION
ARQ Multi Channel (TDM) Mode PLEX 4 Sub-channels 172, 192, 200 Baud	OPTION
ARQ One Channel Standard 48, 64, 72, 85, 96 Baud	OPTION
FEC System with 7 BIT Code according to CCITT No. 3, 96, 100, 192, 200 Baud	OPTION
FEC System with 7 BIT Code Self Checking (Convulgenter Code) 30-250 Baud	OPTION
FEC System with 7 BIT Code according to CCITT No. 3, 30-250 Baud	OPTION
BIT ANALYSE (Analysis of received BIT format)	OPTION
AUTO SPEED-CHECK Baud Rate Indication 30-250 Baud with 1/1000 Baud Accuracy	YES

The price of individual expansion units is available on request and a fully expanded AFR 2010, capable of decoding virtually any transmission in any mode, costs about £1500.

This ad cannot really do justice to this marvellous piece of equipment, so next time you are in the area, come in and try it for yourself – you will be convinced.

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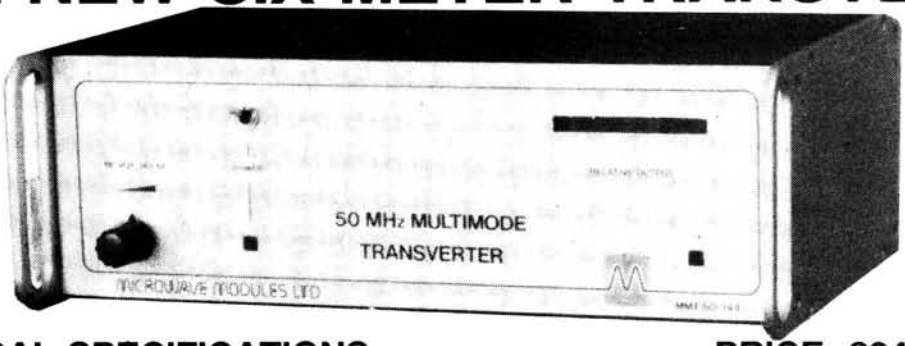
VISA Access

MICROWAVE MODULES LTD

THE NEW SIX METER TRANSVERTER



TECHNICAL SPECIFICATIONS

PRICE: £245.00 inc VAT

TRANSMIT POWER OUTPUT OF 20 WATTS – This power level of 20 watts, when used in conjunction with a typical antenna of 7 dB gain, gives an ERP of 100 watts (the maximum permissible in UK). This power level is also ideal for driving a grounded-grid amplifier.
PURITY OF TRANSMISSION – The MMT50/144 transverter has been optimally designed to ensure that spurious radiations falling with the 88-108 MHz broadcast band are typically better than 90 dB below full output. This has been achieved by the use of 16 poles of filtering, well-balanced mixing and push-pull amplification.
EXCEPTIONAL LARGE SIGNAL RECEIVER PERFORMANCE – The 50 MHz transverter enjoys a uniquely high overload characteristic of typically + 12 dB (third order intercept point at transverter input). This has been achieved by the use of parallel FET's in the front end driving a balanced pair of FET's in the mixer. Given that the background sky noise at this frequency represents an equivalent noise figure of greater than 8 dB, the low noise figure achieved in the transverter ensures that external noise is the limiting factor. The conversion gain of 10 dB is provided to ensure that the 144 MHz transceiver in use will detect the weakest of signals, while not being subjected to overload in the presence of strong signals on the 50 MHz band. In other words, a system of impressive dynamic range is guaranteed!
FURTHER FEATURES – The transverter will accept a drive level at 144 MHz of between 150 milliwatts and 15 watts. The automatic level control (ALC) ensures that the 20 watt output signal is of consistently high quality. An LED bargraph display indicates the relative transmit output power, and the RF VOX control allows the operator to select the "hang" time to anything from 20 milliseconds to 1.5 seconds.

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Prices: **FL2 £89.70, FL3 £129.37, FL2/A £39.67**

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- very compact, only 3 metres overall length. ● professional performance standards.

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DY802	1.50	EY86	1.75	PY81	1.50	6AN8A	3.50	6L7	2.50
E88CC	10.33	EY88	1.75	PY82	1.50	6AQ5	3.25	6LQ6	7.50
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EBF80	1.50	GZ32	4.00	PY801	1.50	6AU5GT	5.00	6SJ7	3.25
EBF89	1.50	GZ33	4.75	QQV02-6	35.70	6AU6	2.50	6SK7	3.50
EC91	8.00	GZ34	4.00	QQV03-10	26.25	6AW8A	3.75	6SL7GT	3.00
ECC33	4.50	GZ37	4.75	QQV03-20A	48.38	6B7	3.25	6SN7GT	3.00
ECC35	4.50	KT61	5.00	QQV06-40A	46.00	6B8	3.25	6SS7	2.75
ECC81	1.75	KT66	15.00	QV03-12	6.80	6BA6	1.50	6SQ7M	2.50
ECC82	1.75	KT77 GOLD	12.00	R18	3.00	6BA7	5.00	6U8A	2.25
ECC83	1.75	KT88 LION	20.00	R19	9.24	6BE6	1.50	6V6GT	4.25
ECC85	1.75	N78	15.00	SP41	6.00	6BH6	2.50	6X4	3.00
ECC88	3.50	OA2	3.25	SP61	4.00	6BJ6	2.25	6X5GT	1.75
ECC91	8.93	OB2	4.35	U19	13.75	6BN6	2.00	12AX7	1.75
ECF80	1.50	OC3	2.50	U25	2.50	6BQ7A	3.50	12BA6	2.50
ECH35	3.00	OD3	2.50	U26	2.50	6BR7	6.00	12BE6	2.50
ECH42	3.50	PC86	2.50	U37	12.00	6BR8A	3.50	12BY7A	3.00
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ECL80	1.50	PC92	1.75	UBF89	1.50	6BW6	6.00	12HG7	4.50
ECL82	1.50	PC97	1.75	UCH42	2.50	6BW7	1.50	30FL1/2	1.38
ECL83	3.00	PC900	1.75	UCH81	2.50	6BZ6	2.75	30P4	2.50
ECL86	1.75	PCF80	2.00	UCL82	1.75	6C4	1.25	30P19	2.50
EF37A	5.00	PCF82	1.50	UCL83	2.75	6C6	3.50	30PL13	1.80
EF39	2.75	PCF86	2.50	UF89	2.00	6CB6A	2.50	30PL14	1.80
EF41	3.50	PCF801	2.50	UL41	5.00	6CD6GA	5.00	572B	55.00
EF42	4.50	PCF802	2.50	UL84	1.75	6CL6	3.75	805	45.00
EF50	2.50	PCF805	1.70	UY41	2.25	6CH6	13.00	807	3.75
EF54	5.00	PCF808	1.70	UY85	2.25	6CW4	8.00	811A	18.33
EF55	3.50	PCH200	3.00	VR105/30	2.50	6D6	3.50	812A	35.00
EF80	1.75	PCL82	2.00	VR150/30	2.50	6DQ5	6.50	813	65.00
EF86	3.50	PCL83	3.00	Z759	25.00	6DQ6B	4.75	866A	35.00
EF91	2.95	PCL84	2.00	Z803U	25.00	6EA8	3.00	872A	20.00
EF92	6.37	PCL85	2.50	2D21	3.25	6EH5	1.85	931A	18.50
EF183	2.00	PCL86	2.50	3B28	50.00	6F6	3.00	2050	7.50
EF184	2.00	PCL805	2.50	4CX250B	58.00	6GK6	2.75	5763	4.50
EH90	1.75	PD500	6.00	5R4GY	5.50	6H6	3.00	5814A	4.00
EL32	2.50	PFL200	2.50	5U4G	3.00	6HS6	3.77	5842	12.00
EL33	4.00	PL36	2.50	5V4G	2.50	6J5	4.50	6080	14.00
EL34	4.00	PL81	1.75	5Y3GT	2.50	6J6	8.93	6146A	12.00
EL36	2.50	PL82	1.50	5Z3	4.00	6J7	4.75	6146B	12.00
ELL80	19.00	PL83	2.50	5Z4GT	2.50	6JB6A	5.00	6550	8.00
EL81	5.25	PL84	2.00	6/30L2	1.75	6JE6C	7.50	6883B	12.50
EL84	2.25	PL504	2.50	6AB7	3.00	6JS6C	6.00	6973	7.50
EL86	2.75	PL508	5.50	6AH6	5.00	6K4N	2.50	7025	3.00
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IC 751A

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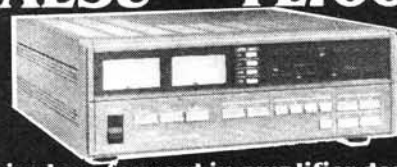
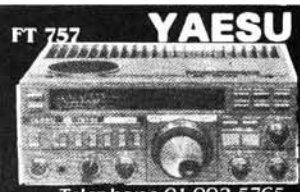


A major leap forward in amplifier design YAESU's new HF fully automatic unit will soon be available and introduces a whole new approach to transistor use at high power. Incorporates fully automatic antenna coupling and band changing! FULL DETAILS NOW AVAILABLE — WRITE OR PHONE 01-992 5765

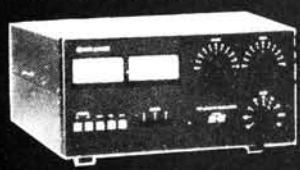
FT 757 YAESU



Telephone 01-992 5765 for latest information on the YAESU value for money high performance equipment. Full range of accessories available.

FT 980

NEW **THE TOKYO TRIPLETS . . .** EXPECTED EARLY JUNE



Available in June — 3 new HF linears from Tokyo High Power. All Amateur bands with power levels up to 3kw. Call now for details on HL-1KGX, HL-2K and HL-3K. Telephone today: 01-992 5765.

CAPCO S.P.C. 300 ANTENNA COUPLER

We are now sole worldwide distributor of this remarkably robust unit. Will match anything from a piece of wire to a halfwave 160m through to 10m — up to 1kw P.E.P.

ICOM R71
General Coverage Receiver

Keypad entry, 32 memories SSB, AM, RTTY, CW & FM (optional) 0.1-30 MHz. Twin VFO's Scanning, Selectable AGC, noise blanker, pass band tuning and deep notch filter! Super value!!

MASSIVE STOCKS OF MANY HAND HELD TRANSCEIVERS INCLUDING PMR UNITS — CALL 01-992 5765 FOR PRICES AND DESCRIPTIVE LEAFLETS WITH FULL SPECIFICATION.

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Twin VFO's plus keyboard/computer interface control — all mode SSB, CW, AM & FM. Memories, scanning, filters. Includes 2-dimensional LCD, graphical SIMPO.

YAESU FT 770 70 cms TCVR

Extremely rugged, yet highly compact. High visibility display LCD. Dual microprocessor design — two VFO's, 10 memories, flexible scanning, etc. Voice synthesizer option.

— 25W/3W FM

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WITH ANY HF RIG BOUGHT THIS MONTH, TAKE YOUR CHOICE FROM 3, 4 OR 5 BAND VERTICALS — 10 AND 15M QUADS — WHILE STOCKS LAST!

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WRITE ON . . . the page where you have your say

Dangerous Driving?

Sir: Cellular in-car phones are becoming increasingly popular and the daily papers contain numerous photographs of a motorist merrily driving along a busy highway with one hand on the steering wheel and the other holding a mobile telephone. The question I would like to raise is whether he is breaking the law by only having one hand free to control the car.

Many amateurs have been stopped by the police over the past few years, and at least warned if not prosecuted for doing just that very thing—holding the wheel with one hand and a microphone with the other. Will the users of these in-car telephones also be stopped for using them whilst driving?

Douglas Byrne G3KPO
Ryde, IOW

Our understanding is that there is no specific law in the UK regarding the use of hand-held microphones or telephone handsets whilst driving. Any action taken by the police will be under laws requiring a driver to exercise due care and attention, and to have proper control of the vehicle at all times. Driving one-handed whilst negotiating a traffic hazard such as a roundabout or road junction would certainly be frowned upon; on a straight stretch of empty road it would probably be acceptable. Between these two extremes is a wide grey area where a police officer has to exercise his judgment as to whether any offence has been committed. Editor.

Send your letters to our Editorial Office in Poole, the address is on our contents page. We will pay £10 for the Star Letter each month, £5 for any others published. letters must be original and not duplicated to other magazines. The Editor reserves the right to shorten or modify any letter. We regret that we cannot answer letters by post unless accompanied by an s.a.e. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of Practical Wireless.

Using the FET Dipper

Sir: As a subscriber to your magazine I would like to congratulate John Thornton Lawrence GW3JGA for his articles on the PW FET Dip Oscillator (*PW*, Oct and Dec 1985).

I have been using a valve type g.d.o. for 25 years so I appreciate their value to constructors and experimenters. Nevertheless I found Mr Lawrence's December article a very useful guide indeed, explaining some ways of using the instrument that were new to me.

Most of the components for my FET Dipper came from my junk box, so my cost has been barely $15. I followed GW3JGA's design fairly closely, my only problem being that the meter available showed only one-fifth f.s.d. This problem was overcome by replacing Tr2 by a Texas Instruments transistor type 2N1108, which with its higher gain gives well over f.s.d. at maximum of the level control.

As a professional and

PW COMMENT

Cutting it Short

UNDERSTANDING THE MEANING of the various abbreviations involved can be one of the most frustrating parts of learning about any technical subject. Now that electronics has found its way into almost every human activity (well, perhaps not quite *every* one), many people have had to learn a whole new set of abbreviations, to add to the ones used in their own particular trade or profession. That can cause some confusion—take for example the simple abbreviation a.c. or a/c. To someone in the electrical or electronic fields, it means alternating current. In business or banking it means account. In civil engineering it means air conditioning. In aviation circles it means aircraft or aircraftman. In the medical profession it signifies before meals.

Or take the humble letter K. It's the chemical symbol for potassium, and it's also the symbol for the SI unit of temperature, the kelvin. Incidentally, note that although we may have degrees fahrenheit (°F) or degrees Celsius (°C), it's not degrees kelvin. The kelvin is the unit in its own right.

For the small letter k—for kilo—the meaning is "times a thousand" or $\times 10^3$, whereas the capital K has now come to be used (with the blessing of the British Standards Institute) in the field of computing as a multiplier meaning what might be called a "binary thousand". It actually has a value of 1024, which is two raised to the power of ten or 2^{10}. So a computer which is advertised as having 64K of memory can actually store $64 \times 1024 = 65\,536$ bytes of data, and not 64 000 bytes as you might expect.

And of course that letter K is also used in the Morse code as a procedure signal meaning "over to you", or to use the official description, it is the "Invitation to transmit". Because the letter K is used here as the Morse character -·- (dah-di-dah), it does not matter whether you write it down as a capital letter or a small letter, but if we are using it as a multiplier then obviously it does matter, though usually it should be obvious which sort of K (or k) is being talked about. Unfortunately, the wrong one sometimes gets used in magazines or even in manufacturer's literature, by people who should know better.

One place where it is not so obvious whether the correct multiplier has been used is when it is an M (or m). It is most important to get it right, as the capital letter M—for mega—means "times a million" or $\times 10^6$, whereas the small letter m—for milli—means "divided by a thousand" or $\times 10^{-3}$. That's a difference of a thousand million in the value of a component being described, so if you got the wrong one you could be fairly sure the circuit you were building wouldn't work. An example occurs in Part 2 of the article on using the Ferranti DVM Kit, which we publish this month. Several of the shunt resistors used for the current ranges have values in milli-ohms (mΩ), and I can assure you that you won't have much success if you build the project reading those values as megohms (MΩ).

One last example of confusion between small and capital letter abbreviations is the letter S. If you mean it to stand for the SI unit of time, the second, it should be a small s, because the capital S is reserved in the SI system for the siemens, the unit of conductivity which replaced the time-honoured unit called the mho. Getting these two mixed up is a particular favourite of the people who put together brochures and catalogues of test instruments.

Some of you may be wondering about the mystical letters SI which I have mentioned. These stand for *Systeme Internationale* of units, which came about as a result of a recommendation passed at an international conference on weights and measures in 1948. It replaces earlier systems such as the MKS (metre—kilogram—second) and the CGS (centimetre—gram—second) and various "Imperial" systems, which were formerly the basis of engineering measurements, and to which some users still fondly cling. I must admit that I still visualise small lengths in inches, but convert them to millimetres in my head using various rule-of-thumb approximations such as $\frac{1}{8}$in is 3mm, $\frac{3}{8}$in is 10mm, 1in is 25mm and so on. I'm a great believer in the decimal system though, as it makes calculations so much easier where all unit multipliers are powers of ten.

One thing which worries me about the decimal and metric system as it is presently taught in our schools is their use of centimetres. In SI, the recommendation is to use millimetres, metres and kilometres, but *not* centimetres or decimetres, etc. The reasoning behind this is that with steps of a thousand between the recommended units, it should be obvious if a drawing or specification has got the wrong unit attached to it, but this might not always be so with units increasing in tens. Why do schools teach pupils a practice which must be unlearnt when they leave to go to technical college or into the engineering industry, where SI units will be used?

Geoff Arnold

amateur radio man I use my new g.d.o. (g for gate) frequently. I think that articles of this nature are very important in fostering the desire to build, to experiment and to learn, particularly in young people. Keep up the good work.
PS: Regards to *Benny!*

T. Mitchell
Kyneton,
Victoria, Australia

SPACE & SATELLITES, JULY 1986 issue

The recorded bulletin from Lasham Ground Station on 025 683 448 is available out of office hours only, and covers just NOAA. We apologise for any inconvenience to both Lasham Ground Station and readers.

SUBSCRIPTION SERVICE

Please note that our subscription service is now handled from a new address. "Practical Wireless" Subscription Department, Competition House, Farndon Road, Market Harborough, Leicestershire LE16 9NR. Tel: (0858) 34567.

THE BEST OF CQ-TV
Edited by John Wood G3YQC & Tony Marsden G6JAT
Published by the British Amateur Television Club, BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN
100 pages, 149 x 210mm (paperback)
Price £3.50 including p & p

Over the last few years interest in amateur TV has increased many fold. This is good news for such groups as the BATC, but the problems arise when all these people want back issues of the Club magazine *CQ-TV*.

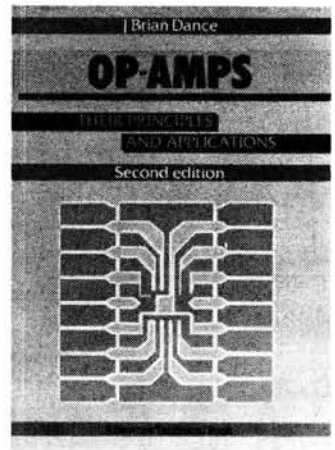
So the solution is this book, hopefully readers will find that it fills a gap in the literature available at the present time.

There are 29 projects in the book covering a wide range of subjects from "In the Studios" to GaAsf.e.t. pre-amps, generators and converters. For some of the projects the p.c.b.s and components are available to members of BATC.

Each project is explained so that the average home constructor could complete them, assuming care is taken! A complete beginner may need help on some of the more complex projects.

For anyone interested in the home construction side of amateur TV then this book is a must, as is membership of the British Amateur Television Club.

OP-AMPS Their Principles and Applications (2nd Edition)
by J. Brian Dance
Published by Newnes Technical Books
102 pages, 137 x 215mm (paperback)
Price £4.95
ISBN 0 600 33372 8



This book is suitable for the home constructor, who should find the non-mathematical and practical approach very useful.

The first 3 chapters deal with applications for the 741, a very well-known and widely used op-amp. There are different ideas for circuits including audio pre-amps, mixers and a Schmitt trigger.

The author also deals with f.e.t. input devices—how they work and what type of circuits they can be used in. Each application has a circuit diagram and component values as well as enough information for the home constructor to build any of the small projects described.

The appendix at the end of the book supplies the readers with a glossary.

OUR SERVICES

QUERIES

Although we will always try to help readers having difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Enefco House, The Quay, Foole, Dorset BH15 1PP,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please. We cannot deal with technical queries over the telephone.

COMPONENTS, KITS AND PCB'S

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for some of our more recent projects are available from **CPL Electronics,** 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE. Tel: 0642 591157. The **printed circuit boards** are available from our new **PCB SERVICE**. For details see p68.

CONSTRUCTION RATING

Each constructional project is given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

Intermediate
A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on his own.

INSURANCE

A special insurance scheme has been arranged for *PW* readers to cover your radio equipment. Details are available from **PW Radio Users Insurance Scheme, B. A. Laymond & Partners, 562 North Circular Road, London NW2 7QZ. Tel: 01-452 6611.**

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1.25 each, including post and packing to addresses at home and overseas (by surface mail).

Binders are available (Price £5.50 to UK addresses, £5.75 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which it is required.

Send your orders to **Post Sales Department, "Practical Wireless', Enefco House, The Quay, Poole, Dorset BH15 1PP.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to Practical Wireless. Access, Mastercard, Eurocard and Visa accepted.

SUBSCRIPTIONS

Subscriptions are available at £13 per annum to UK addresses and £15 overseas, from **"Practical Wireless" Subscription Department Competition House, Farndon Road, Market Harborough, Leicestershire LE16 9NR. Tel: (0858) 34567.** Airmail rates for overseas subscriptions can be quoted on request.

IRTS AGM

The 54th AGM of the Irish Radio Transmitter Society was held just recently.

In the photograph you can see Mike Staunton EI3DY, President IRTS, reading the Society's News Bulletin on the 3·5MHz band at the AGM in Co. Kildare.

The dinner and dance, held on the Saturday evening, was well attended by both EI amateurs and a large contingent from GI too.

More details from ***IRTS, POB 462, Dublin 9.***

Happy Birthday SD

July 3 this year sees the tenth birthday of GB3SD, the 430MHz band repeater in South Dorset. It was one of the first batch of 430MHz band units to go on air, and also one of the stars in the article Amateur Repeaters in *PW* June and July 1981!

The repeater group is fortunate as they have a healthy membership, currently running at 50. So we wish them all the best for the next ten years.

Can You Help

Mrs D. Merrell has written to us as she has a quantity of her late father's *PW* magazines to dispose of. They date from 1952–1985 and she would rather someone had a use for them than throw them away.

Contact: ***Mrs D. Merrell, 101 Bourne Close, Laindon, Essex SS15 6DG. Tel: 0268 411596.***

Thomas Phol DH3AAE has also written to us recently. he is going to be on air on both 144 and 430MHz bands from a QTH in Taunton between July 12 and August 11. He would like to work as many amateurs as possible. On 430MHz it will be 15 watts and on 144MHz it will be 28 watts. Modes to be used are c.w., s.s.b., f.m., RTTY and OSCAR-10.

Another reader writes, "Can anyone help me find a source of old telephone handsets? A few years ago, the older type of robust Bakelite telephone handsets were easily obtainable. I need them for an internal intercom system."

If you can help please contact: ***R. B. Mannion GM3XFD, Badcaul House, Badcaul, Dundonnell by Garve, Ross-Shire, Scotland.***

One of our readers has a Philips Table Radiogram, measuring approximately 15 x 12 x 12in. She needs to obtain an EL4I valve for this radio, can anyone help.

Mrs J. Fell, 5 Fferm Bach Road, Craig-y-Don, Llandudno LL30 1UA. Tel: 70468.

Blank Tape Levy

The government's proposed levy on blank audio tape will have repercussions in the amateur radio world.

Under the proposed legislation all users of blank audio tape will have to pay the levy, probably a nominal 10 per cent, in with the purchase price and then, if they are eligible, claim the payment back.

This will affect such organisations as QTI-TNA, the talking newspaper for visually handicapped radio amateurs, and other similar voluntary organisations.

The Consumers' Association is very worried by the proposed levy which, they believe, could be extended by future governments to cover any recording or copying medium including plain paper which could be used in a photocopying machine!

The Tape Manufacturers Group, representing the interests of blank tape manufacturers in the UK, have been actively opposing the introduction of the levy and have just made known the results of a survey conducted by NOP Market Research into home audio taping.

The survey showed that more than 70 per cent of blank audio tape users record their own records or from radio broadcasts so that they can listen to the recording in their car.

Under present UK copyright law this is illegal. However, with the introduction of the levy the individual would be allowed to copy any recording for his own use. The TMG, however, believe that this is making the user pay twice for the use of copyright material, as they have already paid royalties in the original purchase price giving them the unlimited private use of the record—hundreds of times if they want.

According to the NOP survey heavy buyers of blank tapes are also the heaviest buyers of new records. This proves, says the TMG, that the copyright owners are benefiting from the sale of blank tapes without the need for a cumbersome and undemocratic levy, difficult to administer and seriously affecting groups of users who will find it very difficult to claim their levy money back.

The Tape Manufacturers Group can be contacted at *Aspect Public Relations, 17/19 Foley Street, London W1P 7LH Tel: 01-580 9074.*

New OTH Radar

A supercomputer, the saltiness of the sea and shortwave radio, do not sound like the ingredients for a major breakthrough in air defence.

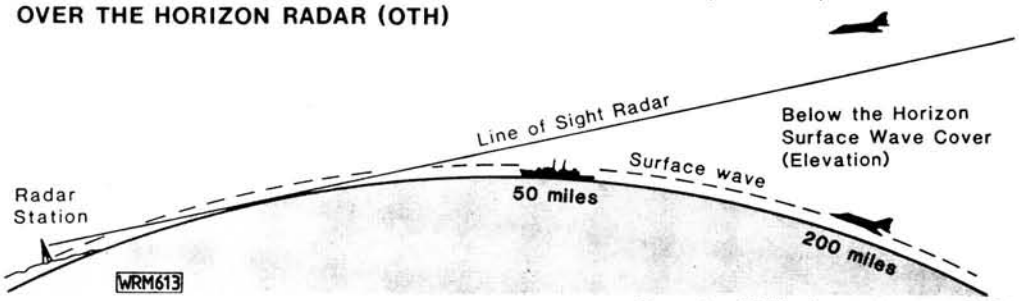
Yet the engineers at Marconi Radio Systems of Chelmsford have developed an over the horizon (OTH) radar that can detect aircraft flying at wave-top height.

As can be seen from the illustration, it's a radar that can see round the the earth's curvature.

The new OTH radar uses shortwave radio to transmit a signal which adheres to the surface and follows the curvature of the earth; target signal return following the reverse path. Targets can be detected up to 200 miles away compared to the 50 or so miles using conventional microwave radars.

The radar engineers have developed an advanced signal processing unit which can handle 10 million decimal computations per second. This means that the new OTH radars have a capacity of 2000 million operations per second.

OVER THE HORIZON RADAR (OTH)



NEWS . . . compiled by G4LFM

The WEIC Awards

This is the first award to be sponsored by the IRTS (Irish Radio Transmitters Society). It may be claimed by licensed amateurs and shortwave listeners worldwide who have worked/heard stations located in different counties of Ireland.

Rules

1: The WEIC Award, issued by the IRTS, is available to licensed amateurs worldwide who have worked stations located in different counties of Ireland (EI/EJ). A list of the counties of EI is given at the end. It is available to s.w.l.s on a "heard" basis.

2: In accordance with IARU Region 1 rules, a claim for the WEIC Award must be accompanied by a QSOs list and by a statement from the applicant's national DX-Awards Manager that correctly filled in QSL cards are in possession of the applicant. If this is not possible the applicant must submit all QSLs concerned. Applicants in Ireland must submit QSLs with the claim.

3: Contacts only on and after 1 January 1982 are valid.

4: There will be a charge of 10 IRCs for the award.

5: There will be no mode or band endorsements.

6: For applicants in EI only: All contacts must be made from the home station. Contacts made via repeaters or while operating mobile, portable or from an alternative address are not reckonable.

Requirements

To work/hear at least 20 of the 26 counties of Ireland (EI/EJ).

Counties

Carlow, Cavan, Clare, Cork, Donegal, Dublin, Galway, Kerry, Kildare, Kilkenny, Laois, Leitrim, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Roscommon, Sligo, Tipperary, Waterford, Westmeath, Wexford, Wicklow.

I think further details can be obtained from: ***Secretary, Irish Radio Transmitters' Society, PO Box 462, Dublin 9.***

Mobile Rallies

July 13: The Sussex Mobile Rally will be held again at Brighton Racecourse. It has almost unlimited free car parking, under the control of Rally Marshalls and the entrance fee is unchanged at £1 (children under 14 free).

So the family don't get bored, there is a free minibus service running regularly to and from the seafront throughout the day. Although the organisers say that there are plenty of things to do on site.

Disabled visitors have free entrance with ramps, lifts and wide gangways for wheelchairs.

PW will be there, of course.

Further details from: ***Mark Spillett G4UAW, 26 Westland, Rustington, Tel: 0903 782594.***

Advance tickets are available from: ***Steve Sims G8NFZ, 71 Green Street, Eastbourne, East Sussex BN21 1QZ.***

Radio Rallies

August 31: Telford Amateur Radio Rally will take place this year at a new venue, the Telford Racquet and Fitness Centre, Telford Centre, Shrops. The doors will be opened at 11am for the general public, but 10.30am for disabled visitors.

All the usual attractions will be there and this year the new venue will provide better facilities for the rally goer.

Don't forget to look out for the *PW* stand—we'll be there again this year.

October 5: The North Wakefield Radio Club's are holding their 2nd mobile rally at Outwood Grange School, Potovens Lane, Outwood, Wakefield. This is off Junction 41 of the M1. There will be all the usual trade stands, bring and buy, Morse tests, films, refreshments and a licensed bar.

Entrance to the rally is free and talk-in provided on S22 for those needing directions.

For more details contact ***G4RCH on Leeds 536633*** or ***G3SPX on Wakefield 828520.***

JEP Electronics

We would like to apologise to JEP Electronics for a price error that crept into their advertisement in recent issues. The gremlins have been hard at work again! The interfaces for the Morse Reader Program (for those computers that need them) should be £2.50 built and tested, inclusive of p&p.

RAE Classes

Swindon: Thursday nights at Oakfield School, Swindon is the place to go for RAE classes. Details from ***Tony Prichard G0CPA (QTHR). Tel: 0793 20734.***

Wednesdays at Dorcan School, Swindon will be the venue for c.w. tuition. Again details from Tony as above.

Halesowen: A 30 week RAE course is being run by Halesowen College, Halesowen on Thursday evenings, 7–9pm. The course starts on September 18 and enrolment is on September 2 and 3.

Further details from ***Colin Prior G60TT. Tel: 021-550 1451.***

SMC on the Move

The well-known amateur radio company South Midlands Communications Ltd is moving to larger premises in early July.

Although the "shop" will move to an industrial site the company say that radio amateurs will find increased parking space on the company's own ground where the car can be left without fear of a parking ticket!

They are planning increased space for demonstrations and a wider range of equipment on display. The move should mean better facility for the display and use of antennas and a complete weather satellite receiving station will be a permanent display feature. This can of course be purchased by those with enough plastic money!

Commonwealth Games

To commemorate the 1986 Commonwealth Games in Edinburgh, the Lothians Radio Society will be organising a special event station for the duration of the games. The callsign in use will be GB8CG, and the station will be active on each of the ten days of the games from a venue in the city near the Meadowbank Stadium.

The station will operate on as many of the h.f. bands as is possible at different times each day to suit prevailing propagation conditions from the UK, and additionally will be using 144MHz f.m. and s.s.b. from what promises to be a fairly good v.h.f. take-off in most directions.

Special QSL cards will be available via the bureau, and whilst the station will be operating QRO, QRP contacts will be welcome and so endorsed. Visiting amateurs are invited to call in on S20 or the local repeater for directions to the venue where coffee might be available with some chat.

Further details from: ***Mel Evans GM6JAG, 56 Southhouse Road, Edinburgh EH17 8EU. Tel: 031-664 5403.***

VHF Pre-amp Kit

If you need to improve your v.h.f. f.m. reception then Electronic & Computer Workshop have a suitable pre-amplifier in kit form.

The kit is claimed to be simple to build and you end up with a metal-housed unit giving 22dB gain from 10 to 150MHz operating from an unstabilised power supply of 12 to 15V d.c. which can be fed either direct or via the coaxial cable. Supply current is of the order of 1 to 3mA.

The kit, K2622, costs £8.84 incl. VAT and postage from ***Electronic & Computer Workshop Ltd., 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.***

More Power Supplies

Global Specialties have just introduced a low-cost bench power supply specifically for use by designers, technicians, educational establishments and hobbyists.

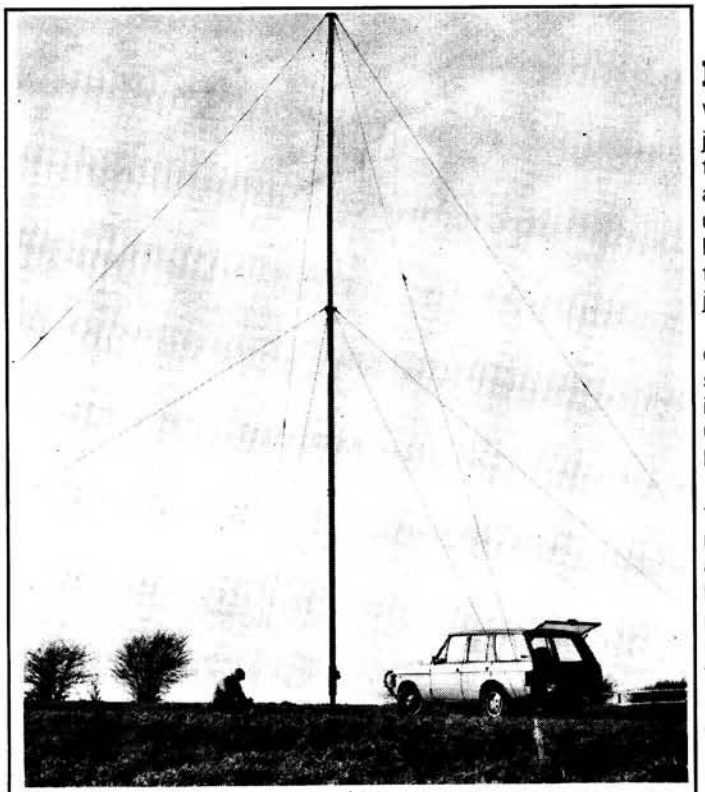
The Model 1300 has a fixed output of 5V d.c. ±0·25V at 1A maximum with a line regulation of 0·2 per cent, load regulation of 1 per cent and a maximum ripple of 10mV peak to peak.

Variable outputs, which can be used independently or interconnected to give different current and voltage requirements, are 0–20V d.c. at 250mA with line regulation of 0·05 per cent and 10mV peak to peak ripple. Current limiting is provided to give protection against short circuit damage.

Meters on the front panel indicate current and voltage output, while an l.e.d. shows overload of the 5V supply.

With the unit, which measures 76 x 254 x 178mm and weighs 2·7kg, you get an illustrated manual with specifications, operating instructions, maintenance and calibration details as well as a circuit diagram.

For more details contact ***Global Specialties, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3QA. Tel: (0799) 21682.***



Carbon Fibre Masts

If you are after the latest ultra-light, super-strong mast—and what serious contest group isn't—then Antenna Technologies have developed just the job for you.

Using carbon/glass fibre composite materials, their new range of masts is particularly suitable for portable professional and tactical defence applications where light weight and high durability are needed.

As well as being typically under half the weight of traditional metal masts the new range are less susceptible to corrosion and icing. A 15 metre high mast can be deployed by two people in under half an hour. They are also transparent to radio signals, so preventing the usual degradation of radiation patterns.

Antenna Technologies use computer programs to analyse users requirements in terms of static loading, wind loading, deflection and safety factors to ensure that the recommended mast is the optimum for performance and cost.

With a maximum height available of up to 25 metres I can envisage the hills of England sprouting these masts alongside the diesel generators so essential to an NFD entry.

Antenna Technologies, Horace Road, Kingston upon Thames, Surrey KT1 2SN. Tel: 01-546 7808 will be pleased to let you have full details.

Toroidal Transformers

Are you building the *PW* Marchwood and having difficulty in getting hold of the mains transformer?

If you are, then Jaytee Electronic Services can help you. They have recently taken over the retail sales of ILP toroidal mains transformers and have stocks of the one designed for the *PW* Marchwood 30A power supply project.

Just quote the magic part number 9T845, offer them £35.45 inc. VAT and postage and they will send you one.

They also have a nice line in amateur radio products including software, BBC-B or Commodore 64/128, to allow several of the Icom range of radios to be controlled by the computer.

For full details get in touch with ***Jaytee Electronic Services, 143 Reculver Road, Beltinge, Herne Bay, Kent CT6 6P1. Tel: (0227) 375254.***

Power Supplies

When I was much younger, just an apprentice in fact, transistors were very new and held in awe. "Always use a thermal shunt on the legs" was the cry—"in case the therms kill the junctions!"

I remember trying an experiment which involved strapping a hot soldering iron bit onto the legs of an OC44 to see what happened—it still worked!

A few weeks ago Coutant, the power supply manufacturers, invited me to a press preview of their latest range of switch mode power supplies. They reckon that they can take on the best in the world and produce something better at a lower price. By going all out and using the latest surface mount technology, together with robots, they have managed to automate the production line and hence lower the cost.

What has this to do with torturing OC44s, I hear you ask? Well, with surface mounting techniques the *whole* component is passed through the molten solder during the flow-soldering operation. Not just the ends of the legs—*the entire component*—the mind boggles!

As well as surface mount technology these supplies use a new design of converter, developed by Coutant with the help of Department of Industry grants. The converter is the subject of patent applications by Coutant and combines the advantages of the standard converter with the low component count and small size of the flyback converter.

The transformer used in the design is also new in concept and gives very high performance and repeatability while lending itself to automated production.

Anyway, if you are in the market for professional power supplies then contact ***Coutant Electronics Ltd., Kingsley Avenue, Ilfracombe, Devon EX34 8ES. Tel: (0271) 63781,*** and ask for details of the new RL Range.

Software

Technical Software have updated their RX-4 Multimode Receive Program to improve the performance and give new features.

Having the ability to receive Morse, RTTY, AMTOR and Slow-Scan TV without expensive hardware RX-4 is available for the ZX Spectrum, BBC-B, CBM64 and VIC-20 computers.

The Spectrum version needs no extra hardware at all, using the computer's EAR socket. The other versions all use a simple interface and can also use a suitable terminal unit for c.w. and RTTY if desired.

All four modes are available in the same program, needing just a single key-stroke to change from one mode to another. On c.w. there is a choice of software filters as well as a wideband decoder capable of reading at over 250w.p.m. The sophisticated autotrack facility is controllable up to maximum speed and can also be locked to help in reading fading signals.

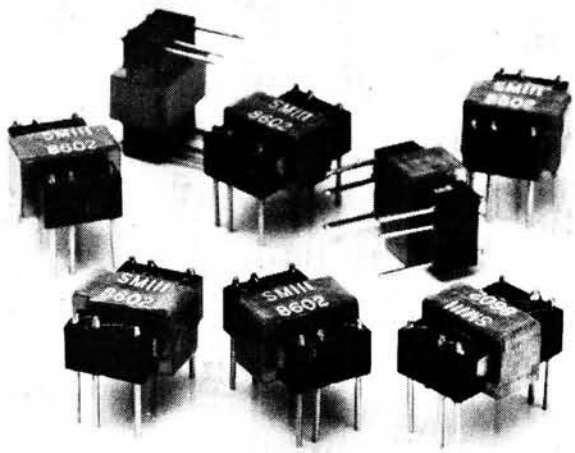
Both RTTY and AMTOR have selectable Unshift-on-Space—useful when tuning in a signal—and switchable Normal-Reverse polarity. Fine tuning is available from the keyboard and the RTTY program has four baud rates and can decode any shift automatically without switching.

The SSTV mode can display 8, 16 or 32 second frames and good pictures are claimed even in the presence of some noise. The grey scale can be adjusted from the keyboard and the picture storage allows you to overwrite one stored frame with a better one if required, making for more efficient use of available memory space.

All received text is stored as well as printed on the screen and stored text and pictures can be recalled to the screen, printed or saved onto tape or disc.

The RX-4 program costs £25 on tape or £27 on BBC-B or CBM format disc. The interface, if needed, is £5 in kit form or £20 assembled with all connections. Prices include VAT and postage and items are available from ***Technical Software, Fron, Upper Llandrwrog, Caernarfon, Gwynedd LL54 7RF. Tel: (0286) 881886.***

See Ron Ham's RTTY column in *On The Air* this month for "off air" tests.



Audio Matching Transformers

These days it seems that audio frequency line matching transformers are like hen's teeth.

With their new SM 200 series, Gardners have produced an economy range of sub-miniature, low level, a.f. line matching transformers at a reasonable price.

Interchangeable with their SM 100 series, the new range derives its significant reduction in cost from minor specification changes coupled with volume production.

One-off prices are £3.25 ex works plus VAT. ***Gardners Transformer Ltd., Christchurch, Dorset BH23 3PN. Tel: (0202) 482284.***

UHF Antenna

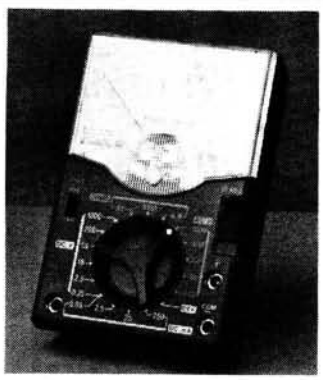
I have just received details of a new u.h.f. mobile antenna which mounts on the windscreen of your car—no need to drill holes in the bodywork. Signal coupling is effected through the glass between the inner and outer parts of the mount.

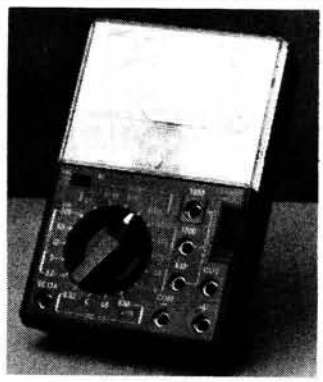
Although aimed primarily at the private mobile radio (p.m.r.) market it can also be used on the 430MHz amateur band and On-Glass Aerials are hoping to introduce a 144MHz version.

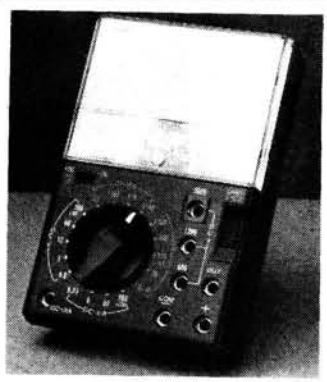
Brief technical details are: Gain 3dB; Impedance 50Ω; Power 200W; Bandwidth (1·5:1) 20MHz; Radiator Length approx. 450mm.

The silver-clad radiator snaps on and off for security and car washing purposes.

The OW432 costs around £35.00 plus VAT and further details are available from ***B. D. Price G4DVB, 93 Highview, Vigo Village, Kent DA13 0TG.***







Compact Multimeters

Eagle International has introduced a range of four new multimeters from Kaise.

Aimed at the hobbyist and general electronics sector of the market the bottom of the range SK 142 is a pocket-size meter with a 20kΩ/V sensitivity and 16 ranges covering d.c. and a.c. voltage, d.c. current and resistance.

The SK 20 is similar to the SK 142 but has extra d.c. voltage and current ranges, polarity reversal switch and mirror scale.

Top of the range is the SK 50 with 50kΩ/V sensitivity, overload protection and polarity switch. There are eight d.c. voltage ranges up to 3kV, five a.c. voltage ranges up to 1·2kV, five d.c. current ranges covering 30μA to 12A, four resistance ranges up to 50MΩ and three capacitance ranges. Typical accuracy is 3 per cent of f.s.d. on the d.c. ranges.

The SK 44 is a 30kΩ/V version of the SK 50 with identical range specifications. All models come complete with case and probes and a two year guarantee.

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

Digital Voltmeter Kit

In the second part of this article, Brian Dance explains how to expand the ranges of the ZN451 Evaluation Kit for voltage, current and resistance.

The basic range of ±1·999mV is unlikely to meet the needs of many users! Some constructors may well feel that they will use an analogue multimeter on most occasions and will therefore be willing to make an appropriate input circuit whenever the digital meter is to be used so that the circuit is optimum for the particular application in hand. Others will prefer to construct a general purpose digital multimeter using the basic circuit of the kit.

If it is desired to use the decimal point in any of the three positions, the decimal point concerned must be provided with a drive signal of the same frequency but 180 degrees out of phase with that of the liquid crystal backplane voltage.

If a decimal point is to be displayed in a fixed position, a small power m.o.s.f.e.t. may be used in the simple inverter circuit Fig. 2.1. The backplane signal from pin 20 of the ZN451E may be taken from the point marked BP on the p.c.b. (without removing the jumper link) and the output from the Fig. 2.1 circuit is taken to the point on the board marked DP1, DP2 or DP3 according to the required position of the decimal point. Only the jumper link to this one decimal point should be removed, the other two jumper links of the unused decimal points being left in position so that these points are still joined to the backplane.

Liquid crystal displays are designed to operate from balanced square wave supplies. The application of a steady voltage above about 50mV can permanently damage the display in quite a short time owing to electrolysis effects.

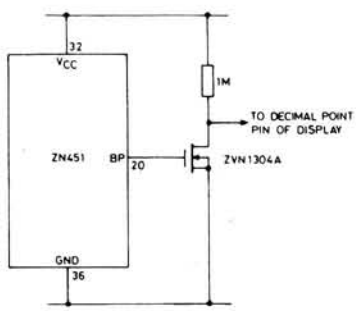
If one wishes the position of the decimal point to change as a range selecting switch is operated, the circuit of Fig. 2.2 which employs a CD4070 quad exclusive OR gate may be used. This provides the oscillator backplane voltage to unused decimal points and a voltage of the opposite phase to the point to be displayed. The inputs to the three upper logic gates shown unconnected should be "low" (0V) for the decimal points which are not to be displayed and "high" (5V) for the displayed point. When the range switch is operated, voltages are fed from an extra set of connections on this switch to the gates to change the position of the decimal point.

If desired, the fourth gate of the CD4070 can be used to activate the low-battery indicator incorporated in the display. In this case the thin track connecting pin 38 of the display to the backplane must be broken and the output from the lowest gate of Fig. 2.2 connected to the soldering point for pin 38. A modified two transistor power supply is required to provide the input to the fourth gate, so constructors may well question whether the extra work on the circuitry can be justified. Details of the modified power supply are given in Fig. 7 of the data sheet supplied in the kit.

Voltage Ranges

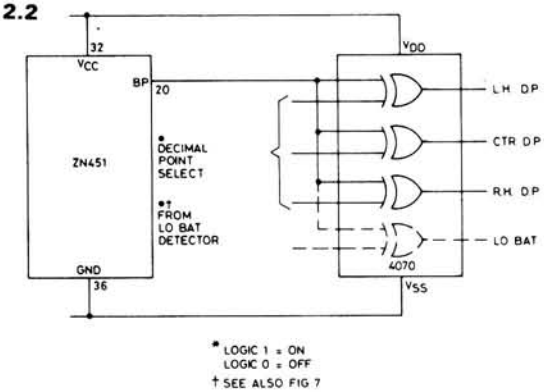
A resistive input voltage divider network may be used to provide almost any required range for steady voltage measurements. One example of such a network was shown in Fig. 1.6, it provides a single ±19·99V (nominally ±20V) range. Unless one calibrates the circuit the accuracy will

Fig. 2.1



Driving a Fixed Decimal Point

Fig. 2.2



Decimal Point Select and 'LO BAT' Indicator Drive using Exclusive OR Gates

obviously be limited by the tolerance of the resistors used. In addition, if large voltages are to be measured, it is desirable to incorporate some form of protective circuit which will absorb switching transients.

A circuit which will convert the basic kit into a multi-range voltmeter is shown in Fig. 2.3. It is not, of course, necessary or in most cases even desirable to include all of the seven ranges shown in this circuit.

Indeed, one may find that mains frequency pick-up is so great on the 2mV range when the internal resistance of the voltage source being measured exceeds about 100kΩ that accurate readings cannot be obtained. However, much depends on the circuit layout, screening, magnetic circuit loops, etc. and any filtering the constructor may choose to add—even a capacitor across the ZN490 diodes can have a profound effect. If affected by pick-up signals, each succeeding reading will vary somewhat from other readings or in the extreme the meter will overload. However, when the resistance across the input terminals is not too high, this problem will not occur on the most sensitive range.

The constructor is therefore left to decide if he wishes to include all of the ranges shown and, if so, to use the sensitive ranges intelligently. If the two lowest ranges are omitted, R1 and R2 can obviously be combined into a single 9·9MΩ component, while R8 can be omitted if the 2kV range is not required.

Transient protection is especially important when measuring voltages or currents derived from mains supplies, since ordinary domestic mains power supplies often have transient voltages superimposed on their waveform whose peak values may be some kV with durations of some µs. Such transients can destroy unprotected digital multimeter circuits, as can pulses developed when current rapidly decays in an inductive circuit.

Two forms of transient protection are employed in Fig. 2.3. The back-to-back ZN490 silicon diode pair across the input of the basic meter circuit will start to conduct when a potential of under 1V of either polarity appears across it. The rapid sub-microsecond switching of these diodes to conduction limits the transient voltage peaks appearing across the meter circuit itself. Further protection is provided by the 425V zinc oxide Varistor connected across the main input; this component passes a rapidly increasing current as the voltage across it rises in the 425V region. If the overload is continuous, the current passed by the Varistor will cause the fuse to blow. The Varistor provides protection within a few µs, but not quite so rapidly as the ZN490 diode pair.

The 2kV input is separate from the Varistor protected input, since voltages above about 425V cause the Varistor to look like a short circuit. Care should be taken not to connect a high voltage supply to the 2kV input unless the high voltage supply is switched off at the time.

The accuracy of the indicated readings will depend on the tolerance of the resistors R1 to R8 in Fig. 2.3. These components should in any case be stable high quality types, but their tolerance and cost depends on the required accuracy. Ideally one should select 0·1 per cent resistors, but if one can accept errors of about 1 per cent more economical resistors of this tolerance may be used. (It would be troublesome to include a separate trimmer resistor in series with each of these resistors for individual range calibration).

The maximum dissipation of 3·6mW will occur in R1 with a 200V input, so no significant heating will occur with resistors which have a 0·25W rating at 70°C. The temperature coefficients are in the ±25 to ±150p.p.m./°C range, so a 10°C change will produce a variation of no more than 0·15 per cent even with the 150p.p.m./°C types.

Most high tolerance metal film resistors are not designed for 2kV nor are they available in the 10MΩ value required for R8, since it is difficult to make precision metal film resistors of such high values. In the prototype a high voltage component of value 10MΩ ±2 per cent was used for R8. This tolerance limit is probably acceptable for this one range, although it was large enough to be noticed. Maximum dissipation in R8 is about 400mW.

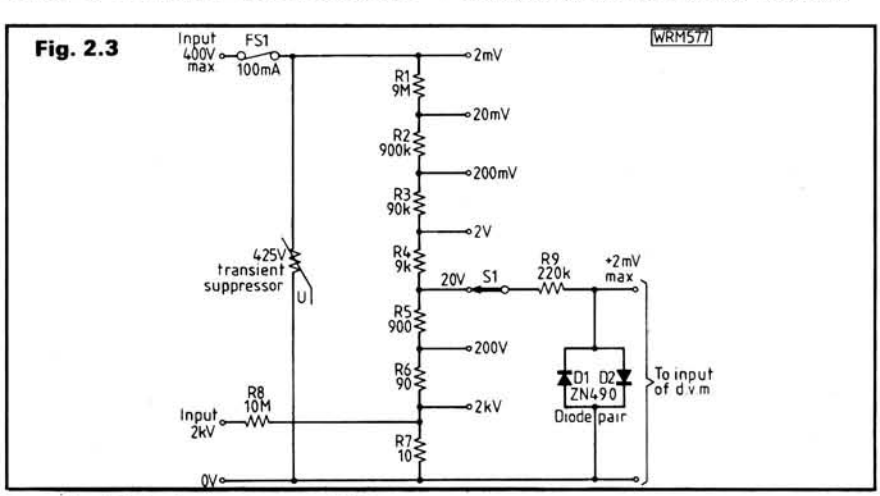


Fig. 2.3

Current Ranges

In the prototype, close tolerance metal film resistors were used for R1–R3.

The circuit of Fig. 2.4 employs the same fast-operating ZN490 diodes across the meter input for protection as those used in Fig. 2.3. Two other diodes, D1 and D2, are used for input protection of the circuit. Let us imagine what would happen if a mere 9V is connected across the input with the 200µA range selected by the switch. Most of the 9V will appear across R3, so nearly 1A flows through this resistor to produce a dissipation of about 9W. This may destroy the metal film resistor R3 even if no other damage arises.

The use of D1 and D2 limits the input voltage to about 0·7V and this potential difference can produce a damaging current only in the resistors of the range determining chain if the total resistance to ground is small. However, the resistors of small value (R4–R8) are wound from copper wire which can withstand a considerable current without damage. The fuses protect the diodes against sustained overloads.

The very sensitive ±2mV basic range of the instrument enables direct currents to be measured with this low voltage drop on all ranges, whereas most high quality analogue meters have a much larger voltage drop on their current ranges (such as 0·5V on most of the Model 8 Avometer ranges). This minimises power loss from the circuit into which the meter is inserted and the low power dissipation in the shunt resistance of the meter reduces any change in its value due to heating. However, very low resistance values are required in such circuits.

A circuit for measuring direct currents with full scale ranges from 2µA to 20A is shown in Fig. 2.4 using the basic 2mV meter range. A separate input is provided for the 20A range so that S1 does not have to be able to carry this current.

If desired, another one or even two ranges may be added with maximum readings of 200nA and 20nA respectively by inserting additional metal film resistors of values 9kΩ and 90kΩ connected above R1 of Fig. 2.4, with appropriate precautions to avoid pick up. If the 20A range is not required, R7 and R8 may be combined into a single 1mΩ component.

The very low resistance values of R4 to R8 inclusive are conveniently made from copper strip in the case of R8 and from copper wire in the other cases. The wire must be of adequate cross sectional area to enable the required resistance value to be obtained with a piece which is long enough for its length to be accurately adjusted; fine adjustments can be made by running a little solder along from the ends. The ±1·999mV basic range was used to

measure the voltage developed across copper wire of various diameters carrying various currents and good agreement was obtained with the calculated voltage using the resistivity of copper $1{\cdot}78 \times 10^{-8}\Omega$-metre. Some suggestions are given in Table 2.1 as to how the resistors R4 to R8 inclusive can be made using the meter and a known current through the resistor for calibration.

Standard 1 per cent (or preferably 0·1 per cent) tolerance resistors can be used for R1 to R3 inclusive. Particular care must be taken when wiring the 20A circuit of R8, a single length of wire or strip being used for the input leads, R8 and the lead to the fuse. The lower connection of R7 should be soldered onto the wire or strip forming R8, without breaking the latter.

Fig. 2.4

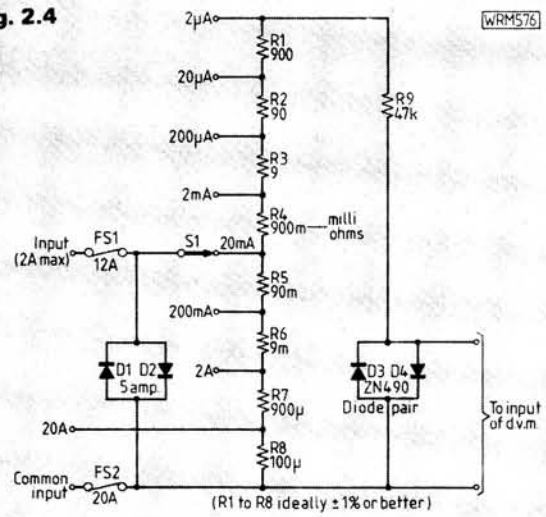


TABLE 2.1

Resistor	Value (Ω)	Current (A)	Power dissipation (Total in chain)	Resistor may be made from: (all copper)
R8	1×10^{-4}	20	40mW	Ideally suitable copper strip, or six parallel wires each 110mm x 2.03mm dia, (14 s.w.g.)
R7	9×10^{-4}	2	4mW	164mm x 2.03mm dia. (14 s.w.g.)
R6	9×10^{-3}	0·2	500μW	332mm x 0·91mm dia. (20 s.w.g.)
R5	9×10^{-2}	0·02	40μW	560mm x 0·38mm dia. (28 s.w.g.) or 250mm x 0·27mm dia. (32 s.w.g.)
R4	9×10^{-1}	0·002	4μW	148mm x 0·19mm dia.a (36 s.w.g.)

Resistance Measurement

Resistor values can be measured by passing a known current through the resistor under test and measuring the voltage drop developed across this resistor. This method was suggested for adjusting the resistor values of R4 to R8 inclusive of Fig. 2.4. Larger values of resistor may be measured in a similar way; for example, if R1 of the Fig. 1.6 circuit has a value of 10MΩ and the supply voltage feeding the upper end of R1 is +11V, then 2mV will be developed across the meter when R2 has a value of 20kΩ, so the display shows the value of R2 with this 20kΩ full scale value.

The basic meter circuit itself, even if uncalibrated, is excellent for selecting closely matched (to ±0·1 per cent) resistors from a batch of high stability resistors of low or medium value. A suitable number of resistors of the same nominal value are connected in series together with a variable resistor across a stable voltage source. The variable resistor is adjusted until about 1·5mV is present across each of the resistors. The digital meter can now be used to measure the voltage across each of the resistors until two or more are found which are matched to one another closely enough to meet the accuracy requirement of the application concerned.

Constant Current

A circuit is given in the ZN451 data sheet incorporating a constant current source and a stable voltage source which will provide ranges with full scale values of 200Ω in decades up to 20MΩ; the maximum voltage across the resistor being tested is limited to 200mV.

Alternating Signal Measurements

An alternating voltage may be measured by converting it into a proportional steady voltage using a precision active rectifier such as the Ferranti Electroncs circuit of Fig. 2.5. No zero adjustment is required, since the use of capacitive coupling prevents any offset voltage from the TL091 from reaching the output. On positive half cycles of the input waveform, C5 charges through R6, whereas on negative half cycles this capacitor charges through R4 and R6. These component values are chosen so that, for input frequencies down to 40Hz, the potential across C5 remains almost constant. A constant value of the displayed digits can thus be obtained. The component values shown provide an accuracy of about ±1·5 per cent over the 40Hz to 1kHz range.

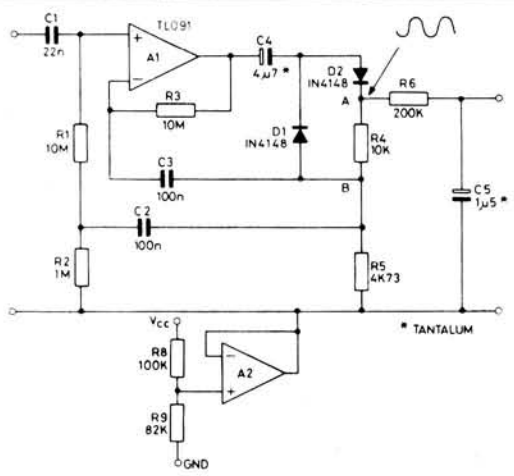
The circuit of Fig. 2.5 may be fed from a voltage divider circuit (such as that of Fig. 2.3) for the measurement of alternating voltages or from a shunt resistor chain (such as that of Fig. 2.4) for the measurement of alternating currents. The circuit has been designed to provide a display of the r.m.s. value of the input signal when the latter is a sine wave, but it cannot display the true r.m.s. value for other waveforms.

Conclusion

The construction of the ZN451E kit and its subsequent use provides a very sensitive meter from which much can be learned. This discussion has concentrated mainly on practical matters, but the ZN451 data sheet contains much more information on the operation of this device.

As a final comment, it must be re-emphasised that careful design and layout of all low-level input circuits feeding the meter is essential, especially when high impedances are involved. Mains hum peaks of some tens of volts are easily picked up on unscreened wires of moderate length and will greatly overload the ±1·999mV basic meter range so that operation is impossible. Layout and design must minimise hum and other pick up. ***PW***

Fig. 2.5



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LPM 144–10–100	2m, 10W in, 100W out, preamp	175.00	(2.50)
LPM 144–25–160	2m, 25W in, 160W out, preamp	255.00	(2.50)
LPM 144–3–180	2m, 3W in, 180W out, preamp	295.00	(2.50)
LPM 144–10–180	2m, 10W in, 180W out, preamp	295.00	(2.50)
LP 144–3–50	2M, 3W in, 50W out, preamp	125.00	(2.50)
LP 144–10–50	2M 10W in, preamp	125.00	(2.50)
LPM 432–1–50	70cm, 1W in, 50W out, preamp	235.00	(2.50)
LPM 432–3–50	70cm, 3W in, 50W out, preamp	235.00	(2.50)
LPM 432–10–50	70cm, 10W in, 50W out, preamp	195.00	(2.50)
LPM 432–10–100	70cm, 10W in, 100W out, preamp	335.00	(2.50)

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GLNA 433e	70cm Pre-amp	89.90	(2.50)
TVVF 144a	2M Transverter	249.90	(2.50)
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Just a Word of Warning

Premature departure from this world aided by electricity must forever be guarded against in our line of hobby. Gordon J. King, TEng AMIERE G4VFV recounts his own experiences, as a lesson to us all.

From early research into the American electric chair there's reason to suppose that a critical voltage is required to delete life with the least delay. Of course, an extremely large voltage, such as that on the grid system or associated with a primary lightning strike, has the certainty of rendering departure of the unfortunate recipient immediate.

There's swift vaporisation of moisture, and since we homo sapiens are composed mostly of water salts the probability of surviving is remote. The same thing happens when a tree is struck by lightning. Conductivity in summer is higher as gallons of water are lifted to the top from the root by capillary attraction. Thus the high electric potential of the strike can return an incredibly high current from earth which translates the sap into steam in the blink of an eye, leaving the so-called "lightning tree" of well seasoned wood.

I've not measured the conductivity of a tree, but I would suspect it to be quite high in summer (for after all, they have been used as antennas!). Like most of us, from time to time I measure the d.c. resistance of my body. This can range over about 10 to 20kΩ using a simple ohmmeter, depending on the contact area, how tight the electrodes are squeezed in the hands, moisture content, ambient temperature and so forth.

However, this is certainly not the real body-current-determining value. The human body represents a multiplicity of conducting paths—some in parallel with capacitance and others passing through the heart. A net impedance rather than pure resistance is thus represented. This means that the current is frequency-dependent, while the current through the heart would need the laws of Kirchoff to resolve! An elementary picture of the situation is given to Fig. 1.

Current flow is also influenced by the skin contact voltage, so the simple ohmmeter measurement is barely relevant. IEC research has indicated that for contact areas between 500 and 1000mm² and potentials between 50V and 1kV, the impedance of the vast majority of human bodies at 50Hz ranges between 1·5 and 4·3kΩ. The recent IEC standard thus gives an average of 2kΩ up to 100Hz and 1·75kΩ from 100Hz to 1MHz, this taking account of the capacitive elements.

Now, I don't know how much current the average heart can accommodate before misfiring (fibrillation); but I think there have been cases reported where death has resulted from a potential as low as 100V under certain conditions. These would be the nature of the supply, area of contact, condition of heart and the like, at the time of contact.

Previous Shocks

Like most of us involved in electronics, I have over many years experienced innumerable electric shocks of various magnitudes, and from these I would certainly go along with the principle that a d.c. shock tends to throw the person away from the source, quickly severing the connection, while an a.c. shock causes the muscles to tighten so that the grip is strengthened, it then being very difficult, if not impossible, to sever the contact by force of will.

Apart from those relatively mild d.c. shocks which most of us have experienced during our lives with radio and electronics, and which at most probably resulted in nothing more serious than a grazed knuckle or cut finger as the hand was accelerated from the source in a confined space, more recently I experienced my first very bad, almost fatal, a.c. shock.

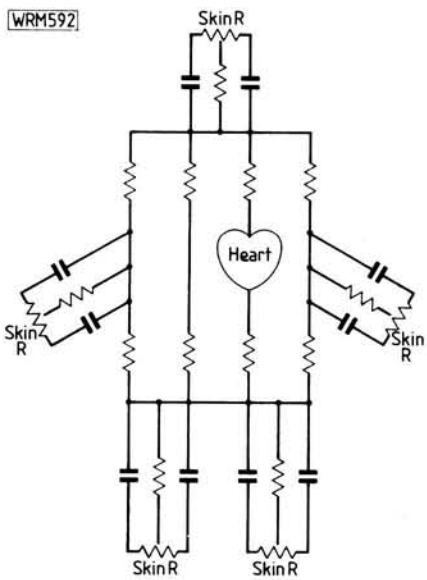

Fig. 1: Elementary impression of the resistive and capacitive elements of the human body, the whole forming a complex impedance

I had been testing radio equipment for review, and early one morning while in bed and contemplating the day ahead, it occurred to me that I should undertake another important measurement before writing up the lab notes. The equipment was all set up in the lab so, leaving my wife to conclude her slumber, I commenced operations with sleep still in my eyes.

I had only to connect mains power to the radio and the matching pad of my Marconi signal generator to a BNC socket at the end of a coaxial lead which was already terminated to the antenna input of the radio. The first mistake I made was to connect the mains power before making the connection to the signal generator. You will appreciate the second, almost fatal mistake, in a minute.

With the radio switched on I simultaneously grabbed the matching pad, a chromium-plated brass screened box conveniently hand-size, with one hand and the BNC connector at the end of the radio-terminated coaxial cable with the other hand. Both were gripped with some pressure because it was necessary to get the BNC connector to mate with the matching pad.

It was then that I experienced the worst electric shock of my life. I found myself gripping the two highly conductive electrodes with a good deal of force, which somehow had become connected across the 240V 50Hz mains supply! First my hand muscles reacted violently and gripped the electrodes even tighter. Then I seemed to simulate a mains transformer—I seemed to vibrate like one, anyway. Red flashes appeared in my vision, and there was absolutely nothing I could do from my own motivation to alleviate the intense discomfort. I can't be sure whether I was worried more when I could smell burning flesh and see a fine trail of smoke coming from my hand which was gripping the matching pad.

I thought if only I could bring the two electrodes together to blow a fuse somewhere and eliminate the torment; but although my mind was telling my

hands to do this there was no movement. The whole of my nervous system was locked to the 50Hz current flow and all normal reflexes were disabled.

I wanted someone to prize open my hand to release an electrode, but there was no-one. After a while (seconds, minutes?) the pain became more acceptable; but time seemed to be slowing down—the second ticks of my quartz clock lengthened. I could feel the heavy thump of my heart (onset of fibrillation?). My mind was still functioning in a hazy sort of way, and I recall looking round my lab and thinking—what a shame I won't be needing these instruments any more. Last thing I could remember was still trying to work out a way of survival—perhaps if I let myself fall full-weight onto the lab floor the contact may be broken . . . An hour or so later I gradually rejoined this world with a doctor standing over me.

Finding me out of bed my wife had decided to rise early herself. She made herself a cup of tea, and as is her way brought one to me in the lab. It was a great shock for her, too, finding me on my back with the two electrodes dangling from the test bench above. It was encouraging to know that her first reaction was to throw the lab's master switch.

With my wife's help I got from the lab to the lounge but can't remember this. It didn't need the doctor to tell me how lucky I had been. Yes, my heart was fine but not to do my long cliff walks for a week or two, and I will be experiencing pain. Indeed, muscular pains at the arm joints and across my back persisted for several months; but the curious, deep, point source burn on my hand is still visible today (Fig. 2).

Yes, that's right, I got the mains wires twisted in the heat of the moment. So easy to do yet so potentially fatal. I inadvertently connected the radio's "earth" wire to mains "live". This put the antenna input at mains live also, and since the signal generator was bonded to real earth I was right across the mains when I gripped the two electrodes! Had I connected the signal generator before the mains, a fuse would have blown.

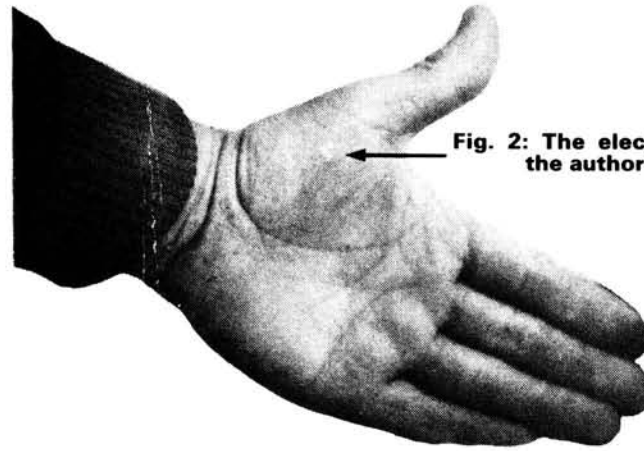

Fig. 2: The electric burn following the author's experience

Assuming a contact impedance of 5kΩ (with the relatively small electrodes) the current flow would have been 48mA; but as the pressure of the electrodes increased and the burning commenced the impedance would have fallen, possibly down to around 1·5kΩ, so the net current would have risen to the dangerous level of 160mA, where the risk of fibrillation is much higher. Thus had the circuit not been broken, there's little doubt in my unfortunate case that fibrillation would have occurred, the heart would have malfunctioned and the blood circulation would have been seriously impaired. I cannot say how long I was exposed to the current. It could have been several seconds or even a minute or more. Neither can I be certain whether I made a conscious effort to fall backwards or whether I went unconscious owing to the pain. I can certainly recall that my heart was having difficulty in remaining active and that muscular convulsions were commencing. It was found later that the braid of the coaxial cable had pulled away from the radio's earth terminal.

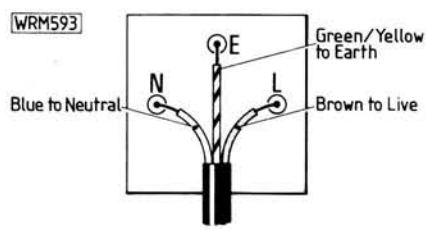

Fig. 3: Colour-coded wiring of mains plug (UK standard)

Day by day use of electricity in our hobby tends to make us forget its lethal potential. The colour-coded wiring of a mains plug is given in Fig. 3. The inadvertent placement of the equipments's earth wire on the "live" terminal could reproduce my frightening experience—but you may not be as lucky!

Never connect or disconnect any cables or leads while the equipment, or any part of it, is connected to the mains supply. Always play safe. It is prudent to keep one hand in the pocket when making internal adjustments which necessitate powering the equipment. In amateur radio installations the employment of an earth trip is not a bad idea; though I would be reluctant personally to place total reliance on this. However, they can act quickly and at a low current of 30mA which is generally considered to be below the fibrillation threshold. ***PW***

See *Electrical Safety—the Shocking Truth!*, beginning in this issue, for more information and advice on safety in the shack

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Have Rotel hi-fi stack in cabinet plus 5in black and white portable TV still under warranty, runs off mains/battery/car. Would exchange for Yaesu, Trio or Icom dual bander. Tel: 0603 867005. *B340*

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Have Yaesu FT-790 430MHz multimode, complete with 10dB gain linear. Would exchange for similar 144MHz multimode (FT-290). Tel: Cambridge 63684. *B356*

Have Trio 9R59DS, GAF64 cine camera, personal a.m./f.m. radio. Would exchange for portable receiver covering short, air, f.m. bands with b.f.o. Flaherty, 10 Joseph Parry Court, Merthyr, Mid-Glam CF47 8HN. Tel: Merthyr 75025. *B357*

Have two guitars, one electric the other twelve string. Also have Canon auto zoom cine camera plus two projectors and Texas TI/99A. Would exchange for FT-707 plus FC-707, Belcom LS102-L. Ian. 5 Sunset Walk, Bush Estate, Eccles-on-Sea, Norfolk NR12 0SX. *B359*

Have Pye Fenman II receiver, eleven valves, v.h.f., a.m./f.m., l.w., m.w., 4 loud speakers, table model, perfect condition, with manual. Would exchange for general coverage receiver CR150, CR100, B40 etc. E. Allison, 138 George Street, Mablethorpe, Lincs. Tel: 0521 77805. *B360*

Electrical Safety— The Shocking Truth

How safe are you, both in your shack and your home? Roger Alban GW3SPA BSc(Hon) C.Eng MIEE, gives some help on making it safer for you and your family.

Two CB operators were electrocuted on 24 June 1984, while apparently erecting a mast for a portable antenna. According to newspaper reports the 10m mast, being erected at Hangmans Hill, near Hungerford in Berkshire, came into contact with overhead power cables. Three other people present at the scene were treated for shock.

A recent report from the consumer safety unit of the Department of Trade and Industry has given details of fatal accidents involving electrical equipment in and around the home in the UK. Taken overall, there has been a steady average number of deaths from electrocution of about 35 per annum.

Amateur radio is probably one of the most safety conscious of all hobbies, and this is reflected in its consistently good record over a period where the number of people joining the hobby has been at a high all-time peak. Irrespective of this fact, how many of you have at some time received an electrical shock and have lived to tell the tale, Fig. 1.1? One aspect of electrical safety has, until recently, evaded a completely acceptable solution—that of shock to earth. All electrical shocks at 240V can cause death, but fortunately the vast majority of shocks are limited to safety levels by pure good luck. Probably the resistance of sound footware and of flooring material saves many lives every year.

Shock Current

The vast majority of electrical fatalities involving users of electricity occur as shock to earth. Electrical shocks experienced by unqualified people are nearly always the result of irresponsible meddling, and it is not possible to provide a means of saving them from the consequence of their follies. The user of electricity is frequently in contact with earth through flooring materials or with adjacent earthed metal. If the frame of a machine becomes "live", or if the enclosure of a plug, terminal box or the sheathing of a flexible cable becomes damaged, it is necessary only for one contact to be made with "live" metalwork to put the user's life at risk.

The effect of electrical current on the human body has been the subject of investigation by many people throughout the world. Much of today's wisdom on electric shock is enshrined in the International Electrotechnical Commission (IEC) Report 479 based on experiments performed by Dalzier over 45 years ago on 134 healthy men and 28 healthy women. Apart from Herr Begelmeir's experiment on himself, almost all the other documented work has been on animals. The second edition of IEC 479 was released in 1984 and contained an update of research into the causes of possible death as a result of electric shock.

Before one can decide upon the safety measures that should be taken to improve the electrical safety within the shack, one first of all needs to have an understanding as to the causes of death from electric shock. The first edition of the report IEC 479 was issued in 1974. Since that date, new research work has been conducted. The results of the research work have produced a better understanding of the effects of electrical current on living organisms and, in particular, on man. For a given current path through the human body, the danger to the person depends mainly on the magnitude and duration of the current flow.

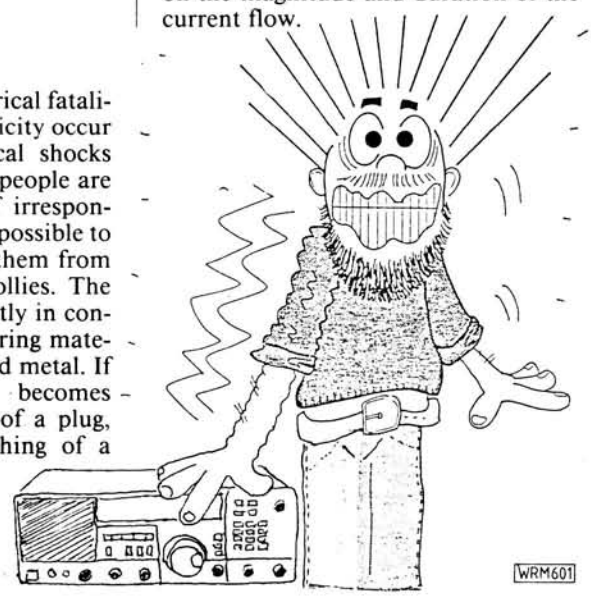


Fig. 1.1: Oops: Here we go again!

However, the relationship between the voltage source touched by the person and the current which passes through that person is not linear because the impedance of the human body varies as a result of a number of factors. The different parts of the human body, such as the skin, blood, muscles and other tissues and joints, present to the electricity a certain impedance composed of resistive and capacitive components. The values of these impedances depend on several factors, in particular, current path, touch-voltage, duration of the current flow, frequency of touch-voltage, moisture of the skin and the surface area of contact.

The impedance of living human beings on a current path from hand-to-hand or hand-to-foot is, on average, approximately 2000Ω. This comes from measurements carried out principally on corpses and on some living persons. However, the impedance will be lower for d.c. values of voltage. The impedance value will also increase as supply frequency is increased.

Results from experiments have shown that a minimum current flow of 0·5mA can be detected by the human body. The threshold of "let-go" is about 10mA. The restriction of breathing begins at about 30mA. "No-let-go" intensities have no permanent harmful effect, providing they do not rise above 20mA or unless they are sustained for very long periods. However, they do cause intense pain and are usually very frightening. The majority of highly hazardous incidents in all cases of electrical shock contain avenues of escape, but usually panic prevents the victim from seeing them, and thereby converts a serious situation into a tragic one. Pre-knowledge of the possible means of escape greatly reduces the tendency to panic. Muscular restriction seldom incapacitates all four limbs, and the one remaining usable, probably an arm, should be used to break contact.

Respiration is unlikely to be affected in the early stages and the victim can shout for help. Anyone involved in such a rescue should take particular care that he does not become a second victim. The rescuer should switch off the supply without delay. If this cannot

be done, the victim should be dragged or knocked from contact, taking care to avoid touching his bare skin and, of course, live metalwork.

Unconsciousness from loss of respiration will not occur until breathing has been stopped for about three minutes, and it can usually be restarted by artificial respiration, which should be given immediately and be continuously applied until the patient recovers or is pronounced dead by a doctor.

So, what lessons can be learnt? The disconnection of the supply is important for both the victim and rescuer. A switch which isolates the complete supply, excluding lighting, to the shack should be located at the entrance to the shack. A suitable type of emergency switch could be a number of emergency stop buttons, strategically placed, which will disconnect all the shack supplies excluding lighting when any one of them is pressed. The stop buttons should be a type which latch in position when depressed and need to be turned to release.

In industry we expect there to be a clear working space wherever work is carried out near live conductors. Why should the shack be considered any different to the work place? A minimum passageway of one metre should be maintained. If two work benches form a corridor, the space between benches should not be less than 1·5m. There is a long-standing rule in industry that when someone is working on live equipment where technical knowledge or experience is required to avoid danger, then they should be accompanied. This is in recognition of the fact that anyone can make a mistake and, in the case of electric shock, immediate assistance can be a lifesaver. This requirement is not always practical as far as the shack is concerned. However, it does suggest that it would be wiser to have the shack inside the house in close proximity to members of your family who could render immediate assistance, instead of an isolated shed or outbuilding away from the house. However, care must also be exercised to ensure that members of your family are prevented from receiving an accidental electric shock from your amateur equipment, Fig. 1.2. I can remember my mother who was very keen to remove the dust from inside a 19in rack of equipment containing a 1000V e.h.t. supply for my top band transmitter! It was not until I left various notices on the equipment, did my mother think twice about her actions.

Ventricular Fibrillation

The most likely cause of death resulting from an electrical shock is the effect the shock has on the human heart. The effect of current flow on the heart function will depend on the physiological parameters as well as the electrical parameters such as duration and pathway of the current flow. The electrical current which interferes with

Fig. 1.2: Some members of the family may receive an electric shock

the heart function causes ventricular fibrillation. This is a condition in which the rhythm of the heart valves is upset by the effect of signals from an external source acting at random, Fig. 1.3. It can only be corrected when the necessary technical skill and equipment are immediately available. Otherwise, death is inevitable. The supply frequency of 50Hz is extremely dangerous because it is sufficiently near the natural heart signal periodically to seriously effect the function of the heart.

High frequency currents and d.c. are free from fibrillation effects, although they can cause damage to the nervous system within the body by overheating. Extremely heavy shocks can cause the heart to stop completely. Ventricular fibrillation is unlikely to occur below 50mA. The old expression, "It's volts that jolts, but mA that kill", is perfectly true. The duration of the shock and its intensity are equally important in relation to its fibrillation effects. Therefore it is important if ventricular fibrillation is to be avoided that some form of protective device should be fitted. One that is not only current sensitive but that will disconnect the supply within a given time of earth leakage being detected. The IEC findings suggest that ventricular fibrillation is unlikely to occur at a current of 50mA for a duration of 4 seconds. If the current is increased to 240mA then the duration of shock must be decreased to below 0·1 seconds.

There is still some controversy over safe limits and the effects of electric shock on the human body. Much depends on whether the current passes through the region of the heart. The IEC document 479–1, second edition, includes a diagram, Fig. 1.4, on which has to be superimposed the trip range for the MK Sentry 30mA r.c.c.b. (Residual Current Circuit Breaker). The IEC diagram of duration of current flow plotted against body current has been subdivided into five separate zones of effect.

Zone 1: (Shaded area). This represents body current of less than 0·5mA which usually will have no effect or reaction on the human body.

Zone 2: Body currents of this magnitude will have no harmful physiological effects.

Zone 3: Body currents of this magnitude will usually do no organic damage to the body. There is likelihood of muscular contractions and loss of breathing but, if the source of the shock is removed in time, artificial respiration could correct this. It is unlikely that ventricular fibrillation will occur.

Zone 4: The probability of ventricular fibrillation occurring is less than 50 per cent.

Zone 5: The probability of ventricular fibrillation occurring is greater than 50 per cent.

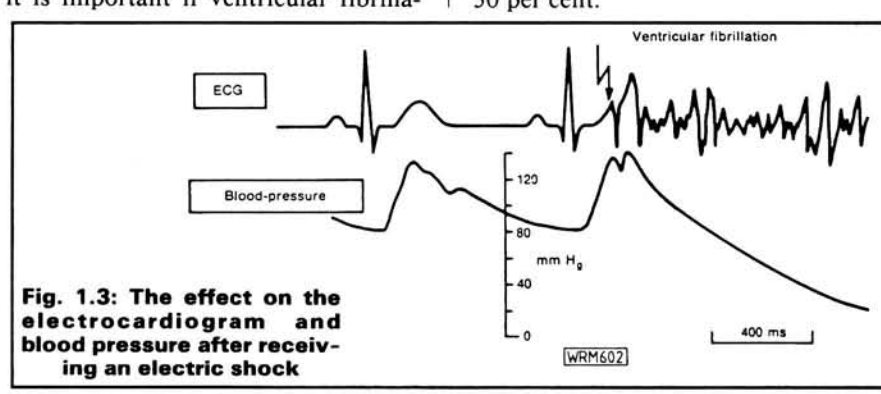


Fig. 1.3: The effect on the electrocardiogram and blood pressure after receiving an electric shock

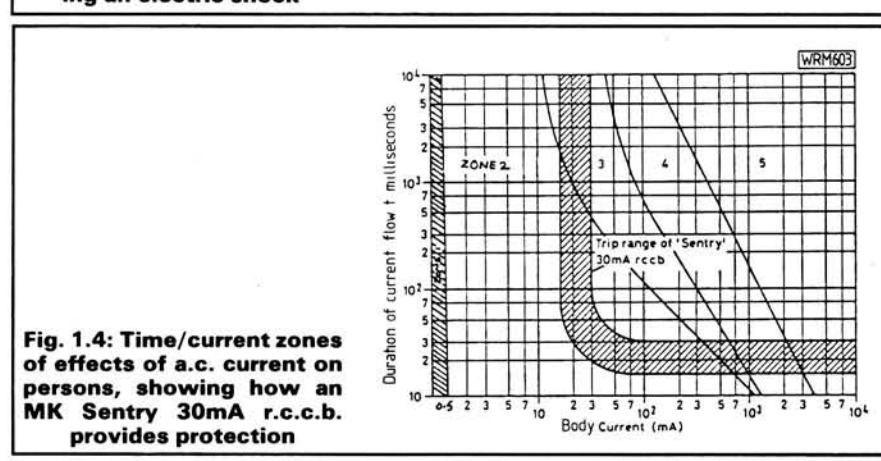


Fig. 1.4: Time/current zones of effects of a.c. current on persons, showing how an MK Sentry 30mA r.c.c.b. provides protection

RCCB

The safety device used to detect leakage to earth and then to disconnect the supply is a Residual Current-operated Circuit Breaker, r.c.c.b., which is sometimes referred to as an e.l.c.b., Earth Leakage Circuit Breaker. The r.c.c.b. relies on the principal that in a fault free electrical system there is no leakage to earth of the live or neutral conductors. The current leaving the r.c.c.b. through the live conductor will return to it by the neutral, Fig. 1.5. In the event of a leakage to earth, some of the current by-passes the neutral conductor and returns to the supply source through any earth continuity which may be present. The live and neutral cables, which carry the load current, pass through a sensing core. The effective sum of the live and neutral currents passing through the core must be zero and therefore produce no magnetic field. When leakage to earth occurs, one cable will carry more current than the other and the magnetic field produced by one core will not now cancel out the magnetic field produced by the other core. A potential difference is induced into the secondary coil wound round the sensing coil which will energise a tripping relay, which disconnects the supply from the load.

The operating time of the r.c.c.b. varies between 30 and 50ms. The margin of safety these devices provide are some 100 times greater. The rapid clearance time prevents any significant rise in shock intensity above 240mA.

As these devices are current operated, they provide a further benefit, by helping to reduce fire hazard due to live to earth faults. With no earth leakage protection, it is possible for a large current to flow to earth due to a fault, yet if the circuit is protected only by a fuse or conventional circuit breaker, no current overload will be detected. The power dissipated as a result of the leakage current can be the cause of a fire. A circuit protected by an r.c.c.b. would have disconnected the supply long before the leakage current can start a fire.

Although the r.c.c.b. device seems ideal to improve the electrical safety within the shack, the device may prove counter-productive in giving the radio amateur a false sense of security, since it provides no protection against electrical shock from the secondary side of any double wound mains transformer. This includes the h.t. supplies to the high power valve amplifier which can often be 1, 2 or 3 thousand volts. More on this later.

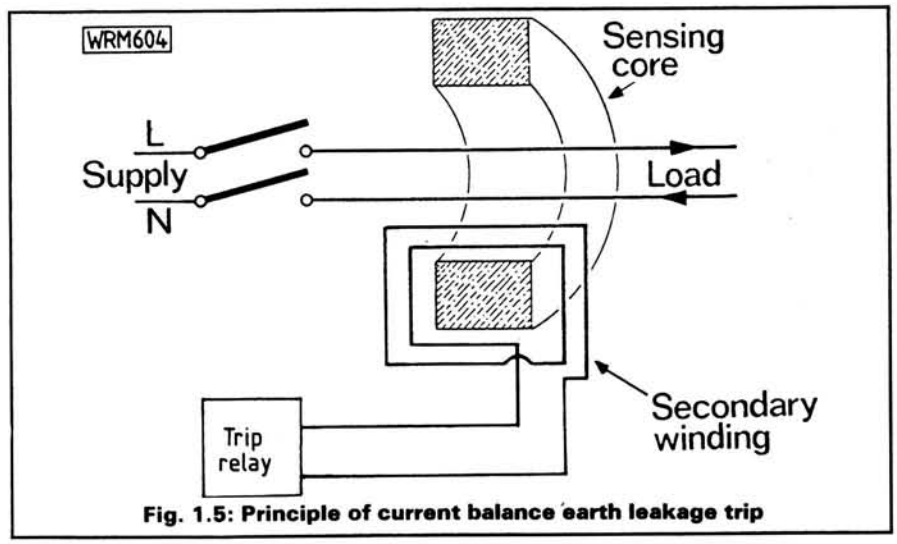


Fig. 1.5: Principle of current balance earth leakage trip

One of the important parameters of the r.c.c.b. device is the trip time. How can one ensure that the r.c.c.b. is operating correctly? The 15th edition of the IEE Wiring Regulations emphasises the necessity that an r.c.c.b. should be tested regularly. This does not imply testing by pressing the internal trip button, but testing by a purpose-made instrument. There are a number of manufacturers producing equipment that will test not only the trip time but also the trip current. You should be aware that if you have incorporated a mains r.f. filter into the shack wiring circuitry then you can expect random tripping of the r.c.c.b. It is most likely that capacitors forming part of the filter will be connected between live and neutral, and live to earth.

The Shack Wiring

In planning the electrical wiring of the shack, consideration should be given to providing devices which will protect the electrical installation against damage resulting from a current overload. This protection has been provided in the past by inserting suitably rated fuses into the various branches of the electrical installation. The protection to over-current provided by a fuse relies on the wire forming the fuse becoming hot and eventually melting to break the circuit as a result of over-current. In 1880, Thomas Edison defined a fuse as a small safety wire that became heated and melts away, breaking the overloaded circuit. As a general rule, a fuse will not blow instantaneously unless subjected to an overload current many times the fuse rating. The time/current characteristic for fuses which conform to BS 88, Part 2, is shown in Fig. 1.6. For the 6A fuse to blow within 10ms it requires an overload current of approximately 72A, which is 12 times the rating of the fuse and it is not always possible to achieve a high fault current due to the short circuit impedance of the total circuit.

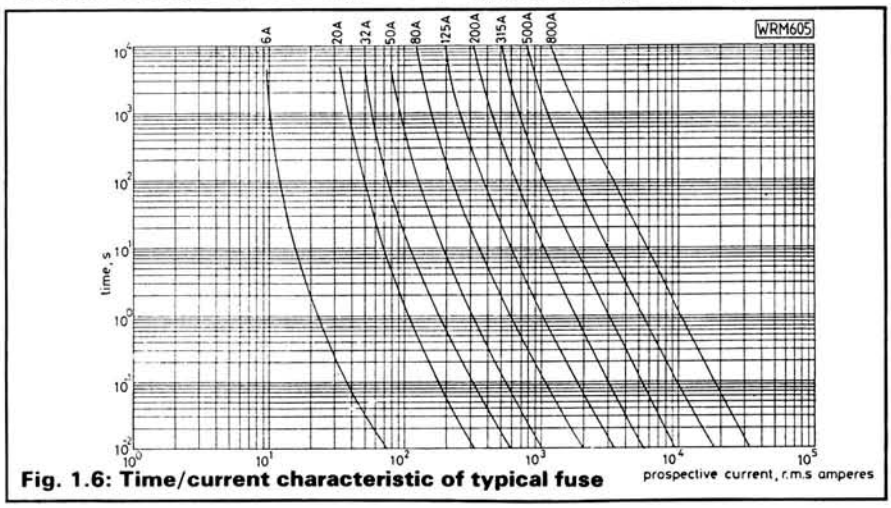


Fig. 1.6: Time/current characteristic of typical fuse

Prospective Fault Current Level

The prospective fault current at a given point is the maximum steady state r.m.s. current which would flow if all the active conductors were solidly bolted together at the point in question. The current is thus the maximum fault current which may have to be interrupted by the protective device. In practice, the actual fault current is usually much less than the prospective fault current, due to the current limiting effect of the fault resistance and of the cabling from the protective device to the point of the fault. Rarely does a zero impedance fault occur immediately adjacent to the protective device.

The main factors which limit the prospective fault current are the size of the supply transformer and the impedance of the cabling, switchgear, joints etc, from the sub-station transformer to the point of application.

The IEE Wiring Regulations require that the prospective short circuit current at the point of protection should be calculated, and that the protective device used should be capable of operating at that current. The Supply

Authorities have a statutory obligation to provide overall current protection and some Area Boards are indicating that for domestic supplies the fault levels could be as high as 16 000A! In the vast majority of domestic premises the Supply Authority cut-out will contain a 60A fuse conforming to BS 1361, which will limit the over-current to an acceptable level. The IEE Wiring Regulations require a maximum disconnection time of 0·4s for socket outlets and 5s for fixed equipment. For the 60A board fuse, this means that the maximum short circuit current to achieve a 5s disconnection time will be 400A, and 700A for a disconnection time of 0·4s, Fig. 1.7. However, some Supply Authorities are tending to increase the rating of the cut-out fuse to 100A because of the higher energy demand levels and to reduce the incidents of these fuses blowing. Under fault conditions, damage can be done to the installation and associated equipment because of the amount of energy that passes before the fault current is completely interrupted. The total energy let through depends on the value of the current and the time for which it flows and is denoted by the symbol I^2t.

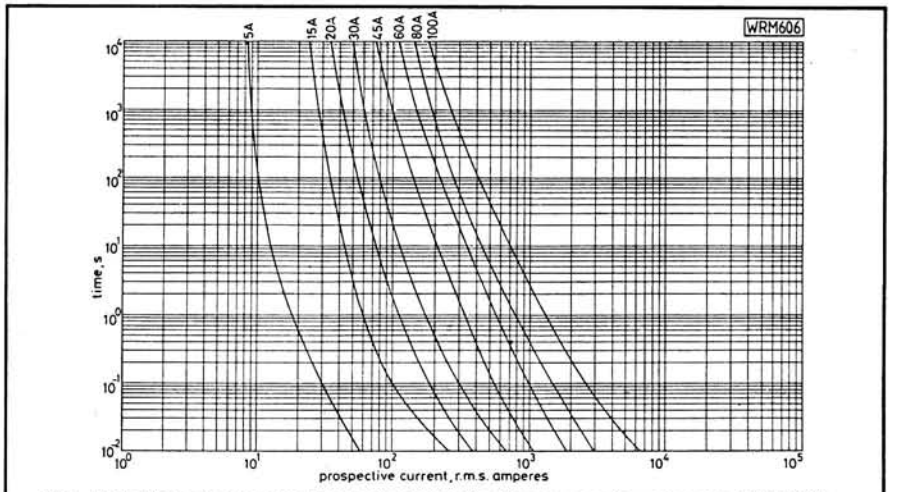


Fig. 1.7: Time/current characteristic for fuses conforming to BS1361

Part 2 continues with safety advice

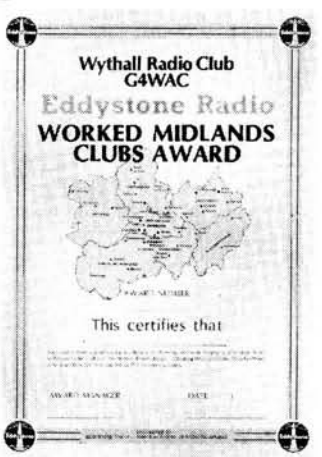
NEWS EXTRA

New Amateur Radio Awards

Wythall Radio Club in conjunction with Eddystone Radio Ltd are offering a *Worked All Midlands Clubs Award* to those amateurs who work the required number of clubs in the counties of Hereford and Worcester, Shropshire, Staffordshire, Leicestershire, Northamptonshire, Warwickshire and West Midlands.

There are four grades of award: Bronze—20 points; Silver—35 points; Gold—50 points and Platinum—65 points.

The points system is as follows:



1 point—Members of Club or Society using personal callsign.

2 points—Members of Club or Society using Club callsign.

5 points—Members of Wythall Radio Club using club callsign G4WAC (all claimants must work G4WAC).

Only one contact per club can be claimed for the award. So for the Bronze awards you could work nine members of different clubs, G4WAC and three different club stations—making the twenty points.

Log extracts, signed by two other amateurs, should be sent to: ***Wythall Radio Club, Awards Manager, Mick Pugh G4VPD, 37 Forest Way, Hollywood, Birmingham B47 5JS.*** The log should include date, time, callsign, band, mode, name, QTH and club name.

The award commences 1 July 1986 and has no time limit.

New TV Relay

A new television relay transmitting station, built by the BBC and IBA, is to bring good reception to more than 1400 people in parts of South Dorking, Surrey.

The new relay has been built at Tower Hill, to the south of Dorking and should be in service by the time you read this. The channels to be used are:

Channel 41—ITV
Channel 44—BBC2
Channel 47—Channel 4
Channel 51—BBC1

Viewers will need Group B antennas, fitted outside and directed towards the new relay with the rods vertical. The use of set-top antennas is not recommended.

Shortly after the station opens, one of the BBC's survey engineers will visit the area to check reception.

Improved VHF-FM in Cumbria

The BBC has installed new transmitters and antennas systems at the Windermere and Kendal v.h.f. f.m. radio transmitting stations. This should particularly benefit users of portable and car radios. In addition, the frequencies used for the BBC national network services from Windermere have been changed, and listeners will need to retune their receivers.

The frequencies in use are:

Windermere

Radio 1/2	88.3MHz
Radio 3	90.5MHz
Radio 4	92.7MHz
Radio Cumbria/Furness	104.2MHz

Kendal

Radio 1/2	88.7MHz
Radio 3	90.0MHz
Radio 4	93.1MHz
Radio Cumbria/Furness	95.2MHz

Listeners are advised to use v.h.f. f.m. whenever possible, since this offers better sound quality and freedom from interference. This is especially important after dark when the medium-wave radio services are often spoiled by interference from foreign stations.

Flat Holme Expedition

From Friday August 22 until Tuesday August 26 the Barry College of Further Education RS will once again be establishing a station on Flat Holme Island in the Bristol Channel. It is to commemorate the Marconi/Kemp tests of 1897.

Using the callsign GB2FI they will be using all h.f. bands as well as 50, 70, 144, 430, 1296MHz and 10GHz w.b.f.m. The working and calling frequencies for each band are given in Table 1 along with a contact callsign for all enquiries.

Don't forget this is one of the stations required for the Marconi Award and for WAB.

Table 1

50·120 GW8NVN QTHR
70·210 GW8NVN QTHR
144·270 GW1JCB QTHR
432·270 GW1JCB QTHR
1296·270 GW8CM QTHR
10GHz w.b.f.m. GW8NVN QTHR
All h.f. bands GW4XKE QTHR

Kit Construction—It's Easy

This month Elaine Richards G4LFM builds the Spectrum Communications Receive Converter, the RC20-2

At this point in the sunspot cycle, many of the amateur bands are rather quiet. This can be very annoying for anyone wanting to start h.f. listening for the first time as the band chosen could cause disappointment with the lack of signals. There's nothing worse than building a project and not knowing whether it works or not because there's no signal to listen for.

The 14MHz (20m) band is a fairly safe bet when looking for signals—I expect that nothing will be heard on the band as soon as this is published! The RC20-2 kit enables the listener to use a 144MHz band rig to "try-out" an h.f. band before committing large sums of money on an amateur or communications receiver.

The converter is a standard circuit type, where the 14MHz band signal is applied to a dual-gate m.o.s.f.e.t. r.f. amplifier (3N201, T1), which in turn feeds a dual-gate m.o.s.f.e.t. mixer (MPF131, T2). A 3rd overtone oscillator (BSX20, T3) produces the required 130MHz signal which is amplified by T4, a BSX20, to feed the mixer and a high level output for a transmit converter. Both power rails are protected against reversal of supply too—well, accidents can happen! Series diodes are used in each case to provide the protection.

Construction

The kit arrived safely and well packaged, so nothing was damaged. The components are all standard types and the tuned components used are made by Toko—that means everything can be replaced if you are a bit clumsy and break any of the components.

The capacitors in the kit were disc and plate ceramic and presented the usual identification problems. Fortunately the instructions with the kit help here as the codes are explained to help with finding the correct capacitor for the correct position. There is no components list so it's not easy to check if you have all the pieces—we persevered with the check and everything was there.

This kit isn't really ideal for the first-time kit builder as the instructions assume some previous constructional experience. That doesn't mean to say you need be an engineer or similar before attempting this project, it's just not one to "cut your teeth on". The order of mounting the components described in the instructions is not standard—see last month's Kit Construction. The first components to be soldered are the coils, then resistors, diodes, capacitors, m.o.s.f.e.t.s and transistors and finally the crystal. There is a good reason for the unusual order—the coils make it easier to identify where the other components go on the board. No particular difficulties were noted during construction, which took about 2 hours in total.

Testing and Alignment

Obviously the first thing you should do is check the board for any bad solder joints. Once you are happy with the standard of your work then you can proceed with the alignment.

The instructions are minimal, but if you have built kits before should present no problems. You do require a signal generator to provide a 14MHz signal though. If you can't beg or borrow one and have difficulties setting the tuned components up then the kit can be returned to Spectrum with £3.50 and they will align it for you. I think it's a reasonable price for such a service. One good point is the hexagonal plastics trim tool supplied with the kit for adjusting some of the cores. The tuned components used in the kit seem well chosen for the design as once tuned the cores in each were approximately at mid-point. The alignment took in the region of 15 minutes to complete.

Performance

The sample kit we built conformed to the specifications supplied i.e.

Noise figure—2·5dB typical (s.s.b.)

Oscillator output—0·6V r.m.s. at 300Ω

Spurious oscillator outputs—better than −45dB on the fundamental

Current—less than 30mA at 13·5V

Gain—26dB (20μV i.f. output for 1μV i.f. input)

During "on-air" testing the 26dB gain was found to be excessive causing overloading of the 144MHz band rig. The problem was solved with a 20dB attenuator between the converter and the v.h.f. rig. I think that as the converter design is used for four different amateur bands, the 70, 50, 28 and 14MHz bands, the 26dB gain is needed more on the first three than on the last band. The frequency stability of the kit was quite adequate for trouble free reception of narrow band signals.

We used a long wire antenna trailing from the shack window to a washing line post—probably some 15 or 20m away. Signals heard on the band almost straightaway were a Gibraltar station and a Brazilian station.

Overall I feel the kit is good value for money. It is available from **Spectrum Communications, Unit B6, Marabout Industrial Estate, Poundbury Road, Dorchester, Dorset DT1 1YA** and costs £17.25 in kit form unboxed or £24.50 readily built and unboxed.

Prices for boxed version are £25 and £35.25 respectively. ***PW***

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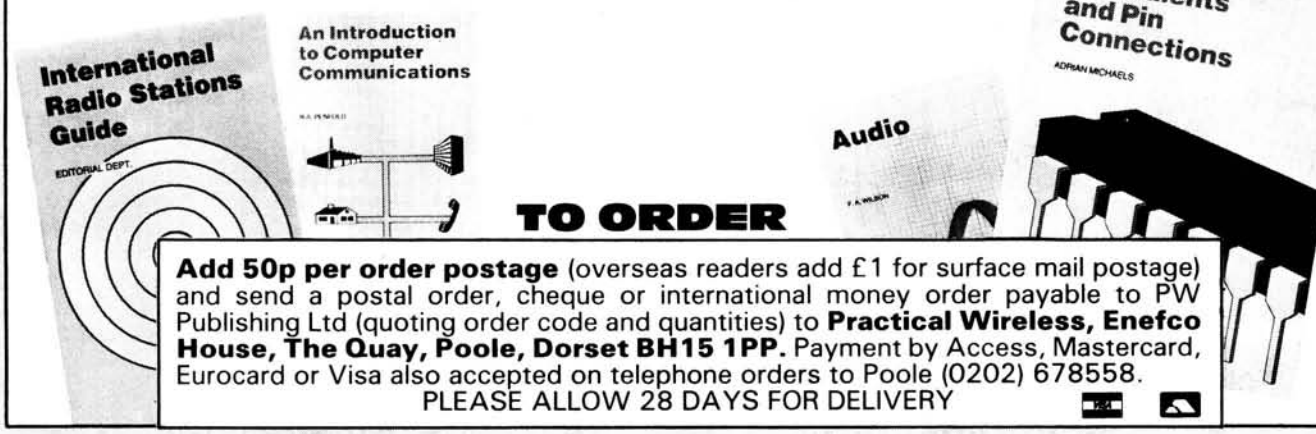

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Portrait of an Old Timer

Reg Baker G6QN recounts his experiences to Tony Smith G4FAI

When I met him, Reg was 84 years old. He began to lose his sight a few years ago, and is now almost totally blind. That doesn't stop him operating on the amateur bands however, and he can be heard daily on h.f. and v.h.f. Like so many old-timers on the air, he has a remarkable memory, and listening to him without knowing his age, he could be taken for a much younger man.

He works with both telephony and c.w. "I'll work anyone", he says, "if it's the chap round the corner, alright. If he wants to go at five words a minute, alright. If he wants 50, I don't mind. I can read 50w.p.m. in my head, and talk to you at the same time. If necessary I could use either hand for keying — it's what you teach yourself over the years".

He learnt Morse when he was a telegraph boy in the sub-post office on Tooting Broadway, in South London, just before the First World War. There were two keys and two sounders, operated by the counter clerks. He listened to the machines ticking away and he learnt by asking the girls what the various letters were.

There was motive behind his keenness. There were certain telegraphic addresses in the district which tipped the boys delivering the telegrams. He realised that if he could read these addresses coming over the sounders he could "volunteer" to deliver them, and reap the benefits.

"I earned seven bob a week, and my pocket money out of that was threepence. Come the end of the week I amassed about half-a-crown in tips, which Mum didn't know about!"

Most of his relatives were in the Post Office, including two who were telegraphists. One of these was determined Reg should join also, and even bought him a bicycle, to teach him to ride, to be sure he got the job. He took the Civil Service examinations, came 12th out of 800, and was given a male learnership, leading to appointment as a telegraphist.

For various reasons, he decided that life in the Post Office was not for him. He joined the army, under age, and was selected for Signals work. He found himself being taught Morse, army style, although by this time he could read it at 25w.p.m. He held himself in check, but it was soon realised he knew as much, if not more, about the subject as his instructors.

He went to France in 1918 to join the signals section of the 20th Division and saw action there, providing communications by cable and by means of spark loop wireless sets powered by 24V batteries.

Released from the army in 1919, he re-enlisted for a further period, serving in the Khyber Pass, India, and in Southern Ireland during the troubles. He operated spark transmitters running about two kilowatts, and the receivers had carborundum and steel crystal detectors. Change-over from transmission to reception was a slow business, as the generator had to be stopped after each transmission to avoid blocking the receiver, and restarted again before each new over.

Finally discharged from the army in 1921, Reg met Jack Partridge G2KF, who later, on 8 December 1923, was to become the first British amateur to establish two-way contact with the United States. Jack's QTH was just over the road from where Reg lives today, and his antenna ran behind the shops in Colliers Wood High Street. He was the official operator of the Wimbledon Radio Society's transmitter, callsign 6JB.

Reg joined the society just as Jack was moving away from the district, and, with his experience, he was asked to take over as operator. He had to take a GPO Morse test first, and he was the official operator of 6JB for ten years, although he had no licence in his own name.

He eventually applied for, and obtained, his own call, a somewhat different process to that of today. As part of his application he outlined an experimental scheme to connect police stations, and all police boxes in their area, by radio to give police constables better communications with their bases, and on the strength of this he was allocated the call 6QN in 1932. Ironically, his RAOTA service (Radio Amateur Old Timers' Association) counts for the period during which he has held a personal call. The ten years spent operating 6JB cannot count, although he was an active radio amateur throughout that time.

All of that was over 50 years ago, but Reg is as enthusiastic about amateur radio as he ever was. When I visited him to record some of his memories, on a hot summer's day, his front door was open and he called me in. He was in the middle of a c.w. QSO on the 7 MHz band. It was going on at a rattling pace, and it was true what he said about holding a conversation at the same time. He was following the other station's c.w. whilst he greeted me, and went back to him with Morse too fast for me to read.

When he wants a break from amateur radio he sits at the console of his electronic organ, and plays away happily for hours with a repertoire ranging from popular music to the classics. He treated me to a mini-concert straight from *The Organist Entertains,* and I got that onto tape as well.

His only frustration, and he freely admits it, is the loss of his sight. He has always been an active man, and he fights the handicap continuously, reluctantly calling in local amateurs, who are more than willing, to help him with antennas and other matters that now present problems for him.

I left him with his rigs, his souvenirs, and his memories. As I went down the garden path he was back at his organ, and the strains of Arthur Askey's *Bee* song followed me into the street. **PW**

★ Special Offer ★

MEASURE FREQUENCY TO 1·5GHz

The increasing popularity of 934MHz CB and of the 23cm amateur band means that more enthusiasts are looking for an accurate and reasonably priced instrument to check frequencies up to a gigahertz and beyond. With this in mind, we offer our readers this month the opportunity to purchase the latest digital frequency counter from the Black Star range, at a price of £230 including carriage, insurance and VAT. We've had a pre-production sample around the *PW* offices since the beginning of the year and have found it reliable and easy to use. Cross-checked against our regular lab instruments for accuracy and sensitivity, it's comfortably beaten the manufacturer's specifications throughout its ranges. It also copes happily with n.b.f.m. signals, and with a.m. depths of up to 30% at minimum specified input signal levels.

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10MHz–100MHz	10mV <50MHz 25mV >50MHz	100Hz	10Hz	1Hz
80MHz–1·5GHz	15mV <600MHz 50mV >600MHz	10kHz	1kHz	100Hz

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BLACK STAR OFFER

Biggest in the World

The Dayton Hamvention is the biggest amateur radio event in the world. Over 30 000 amateurs attended this year's three-day event in April, including Nigel Cawthorne G3TXF, who reports for PW

The convention programme covers all aspects of the hobby of amateur radio from QRP to Moonbounce and from DXing and Contests to traffic nets. Six parallel streams of lectures and talks cover everything from DX and contesting through SSTV, 28MHz f.m., QRP, AMSAT and Amateur Radio and the Law.

Among the crowds of US amateurs attending Dayton, many international callsigns can be spotted. There were at least five UK visitors attending this year's Dayton (April 25–27): G3GIQ, G3MXJ, G3SXW, G3SZA, G3TXF and G4BUE. There were probably several more in the crowds.

Apart from the enormous size, an important difference between Dayton and the RSGB's NEC show is that Dayton is run just by one local club—not by the national society. The Dayton Hamvention is organised and managed by a team of amateurs from the Dayton Amateur Radio Association. The ARRL, the national society of the US, are in attendance at Dayton with a major stall in the trade show, but do not take part in organising it.

Flea Market

Dayton boasts the largest amateur radio flea market in the world. The several acres of stalls open as early as six in the morning. Bargain hunters are out in force just as the sun comes up. During the day the acres of stalls, each piled high with second-hand amateur gear of all descriptions, get pretty warm under the Ohio sunshine. Countless bargains are to be found among the several hundred stalls. "If you can't find it at Dayton, you never find it!" is the way the Dayton organisers describe their flea market.

Equipment ranged from satellite antennas to antique wireless sets. Bargain hunters scour the stalls all day. Overseas visitors find amazing bargains there too, but the real problem is "excess baggage" on the journey home. That second-hand L4B linear might look like a bargain until you work out how much it's going to cost you to get it home!

Trade Show

As well as the acres of open-air flea market there is also a large trade show under cover of the main convention buildings. Every US amateur equipment manufacturer and supplier, big and small, appears to be there.

If you are looking for anything in Amateur Radio, you'll find it at Dayton. Among the over 200 mostly-US trade stands, there were two enterprising UK exhibitors out to take advantage of the falling dollar. The two exporting UK exhibitors were Microwave Modules and Kent Morse Key Kits.

Microwave Modules were highlighting their latest range of v.h.f. transverters and amplifiers. MM boss Richard G3XVK told us that they had been active in the US market since the early 70s, but that this was their first major showing at the Dayton Hamvention. So that visitors to the MM stand were in no doubt where Microwave Modules come from, there was a large Union Jack flying over their heads.

Robert Kent's (G4POY) Morse Key Kits were also attracting a lot of interest from the crowds at Dayton. The Kent solid brass Morse keys were being offered either as kits or as fully assembled products. US amateurs would probably think that having a real brass pounder in their shack is "quaint", even though they may never work any c.w.! Kent keys were probably also being bought up for use as trophies, as well as for use as straight Morse keys as originally intended.

The crowds inside the trade show at Dayton were several layers deep in front of all the trade stands. With the outside temperature reaching towards the 90s, there was also brisk trade for the Coke and beer vendors too!

Round-the-clock

Dayton is an around-the-clock event. Each evening there are several special interest dinners and activities arranged. The main Hamvention banquet, attended by several thousand, is on the Saturday evening.

On Friday there was a DX dinner attended by hams from all over the world. DX dinner attendees included visits from HI, KP4, VK9, 4S7, 4X and 5N8. After-dinner speeches included a humourous account of the early days of DXing from Bob Locher W9KNI, author of *The Complete DXer*.

As well as the formal evening dinners, there is also a whole range of much less formal entertainment including the aptly named "hospitality suites".

Hospitality suites are organised by clubs and groups with specialist interest in order to receive and entertain visiting amateurs of similar persuasion. One hotel in Dayton (Stouffer's) houses the hospitality suites run by the DX and Contest Clubs. Other hotels have hospitality suites for QRPers, v.h.f.ers, Amateur TV enthusiasts and many other interests. In true North

Plenty of choice in the Dayton flea market

American style, bathtubs are filled with cans of beer and ice. "Fisherman's tales" of DXing and contests are exchanged well into the early hours.

One hospitality suite that always proves popular with c.w. contesters is the Kansas City DX Club's, because the KCDXC run a "c.w. pile-up test", for which several prizes are offered.

CW Pile-up Tape

This year's KCDXC pile-up tape ran for just under five minutes and during that time one hundred different callsigns were sent at different speeds and at different levels as in a c.w. contest or DX pile-up. The idea is that you listen to the tape once and write down as many of the callsigns as you can identify. As in real-time contesting, several callsigns may be sent at the same time and louder calls will blot out the weaker ones. The KCDXC set up the tape in a room annexed to the main hospitality where six people can take the test at a time.

Veteran DX contester Larry K0RWL checks and tallies each sheet and the scores are chalked up on a large plaque in the suite. All DXers, contesters and budding DXers are encouraged (or coerced) into taking the tape. This year's top scorer was Bob W3VT with 58 correct calls out a possible 100. Top UK entrant was Roger G3SXW with 55 correctly logged calls. The KCDXC have written a special pile-up tape-generating program for use on an IBM-PC.

Pile-up tapes are becoming popular at amateur radio events. At Birmingham this year the RSGB's HF Committee ran last year's Dayton tape.

Non-stop

Unlike the RSGB's National Show at the NEC, which tends to be an "out-in the morning and back in the evening" event, Dayton runs non-stop for nearly three days. Also because of the much greater distances involved in the US, nearly everyone who is visiting the Dayton Hamvention is staying somewhere in Dayton itself. All Dayton hotels are fully booked for months ahead of the show. During the Hamvention, which with an influx of 30 000 hungry ham visitors is good business for the local restaurants and hotels, the convention organisers provide free shuttle buses between all the hotels in town and the main event, which is about seven miles out of Dayton.

"Conventioning" is big business in the US, and towns which hope to attract and keep major conventions know they are competing with other towns and cities across the US to host major conventions. Because of this competition to "keep the convention in town" local services are well organised.

Most Dayton conventioners arrive in Dayton during the Friday and leave around midday on Sunday. The event is open, however, from noon on Friday through to 1630 on Sunday afternoon.

Hamvention visitors take a rest in the shade

DX Forum

The DX forum consisted of a number of slide-shows and talks from recent DXpeditions. These included a talk by Dave K3ZJ on the Barry Goldwater organised DXpedition to Taiwan BV0BG, a slide-show by Kirsti VK9NL and Jim Smith VK9NS on "South Pacific DXing" and by Iris W6QL and Lloyd Colvin W6KG on the "1985–86 YASME African DXpedition".

Saturday afternoon's contest forum heard eleven presentations and slide shows including "DX Contest strategy, the East Coast perspective" by John K1AR and "How the West was won: DX Contest Strategy (from the West Coast)" by Gary WA6VEF. DX contesting is a serious business in the US. European visitors sat stunned by the endless slides of massive stacked h.f. arrays pointing in all directions and for every band.

The two contest strategy papers highlighted the major differences that exist in operation on the East Coast and the West Coast of the US. The West Coast DX contest strategy speaker suggested that the best approach in major DX contests consisted of working as many JAs as possible. (Remembering that JA from the West Coast of the US is an all-sea path.)

According to WA6VEF, there are now over 1·3 million amateur licences issued in Japan (yes, 1 300 000!), but that 1·15 million of these are 10W (no c.w.) licences. There are about 125 000 JAs licensed for h.f. c.w. operation, and of these only about 40 000 are licensed for 14MHz. This explains why (when conditions are good) there are so many JAs to be worked on 21MHz, but few relatively on 14MHz.

Next Year

The Dayton Hamvention is the largest single amateur radio event in the world. For a visiting amateur, there is just so much to see and do at Dayton that it is impossible to fit it all in. The 1987 Dayton Hamvention is scheduled for April 24–26. It's well worth the effort to get there! ***PW***

"Off the back of a lorry" at Dayton! *Pictures by G3TXF*

Reminiscences of a Portable Contest Station

David Isles G4XGA didn't deliberately set out to be a contest operator—it was more a combination of circumstances that led him into the situation recounted here.

Although I am not a member of the RSGB, and therefore not able to participated in their contests, I had the occasional urge to test both myself and my equipment in the more rigorous conditions of a contest. As a keen hill-walker I spend as much time as I am able wandering over the hills of Scotland and—as a poor second-best—Wales. I had got into the habit of carrying my Yaesu FT-290R with me, and had long ceased to be surprised at how far my precious r.f. waves could reach from those heights in spite of the low power. I had also resigned myself to the amazing property that this rig seems to possess of being able to increase its weight by a factor of two for every hour spent hauling it around in my rucksac!

A Golden Opportunity

When *Practical Wireless* first mooted the idea of a QRP Contest it seemed like a golden opportunity. The contest was to be true QRP—3 watts maximum—and not a mere pretence at being QRP. It would be eight hours long, enabling single operator stations to get in with a chance and it was open to *all* licensed operators.

G4LDR—*PW* QRP contest 1983

Strategy

This suited my situation perfectly. Even as I decide to have a go, a strategy was forming in my mind. It represented an ideal opportunity to combine two hobbies! I realised that since I had never worked a contest before, and being determined to work as a single operator, I needed all the help that I could muster. The fact that I did not possess the capability for a large power output was no longer a problem—the terms of the contest saw to that. But how to compete with the more experienced multi-operator stations? The two main elements of my *Grand Plan* were to work portable from an unusual square and to achieve as much height as possible. The station would have to be trimmed down in order to be as light as possible, but if this could be achieved what better location than some mountain top in Snowdonia?

This offered the height—900 metres a.s.l. or more—and the relatively unusual square XN80 now IO73, which I hoped would encourage those stations wishing to work this square to give me a call, whether in the contest or not.

I missed the first contest, but took part in the second with fair, but by no means spectacular, results. I was sure that I could improve on my score, so I adopted the same strategy in 1985, with only one amendment—the use of a speech processor—about which more anon.

Sunday 16 June 1985 arrived. I allowed myself two hours to drive to Capel Curig from my Shropshire QTH. This was generous in view of the fact that traffic should be very light so early in the morning. A further two hours were set aside to walk up the mountain. This was a little worrying since I am an amazingly slow walker in the hills, especially when carrying a load. By 0530 BST I was in the car and ready to set off. While I am quite used to sleeping out in the hills, I judged it best on this occasion to assess the conditions from home rather than risk having to spend the night out on a mountain in the pouring rain. In the event it

Ayr ARG "A" Team GM4PPT/P

was not raining, in fact there was a cloudless blue sky, even at that hour.

As I parked the car after an uneventful journey I checked the time—0720—on schedule but can I get up the hill in time? Nothing else for it, rucksac on—how can anything weigh so much?—head down, away we go. My objective was Glyder Fawr, at 1000 metres a.s.l.—730 metres above my present location—impossible!

Psychological

Don't ask me how I did it. I still do not know myself. After resolving not to look at my watch at all on the way up, and having overcome the psychological hiatus that I always experience about thirty minutes after setting out, when my legs and lungs tell me that I will never make it, I finally arrived at my destination well before 0900 BST. Over an hour to set the station up, an unexpected but very welcome luxury.

I was grateful for the extra time because at that altitude a thick grey mist enveloped the whole landscape, and after the promise of the early morning sunshine I now felt more cold than I had for a long time. My fingers soon began to feel numb, and I man-

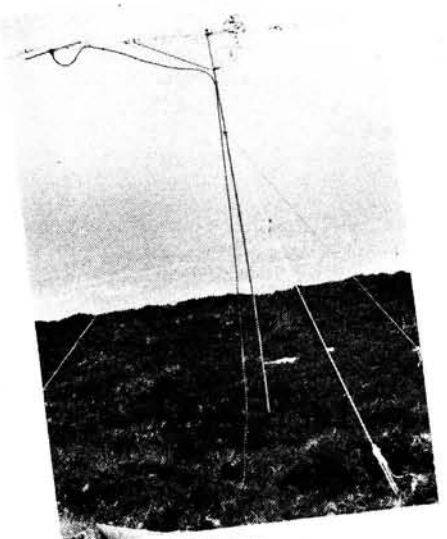
aged to drop two of the bolts that fix the elements of the antenna to the boom. They disappeared quietly and irretrievably into the interstices of the rocks at my feet! Just two spares, what foresight! I was careful to congratulate myself only after the successful assembly of the five-element Yagi upon which I pinned all my hopes during the next eight hours.

Brief Technicalities

For the technically minded the station details are brief. They need to be when you are carrying everything on your own back! The rig was a Yaesu FT-290R with the MuTek board fitted. The antenna was a five-element Yagi purchased at a recent radio rally quite cheaply and only just adequate for the job. It must be the weakest link in the chain when it really should be the most reliable. ("... oh, yes, sir ... 10dB gain at least ... a nice little antenna for the price ...", My own quick, but not entirely scientific, back-garden test put the gain at closer to 4dBd. Still, what can you expect—"for the price").

Power came from a 6Ah Gel-cell, more than enough for my requirements, as I knew from experience, but I didn't want to rely on the NiCads as they are a little bit old and their reliability suspect. The antenna was supported on a three-section lightweight aluminium pole giving a total height a.g.l. of 3 metres.

The only other piece of equipment used was my secret weapon—the speech processor. I hadn't used one before, indeed I had always vehemently resisted the temptation—ever since I had experienced the most appalling interference from so-called QRP stations usingly badly adjusted processors on a previous occasion. However, I allowed myself to be persuaded by a friend—G1BOF—who had constructed one of these machines from a design published some time ago in *Practical Wireless*. After what seemed like hours of off-air testing he assured me that it sounded perfect, but as someone once said ... "He would, wouldn't he ..."



EI7DG/P

Bouquets

He must have been right. Having used it on many occasions now I have received no complaints, only bouquets.

And that seems to be it—all ready for the contest to start.

Starting Times

Now I will forgive those of you who imagine that a contest timed to start at 1000 actually starts then. I also thought the same at one time. However, it actually starts at any time from about 0900 onwards.

Don't mistake me. There is no suggestion that rules are broken. I believe that hardened contest operators call this "gamesmanship". The idea seems to be that a contest station secures the help of another friendly station. This station will answer a general CQ call put out by the contest operator at any respectable time before the contest starts. The two stations can then QSY to a frequency as close as decently possible to the calling frequency and secure that frequency by engaging one another in the exchange of pleasantries for as long as is necessary until the start of the contest proper. Clever stuff.

Not having any compliant friends —it's at times like this that one discovers who ones friends are!—I could only sit in mute frustration during the long minutes leading up to 1000 BST and listen to the rapidly growing number of "pre-contest" stations moving to their preferred frequencies and chatting about the weather.

Paranoid

I seethed with desperation. I became paranoid with the conviction that there would be no room left for me on the band.

Of course it was by no means as bad as that. Things always seem to be a lot worse during those last few tense moments when the adrenalin begins to flow and one is in an agony of uncertainty as to whether all the painstaking preparations or the conditions will yield any results at all. In the seconds leading up to zero hour I tuned to 144·340MHz and found it miraculously clear. Not bad at all. One advantage of not being too near the calling frequency is that there is less likelihood of having to share the frequency with another station, a not unusual occurrence during this contest.

Spectres

This raises another spectre—frequency occupation. Some stations get very upset when they imagine that another station is attempting to usurp their place on the band. As for me, I try not to worry too much. A certain amount of jostling on the band is par for the course during any popular contest. If another station pops up close to mine. I just make a slight

PW QRP contest entrants

adjustment of the frequency, and move my antenna a few degrees away from the heading of the other station. That usually does the trick. Certainly on the part of the band that I was drifting through, signals seemed a lot cleaner and manners more gentle this year.

A Gust of Wind

A deep breath and off we go. The contest plodded on in a fairly commonplace manner. The worst moment for me came about halfway through. I was just tucking away a completed sheet of the log at the back of the clipboard when a gust of wind snatched it out of my hand and carried it towards a distant outcrop of rock which fell away alarmingly for 500 metres into the Ogwen Valley. I had just made contact with another station and I suddenly found myself doing several things at once.

Trying to stay calm—there were at least 30 contacts recorded on that piece of paper, after all—I took details of the other station, sent him a quick report, and then, in a desperate attempt not to make a drama out of a crisis, I placed a stone on top of the clipboard to prevent any further escapes and went in pursuit of the errant piece of paper. Much to the amusement of the "sticky-bricks" wandering over the summit plateau at the time. Luck was with me. The logsheet was lodged behind a stone perched on the brink of the abyss. I returned to the rig as quickly as possible and breathed a sigh of relief.

Apart from that crisis, the bad times are the early hours of the contest when you begin to wonder whether you will last—no time for a break, no time for a sandwich or a drink—my flask had, in any case, perversely decided to break, leaking its burden all over the contents of my rucksac—just eight hours of talking into a microphone

"... CQCQCQCQCONTEST
CQCQCQCQCONTEST ..."

Even the rubberneckers who started to arrive about 1200 ceased to amuse me after I had been asked for the umpteenth time if I was a CBer.

Targets

I set myself a target on an average of 30 calls an hour. No, I know that is not contest winning stuff, but I knew that if I could manage that, I would at least improve on 1984's performance.

And I did—just!!!

At this stage you may be excused for wondering why I do it. Getting out of bed at some unearthly hour; sweating my way up a hill carrying far more than is good for my constitution; talking myself dry for eight hours without a break; arriving back home over 16 hours after setting out to be greeted by an incredulous family, worn out—I'm beginning to wonder myself.

Wild Goats

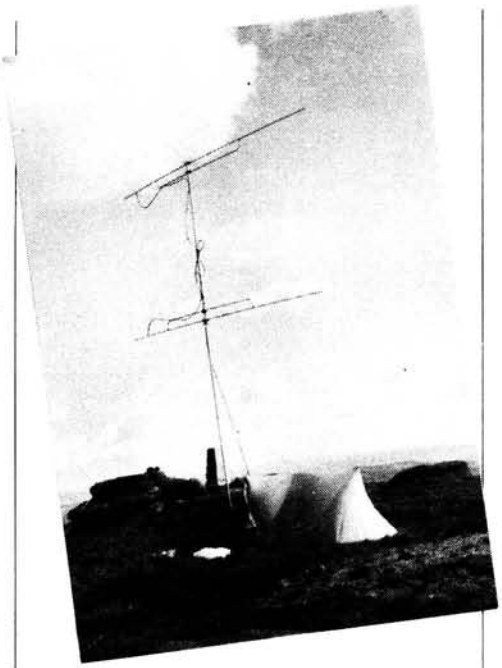
But then I remind myself of the other things—walking up the hill in the early morning sunshine and having the mountain all to myself; startling a herd of wild goats drinking from a stream about halfway up. Yes they are there, but you have to be up and about early to see them. Testing oneself and ones equipment in truly extreme conditions; making contact all over the British Isles using only the smallest amounts of power and the most basic of station accessories; at the end of the day making ones way back down a once-more quiet and empty hillside, pausing to watch the golden evening sunshine fill up Cwm Tryfan, tired but very satisfied.

Paperwork

I am sure that many will agree that the hardest part is the paperwork. The log checking, although made much easier with computers, is still a chore. Making a good copy of the log seems an endless task, but it is done at last, and despatched to the adjudicator with some apprehension. Although I take the greatest care to record callsigns accurately, including suffixes, there is nothing one can do about the station who forgets to send it, and I wouldn't think there is a single station sending in a log who doesn't have some points deducted because of callsigns recorded without the small, but significant --/P or --/M.

Aspirations

I have no great aspirations. I can join with many of the other stations working this contest who declare that they do not expect to win, but it really is the fun one gets from taking part that is the most important. Well all right, if you press me I will admit that it would be a tremendous ego-trip to see my callsign up amongst the leaders. My trouble is that I enjoy talking too much. It only needs a station to come on requesting the WAB 10km square to send me rummaging in my rucksac for the map to find the relevant information. I can



G0AYN/P in a *PW* QRP contest

remember chatting to a station on the summit of Ben Nevis during the 1984 contest for far more time than any self-respecting contest station would allow. Sheer magic!

The Good Moments

Even now as I glance back through the log I can savour the good moments when the calls came flooding in and the serial numbers mounted with satisfying rapidity. During the quieter moments I could lean back and enjoy the spacious expanse of the view from my airy perch.

What, no grumbles? Well, conditions were not as good in '85 as they were during the '84 contest, in spite of the fact that I managed to increase my score. I attribute this to the fact that I was using the speech processor, which really seemed to work. I am now converted to the use of these accessories, if well designed and set up. However, I only managed to work one GM station and very few EI and GI stations, very unusual. Most unusual of all, even though there was a bitterly cold wind blowing for most of the day, as I was packing up the station I began to feel the tell-tale soreness around my neck, forehead and knees where the bottoms of my breeches just failed to reach the top of my socks—I was suffering from a bad dose of sunburn!

A Great Day Out

Nevertheless, a great day out. I experienced none of the traumas that have afflicted me from time to time in the past, when I was learning just how careful ones organisation needs to be for even the most casual day out playing at radio on a mountain top. The time, for instance, when I packed all the gear and set off for the summit of Cader Idris. The NiCads were exhausted, but no need to worry as I had the Gell-cell to keep me powered up. It was a very hot day and as I crawled upwards contemplating the trickle of sweat that ran down my nose and splashed onto the ground just in front of my feet, I was reminded of the description of Falstaff "larding" the earth with perspiration as he moved. When I arrived, I settled down to enjoy several hours of radio. Conditions just had to be the best for weeks. Out came the equipment, lacking only the power lead to connect the battery to the rig! I cried. I admit it. The tears of frustration ran down my cheeks. A radio, an antenna, a microphone and a burning desire to indulge myself with my hobby—but I had no means of using the equipment!

The time, again, when I was in the Cairngorms, a wonderful location from which to work, and a good one for the less energtic since the chairlift will carry you, at a price, to within 150 metres of the summit of Cairngorm, just over 1220 metres above sea level! Pick a fine day in order to enjoy the breathtaking views across the Spey Valley.

On this occasion I had trekked into the vast plateau which links the summits of Cairngorm and Ben Macdhui. I had double checked the equipment and was certain that it was all present and correct. I opened the rucksac and discovered that indeed it was. I assembled the mast sections and bolted the HB9CV to the top, tied on the guys and hoisted it skywards.

If you have ever seen the photograph of the American Marines planting their flag on the summit of a hill during the war in the Pacific, you will have some idea of what I must have looked like as I leant into the mast urging it into the vertical position. I only hope that the Marines had better luck than I did, for a sudden gust of wind caught the top of the mast and it came crashing down. I contemplated the remains of the HB9CV with uncharacteristic resignation, and spent the rest of the time on the hill working through the whip. At least I had that consolation.

All Great Fun

We learn through our mistakes, or so I am told, as my experiences and mistakes mount up, I make less of them. Certainly if you are thinking of working a contest, you would be wise to check and triple check all your gear before setting out, and don't be put off by anything that you have read here. It's all great fun, and very satisfying, even on those days when conditions are not so good.

Finally, my thanks to all those stations who took the trouble to give me some points during the contest—see you all again this June.

Any station wishing to make a sked into some of the more unusual or sparsely occupied WAB Squares is invited to get in touch with me. I am often out there looking for someone to talk to—just drop me a line. ***PW***

Folded Coaxial Dipole

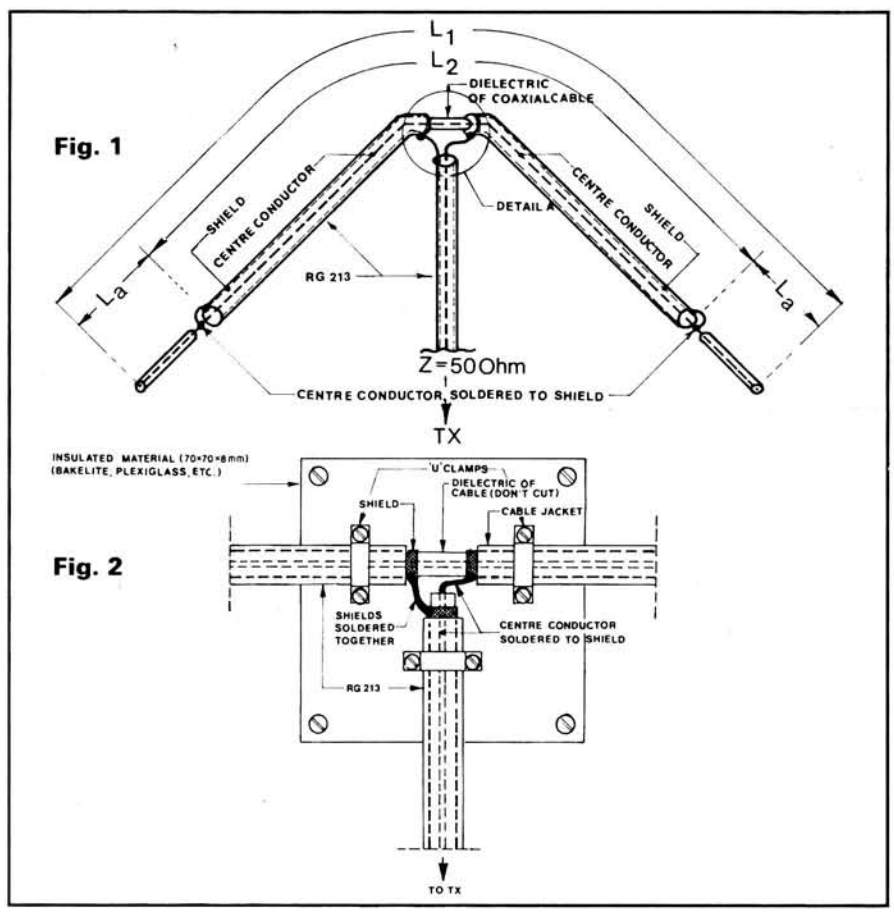
Martin Michaelis DK1MM puts a new slant on folded dipoles made with coaxial cable.

The Folded Coaxial Dipole Antenna

A simple inverted "V" antenna used in the attic exhibits essentially the same characteristics as a folded dipole when used in a similar environment. The main difference being that the "V" needs a matching balun when fed with coaxial cable.

Basic Theory

To understand the characteristics of the FCD-Antenna (Folded Coaxial Dipole), one must first grasp the concept that unlike a conventional folded dipole where both conductors are of the same diameter, the coaxial dipole has one conductor larger than the other. This then brings about a change in the feed point impedance. This form of construction can now be matched to a much lower impedance feeder e.g. 52Ω. The function that is normally carried out by a balun is dealt with by the action of the coaxial stubs which are an integral part of the antenna. The two coaxial sections of the dipole are just under λ/4 long and form the matching stubs mentioned above. The whole coaxial structure is brought to resonance by the wire extensions connected to the ends of the dipole.



Construction

The basic dimensions of the FCD-Antenna are shown in Fig. 1. The detailed dimensions for the antenna appear in Table 1 for 3·5MHz (80m) through to 144MHz (2m) covering all WARC bands. The wire tuning stubs (dimension La) should be made slightly over length (say 10 per cent) to allow for subsequent tuning.

It should be mentioned at this point that the design shown in Figs. 1 and 2 is for use indoors, i.e. in the roof. If you wish to use it outside then it will require a high degree of waterproofing at the coaxial joints and ends as coaxial cable will readily absorb moisture. After you have made your antenna for whichever band you have chosen, it can be installed in the roof space in an inverted "V" formation using the rafters as a framework.

To aid in the tuning of the antenna a noise bridge can be used, carefully trimming the tuning stubs for best results. In the interests of avoiding TVI and poor performance, one should try to situate the antenna as far as possible from mains wiring, water tanks and pipes, TV and "f.m." antennas, etc.

PW

Table 1: Dimensions of FCD-Antenna

Desired Band m	Centre Frequency MHz	L_1 m	L_2 m	L_a m	Coaxial Line Type
80	3·650	38·58	27·23	5·67	RG-213
40	7·050	19·98	14·10	2·94	
30	10·125	13·91	9·82	2·05	
20	14·170	9·94	7·02	1·46	
16	18·118	7·77	5·49	1·14	
15	21·170	6·66	4·69	0·99	
12	24·940	5·65	3·99	0·83	
10	28·800	4·89	3·46	0·72	
6	51·000	2·77	1·95	0·41	
2	145·000	0·97	0·69	0·14	RG-58/U

Formulas Used:

$$L_1\ (m) = \frac{140{\cdot}80}{F_{(MHz)}};$$

$$L_2\ (m) = \frac{99{\cdot}40}{F_{(MHz)}};$$

$$L_a\ (m) = \frac{(L_1 - L_2)}{2};$$

For coaxial line with Z = 50 ohms and velocity factor 0·66.

MICROSTRIP

A Marconi quarter-wave grounded antenna can be thought of as a half-wave dipole whose bottom half is formed by the reflection of the top half in the "ground mirror".

In the same way, a microstrip transmission line can be considered as a two-wire line, in which one of the wires is represented by the image of the other wire in the ground plane. S. J. Davies G4KNZ gives some practical pointers for home construction.

Microstrip is the name given to a transmission line consisting of a flat conductor spaced above a ground plane by an insulating material, as illustrated in Fig. 1. It can easily be made by etching one side of double sided p.c.b. and is widely used at u.h.f. and above; for example the 50Ω tracks between stages on a converter or transverter p.c.b. at these frequencies are microstrip. The most common dielectrics used, often referred to as substrates, are glass fibre and ptfe or combinations of these.

Electric Field

The electric field present around microstrip is illustrated in Fig. 2. This shows that the field is not confined to the dielectric, but rather part of the wave travels in the dielectric and part in the air. This means that the effective dielectric constant is lower than that of the substrate. This effective constant partly determines the impedance, and is a function of both the dielectric constant of the insulator and the ratio of the conductor width to dielectric thickness (w/h). So it is obvious that any expression for the impedance of microstrip is not going to be simple.

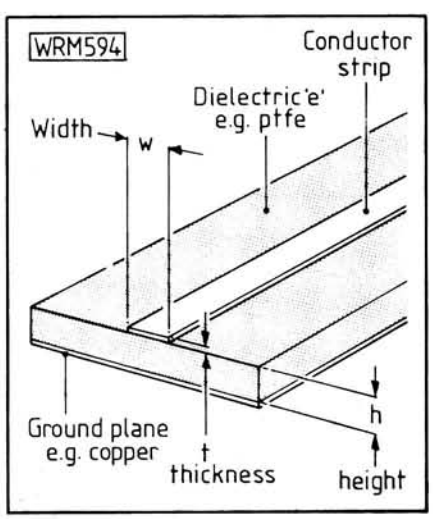


Fig. 1: The microstrip

Impedance

There are numerous approximations, and one most useful for amateur applications is the following, which is valid for the ratio w/h between 0·5 and 5, for any dielectric constant:

$$Z_0 = \frac{57}{\sqrt{(e + 0{\cdot}47)}} \times \log_e \frac{(13{\cdot}5)}{w/h}$$

where: Z_0 is the characteristic impedance
h is the dielectric height
e is the dielectric constant
w is the conductor width

This equation will normally give results within 5 per cent. The thickness of the strip conductor is ignored, since it has negligible effect if thin.

Accurate plots of the characteristic impedance against w/h for various dielectrics is shown in Fig. 3. For standard glass fibre, dielectric constant 4, thickness 1·6mm (⅛in), then 50Ω track should be 3·3mm wide. The equation shown gives 3·4mm.

Velocity Factor

The velocity of propagation of the waves is reduced by the dielectric, and microstrip has a velocity factor, similar to coaxial cable. As with the impedance though, expressions for this are complicated, because part of the wave travels in air. The velocity factor plotted against w/h for various dielectrics is shown in Fig. 4.

Practical Materials

In order to confine most of the energy to the dielectric (to minimise the amount of stray radiation), a high dielectric constant should be chosen. Professionally, such materials as alumina with a dielectric constant of 9·7 are used. However, these high dielectric constants mean that the wavelength is much shorter, and the line widths also become very narrow. Very high accuracy is therefore necessary in defining the line widths, and a very smooth surface necessary on the substrate.

These materials are not very suitable for amateur use and lower dielectric materials will have to be used. Standard glass fibre epoxy p.c.b. is the cheapest, and has a dielectric constant of around 4. Above 1GHz, however, it is too lossy for many applications, and a better alternative is ptfe. Rather than pure ptfe (dielectric constant 2·1), a combination consisting mostly of ptfe with a little glass fibre strengthening is used, and this has a dielectric constant of about 2·3. With these materials, be aware that there will be significant radiation from the lines.

Prototype Construction

Prototype p.c.b.s using microstrip can be made quite easily using a soldering iron and some double sided glass fibre epoxy or ptfe board, provided the lines are not too thin. First mark out the lines on one side of the p.c.b. When you are satisfied with the layout, make a cut round each piece of line using a

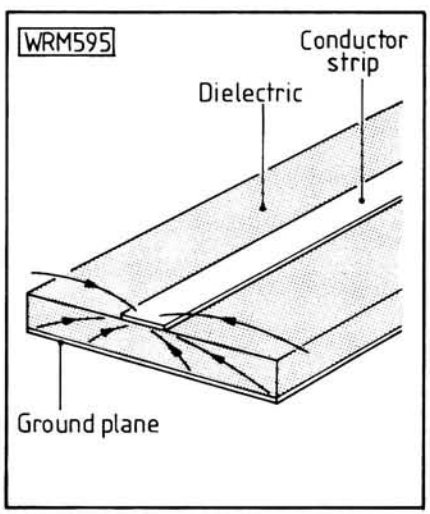


Fig. 2: The electric field around microstrip

sharp knife with a steel rule to guide it. This is illustrated in Fig. 5.

Next remove the unwanted copper as follows. Hold a hot soldering iron on a piece to be removed, at one corner, and apply just enough solder to the iron tip to make sure that a good thermal contact is made between the bit and the copper. Then lift up a corner of the unwanted copper using the knife. The heat will weaken the bond between the copper cladding and the dielectric, and the copper can now be peeled away. Gradually move the soldering iron along as it is peeled off, as shown in Fig. 6.

The unwanted areas of copper will normally be quite big, and often complex in shape. It is easier to divide them up with the knife first, and remove small strips at a time. Eventually just the wanted microstrip lines will be left. After this has been done, drill any holes needed to earth components (such as trimmers) or resonant lines, and link them through to the earth plane underneath with a short length of tinned copper wire.

Resonators and Antennas

Apart from routing signals between stages, microstrip can also be used to form components. The simplest is a resonator formed from a shorted quarter wave line, simiiar to its coaxial equivalent. More usually a shorter line is used, say one-eighth of a wavelength, tuned to resonance by a parallel capacitor. Several of these resonators can be coupled together to form a filter.

Professionally, microstrip is used at microwaves to form radiating elements, which are then built up into antennas known as phased arrays. A large number of radiators can be laid out on a flat sheet, and quite complicated radiation patterns achieved, depending on how all the elements are phased together. ***PW***

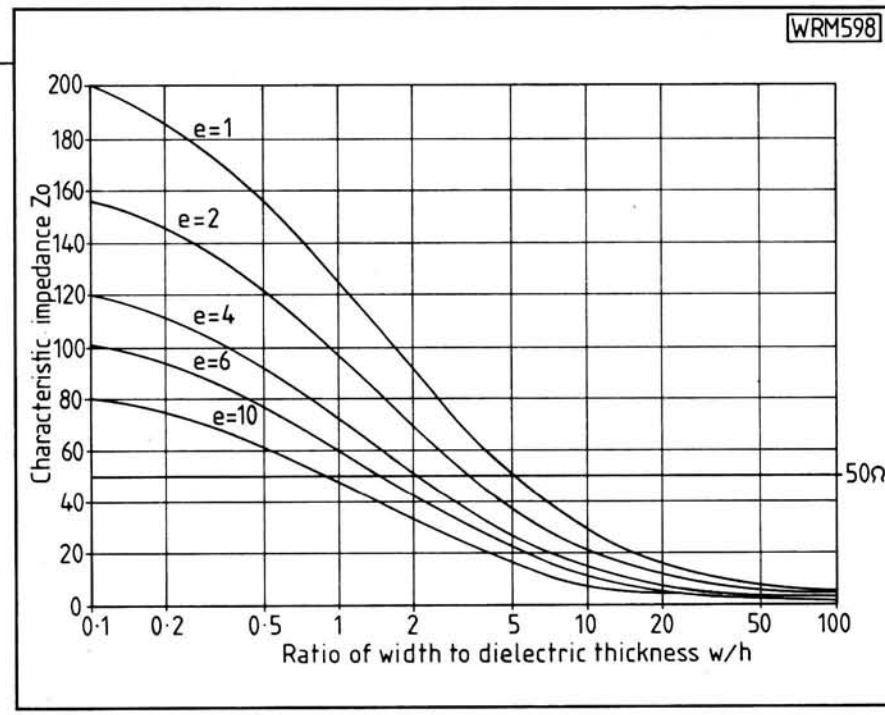


Fig. 3 ▲

Fig. 4 ▼

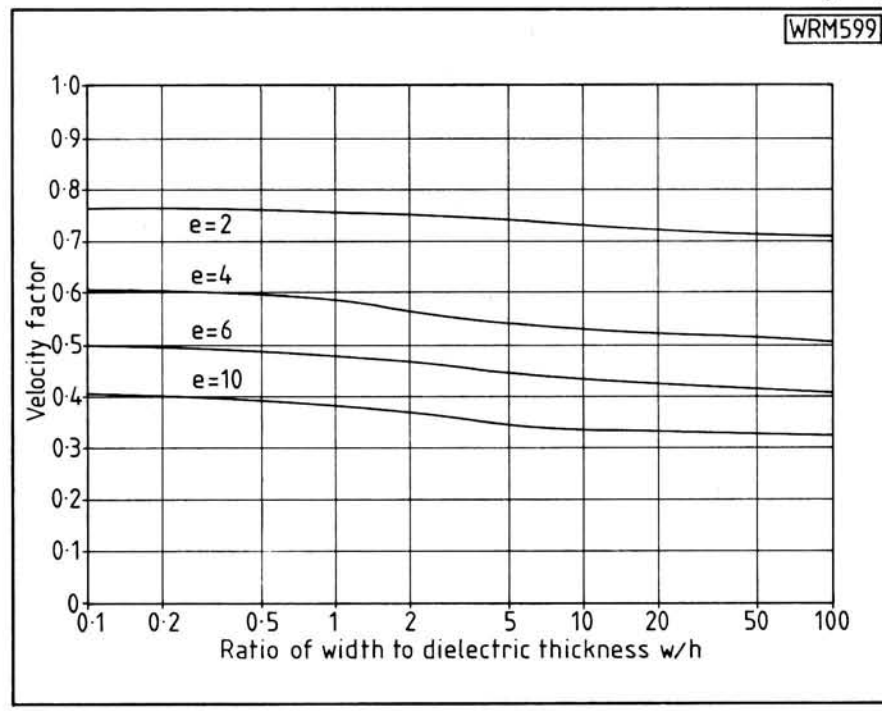


Fig. 5 ▼: Cut round each piece with a sharp knife

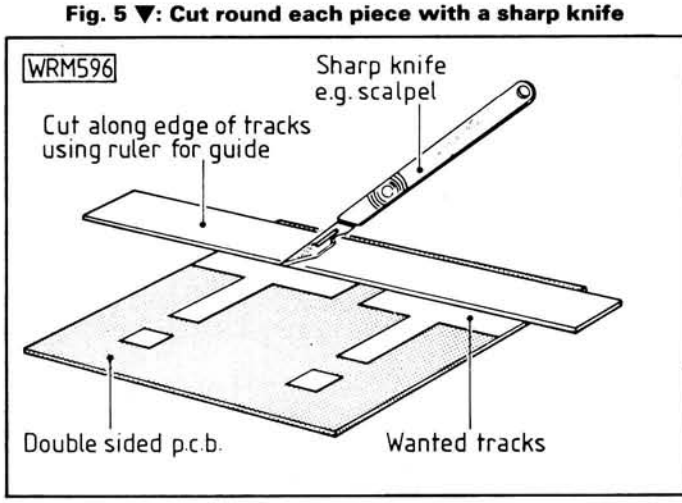
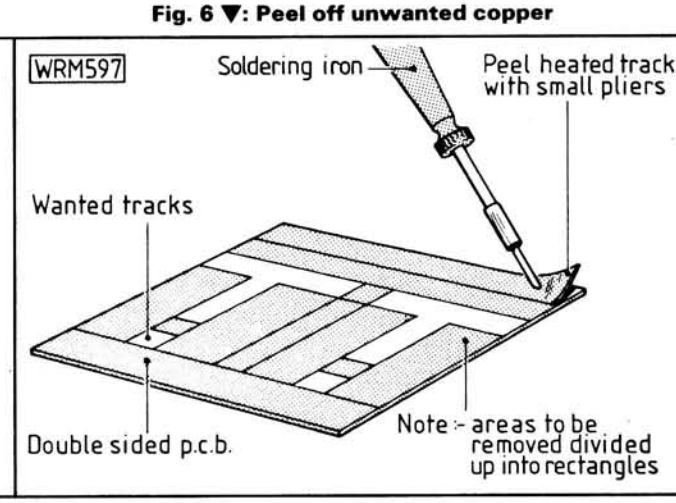


Fig. 6 ▼: Peel off unwanted copper



'It comes to us all,' he said

John F. Feeley G4MRB talks about a subject most of us try and avoid even thinking about, but is that wise . . .

Some years ago I heard on a copy of *World Radio*, which had been sent to me by Kel Hicken W4GH, a sad little story. As far as I can remember it went something like this:

A local radio club were having their annual junk sale. As the auction was in full swing an elderly lady came into the room and appeared to be lost. When approached by the club secretary she said that she understood that this was a meeting at which the local radio amateurs sold off junk and unwanted equipment. It seemed that her husband had been a keen "ham" and had died the previous winter leaving her with a shack full of radio gear. He had put some boxes on one side which, he had told her, contained "junk" and she had brought these boxes to the sale in the car. He had been a regular club member and she wanted the proceeds to go to club funds.

The secretary gathered a few club members, and together they unloaded a number of boxes from the car and took them into the sale. Like all good junk sales the bidding was brisk but in pennies as items weird and wonderful, but unquestionably "junk", were auctioned by the club chairman.

When the time came to open the boxes it was discovered that they contained not "junk" but a complete new h.f. and v.h.f. station in original wrappings clearly just bought. The silent key had spent some of his money on a new station which he had not had the chance to commission.

Rapid Committee Meeting

The sale came to a very rapid end while the committe had an emergency meeting. Clearly the club could not keep what was thousands of dollars worth of gear. One of the members worked in a local Ham Radio Store and could identify the station as items he had sold. It was agreed that he would take the gear and sell it on behalf of the club. He was able to check his book and trace the original buyer. The club chairman then visited the widow and took her a cheque for the proceeds. He explained that the club had small needs and the gift of equipment had been over-generous.

The wife was very grateful—the funeral had been very expensive and she was pressed for cash. She confessed that she had no idea that her husband had spent so much money on his hobby. She went on to say how she regretted nagging him about spending money, when in his later years, he had spent more and more of his time by himself in the shack. She had been lonely in the house but felt shut out of his hobby. She would have liked to share his interest but didn't know how to start.

As a result of telling this story in the club magazine, many club members began to share the hobby with their wives and as a result the number of lady "hams" in the club increased.

Does This Affect Me?

Soon after I heard this story, I was chatting up John Mortimer G2MF on air and the subject came up. "It comes to us all," he said. John was a long established licence holder who dated from the days of spark transmitters. He enjoyed chatting with us younger amateurs, telling tales of days gone by when you not only had a callsign but also a signature tune—his being *The Anniversary Waltz*.

John was now in his fading years and following his second heart attack was wakeful in the early mornings. He went on to say, "I'm about ready now, I've spent the last few days labelling my bits." After that, a visitor to John's shack was always invited to turn equipment over if they were interested. Underneath he would find the price John would sell for. As a result of these tactics, when he finally left us, there was a lot less for his family to deal with.

I am lucky, because my wife is also interested in the hobby. If I were to go silent key as a result of an accident she would know what the gear is worth and what to do with it. I must also say what a pleasure it is to have a wife who shares the hobby with me. She takes her part in purchase decisions and exchange deals. Since she uses the gear, she doesn't moan about paying for it.

Other people are less lucky. Unpleasant though it might be to think about, more wives outlive their husbands than the other way around. The amateur radio station represents a fairly large cash investment and yet could be difficult to convert back into cash at a time when cash may be needed.

John's example is a good one, but it could be taken a little further. A note could be left nominating a friend or club officer to act on your behalf to disperse the station. Each item could have a label which states how you wish it to be disposed of. Many dealers will undertake sales on behalf of silent keys and will obtain the best price for newer gear. Older working gear—in particular receivers—might be donated to school radio societies, the Air Cadets or the Boy Scouts. If you feel able to leave instructions to donate newer transistor gear to the Radio Amateur Invalid and Blind Club, it would be very welcome and a good home would be found for it.

The expensive gear is easy to dispose of. The junk and older gear is more difficult. Some of the older gear might be of interest to collectors and Morse keys often fetch good prices. A label on items of value—naming a possible buyer—will prevent them going as "junk". The real junk can go to a local club. If the proceeds are to go to charity like QTI–TNA, the talking newspaper for Blind Radio Amateurs, or a club supporting the disabled such as RAIBC, most clubs will be pleased to arrange a junk sale.

What to do with Your Cash

If you have cash which you wish to leave to Radio Charities, it is vital to consult your solicitor. The Radio Society of Great Britain is not a charity and yet from time to time cash is left to it. This must be used for the society and is not allowed in law to be used for charitable purposes. As a result the Society is lumbered with money which is tied up in the bank. Efforts have been made to release it, but rules, it seems, are rules.

I am told that a similar thing happened with kidney machines. Often money was left to buy machines, but not to install and run them. As a result several machines stood idle because the cash could not be used other than in the terms of the will. The exact words are important and this is why the visit to the solicitor is so important.

If you do wish to leave cash to the hobby, you may care to consider QTI–TNA which supplies technical literature to the blind, RAIBC, or if you have an interest in the young, the Boy Scout Centre at Gilwell Park.

This may be a depressing subject but in a hobby where we play with thousands of volts, preparation may help us to take just a bit more care. After all, it only takes one careless move to see us off. On the principle that it never rains if you take an umbrella, being ready may itself be a safeguard! **PW**

Avon

Bath & District ARC: L. Lear G3FIH (Bath 837539). Meets alternate Wednesdays, 7.45pm in the Englishcombe Inn, Englishcombe Lane, Bath. Next meetings July 9 and 23.
Bristol ARC: D. Gully G4YOC (Bitton 4116). Meets Tuesdays, 7.30pm in the YMCA, 6 Park Road, Kingswood, Bristol.
City of Bristol RSGB Group: Colin Hollister G4SQQ (Bristol 508451). Meets 4th Mondays, 7.30pm in the small lecture theatre, Queens Buildings, UoB, Clifton. July 28—RSGB Propagation Studies Group by G3LTP.
North Bristol ARC: Alan Booth G4YQQ (Bristol 690404). Meets Fridays, 7pm in the Self-Help Enterprise Centre, 7 Braemar Crescent, Northville. July 11—Converting 27MHz gear to 28MHz by G4TRN.
Bristol (Shirehampton) ARC: Ron Ford G4GTD (Bristol 770504). Meets Fridays, 7.30pm in Twyford House, Lower High Street, Shirehampton.
Gordano ARG: John Davies G3LJD, 273 Down Road, Portishead, Bristol. Meets 4th Wednesdays, 8pm in The Ship, Redcliffe Bay, Portishead.

Bedfordshire

Bedford & District ARC: Chris Lenn G4VHF (Bedford 751763). Meets 1st and 3rd Thursdays, 8pm in the Allens Club, Hurst Grove, Queens Park, Bedford.
Dunstable Down RC: Philip Morris G6EES (Dunstable 607623). Meets Fridays, 8pm in Room 3, Chews House, 77 High Street South, Dunstable. July 18—Junk Sale.
Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm in the Church Hall, Ampthill Road, Shefford.

Berkshire

Newbury & District RS: Mike Fereday G3VOW (Newbury 43048). Meets 2nd Tuesdays in Newbury Technical College. July 8—Satellite Operation by AMSAT-UK.

Buckinghamshire

Milton Keynes & District ARS: Dave White G3ZPA (Milton Keynes 501310). Meets 2nd Mondays, 7.30pm in the Meeting Place, Hodge Lea, North Milton Keynes. July 14—Royal Corp of Signals Talk.

Cambridgeshire

Cambridge & District ARC: Brian Davy G4TRO (Cambridge 353664). Meets Fridays, 7.30pm in the Visual Aids Room, Coleridge CC, Radegund Road, Cambridge.
Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848). Meets 4th Thursdays, 7.30pm in Southfields Junior School, Stanground, Peterborough. July 17—Junk Sale.

Central

Falkirk & District ARC: Brian Waddell GM4XQJ (Falkirk 31258). Meets 1st and 3rd Wednesdays, 7.30pm in the Grange Centre, Redding Road, Brightons-by-Falkirk.

Cheshire

Chester & District ARS: Dave Hicks G6IFA (Chester 336639). Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm in the Chester RUFC, Hare Lane, Vicars Cross, Chester. July 8—FT-726R plus a Video Show by G4UXD; 15th—Treasure Hunt at 7pm; 22nd—Visit to British Aerospace at Broughton; 29th—My Trip Round the Western Isles by GM3TZO/MM.

CLUB NEWS

Compiled by Eric Dowdeswell G4AR
Reports to: Eric Dowdeswell,
57 The Kingsway, Ewell Village,
Epsom, Surrey KT17 1NA
PLEASE MARK "CLUB NEWS"

Warrington ARC: Paul Forster G0CBN (Warrington 814005). Meets Tuesdays, 8pm in the Grappenhall CC, Bellhouse Lane, Grappenhall, Warrington. July 8—Microwave Modules Presentation by G4WOH; 15th—DF Matters by G8TRY and G6SNO of Wirral Club; 22nd—Treasure Hunt; 29th—RSGB Film.

Clywd

Rhyl & District ARC: Melfyn Allington GW1AKT (Nantglyn 469). Meets 1st and 3rd Mondays, 7.30pm in the Mona Hotel, Market Street, Rhyl. July 7—RSGB Video.

Cornwall

Cornish RAC: Tony Bevington G4ZUI (Stithians 860572). Meets 1st Thursdays, 7.30pm in the Church Hall, Treleigh. Computer Section meets following Mondays and Constructors Workshop on 3rd Mondays.

Cumbria

Carlisle & District ARS: Tony Leach G4WOQ (Scotby 500). Meets Mondays, 7.30pm in Uppersby Parish Hall, Uppersby Road, Carlisle.
Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith. Meets 3rd Thursdays, 7.30pm in the Kings Arms, Temple Sowerby. July 17—DF Hunt.

Derbyshire

Bolsover ARS: David Fleetwood G1GNC (Chesterfield 824061). Meets Wednesdays, 7.30pm in the Black Bull, Bolsover.
Buxton ARS: Tony Briggs G8YHX (Buxton 6800). Meets alternate Wednesdays, 8pm in the Haddon Hall Hotel, London Road, Buxton. Next Meetings July 8 and 22.
Nunsfield House CAARG: John Robson G4PZY (Derby 767994). Meets Fridays, 7.45pm in Room 7, Nunsfield House, Boulton Lane, Alvaston. July 4—NFD Preparation; 5/6—NFD; 11th—Holiday Photography by Sean Dodds; 18th—Rally Barbecue, 25th—Surplus Sale.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Fridays, 7.30pm in the Cavalier Inn, West Street, Axminster. September 5—Impedance of Matching at v.h.f. by G3GC.
Exmouth ARC: Hugh Edwards G4RUT (Exmouth 273157). Meets alternate Wednesdays, 7.30pm in the 6th Exmouth Scout Hut, Marpool Hill, Exmouth. July 16—Barbecue on the Maer, Exmouth Seafront.
Plymouth ARC: A. Veale G4SCA (Plymouth 337980). Meets 1st and 3rd Mondays, 7.30pm at Plymouth Albion RUFC, Beacon Park Road, Peverell.
Torbay ARS: Brian Wall G1EUA (Teignmouth 78554). Meets Fridays and last Saturdays, 7.30pm in the ECCSC, Ringslade Road, Highweek, Newton Abbot. July 22—Signal Reporting Talk; July 26—GB2APF for the Apple Pie Fair; July 31/Aug 12—GB4MEJ for Jamboree at Torpoint.

Dorset

Flight Refuelling ARS: Ashley Hulme (Bournemouth 872503). Meets Sundays, 7.30pm at the FR S&SC, Merley, Wimborne. July 6—Video; 20th—ATUs by G3RZP; 27th—Air Traffic Control by G3AAO; Aug 10—Hamfest '86.
Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Fridays, 7.30pm in Commander House, Constitution Hill Road, Poole. July 25—Talk on GB3SC.

County Down

Mid-Ulster ARC: Sam White (Craigavon 22855). Meets 2nd Sundays, 3pm in the Guide Hall, Castle Hill, Gilford.

Dumfries & Galloway

Maxwelltown ARC: Trig Rodgers GM4NNC, 5 Elder Avenue, Lincluden, Dumfries. Meets 1st and 3rd Wednesdays, 8pm in the Tam O'Shanter Inn, Dumfries.

Dyfed

Carmarthen ARS: A. F. Dowling GW3GUE (Carmarthen 883460). Meets 2nd and 4th Fridays, 7.30pm in the Carmarthen Boat Club, The Quay, Carmarthen.

Essex

Braintree & District ARS: Dave Willicombe G0DEC (Braintree 45058). Meets 1st and 3rd Mondays, 7.30pm in the Braintree CC, Victoria Street, Braintree.
Havering & District RC: D. St J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm in Fairkytes, Billet Lane, Hornchurch. July 16—DF Hunt.
Loughton & District ARS: John Mattison, Aylmers Farm, Sheering Lower Road, Old Harlow. Meets alternate Fridays, 7pm in Loughton Hall, Rectory Lane, Loughton. July 19/20—GB2LRS for the club's 25th Anniversary.
Stanford-le-Hope & District ARC: J. R. Thompson G4OVG (S-I-H 642312). Meets Mondays, 8pm in St Joseph's Parish Rooms, Scratton Road, S-I-H.
Vange ARS: Mrs D. Thompson, 10 Feering Row, Basildon. Meets Thursdays, 8pm in the Barstable Community Centre, Basildon. Junk Sales on 1st Thursdays.

Fife

Dunfermline RS: Donald Ingram GM1OIN (Inver-

keithing 414283). Meets Thursdays, 8pm at the Outh Wireless Station, Knockhill. Transport available from Dunfermline.

Glamorgan

Barry College of FE RS: John Cooper GW0ACH (Wick 710). Meets Thursdays, 7.30pm in the Annex, Weycoch Cross, Barry.
Bridgend & District ARC: Trevor Morgan GW4SML, 4 Rhiw Tremaen, Brackla, Bridgend. Meets 1st and 3rd Fridays, 7.30pm in the YMCA, Angel Street, Bridgend.
Rhondda ARS: John Howells GW4BUZ (Tonypandy 432542). Meets Thursdays. 7.30pm in the NUM Club, Tonypandy. July 24—Llanwonno Mobile Evening.

Gloucestershire

Cheltenham ARA: Tim Kirby G4VXE (Cheltenham 36723). Meets 1st and 3rd Fridays, 7.30pm in the Stanton Room, Charlton Kings Library, Cheltenham. July 18—A 50MHz Evening—Bring Your Own Gear.
Stroud ARS: P. R. Gainey G0DZM, Prencott, Harley Wood, Nailsworth, Stroud. Meets in Nelson School, Stratford Lodge, Stroud. Next Meetings on July 9 and 23.

Grampian

Aberdeen ARS: Don Travis GM4GXD (Pitcapple 251). Fridays, 7.30pm at 35 Thistle Lane, Aberdeen. July 13—GB4BGG at Beechgrove Gardens.

Greater Manchester

South Manchester RC: Dave Holland G3WFT (061-973 1837). Meets Mondays and Fridays, 8pm in the Sale Moor CC, Norris Road, Sale.
West Manchester RC: Dave Comac G1IOO (Bolton 24104). Meets Wednesdays, 8pm in the Astley and Tyldesley MW, Meanley Road, Gin Pit Village, Astley.
Stockport RS: Mel Betts G4FFW (061-224 7880). Meets 2nd and 4th Wednesdays, 8pm in the Magnet Inn, Wellington Road, Stockport. July 9—Slide Show; 23rd—Colour Slide Processing by G4RLD.
Trafford ARC: Peter Greenhalgh G3XGE (061-748 9804). Meets Thursdays, 7.30pm in the TS de Trafford, Sea Cadet Corp, Bradshaw Lane, Stretford.

Gwent

Abergavenny & Nevill Hall ARC: J. B. Davies GW4XQH (Abergavenny 4655). Meets Thursdays, 7.30pm in Pen-Y-Fal Hospital, above Male Ward 2. Video Show on 1st Thursdays. July 15—Jumble Sale at the Corn Exchange from 9 'til noon.

Hampshire

Andover RAC: Mike Adams G0AMO (Andover 51593). Meets 1st and 3rd Wednesdays, 8pm in the Wolversdene Club, Love Lane, Andover. July 16—Vidicon History Lecture by G8AER.
Basingstoke ARC: Dave Burleigh G4WIZ (Tadley 5185). Meets 1st Mondays, 7.30pm in the Forest Rings CC, Sycamore Way, Winklebury, Basingstoke. July 7—Packet Radio by G4NNS; Last Sunday—DF Hunt at 2.30pm.
Fareham & District ARC: Alan Chester (Fareham 288139). Meets Wednesdays, 7.30pm in the Porchester CC, Westlands Grove, Porchester. July 16—Junk Sale.
Three Counties ARC: Keith Tupman G0BTU (Petersfield 66489). Meets alternate Wednesdays, 8pm in The Railway Hotel, Liphook. July 9—History of UoSAT by G8VLY; 23rd—CW Operating—G4RRA; Aug 6—HF and VHF On Air Nights.
Winchester ARC: Gordon Crittell G4ZNO (Southampton 772191). Meets 3rd Fridays, 7.30pm in Durngate House, Winchester. July 18—Topical Quiz by G6DIA; August—No Meeting.

Hereford & Worcester

Bromsgrove ARS: Alan Kelly G4LVK (021-455 2088). Meets 2nd & 4th Tuesdays, 8pm in The Aston Fields WMC, Stoke Road, Bromsgrove.
Droitwich ARC: Gordon Taylor G4HFP (Stourport-on-Severn 3818). Meets 2nd Mondays, 8pm in the Club Shack, 17 Ombersley Street West and 4th Mondays, 8pm in the Scout HQ, Union Lane, Droitwich. August 25—RTTY and SSTV by G3CXI.
Hereford ARS: F. E. G. Cox, 35 Thompson Place, Hereford. Meets 1st and 3rd Fridays, 8pm in the County Council CD HQ, Gaol Street, Hereford. July 4—Nuclear Medicine Dept of County Hospital Visit.
Kidderminster & District ARS: Tony Hartland G8WOX (Kidderminster 751584). Meets 1st and 3rd Tuesdays, 8pm in the Harrier FC, Hoo Road, Kidderminster. July 8—Lowe Electronics.

Hertfordshire

Harpenden ARC: Peter Simons G1BJC (Harpenden 2455). Meets 2nd and 4th Tuesdays, 8pm in the Silver Cup, St Albans Road, Harpenden.
Stevenage & District ARS: Frank Wilson G4ISO (Baldock 893736). Meets 1st and 3rd Tuesdays in Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage.
Verulam ARC: Gerry Wimpenny G4OBH (St Albans 52003). Meets 2nd and 4th Tuesdays, 7.30pm in the RAFA HQ, New Kent Road, off Marlborough Road, St Albans. July 22—Running DXpeditions by G4OBH and G3RFS.
Welwyn Hatfield ARC: Dave Fairbanks G0AII (Welwyn Garden 326138). Meets 1st and 3rd Mondays, 8pm in Knightsfield Scout HQ, Welwyn Garden City. July 21—DF Hunt.

Highland

Inverness ARC: Brian Adam GM1GFX (Inverness 242463). Meets Thursdays, 7.30pm in the Cameron Youth Club, Planefield Road, Inverness.

Humberside

Grimsby ARS: George Smith G4EBK (Grimsby 887720). Meets Thursdays, 7pm in the Cromwell SC, Cromwell Road, Grimsby. July 10—Sunspots; 17th—DF Hunt.
Hull & District RS: David Potter G0DMP, 102 Normandy Avenue, Beverley. Meets Fridays, 8pm in the West Park RC, Walton Street, Hull.

Isle of Man

Isle of Man ARS: Anthea Matthewman GD4GWQ (Douglas 22295). Meets Mondays, 8pm in the Howstrake Hotel, Onchan; Tuesdays in the Peverill Court Hotel, Ramsey; Thursdays in the Tynwald Inn, St Johns; Fridays in the Perwick Bay Hotel, Port St Mary.

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesdays, 8.30pm in Downe Village Hall, High Street, Downe. July 15—Computers.
Bredhurst R&TS: Kelvin Fay G0AMZ (Medway 376991). Meets Thursdays, 8.15pm in Parkwood CC, Parkwood Green, Rainham. July 10—Howes Communications Demo.
Darenth Valley RS: L. F. W. Thomas (Swanley 63368). Meets last Wednesdays, 8pm in the Crockenhill Village Hall, Swanley.
Edenbridge ARS: J. Grevatt (East Grinstead 24748). Meets 2nd Wednesdays in the Scout Hut, High Street, Edenbridge.
S.E. Kent YMCA ARC: John Dobson (Dover 211638). Meets Wednesdays, 7.45pm in the Dover YMCA, Godwynehurst, Leyburne Road, Dover. July 9—Treasure Hunt; 16—Natter Nite.
Medway ARTS: P. J. Poole, 5 River Drive, Strood, Rochester. Meets Fridays, 7.30pm in No. 1 Hall, St Luke's Church, King William Road, Gillingham.

Lancashire

Bury RS: Miss C. J. Ashworth G1PKO (061-764 5018). Meets Tuesdays, 8pm in the Mosses Y&CC, Cecil Street, Bury. July 8—Surplus Sale.
Fylde ARS: H. Fenton G8GG (Lytham St Annes 725717). Meets 1st and 3rd Tuesdays, 7.30pm in the Kite Club, Blackpool Airport.
East Lancs ARC: Stuart Westall G6LXU (Accrington 887385). Meets 1st and last Tuesdays, 7.30pm in the Conservative Club, Cliffe Street, Rushton.
Oldham ARC: Kath Catlow G4ZEP (061-624 7354). Meets Thursdays, 8.30pm in the Moorside Conservative Club, Ripponden Road, Moorside, Oldham.
Rossendale Valley RC: Bernard Murray G4VVK (Rossendale 229026). Meets Thursdays, 8pm in the Huntsman, Loveclough, on the A56.

Leicestershire

Welland Valley ARS: Judith Bay G6OFZ, c/o WVARS, POB 16, Market Harborough. Meets Mondays, 7.15pm in the Welland Bank CC, Market Harborough.

Lincolnshire

Bourne Amateur Radio Society: A. T. Johnson G4RQK (078 087 326). Meets 1st and 3rd Tuesdays in Edenham Village Hall, Edenham, Bourne.
Sleaford & District ARC: Dave Beilby G2HHK (Sleaford 304454). Meets 3rd Sundays, 7.45pm in Hale Magna Village Hall, Great Magna.

London

Acton, Brentford & Chiswick ARC: W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London. Meets 3rd Tuesdays, 7.30pm in the Chiswick Town Hall, High Road, Chiswick W4. July 15—Home-brew Equipment.
Grafton RS: John Kaine G4RPK (01-267 1000). Meets 2nd and 4th Fridays, 8pm in the Haringey Sea Cadet Corp, Training Ship Wizard, White Hart Lane, Wood Lane, London N22.
Southgate ARC: D. C. Elson G4YLL (Waltham Cross 30051). Meets 2nd Thursdays, 7.30pm in the Holy Trinity Church Hall, Green Lanes, Winchmore N21. July 10—Home-brewing by G3DKZ.
Wimbledon & District ARS: George Cripps G3DWW (01-540 2180). Meets 2nd and last Fridays, 7.30pm in the St John Ambulance HQ, 124 Kingston Road, London SW19. July 11—Talk on GWR; 19th—GB0LSW for the Cub-er-ee at Hook Arena; Aug 9 to 17—Annual Camp on the Barwell Estate, Chessington.

Lothian

Leith Nautical College AR&EC: Susan Beech GM4SGB, c/o Club Address. Meets Tuesdays, 5–7pm in T2-4 Electronics Lab, Leith Nautical College, 24 Milton Road East, Edinburgh.

Merseyside

St Helens & District ARC: Alan Riley G6MXT (051-430 9227). Meets Thursdays, 7.30pm in St Helens ITC, Water Street, St. Helens.
Wirral & District ARC: Peter Morton G6CGJ (051-677 7376). Meets 2nd and 4th Wednesdays, 8pm in Irby Cricket Club, Mill Hill Road, Irby. July 9—Annual Barbecue; 23rd—DF Hunt.

Middlesex

Echelford ARS: Peter Coleson G4VAZ (Sunbury 783823). Meets 2nd Mondays and last Thursdays, 7.30pm in The Hall, St Martins Court, Kingston Crescent, Ashford.
Edgware & District RS: John Cobley G4RMD (Hatfield 64342). Meets 2nd and 4th Thursdays, 8pm in the Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. July 10—Microwaves by G6ODA.

Northamptonshire

Nene Valley RC: M. P. Bayles G6UWS (Wellingborough 71189). Meets Wednesdays, 8pm in the Prince of Wales, Well Street, Finedon.

Nottinghamshire

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets 2nd and 4th Tuesdays, 7.30pm in the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop. July 15—Packet Radio by G4KAL; Aug 2—Barbecue in Clumber Park.

Oxfordshire

Vale of White Horse ARS: Janet Baker G4SYL (Didcot 816845). Meets 1st and 4rd Tuesdays, 7.30pm in the upstairs meeting room, Waterwitch, Cockroft Road, Didcot.

Shropshire

Salop ARS: Simon Price G6MOJ (Shrewsbury 67799). Meets Thursdays, 8pm in the Olde Bucks Head, Frankwell, Shrewsbury. July 10—DF Hunt; 24th—Oscilloscopes.
South Shropshire RC: G. Cowan BRS 87654 (Telford 581130). Meets Tuesdays, 8pm in the Broseley SC, Broseley.
Telford & District ARS: Tom Crosbie G6PZZ (Telford 597506). Meets Wednesdays, 8pm in the Dawley Bank CC, Bank Road, Dawley. July 9—Natternight; 16th—NFD Debrief.

Somerset

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm in the Recreation Centre, Chilton Grove, Yeovil. July 10—HF Propagation by G3MYM; 17th—Dipoles by G3MYM; 24th—Netting Techniques; Aug 7—0800Z G/VK Phenomenon by G3MYM.

Staffordshire

Stafford & District ARS: Tony Bairstow G4RSW (Stafford 46306). Meets Tuesdays, 8pm in the Coach & Horses Motel, Weston.

Strathclyde

Helensburgh ARC: Dave Reid GM0BZF, 28 Bainfield Road, Cardross, Glasgow. Meets Thursdays, 7.30pm Cairndhu Nursing Home, Old Cairndhu Hotel, Rhu Road, Helensburgh.
West of Scotland ARS: V. J. Kusin GM4HCO (Paisley 2472). Meets Fridays, 7.30pm at 154 Ingram Street, Glasgow.

Suffolk

Felixstowe & District ARS: Paul Whiting G4YQC (Ipswich 642595). Meets alternate Mondays, 8pm in the Feathers, Walton High Street, Felixstowe. July 14—Social; 28th—Ipswich Hospital Radio Talk.

Surrey

Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays and last Thursdays, 7.45pm in St Swithuns Church Hall, Grovelands Road, Purley, Surrey. July 14—Cellular Radio by G6VYT.
Dorking & District RS: J. Greenwell G3AEZ (Newdigate 77236). Meets 2nd and 4th Tuesdays, 8pm in the Star & Garter Hotel, Dorking.
Surrey Radio Contact Club: J. L. Simpkins G8IYS (01-657 0450). Meets 1st and 3rd Mondays, 8pm in The Waldrons, TS Terra Nova, South Croydon.
Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam, Sutton. Meets 3rd Fridays, 7.30pm in the Downs LT Club, Holland Avenue, Cheam. July 18—Films and Video by G6MKC.
Thames Valley ARTS: John Pegler G3ENI (East Horsley 4279). Meets 1st Tuesdays, 8pm in the Thames Ditton Library, Watts Road, Giggshill, Thames Ditton.

Sussex

Brighton & District ARS: Peter Turner G4IIL (Brighton 607737). Meets 1st and 3rd Wednesdays, 8pm in the Seven Furlong Bar, Brighton Racecourse.
Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesdays, 7.30pm in the North Lodge Bar, County Hall, Chichester. July 12/19—GB3CHI at the Guildhall, Priory Park.
Hastings E&RC: Dave Shirley G4NVQ (Hastings 420608). Meets 3rd Wednesdays, 7.45pm in the West Hill CC, Croft Road, Hastings and on Fridays, 8pm in the Club House, Downey Close, St Leonards-on-Sea. July 16—Converting CB Gear.
Southdown ARS: R. Wilson G1BAB (Eastbourne 890234). Meets 1st Monday, 7.30pm in Chaseley Home, Southcliff, Eastbourne and Tuesdays and Fridays in the Wealdon Council Offices, Vicarage Field, Hailsham. July 7—Barbecue at the RGO Clubhouse.
Mid-Sussex ARS: C. R. Cook G1FRF (Hassocks 2937). Meets Thursdays, 7.30pm in the Marle Place AEC, Leylands Road, Burgess Hill.
Worthing & District ARC: Roy Jones G4SWH, POB 599, Worthing. Meets Wednesdays, 7.30pm in Lancing Parish Hall, South Street, Lancing. July 16—Junk Sale; 30th—Talk on PSUs.

Warwickshire

Atherstone ARC: Roy Fuller G6YQU (Chapel End 393518). Meets 2nd and 4th Mondays, 7.30pm in the Physics Lab, Atherstone Upper School, Long Street, Atherstone.
Stratford upon Avon & District ARC: David Boocock G8OVC (S-u-A 750584). Meets 2nd and 4th Mondays, 7.30pm in the Baptist Church, Payton Street, S-u-A. July 28—Construction Competition.

Cover Date	Deadline	For events from early
October	July 15	August
November	Aug 15	September
December	Sept 15	October

Mid-Warwickshire ARS: Stan Hobbs G6XRI (Kenilworth 53099). Meets 2nd and 4th Tuesdays, 8pm at 61 Emscote Road, Warwick. July 8—DF Hunt and Barbecue; 22nd—Test Gear by G6ARP.

West Midlands

South Birmingham RS: Matthew Twyman G6KOA (021-458 1941). Meets 1st Wednesdays, 7.45pm in West Heath CC, Hamstead House, Fairfax Road, West Heath.
Coventry ARS: Robin Tew G4JDO (Coventry 73999). Meets Fridays, 8pm in Baden Powell House, 121 St Nicholas Street, Radford, Coventry.
Midland ARS: Tom Brady G8GAZ (021-357 1924). Meets every week night in Unit 5, Henstead House, Henstead Street, Birmingham 5. July 15—G4ZPA of RRD talks.
Sandwell ARC: Malcolm Strong G4UMY (021-422 1554). Meets Mondays and Thursdays, 7.30pm in the Broadway, Oldbury, Warley.
Stourbridge & District ARS: Malcolm Davies G8JTL (Lye 4019). Meets 1st and 3rd Mondays, 8pm in the Robin Woods Centre, School Street, Stourbridge.
Walsall ARC: Linda Price G6HZI (Walsall 32607). Meets Wednesdays, 8pm in the Forest Comprehensive School, Hawbush Road, Bloxwich, Walsall.
West Bromwich Central RC: G. Kitson G4ZAD (Bilston 48263). Meets Sundays, 7.30pm in the Victoria, Lyng Lane, West Bromwich.

Wiltshire

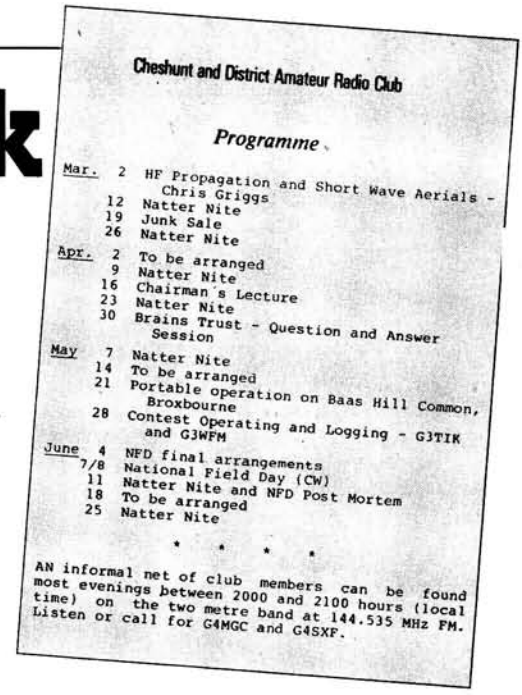
Blackmore Vale ARS: Bill Bailey G1GRG, 11 Brine Orchard, Templecombe. Meets 2nd and 4th Tuesdays in The Old Coachhouse, Bell and Crown, Zeals.
Swindon & District ARC: Francis Neufville, 1 Bungalow Park, Bradenstoke, Chippenham. Meets Thursdays, 7.30pm in Oakfield School, Marlowe Avenue, Swindon. July 10—Photography by G1MCS. Next meeting then is September 4—after the summer break.

Yorkshire

Halifax & District ARS: D. L. Moss G0DLM (Halifax 202306). Meets 3rd Tuesdays, 7.30pm in the Running Man, Pellon Lane, Halifax. July 15—Open Forum.
Keighley ARS: Kathy Conlon G1IGH (Bradford 496222). Meets last Tuesdays, 8pm in the Victoria Hotel, Keithley. July 29—DF Hunt.
Pontefract & District ARS: Colin Mills G0AAO (Pontefract 43101). Meets Thursdays, 8pm in the Carleton CC, Pontefract.
Sheffield ARS: Peter Cardwell (Sheffield 581766). Meets 1st and 2nd Mondays, Firth Park Pavilion. July 7—Junk Sale; 14th—DF Hunt.
Tordmorden & District ARS: Val Mitchell G1GZB (Todmorden 7572). Meets 1st and 3rd Mondays, 8pm in the Queen Hotel, Todmorden.
Wakefield & District RS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. July 22—Pitch and Putt Competition at Homefield Park.
North Wakefield RC: S. Thompson G4RCH (Morley 536633). Meets Thursdays, 8pm in the White Horse, East Ardsley. July 10—Kirksal Fire Station Visit.
White Rose ARS; Steve Clack G4YEK (Harrogate 884481). Meets Wednesdays, 8pm in the Moortown RUFC, Moss Valley, King Lane, Leeds.

What Do You Think Of Your Club's Newsletter?

Eric Dowdeswell G4AR makes some valid comments on producing and running your club's newsletter



Cheshunt and District Amateur Radio Club

Programme

Mar. 2 HF Propagation and Short Wave Aerials - Chris Griggs
12 Natter Nite
19 Junk Sale
26 Natter Nite

Apr. 2 To be arranged
9 Natter Nite
16 Chairman's Lecture
23 Natter Nite
30 Brains Trust - Question and Answer Session

May 7 Natter Nite
14 To be arranged
21 Portable operation on Baas Hill Common, Broxbourne
28 Contest Operating and Logging - G3TIK and G3WFM

June 4 NFD final arrangements
7/8 National Field Day (CW)
11 Natter Nite and NFD Post Mortem
18 To be arranged
25 Natter Nite

* * * *

AN informal net of club members can be found most evenings between 2000 and 2100 hours (local time) on the two metre band at 144.535 MHz FM. Listen or call for G4MGC and G4SXF.

I have in front of me a newsletter from a big Midlands club, 28 pages of A4 no less, well printed with excellent circuit diagrams and other graphics. Supposing I am interested in joining this club, all I have to do is write or telephone the club's secretary and get more information on the club's activities. Simple isn't it, except for one small point. There is no address of any club official anywhere in the newsletter.

The only full QTH I can find anywhere is of a member wanting to sell his transceiver. Nor are there any details of where and when the club meets so I can't even drift along to a meeting. Lots of callsigns of course but if I'm a newcomer I am hardly likely to have a copy of the UK callbook. Anyway, why should I have to do a Sherlock Holmes act in order to contact the society.

There are plenty of other newsletters like this one I can assure you and it simply is not good enough. Club information is now published by a number of AR magazines every month giving wide publicity. The parochial attitude of some club officials and particularly magazine editors is quite out of place today. But let's not blame the editors, for the club chairman is the ultimate can-carrier and having voted in an editor he should be guided in his task if he is new to the job.

The problem starts at the club's AGM, when officials for the coming year are nominated, seconded and voted in. All too often the average club member's attitude is "anyone but me" with the result that often the editor, secretary or whoever is the wrong bod for the job. He or she will do their best of course, but you can bet your life that there is someone else in the club that is better able to do a particular task than the poor lad or lass that has been "volunteered" for the post. It then becomes the old story of little praise but lots of brickbats.

ISSUE No. 42

Cheshunt and District Amateur Radio Club

Club Callsigns G4ECT G6CRC

HAMSTER

SPRING EDITION

1986

There are now hundreds of licensed lady radio amateurs and others coming along, many of whom work as secretaries or are in other office jobs, and who should be invited to undertake similar work for the club. They could do it standing on their heads. What an interesting thought! At one time the only occasion one saw a lady at a club function was on one of the field day events when they were kindly "allowed" to cook bangers and mash, make the tea and generally cater behind the scenes for their menfolk. Yet, today, there are still some OMs who seem to resent the intrusion of the ladies into our clubs.

The Editor

But back to the club newsletter. The editor must take a firm grip on the job. He must edit letters and articles from members for grammar and spelling mistakes and always have a dictionary at his elbow. Technical articles must be checked for accuracy, often needing the advice of more experienced members of the club. Never be afraid to ask for advice! All too often articles and letters are published just as they are received frequently lowering the general tone of the newsletter. Circuit diagrams must be checked for accuracy and redrawn if necessary, and they must always be clear and uncluttered. Components lists must likewise be checked against the circuit diagram.

In a larger club, a deputy or assistant editor is not a bad idea helping to relieve the editor in a job which can be quite hectic if it is to be done properly. It is not the editor's job to originate articles, etc. for a magazine other than the usual introductory editorial although even this can be written by the chairman if necessary. Material should come from the membership or copied from another source such as another magazine but be sure that you get the necessary permission before doing so and give the required acknowledgement of the source in the subsequent article. One way of getting people to write for the newsletter is to draw member's names from a hat each meeting, say two or three, and give them a deadline of a month or so in which to come up with something. It may just be a useful hint or tip for the shack or something more extensive like constructing a 144MHz beam. There is always talent in a club waiting to come to the surface.

Persuade members that they do not have to produce material in a finished state but that it will be knocked into shape by the editor and his helpers. There will always be members in a club who are essentially practical by nature, able to fix a fault on a bit of equipment at a moment's notice and there are those who can only write about it and hardly know one end of a screwdriver from the other. A little co-operation here and you have a source of articles for a long time into the future. These practical types are the backbone of any club, always to be found on hand for any job at field day time or when a dirty job has to be done, but so often they are unable or are afraid to write down their experiences for the benefit of others.

Such co-operation can lead to excellent lectures and demonstrations with one member delivering the lecture with another member helping to show off the equipment or whatever. A good lecture can be worthy of repetition during the year especially for new members and those who may have missed it first time around. There

seems to be little in the way of communication between local clubs and an exchange of lectures would help to fill many a hole in the club calendar.

Now for a word about the way that a newsletter is presented. There is a rapidly increasing use of computers to produce printouts with the odd word processor in use here and there but unfortunately all the well-established rules applying to the layout of material seem to have gone by the board. The use of paragraphs has disappeared as have sub-headings all of which are supposed to help in the reading of printed matter and we are left with long blocks of material without the relief of a single heading making it very difficult to read. Almost invariably the actual printout is not dense enough and done on a comparatively thin paper just to make matters worse, making reading a very tiring task.

The pound sterling sign "£" seems to have gone by the board and we have sillies like a bit of equipment of sale for "250 pounds"! Material produced using a dot matrix printer is by far the worst to read, unless "Letter Quality" print is used. I know it may be easier and quicker to produce a magazine that way but all the characteristics of a good, well-laid-out magazine have disappeared and the chances are that it will just not be read by members. It is rather like the old controversy over valves and transistors where transistors are pressed into service on every possible occasion whereas the old valve would do a much better job in some applications but is still ignored.

Future Events

In the matter of club programmes any club committee worth its salt should come up with a programme for several months ahead, especially for the winter months whereas many clubs seem to stagger on from month to month without any clear defined programme, details of meetings being passed by word of mouth or over the air. Lots of clubs produce small pocket-sized cards of events together with details of where and when the club meets, sometimes even including a simple map of the club's location.

Finally, the first page of the magazine, or the first inside page must contain all those details just mentioned plus the full name and address and callsign of the club secretary and telephone number and similar data on other club officials if thought appropriate. The club chairman always likes to see his or her name in print! On the matter of describing when a club meets I do wish that expressions like "alternate Wednesdays" would be avoided as without a datum date such information is useless!

I would also submit that a club is always going to do better if it holds meetings at least twice a month giving a wider choice to the membership and ensuring a better turnout and a closer tie between members. **PW**

ON THE AIR

AMATEUR BANDS

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey KT17 1NA
Logs by bands in alphabetical order.

by Eric Dowdeswell G4AR

Regular correspondents will know that I can supply log sheets for those who want to send in monthly reports for publication in this feature of exotic DX that they have heard on the amateur bands. The newcomer will often ask for advice as to what constitutes DX, which is not very easy to answer, a lot depending upon gaining experience by listening on the bands.

DX has come to mean a long distance but other factors must be taken into consideration. Generally DX is the operation of an amateur station from some location where there is little or infrequent amateur activity and is thus sought eagerly by many amateurs around the world to add to their lists of different countries worked/heard. For some transmitting amateurs one of the first targets is to acquire the DX Century Certificate sponsored by the American society, the ARRL, for providing confirmation of having worked stations in 100 countries. Hence any info gleaned from DX columns is likely to be of use.

To illustrate the various factors in DXing, the country of Albania does not permit amateur operation although individuals and groups have tried to get permission on a temporary basis. If, one day, a licensed amateur should appear in ZA-land it would certainly be classed as rare DX! Yet it would not be very distant as far as we are concerned.

Yet, almost any morning around 0800Z, especially during the winter months, it is possible to hear/work plenty of stations from Australia and often New Zealand without much difficulty so they would hardly be classed as real or rare DX in spite of the distances involved. This happens because the long path to VK/ZL is involved and the signal takes two or three hops over the South Atlantic and Pacific Oceans via the ionosphere, the oceans being good reflectors of radio signals. The short path, in the late afternoon, is much more difficult because it is almost entirely over land masses.

G4XLM, attired in safety goggles, cautiously inspects the "Biddulph Bomb" devised by Dr Dick Biddulph G8DPS to demonstrate the large amounts of energy stored in electrolytic capacitors. The bomb and other devices were used during a lecture on electric shock given by the Wimbledon & District ARS and the St Johns Ambulance Brigade. The Tea Time Creams were all eaten at the interval!

Whether a station is DX or not also depends upon the frequency of the band in use. On Top Band, or 1·8MHz, working around Europe is not too hard after dark, especially in the winter months, but anything further can be called DX. To hear, let alone work, a VK or ZL station is probably a very rare event especially for UK amateurs who are limited to 10W input on c.w. It is worth noting that one of my regular contributors **Robert Parsey** of New Malden, Surrey, has heard, and had confirmed, a ZL station this past winter on Top Band.

Now that we are at the bottom of the 11-year solar cycle, radio conditions on the lower frequencies are at their best. In contrast the 28MHz band (10m) is virtually dead most of the time but there are odd occasions when a distant station does break through and can be counted as DX. Yet in a few years time when we are climbing up the next solar cycle the 28MHz band will be wide open to every corner of the globe when only the more exotic calls could be classed as DX.

There is the case of the low-power (QRP) station to whom any contact outside Europe is DX. A station with a 3-element beam and a few hundred watts of power expects to be able to work into most parts of the world given the right band and the optimum time of day. It is the low-power station, perhaps with a poor antenna, tucked away in some remote spot that constitutes real DX. These have to be sought below the level of the general QRM.

General

The Dunfermline RS has had a busy couple of years. It bought the lease of Outh Wireless Station, about seven miles north of Dunfermline, from the Forestry Commission. It is 244m a.s.l. and with a clear take-off. It was derelict and stripped of all masts and antenna and without power. Now the club has its own generator and 15m mast and tribander, and is also active on v.h.f., with the call GM3IDS. Shows what can be done with a few dedicated people.

More on monster antennas. I read in the Bury RS magazine *Feedback* that the Royal Navy is anxious to keep in touch with its submarines when they are at sea and to this end will be laying a single wire 22·5km long in Glengarry Forest, near Fort William. The "wire" is actually 25mm in diameter and will be buried for most of its length and, presumably, will work on very low frequencies.

From John Clarke TK5FF/G8KA details of a new award, the *Diplome de Corse,* which I am assured is a very fine looking affair. It is available to licensed amateurs and s.w.l.s. Photocopies of the necessary QSL cards are required, and will be issued for all c.w., all 'phone, all RTTY or mixed modes. The fee is 15 IRCs, and the requirement is contact (or heard) five different TK stations. Exclusions are contacts via repeaters or with non-residents. The QTH for applications is Roland Colin TK5CH, Rue Jean-Nicoli, Rocca Poretta, 20210 Porto Vecchio, Corsica, France.

Your scribe G4AR, left, making friends with a koala bear during a recent three-week trip to VK and ZL-land

The Aire Valley Repeater Society runs the Trans-Pennine repeater GB3TP on channel R5 running since December 1985. The coverage runs from south-east of Settle in N. Yorks to Skipton, the Aire Valley, parts of Lancashire, part of the M62, Bradford, Halifax and Huddersfield. The repeater antenna is located on the IBA transmitter mast at Rivock Edge, above Riddlesden, near Keighley. The society had its first AGM recently and meets on the first Tuesday of the month at 8pm at the Victoria Hotel, Cavendish Street, Keighley. More details from PRO Kathy Conlon G1IGH on Bradford 496222.

Those readers wanting a card for the Lundy Island expedition station GB4LI are asked to send QSLs via the RSGB bureau or direct to G5LP, L. Parker, 128 Northampton Road, Wellingborough, Northants. This info from M. P. Byles G6UWS, 108 Kingsway, Wellingborough, who will also pass on the cards. He is secretary of the Nene Valley RC and he points out that the club QSL Manager G4XEM is not QTHR.

According to the RSGB's *Council Letter* Class B licensees can now use the Morse code permanently which follows the completion of the successful concessionary period, and the previous restriction on code operation only from the station address is lifted. As far as frequencies for code operation are concerned it is hoped that Class B licensees will observe the RSGB guidelines on the subject.

From the White Rose ARS I learn that a series of "10m Activity Days" have been arranged coinciding with the assumed bottom of the solar cycle. The remaining dates are Sundays June 29 and August 31. The RSGB HF and Propagation Studies committees will be monitoring the results. The period is nine hours starting at 0900Z. Any mode may be used by licensed ama-

teurs or s.w.l.s. and the club will give three prizes to the most useful logs submitted. Notes on how the signal is being received will be most helpful, for example groundwave, skywave, tropospheric, sporadic-E (Es) or meteor scatter, all of which can be anticipated on 10m at the bottom of the solar cycle. More info from (and logs to) White Rose ARS POB 73, Leeds, LS1 5AR. Logs to arrive not later than one week after each activity day.

DX Bands

According to **Mike Willgoss G4XRR,** Es conditions have started showing up on the 28MHz band and some good DX has been worked. Personally, all I have heard in the way of DX has been the German beacon DK0TEN and that for a few minutes only. Es should become more prevalent now so don't neglect the 28MHz band.

Mike now has a new QTH at Weymouth, Dorset, and that at a height of 55m a.s.l. For the time being he has a vertical on 28MHz and an 8-element Yagi for 144MHz. A telescopic tower is about to be erected to carry, amongst other antennas, a 4-element quad for 28MHz. Contacts made so far include LZ1BY, 4X4VL, SP9DBA, EA7GEZ, CF3FE, IK2GXK, CS8DIZ (QSL to CT0), UQ1GWW and TK5EP. He says gotaways were C39HF, PY2TSB and IS0ZK.

Another 28MHz enthusiast is **Phil Dykes G4XYX** of Poole, Dorset, who identified some Es effects on May 7. He noted openings to Africa and S. America and, at other times, to West Indies, Central America, W4/8 and VE. With his 10W p.e.p. from a converted CB rig Phil worked CS3FE, CE3HFI, CQ6AHU and EA8AMT. On c.w. on the 7MHz band with just 3W Phil worked HB0/DJ2CS, UA1ZFD and UB5GDN. This was using a modified groundplane antenna of which only 8m is vertical.

George Hitchins BRS88435 of Frimley, Surrey, sent me one of his QSL cards which allows quite a lot of extra information to be sent to a DX operator instead of the more usual "You were 59+ PSE QSL" type of report. It certainly ought to help lift the percentage of cards received in return. George has an RF3100LBE receiver and a 40m-long wire antenna.

On 21MHz George copied T3EUT on Kiribati, VQ9ZZ, ZP5CT and 9L3MW. A few more on 14MHz and BV8QFL (Taiwan???), C21RK, KH6LJ, SU1HK (QSL POB 11571 Cairo), WH8AAJ (QSL POB 973 Pago Pago, American Samoa), 5N8NHM and QSL to POB 1160 Kano, and sole catch of note on 7MHz was HK3BED. Heard on the 10MHz band was VK5BP at 0800Z on 10·134MHz to be precise so this band is worth watching as it is almost entirely ignored in reader reports.

Andy Durrant, normally of Aldershot, decided to go portable on 183m Butser Hill, Hants, using a 20m-long wire between the car and a distant post, feeding his FRG-8800 and FRT-7700 a.t.u. He stuck to 14MHz and between 1930 and 2100Z he logged J37AH, QE5JTL/YK, ON7VD/5N6, SU1HK, VK6AVO (via the short path), Z34MR, 4X4KE, and 5Z4DE (QSL W4PKM). Back at home, with a VR3 Jaybeam antenna, on 14MHz Andy copped SU1UD, TI9C, VE7VNP, V44KQ (QSL WB2LCH) and W2KW/KV4. Sole station noted on 7MHz was 7X3LS who wants cards via IK8AUC. Some lovely catches on 3·5MHz included JA6GIJ at 2130Z, JW0A at midnight, VK2AVA, ZL4BO, ZL4AP all between 2030 and 2130Z, plus Z21EV, 4X4MZ and 4X5J between 2230 and midnight.

Melvyn Dunn BRS86500 of Grimsby runs his FRG-7700 with a 40m-long wire and is busy chasing awards for which cards received from XE1J, 8P9AF and TG9HH were most helpful. Catches on 21MHz were 5B4QA, YC2GHE, 4Z4TA and G3ZCZ/4X. Down to 14MHz and 9M2HR around 1700Z, SV8CS and SV8RX, VP2MCG and EA9KD. An unusual one was 4Z4OZ/AM aeronautical mobile at 11 300m (37 000ft) over the Med, but doubt if it qualifies for any award! On to 3·5MHz and 4X6FR, HK7FUE and HI8FXR.

A. Greenwood of Rochdale apologises for not being very active of late but did manage to log JY9VQ (G3OVQ in disguise) and 4Z4YV on 21MHz, with just 4U1VIC (UN Vienna) on 14MHz. The 3·5MHz spot came up with JY5CI, C39UA and two goodies in ZL2BDY and ZL4BO.

Michael Sargeant of Bolton has a Panasonic DR49 receiver coupled to a Datong AD370 active antenna and did well on 14MHz on BV2B, DU7PI, HL9TX, TI8CRT, 5J3HM, 9M8GH (QSL POB 2870 Kuching), TU200 with QSL cards to POB 222 Abijan. A strange one was DP0GVN (QSL DL2NF) on 21MHz who apparently gave his QTH as 70°S and 08°W which puts him in the Antarctic. More familiar ones were A92EM, CX5CB, HK3CC, PZ5SGR/7, VQ9RB, YC7NI, 6W1JN and 9K2DX.

I'm glad to report that **Angela Sitton BRS88639** of Stevenage, Herts, has come into the fold from the world of CB but I imagine it will not be long before she has her own amateur ticket. At the moment Angela has a Heathkit HR10B receiver and a 10m-long wire antenna straight on to the receiver. She stuck to the 14MHz band and caught BV2B, CE3RC, IM0JOO, DL7FT/SV5, JH4PN, KF7S/KL7, SU1ER, SV8CS, TA2G, XA5FHE which I suspect is really XE, 5B4OA and 9H4GT. Others also on 14MHz were mostly in a DX net run by RA4HZ like CX8NG, C3EEG, J37AC, PP4UG, TA1ER, TU4DR, T4ET (unofficial Vendeland), 3A2LF, 5A1ET and 5H1GT. Both Angela and the OM will be taking the RAE in December plus the code test to go straight for their "A" tickets. Good luck to you both!

Brian Fields G4XDJ of Billingham, Cleveland, is using a 20m-long dipole with loading coils to reach resonance on the 3·5MHz band and is very pleased with its performance on QRP c.w. around 5W with his Sommerkamp FL-200B or 1W with a home-brew rig. The receiver is a Sommerkamp FR-100B. Brian also has a half-wave dipole for his 5W c.w. on 14MHz where he has worked OK2KLN, HA7LG, IK2GOT and a good one indeed with TA3D. Back to his contacts on 3·5MHz c.w. with GM3OXX the QRP stalwart, LA9LE, DL5EY, FD1LGE, GI4PCY, HA6PP, DL0HSC, PA3DXO, EA3CUU, EM3W, SP2JGK and LX1GN, which can't be bad!

Other DX to be looked for and gleaned from various sources include TA2G around 14·290MHz at 1530Z, Z21GN on 14·314MHz at 1030Z, Z21GT who is G4XPG looking for contacts with Yorkshire on 14, 21 and 28MHz, 9Q5MA on 14·185MHz at 2000Z, S92LB same frequency at 1900Z, CE9HOP on Greenwich Island 2300Z on 14·025MHz, AH2BE on 14·175MHz at 1600Z while XU1SS has appeared on 14·020MHz c.w. and 14·180MHz s.s.b. at 0700Z or so. A DXpedition to Clipperton Island should produce QSOs with FO0XX on several bands.

From *RadCom* I see that there is a DX information net on 14·212MHz on Saturday between 1400Z and 1530Z, which could prove very useful for readers. It is reported that the Egyptian authorities do not allow QSLing via a bureau so QSLs to SU calls should be sent direct where possible with four IRCs.

Listener members of the RSGB have their own contest between 1400Z Saturday July 12 and 1400Z on the Sunday on bands from 1·8 to 28MHz excluding the WARC bands, in c.w. or s.s.b. modes. The station in QSO with the logged station must be given so CQs and QRZ calls are not permitted. One point for each station heard on 28, 21 and 14MHz bands and three for 7, 3·5 and 1·8MHz bands plus a multiplier for each country heard on each band. Even if you are not a member of the RSGB you can still tot up your score and see how it compares with the winners when the results are announced. More details in the May issue of *RadCom*.

Don't forget to have a go in the "10m Activity Days" organised by the White Rose ARS. Details under the "General" heading.

Good listening and here's to the bottom of the solar cycle! Don't forget the deadline. All reports welcome.

ALL REPORTS BY THE 15th PLEASE

RTTY

Reports: as for VHF Bands, but please keep separate.

by Ron Ham BRS15744

"The enhanced conditions which prevailed on the 14MHz band, until last weekend, have brought with them the most comprehensive data log that I have compiled so far," wrote **Len Fenelow G40DH** from Wisbech on May 8. Len copied 85 prefixes from all corners of the earth including 10 new countries on RTTY and 2 on AMTOR—those marked * in Figs. 2 and 3. These bring Len's datawatch catalogue up to 116 countries.

I found one strange, but interesting, period between 0825 and 0855 on April 17. First, at 0825, the only RTTY signal audible was ZK2JB (Niue Is) on 14·088MHz and this was very watery, then at 0848 an echoing KL7HPR (Alaska) appeared called CQ and at 0852 WH8AAJ (American Samoa) also came up with watery RTTY signal and worked F8XT. When the French station replied, I copied his signal while it was jumping, in short bursts, between 529 and 599. I agree with Len, conditions were good for most of this period.

While I was trying Technical Software's RX-4 multimode receive program with my Spectrum, in its RTTY mode, on the 19th I logged 4 countries (DJ, IT9, OH and SP) in about 30 minutes. It should have been more, but I was so fascinated with the "on-screen" AMTOR/RTTY tuning indicator built into the program, that I spent more

Country (Prefix)	Band (MHz) 3·5	7	14	21
Ascension Is (ZD8)*			X	X
Alaska (AL7)			X	
American Samoa (AH8, WH8)			X	
Andorra (C3)			X	
Argentina (LU)			X	
Australia (VK2)			X	
Austria (OE)		X	X	
Balearic Is (EA6)			X	
Belgium (ON)			X	
Botswana (A2)			X	
Brazil (PT,PP,PY)			X	
British Virgin Is (VP2V)			X	
Bulgaria (LZ)			X	
Canada (VE)			X	
Canary Is (EA8)			X	
Cayman Is (ZF)			X	
Ceuta & Melilla (EA9)			X	
Chile (CE)			X	X
Cuba (CO)			X	
Cyprus (5B)			X	
Czechoslovakia (OK)			X	
Denmark (OZ)	X		X	
Dominican Republic (HI)			X	
Ecuador (HC)			X	
East Germany (Y2)	X		X	
England (G)	X		X	
Estonia (UR2)			X	
Finland (OH)			X	
France (F)	X	X	X	
French Guiana (FY)			X	
Gabon (TR)			X	
Germany (DF,DJ,DL)	X	X	X	
Greece (SV)			X	
Greenland (OX)			X	
Guatemala (TG)*			X	
Hong Kong (VS6)			X	
Hungary (HA)			X	
Iceland (TF)*			X	
India (VU)			X	
Indonesia (YB)			X	
Israel (4X4)			X	
Italy (I,IK,IT)	X	X	X	

Country (Prefix)	Band (MHz) 3·5	7	14	21
Ivory Coast (TU)			X	
Jamaica (6Y)*			X	
Japan (JA)			X	
Korea (HL)*			X	
Kenya (5Z)			X	
Lebanon (OD)			X	
Luxembourg (LX)			X	
Mali (TZ)*			X	
Malta (9H)			X	X
Moldavia (UO5)			X	
Navassa Is (KC4)*			X	
Netherlands (PA)	X		X	
Nigeria (5N)			X	
N. Ireland (GI)			X	
Niue Is (ZK2)			X	
Norway (LA)			X	
Oman (A4X)			X	
Pakistan (AP)*			X	
Panama (HP)			X	
Poland (SP)	X		X	
Portugal (CT)			X	
Rhodes (SV5)			X	
Rumania (YO)		X	X	
South Africa (ZS6)			X	
Sardinia (IS)			X	
Scotland (GM)	X	X	X	
Sicily (IT9)			X	
Spain (EA)		X	X	
Sweden (SM)		X	X	
Switzerland (HB)		X	X	
Tanzania (5H)*			X	
Turkey (TA)			X	
Ukraine (UT)			X	
USA (K,N,W)			X	
USSR (RA,UA,UZ)			X	
Vatican (HV)			X	
Venezuela (YV)			X	
Wales (GW)	X		X	
West Malaysia (9M2)			X	
Yugoslavia (YU)			X	
Zaire (9Q)*			X	

◀ **Fig. 1**

Country (Prefix)	Band (MHz) 3·5	7	14
Australia (VK)			X
Austria (OE)			X
Brazil (PT,PP,PY)			X
British Virgin Is (VP2V)			X
Canada (VE)			X
Canary Is (EA8)			X
Chile (CE)			X
Costa Rica (TI)			X
Crete (SV9)			X
Denmark (OZ)	X		
England (G)	X		X
Finland (OH)			X
France (F)			X
Gabon (TR)			X
Germany (DF,DJ,DL)	X	X	X
Greece (SV)			X
Greenland (OX)			X
Italy (I,IK,IT)			X
Japan (JA)			X
Kenya (5Z)			X
Kuwait (9K)			X
Mexico (XE)			X
Namibia (ZS3)*			X
Netherlands (PA)			X
Norway (LA)	X		X
Oman (A4X)			X
Poland SP)			X
Sicily (IT9)			X
Spain (EA)			X
Sri Lanka (AS7)			X
Sudan (ST)			X
Sweden (SM)	X		X
Switzerland (HB)	X		
Tanzania (5H)			X
Togo (5V)			X
USA (K,N,W)			X
Venezuela (YV)			X
West Malaysia (9M2)			X
Windward Is (VP2)*			X
Yugoslavia (YU)			X

Fig. 2 ▲

time playing than logging! Radio enthusiasts will know the feeling.

My thanks to Richard Wilmot GW3RRI for lending me this package, which loads the AMTOR, c.w., RTTY and SSTV program into the Spectrum, from tape, in about 30 seconds. In my view, like all computer software, once the technique of using it has been mastered, then the RX-4 should add greatly to the enjoyment of an s.w.l.s station. Further details are available from Richard, at Technical Software, QTHR or *Products* this month.

I also copied RTTY signals from the Vatican Observatory station (HV2VO) at 0835 on the 26th. At 1934 on the 30th I heard LZ2KIM, and read the text, "LZ2KIM is students radio club". I also logged 5H3ZO (Tanzania) working into France at 0849 on May 10.

Between April 7 and May 10, **Bob Borzych G4WWD** in Liphook logged over 100 AMTOR stations. When I analysed his log, I noted that he had heard 28 countries, including both Americas, Australia, India, Japan, Scandinavia and parts of Europe. He also managed to work 13 stations in similar directions on 14MHz. He also worked and/or heard 2 Europeans on 3·5MHz and one LA on 7MHz. While using RTTY, Bob heard 6 countries on 14MHz including Brazil, Greenland and Norway.

Fig. 3

Geoffrey Powell in Tamworth, a broadcast listener, has had an FRG-7 (Fig. 3) for some years, but now has installed a Trio R-600 receiver, long wire antenna and a Telereader converter for RTTY. Since using this mode he has logged various G stations on 3·5MHz, DLs on 7MHz and France, Germany and Rumania on 14MHz. He writes, "I enjoy s.w.l.ing, but this is a new dimension, seeing what you are hearing." I like that description Geoff.

My thanks to Bob, Geoff and Len for their detailed logs which I have used, along with my own, to compile the monthly RTTY and AMTOR charts, Figs. 1 and 2.

"Data communications must surely be one of the few remaining areas of amateur radio which still allows such a wide scope for the true experimenter to devise new techniques for passing of information," writes **Alan Hobbs G8GOJ** in the Spring Edition of *DATACOM*. He is Chairman of the British Amateur Radio Teleprinter Group. BARTG is now in its 27th year and this latest issue of *DATACOM* contains 100 pages, full of gen for the data enthusiast. Readers wishing to know more about BARTG should send an s.a.e. to Pat and John Beedie, Ffynnonias, Salem, Llandeilo, Wales SA19 7NP.

Finally, with increasing numbers of people using programs, like the RX-4, with their home computers, I should be receiving more reports, so don't forget, I am always pleased to hear about your equipment, computer program and details of what you have heard or worked.

SPACE & SATELLITES

Reports to: Pat Gowen G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

by Pat Gowen G3IOR

Phase III-c Progress

Werner DJ5KQ and Hanspeter DK1YQ of AMSAT-DL had a productive visit to Golden, Colorado, with the AMSAT team, promoting information, sharing among the constructors and integrators of the forthcoming satellite that should soon become OSCAR-12. A further rewarding meeting took place with the Tucson Area Packet Group discussing the "RUDAK" experiment.

On the constructional side of things, the main fuel tank was mounted with few problems, but the r.f. power amplifier module was found to be slightly larger than anticipated, needing the fabrication of new mounting joints and stringers. The Arm-Safe plug is now wired and installed, and the main battery pack is wired and housed in the casing. The wiring harness fit was successful (see Fig. 1) and the Helium

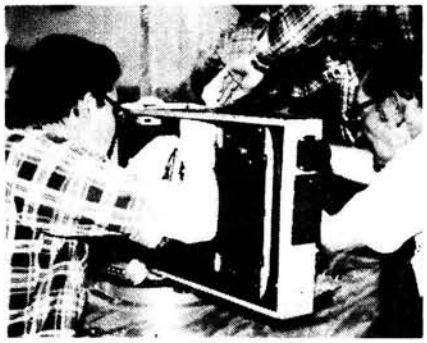


Fig. 1: Doug WA0VSL (left) and Ed W0VO (right) fitting the Phase IIIc wiring harness in Golden, Colorado

bottle problems seem to be overcome. The Internal Housekeeping Unit is mounted in position (see Fig. 2).

The progress on the main transponders proceeds satisfactorily, with the power amplifiers and modulators complete. The "RUDAK" module has been tested on the air, and all was well. The onboard kick-motor mounts have been completed and await installation when the satellite returns to AMSAT-DL in Marburg following completion at Golden, Colorado, when the kick-motor will be placed in position and vibration tests commenced.

Bill McCaa K0RZ reports that the N6CA Mode "S" power amplifier has been received at Boulder, Colorado, and has been passed to Charlie Hill K0YS, for integration with the Oscillator-mixer-multiplier modules that will be completed by the group working at Colorado Springs. Eric K0KE will complete the flight unit, i.f. and control board for the Mode "S" transponder, to be ready for the coming thermal-vacuum testing.

The Propellant Flow Assembly is now complete, and has been shipped to Colorado by Dick Daniels W4PUJ, who will go there himself soon to install the unit.

The main antennas have been cut, and the elements are presently being gold-plated. The final semi-rigid coaxial lines have been installed by K0KE, but a few problems remain to be solved with regard to the 2·4GHz helix antenna. A conference is to be held to discuss these difficulties to final practice.

The construction of the new satellite demonstrates the enormous value of international co-operation established between the AMSAT groups of West Germany and the USA, who despite the problems of communications and language barriers, are setting an example of just what can be achieved when radio amateur groups of the world work together with a common ambition toward a mutual target. That such expertise can be jointly co-ordinated into a final technologically advanced product of such value to the world community of radio-amateurs does the International aspect of AMSAT much credit.

Fig. 2: Ed W0VO (left), Hal W8FAR (centre) and Jan W3GEY (right) busy mounting the Internal Housekeeping Unit to the Phase IIIc satellite frame

Fig. 3: Salyut-7/Soyuz docking ▶

ESA have advised AMSAT that the earliest possible launch date will not be before seven months following the first launch from the ELA-2 pad, which occurred on March 28 this year. As expected, due to the misfortune that seems to have beset NASA launches, ESA are getting customers for Ariane launches, so the earliest possible date now for the launch of what may be OSCAR-12 on the primary ARIANE IV mission will be in late October this year, and probably not until the end of the year or even 1987 when other possible reasons for delays are considered.

Weather Sats

A few frequency changes have been effected on the Meteor series, with Meteor 3/1 now on 137·850MHz, Meteor 2/13 on 137·400MHz, and Meteor 30 on 137·050MHz.

Bedtime Reading

An excellent book on Weather Satellites has been recommended by several of our readers who specialise in this specific interest. It is *The New Weather Satellite Handbook* by Dr. Ralph E. Taggart WB8DQT, published by Wayne Green Publications of *73* magazine fame. It is available from the Modern Book Company, 15/21 Praed Street, London W2, telephone: 01-402 9176.

MIR & Salyut-7

Whilst this column is being written in early May, Salyut-7, followed by Soyuz, followed by MIR, have all just passed overhead as clear bright objects all in the space of ten minutes. Soyuz with its crew of two and half-a-ton of equipment and supplies have left MIR and are en route to Salyut-7 to link up and get the older space station into action again, undoubtedly for the stable platform experiment listed in last month's column. (See Fig. 3 showing a Soyuz/Salyut-7 docking.)

This is the first space station to space station transfer, and shows just how much incredible progress has been made since Yuri Gagarin UA1LO made the first manned space flight just twenty-five years ago.

It was also twenty-five years ago that the first amateur radio satellite was launched from Vandenburgh into space on a Thor-Agena vehicle at 2012UTC on 12 December 1961. It lasted just 18 days in its 92 minute 82 degrees inclination orbit.

By the end of this year five new amateur radio spacecraft should be in orbit, which shows that the amateur movement has also made huge strides in space technology. We have gone from a simple beacon that sent a temperature indexed "HI" rate from space to the advanced sophistication of OSCAR-10, multiple RS launches, Robots and store and forward packet radio devices, and with transponders that can supply faultless DX QSOs. If mankind's philosophy and social progress is capable of keeping in step with his rapidly growing technology, one wonders what the next quarter-century of progress will produce.

RS-9 and 10

Leo Labutin UA3CR reports some slight further delay has occurred in the launch of the coming "RS" pair, due to elongated availability of the launch vehicle, but it is still hoped that they will be in orbit by the time that you read this column. Although no firm date has been given, the end of May is still viable. See some of the space event stamps that Leo finds for his letters depicted in Figs. 4 & 5.

ISKRA-4

We regret that a further delay has arisen in the orbiting of this spacecraft, not due to launch vehicle delays, but due to student changeover at the Moscow Aviation Institute UK3ABT. Regular readers will know that the ISKRA series are built by the students, and the current class members will be finishing their course before the required frequency changes and final testing of the spacecraft is complete. Following an organisational meeting in May on the project, it was decided to postpone the final construction until the new class commence studies, so several months' delay is now expected.

JAS-1

JAS-1 has also undergone a change of launch date, but for a change, it is now planned one day earlier on 31 July 1986. Readers who operated through OSCAR-8 on the "J" Mode will find that the self-same system, allowing for the frequency changes, will perform very well on this new transponder. In addition to the crossed Yagis for low angle passes, your scribe employed a crossed dipole for both uplinks and downlinks for OSCAR-8 Mode "J", and with just 5 watts of r.f. power, this performed very well indeed.

UoSAT

Steve Holder of the University of Surrey team reported to Harold Meerza that the reason for the anomalous readings of the radiation detector were mainly due to accidental powering down of the system whilst the 2·4GHz beacon was activated.

The bulletin is transmitted on OSCAR-9 over the weekends, and the digitalker is normally in operation on Wednesdays.

The 21MHz and 2·4GHz beacons alternate on a weekly basis.

The CCD imager on UoSAT-1/OSCAR-9 has been in regular use over the last year on a weekly basis, and has yielded some quite good images of the Mediterranean area. The University of Surrey point out that the CCD array employed is an early development device, and the quality of the results cannot be favourably compared to those of the NOAA and Meteosat series if high grade pictures are demanded. However, although the experiment has been allocated a low profile, it is known to be of interest to numerous experimenters, some of whom have produced good, clear, earth images by the use of advanced techniques.

Silent Uplinks

Early satellite users will be sad to learn of the death of Bud Schultz W6CG. Bud was until his recent illness very active on the satellites, and held with your author the OSCAR-6 and OSCAR-7 DX record, when after three months of attempts to make a two-way QSO by the use of MS techniques using Es, high m.u.f.s and v.h.f. reangulation, a mutual sub-horizon QSO finally resolved. Torsti Paatino OH2RK and Ted Vogel HB9OP have also died this year, and all will be missed on the satellite bands where they were very active.

Satellite DX

Mark 5H3DR is currently active on the RS-5 and 7 satellites, whilst V85GA (originally VS5GA) is frequently operating via OSCAR-10.

Shuttle and Jupiter Probes

As NASA officials collect the final evidence of what caused the Challenger disaster, a work program of modifications is now emerging which suggest a possible renewal of Shuttle launches commencing in February or March 1987.

John Branegan GM4IHJ reports that aside from military payloads there are three missions which appear likely to have priority on the flight schedule. These are the two missions involving Jupiter flights, the Galileo Jupiter probe and orbiter, and the European Ulysses Solar Polar exploration mission, which requires a gravity slingshot curve around Jupiter as an accelerator to throw Ulysses out of the elliptic plane on a trajectory which will take it back into the inner solar system and up over the poles of the Sun.

Third, but by no means least, it is the enormously important Space Telescope which does not need to go far from Earth but does need to be launched soon because of the enormous number of scientific projects which have been marking time (and eating up money) because of the present launch delay.

Jupiter launch windows occur at intervals of thirteen earth months, and the next one is due in June 1987. Up to now everyone has been confidently assuming that because only one Shuttle was available with the capability to launch the Centaur G plus Ulysees or Galileo to Jupiter, only one, e.g. the American Galileo, would be the one to go. It now emerges that there are lots of good reasons why both should go on separate launches during the single month of June 1987, and this will entail the modification of another Shuttle to carry the special Centaur G rocket plus the payload. It would now appear that present NASA planning anticipates modifying Shuttle *Discovery* for the job.

Why are the Americans spending so much money to launch a European spacecraft? It turns out that it has considerable advantages for them, and the reason is quite simple. Ulysses is much lighter than Galileo and, propelled by the same Centaur G booster, it will get to Jupiter 22 months before Galileo even if they start together. Once at Jupiter, Ulysses must skim very close to the giant planet in order to get maximum gravity slingshot effect. In doing this it will provide a very detailed survey of the very dangerous radiation zones near Jupiter, hopefully allowing NASA scientists to plot a route for Galileo which must go through these same zones nearly two years later. Thus, Ulysses is the perfect pathfinder for the very precious and very sensitive Galileo.

Given accurate charts of Jupiter's radiation belts, Galileo will be steered through what some people are calling the world's best billiards shot. Using gravity assist only, no fuel at all, Galileo will be steered from one Jupiter Moon to the next, providing vital close-up data of not just one or two, but virtually all the big gas giant's many moons. It may be likened to twenty bounces off the cushion before the cue ball pots everything on the table, all in the right order, one after the other, and all from just one shot!

Regular readers of this column will realise that this technique is beginning to dominate most of our space encounters. Indeed there are already long range plans to suggest that eventually we will not need to worry any more about Jupiter launch windows, but will be able to use our own Earth's gravity in this game of celestial billiards to cheaply thrust perhaps even Amateur Radio satellites out to the other planets.

Unfortunately, as thought earlier, there is one obvious casualty of the present Shuttle program delay. No Amateur Radio activity is likely to be scheduled from Shuttle for at least another year or more.

Cosmos Puzzles

Whilst travelling round the UK recently, GM4IHJ's activities have been restricted to listening only, but even using his travelling R2000 from a wire strung round the room, he has found that interesting things are happening.

Among the more interesting are the results of listening to Cosmos 1686 on 19·955MHz. Usually this beacon co-orbiting with the old Salyut-7 station produces a nice five orbits a day some 93 minutes apart, but for several days in late April things were very different.

Taking 28 April as a good example, the beacon was found to be present on five normal passes that commenced with the one at 2016UTC in the evening, all of which is quite normal and as expected. However, quite abnormally, there was clear activity from his beacon audible in central England at:

(1) 1540UTC when satellite was over Soviet Asia

(2) 1612UTC when satellite was south of Hawaii

(3) 1712UTC when satellite was over Israel and Jordan

The first and last of these both occurred when the satellite was nearest to the United Kingdom, but a long way sub-horizon. The middle one, however, was very odd, and to add to the puzzle, the signals demonstrated no discernible Doppler shift.

It is well known that the USSR use this type of beacon on virtually all vehicles which are manned, or operate with manned spacecraft, so it is possible that the source signal of these reports may not be Cosmos 1686. Equally possible, the Soviets do ground test spacecraft equipment from time to time, and an additional clue is that as these same signals appeared at almost the same times on next day suggest that this may have been a ground test. In view of the immense amount of propagation data these small beacons provide it is perhaps worth asking the Soviet authorities if they can announce ground testing of these beacons through their excellent Saturday morning news forums.

Spacelab D-1 QSOs

Last month we promised you the full DARC list of those radio amateurs worldwide who appeared on the tapes made by DP0SL during the D-1 European Spacelab/Columbia mission. Your scribe found it quite surprising to see so few "G" prefixes listed (only eleven in the whole UK compared with seventy-four German prefixes) as at least two hundred were known to have been calling from Britain. Perhaps the advance publicity resulted in so many callers that it was impossible to resolve any one station for most of the UK area passes.

Whilst a few more are expected to be read out yet by careful listening after filtering, the current main list is as follows:

4X4AS 4X4AT 4X4CW 4X4GI 4X6KA 4X6LA 4Z4ZB 8Q7AV AA6G AJ5L CE3BCF CE3DWK CE3KB CE30K CE3XK CE4DLG DBØEG DB2FB DB3FB DB3ZJ DB4OF DC3KP DC3QV DC6CF DC8QB DC9NM DC9PK DC9TM DDØSU DD9KI DFØFMN DF3GY DF5BO DF5EO DF50I DF50R DF8NS DF8QB DF8RW DF8XR DG1GR DG1PV DG2JO DG3RAP DG4NAI DG5JA DG6NP DJ3TF DJ7ZG DJ9YW DKØBU DKØEK DKØEM DKØSG DK2DB DK2LM DK2ZF DK5AJ DK5MN DK5OU DLØBX DLØDZ DLØMI DLØOP DLØRT DLØST DL1AL DL1BCF DL1CF DL2BC DL2GCO DL2ZBY DL3LBJ DL3MDT DL4GCM DL4GCT DL4IE DL4JS DL5BAM DL5NO DL5OT DL6BAM DL6NX DL6SCE/P DL7RP DL8BBM DL8NCI DL8OAT DL9DQ DL9MH/P DU1AK EA1BLA EIØRTS EI6AS EI7BJB F1YJ F6DOK F9XG FK8AH FK8CR G3AHX G3IOR G3RUH G4FCD G4RKV/A G4VRC G6HMS G8SBF GM6FPX GM6JVC GU4YMV HB9CRQ HB9XB HB3PMF HL1EJ IØLYL I3LIW I5IT I8CVS I8PWR IK8BSA IK8EYV IK8BZA IN3ZWF IWØBVG IW4ARD IW8AS JA1JBF JA2BGX JA2YNQ JA6HOR JA7IE JA8ZWI JG1OZH JG1QPT JG1SHH JG1SZH JH1ENZ JH1RNZ JH4JPO JH6EGU/1 JH7CKE JH7CKF JH8DYJ JL1NHF JL3SHC JQ11TV1 JR1AQE K1PXE K6CO K6LNP/DU2 K6NLP K6RTC K7PYK KAØNVT KAØDO KA1DUX KA2RBX KA6CR KA7SJP KB4CRT KB6FFJ KB7RV KC7EM KD5RO KD6PY KD6WG KD7AW KG6GF KG6KO KG6LC N1DBB N2BKT N3FL N6CAV N6FF N6GVP N6IDN N6RW N7GDW N7ZL N9AB NA6E ND2X/5 NF6S NK6K NNØV OE1WRK OE1WRS OE1XTU OE5THL OE6CXG OH1AF OH1AYQ OH2BOZ OHEAZB OH3TR OH4UC OH5LK OH7AZL OK3AU ON1WK PAØJMV PY2BJO SM5FC SP9BGS SP9DSD SP9RKS SP9YW SV1AB SV1GE SV1LY SV1OE SV1SL SV1UK SV1YL SV4LD SV7RQ TR8JLD VE1AIC VE3EF VE3KLW VE3KRP VE3LVS VE3PDD VE5LY VE5XU VE7CKA VE7CLD VE7DOX VE7XQ VKØDJ VK2ACI VK2AHE VK2AHV VK2AIT VK2ALU VK2AQR VK2AS VK2CPO VK2DFH VK2DFY VK2KYP VK2XW VK2YHX VK2ZDE VK2ZZV VK3AQR VK3BLX VK3DTO VK3ZDE VK3ZOT VK4AJI VK4ASB VK4KFQ VK4MS VK4ZAZ VK4ZGF VK5HK VK5QR VK5ZLL VK5ZZ VK6ADF VK6DM VK6KDX VK6OF VKYPR VK7PF WØBPP W1HH W1NU W2JNO W3IP W3PM W4BE W4MOP W5AQQ W5CBT W5EBH W5HQQ W5HUQ W5RRR W5VY W5ZIB W6KH W6MFO W7MCU W7OHF W7QLC W7US W9ODI WAØRCX WA1FCK WA1OMM WA3HUP WA3WBU WA4BUS WA5NOM WA5RCL WA5ZIB WA6YBT WA7GCS WB4KXB WB5BSH WB5GLD WB5LBJ/DU6 WB7AYU WB7OHF WB8OTH WD4AHZ WD4BCS WD4NAE WD4PQN WD5EZR WD9IIC XE1TU YU2DI ZD8LM ZL1AOX ZL1BEZ ZL1QS ZL1TTS ZL2AHK ZL2ARW ZL2AVI ZL2QL ZL2TAI ZL2TAX ZL3ADT ZL3AR ZL3QL ZL3TMY ZL4FX ZM1AOX ZM1TWR ZM3QL ZM6QRU ZR1KB ZR1KE ZR1L ZR2FK ZR5JJ ZR6AGN ZS1BI ZS1BR ZS5AAK ZS6ALE ZS6AXT ZS6BMN ZS6BTD ZS6BWW ZS6BZT ZS6HS ZS6SAT

Figs. 4 and 5: Soviet Space Commemoration stamps on mail from UA3CR

Radar Interference

A considerable number of satellite users and u.h.f. enthusiasts have complained recently about radar interference and asked how to identify the problem source. This latter point is a good one, because in fact much of the interference is not actually due to radar. It appears that a general review of the problem experienced may be in order.

Most radar systems send out very powerful pulses of radio energy at a fixed repetition rate, as also do motor-car ignition systems, navigation aids, micro-computers, sparking electrical motors and power lines. Some of these culprits can be eliminated quite quickly.

Motor ignition speeds up and slows down as engine revs are changed and the source is usually not tunable. Micro-computers send out very rough sounding pulse trains every few tens of kilohertz of frequency over a wide bandwidth of several megahertz. Sparking electric motors and power lines produce pulse interference over a very wide frequency range with problem power lines at their worst in the 28 to 50MHz range. It should not be too difficult to eliminate these problems following your search to identify the root of the interference experienced. A further recent problem has arisen with some modern telephone systems, which can give a pyramid of wide band signals over several spots in the 144–146MHz band, which are tuneable, sounding like a rough whine when f.m. detection is used at the receiver.

By contrast, radars and navigation aids are confined to one frequency band and the signal can usually be clearly tuned, e.g. the powerful Wick Sabre Auroral radar on 153·213MHz is only heard over about 10kHz of bandwidth, whereas ignition noise and micro-computers (the most likely source of interference of this band) appear over a megahertz of bandwidth.

Low frequency radars are used for Over the Horizon Radar utilising ionospheric propagation, so they transmit in the h.f. bands, usually chasing the maximum usable frequency at the point of origin. They employ long millisecond pulses and have low circa 50Hz pulse repetition frequencies. The infamous "Woodpecker" is the best known example in this class. "Woodpeckers" operate from Minsk in Eastern USSR, Central Asian USSR from the Eastern Crimea and Far Eastern USSR from near Vladivostok. Similar American "Woodpeckers" are much more frequency-agile. American examples are located in Maine (USA), and Crete.

Next to our list come v.h.f. Scientific Radars, and a great deal of research into ionospheric propagation is done these days using v.h.f. radar. Some transmitters outside Europe operate as low as 50MHz, but in Europe most v.h.f. radars are in the band between 140 to 160MHz. Typical examples are the Swedish Stare radars, the Wick and Uppsala Sabre radars at 153·213 and 142·583MHz, that use 60 second bursts of pulses, missing out the pulse on the minute. These radars propagate very widely in Aurora, but they are very narrow band signal and cause virtually no interference.

Many old Military Air Warning Radar systems are in use, and for best echo return results with these it is desirable to have a radar frequency such that the wave length corresponds to the dimensions of likely reflectors on the target, which means that 160MHz to 200MHz is a favourite radar frequency spectrum. Pulses are a few tens of micro seconds long, and the pulse repetition frequency varies between 50 and 250Hz. A lot of interference is created whenever one of these radars is operated in an area using Band III TV, and many stations in Scandinavia get problems on the E4 TV channel.

UHF Radars come in two distinct groups. One small group features Tromso Eiscat Auroral study radar at 224MHz and also the very different Archer City Fence at 214MHz. The Archer City Fence is set up in Texas to catch any satellite crossing its beams. It is very powerful, and uses receiving stations in several other states of the USA.

The second group of u.h.f. Radars mainly occupy frequencies between 400 and 450MHz. These are the megawatt powered Ballistic Missile Early Warning Radars (BMEWS at Fylingdales, North Yorkshire, Thule in Greenland, and the newer "Pave Paws" radars at Cape Cod, Texas, California and North Dakota, USA). They have their counterparts in the Soviet Union, where a chain of six stations is usually referred to under the name of the first one built at "Pechora" in the European Soviet Arctic. These stations use multiple transmitters, usually triplets in the case of BMEWS. The transmissions contain a lot of f.m. developed in a technique called pulse compression, and they can propagate both world-wide via standard anomalous propagation, or via reflection from spacecraft and the Moon. Their ability to be detected on amplitude modulation, c.w. and wide (100kHz) f.m. makes them easily picked out if heard. The older BMEWS use mechanically rotated antennas, so they appear as bursts of pulses every 20 seconds or so as the beam passes, but the newer Pave Paws use electronic scanning giving a ripple effect to the signal detected. These radars quite often interfere at the bottom of the Radio Amateur 430MHz band.

Higher Frequency Radars operating around 1GHz, 2·9GHz, 9·9GHz and higher, rarely cause serious interference outside their immediate area.

Finally, we come to the Navigation Aids, which are certainly the major problem of our e.m.e. and u.h.f. work here in Norfolk. Several classes of secondary transponding radars, where the target amplifies and retransmits the received signal, are in regular use. The Tacan system used for aircraft navigation is not normally a source of interference, and neither are the many secondary radars used to identify modern aircraft to air traffic controllers. Unfortunately, however, this is not the end of the story, as at least one navigation aid called Syledis is probably the biggest source of widespread interference, particularly to both military and amateur u.h.f. communications. It is easily recognised by the manner in which its pulsing changes as it is interrogated, and it can be brought up by a signal from any amateur in the hit area. Very unfortunately, Syledis is not readily able to distinguish true Sydelis slave interrogation from inadvertent interrogation by other signals normal to that band, such as any satellite or terrestrial transmission within the amateur 430MHz band. Needless to say, the moment one puts out a call on a previously clear band, up comes Syledis and wipes out the return.

All things considered, both the terrestrial and satellite h.f., v.h.f. and u.h.f. user have to contend with quite a lot of interference for which radars get blamed, but in fact much of the interference is either not radar at all, or is confined to the two major culprits, e.g. old military radars from 160 to 200MHz, and Syledis from 400 to 460MHz. Sometimes (but only sometimes) a good noise blanker may help, and even noise limiters can be of some assistance, but with ultra-weak signal work such as e.m.e., extreme patience and tolerance are vital.

In later columns, when our series of "Getting started on satellites" has covered the requirements for the Phase III elliptical orbit satellites, we shall, as space permits, attempt to give you readers some of the information to help establish a "moonbounce" (e.m.e.) station, the requirements for which are very demanding, but highly rewarding.

Getting Started . . .

Now that we are able to track the current Phase III satellite OSCAR-10, our next task is to hear it. Due to the distance involved when the spacecraft is at Apogee, it **IS** necessary to track the satellite, as a beam is required in order to acquire a reasonable signal over the noise. Although one can copy signals on simple monopole antennas, particularly at Perigee paths, when the source is only some 4000km distant, at Apogee we are seeing the signals from some eight times the distance, hence both the downlink and uplink are 18dB down at optimum coverage times.

The path loss at 145MHz is much greater than at 29MHz, and so, despite the extra satellite power, the signals are well down on those that we have for the mode "A" RS satellites, but, in the same space, we can put up a far better antenna for the 146MHz band than for the 28MHz band. Turning the antenna to follow the satellite is no problem, as when the satellite is at or close to Apogee, no more than a small shift every fifteen minutes or so is normally

needed. This can be performed by hand without necessitating expensive motors, as the antenna can be within reach, as there is no point in having a high antenna providing it can "see" the satellite above horizon.

On the proviso that we recognise the greater feeder losses at 145MHz and make compensations for this, and we use an antenna with a sufficiency of gain, a minimum of noise capturing side lobes, a maximum back to front ratio, and preferably with circular polarisation, we should have no problems on Mode "B". It is important to have the antenna adjustable in both Azimuth and Elevation, or "Az" and "El" as they are known among satellite enthusiasts. There are a number of ways of accomplishing these requirements, some of which will be detailed in future columns.

If a commercial antenna is employed, then it is important that it performs well at the very top end of the 145MHz band, as some makes fall off rather badly in gain and matching at the higher band edge. If you already use one of these for general 144MHz work, then a little gentle pruning and tuning may help things considerably, with careful observation of the side lobes, as these can be a source of capturing not only domestic, car and commercial QRN, but also strong local ground signals when the antenna is elevated to the satellite. The addition of a further reflector or a trigonal reflector replacement may not produce much more gain, but can often assist by way of improving the back to front ratio (hence diminishing ground noise) and the antenna's side lobes.

One essential component to maintain a good signal to noise ratio is to use a good quality feeder to the receiver, ideally Andrews Heliax, but the less costly H100 feeder will perform well. **IF** a long length of feedline **HAS** to be used, then it is advisable to use a low noise amplifier at the antenna. Whilst GaAs f.e.t.s are ideal, they are not vital at 145MHz, as the 144MHz sky noise is so high compared with 430MHz and up. Any low noise amplifier with a noise factor of some 3dB or better will perform well on the proviso that it is well matched and is proof from strong local f.m. signals in the band. If a receive converter is used, then this can be mounted at the antenna instead of in the shack, and considerable improvement should be evidenced.

Some degree of attention may need to be given to the receiver mixer, as some of these can produce poor signal to noise ratios that would not normally be noticed on run of the mill strong terrestrial signals.

It cannot be emphasised enough on just how important the satellite reception side is, and an hour spent on improving your receiving system is worth far more than a kW linear. You will note that one of the greatest problems on OSCAR-10 are the high power stations who have increased their uplink powers in order to put in what they take to be a reasonable signal, compensating for their reception inadequacy. They miss out on the many logically powered stations calling them who they cannot hear, and attenuate other reasonably powered DX signals over the entire passband, thus reducing the population of those they would otherwise work. The satellite, when not attenuated, is very sensitive and will easily transpond even a 1 watt signal to an average 10dB gain antenna. Your problem is to hear the signal!

Contrary to popular belief, one does not have to spend a fortune to work the world on OSCAR-10. In future columns we shall describe a suitable d.i.y. low cost antenna, which, on the proviso that your basic receiver is up to the mark, will give you adequate signals from OSCAR-10 Mode "B", as well as a simple to make 435MHz uplink antenna.

CORRECTION

In the July issue of Space & Satellite, page 58, we mentioned a tape recorded bulletin from the Lasham Ground Station giving the latest news and data on the NOAA and Meteosat weather satellites. The details should have read that this recorded data is available **out of office hours only** and just covers NOAA. We apologise to both the Lasham Ground Station and readers for any inconvenience caused.

VHF BANDS

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

by Ron Ham BRS15744

It would be all too easy to conclude that, over the past year, the bands have been dead. The low level of activity, due to poor atmospheric conditions, certainly makes it seem like that—until I read your letters each month! The dedication of listeners certainly shows how much can be heard during poor conditions.

Like many dedicated listeners, my own station is used at least once a day to check conditions. One piece of my station many people ask about is the ex-army R216 v.h.f. communications receiver. This can be seen on the left of the middle shelf, Fig. 1, next to its main power unit. Although, by today's standards, it is not very sensitive—it lacks a wide-band pre-amp—this 30-year-old receiver still performs well. It is tunable from 19 to 157MHz and has several feet of moving film tuning scale on each of its five wavebands.

For my listening I mainly use three ranges, 30/46, 46/68 and 68/101MHz. I find I can check for DXTV sound and vision signals in Band I (40/68MHz), Eastern European broadcast stations (66/73MHz), beacons and DX signals in the 50 and 70MHz amateur bands as well as continental broadcast stations in Band II (86/100MHz).

Some features included on the R216 are narrow and wide selectivity, 1MHz and 5MHz crystal calibrators and a 4·86MHz i.f. output socket—this enables the front end to be used as a v.h.f. converter (in conjunction with an h.f. communications receiver).

These sets do appear in adverts, usually for a price! Yet before you rush off and buy one make sure you can get a stock of spare valves—especially the 1·4V types used in the i.f. section.

Other pieces of equipment seen in Fig. 3 are (from l-r) the FRG-7, used as a 28MHz i.f. amp for my solar radio telescope; SX200N for quick reference on each of the 144MHz repeater channels; R-2000 for 28MHz beacon monitoring. The R-2000 is fed by a long wire antenna and can also be used for receiving h.f. RTTY signals, with the Tono 500 decoding the text. On the top shelf, the JVC receivers tune through the v.h.f. and u.h.f. TV bands and the large TV is used to display RTTY text.

Well, that's part of my station, how about readers letting me know about their stations.

Solar

"A sunspot group of moderate size (14 spots) was around central meridian on April 24 and near the limb on the 29th," writes **Ted Waring** from Bristol. In Johannesburg, Bob Anderson's team counted 2 spots at 0710 on the 18th, 4 at 0820 on the 22nd, 24 at 1510 on the 24th, 18 at 0548 on the 27th and down to 4 at 0920 on the 30th. The main group was also observed in Brixham, by 16-year-old **Helene-Marie Lott**, who made a drawing of her observation at 1700 on the 25th, Fig. 2 and followed its progress on the two subsequent days. I was very pleased with this information because my 143MHz radio telescope recorded small bursts of noise on days 24, 27, 28 and 29, large bursts on the 25th and a mild noise storm on the 26th. In Sevenoaks, **Cmdr. Henry Hatfield**, recorded a 3 minute burst at 136MHz at 1257 on the 21st and greatly increased solar noise between 1100 and 1230 and 1600 and 1640 on the 24th.

Ron Livesey in Glasgow is auroral coordinator for the British Astronomical Association. By early May he had received reports such as, "Auroral glow on the night of April 2/3", from the weathership, *Starella* and, "Overhead aurora with coronal structures on 9/10", "Rayed structures on 11/2" and "All sky multiple bands and other structures on 12/13", from Peter Brown, Alberta, Canada. "The Boulder, Colorado, Observatory, reported activity in the high latitudes-recurrent type solar event, on April 10". Ron added "My suspended-magnet magnetometer showed activity on the rotational return period, May 1 and 2."

Something happened at that time Ron, because at 1800 on the 2nd, **Gordon Pheasant G4BPY** in Walsall made contact via aurora with GM3YMK on 50MHz.

Furthermore, after receiving a 144MHz auroral alert from GM4ZMK at 1700 on that day, **L. Morgan GM0ATQ** in Greenock worked 12 stations in England, plus LA7AK, OY9JD, PA0DZL, PA0FHG and PA0KNA/A, at various tone-A strengths.

"The event lasted until about 2355 when I worked OY9JD again," writes GM0ATQ, making contacts in 13 QRA squares during the evening. "28MHz was open most of the time but I concentrated on 144MHz c.w.," he said and confirmed that there was another aurora on May 6. During this one, **Dave Coggins** in Knutsford received auroral reflected signals on the Band I television Chs. R1, 49·75MHz and E3, 55·25MHz. Gordon Pheasant logged the Norwegian beacon LA5TEN on 28·237MHz. We know the sun was active around this time because, at 0950 and 1640 on the 4th, Henry Hatfield recorded 15 and 4 minute bursts of solar radio noise respectively. It is worth remembering that when sunspots are present or an aurora has manifested, direct your 144MHz beam toward the sun, switch your receiver to the

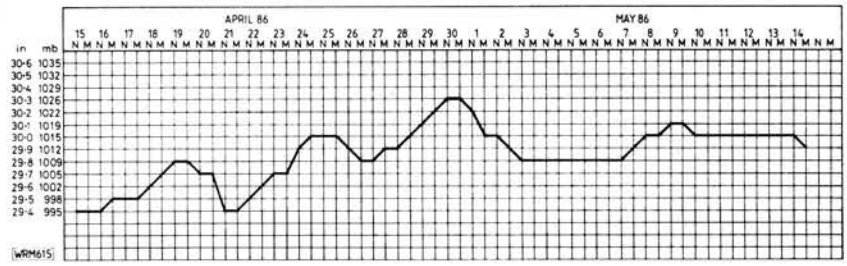
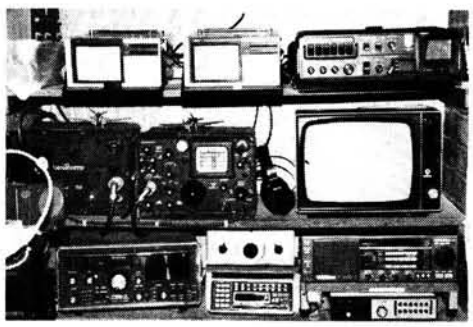


Fig. 1 ▲



◀ Fig. 3

Fig. 2 ▶

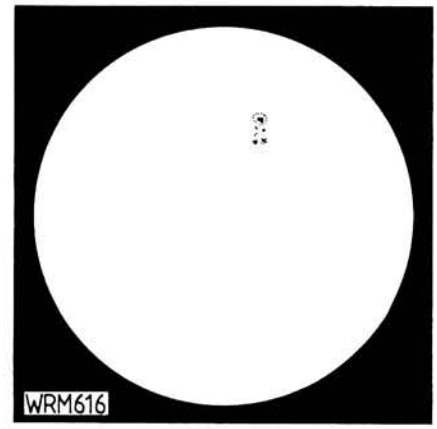
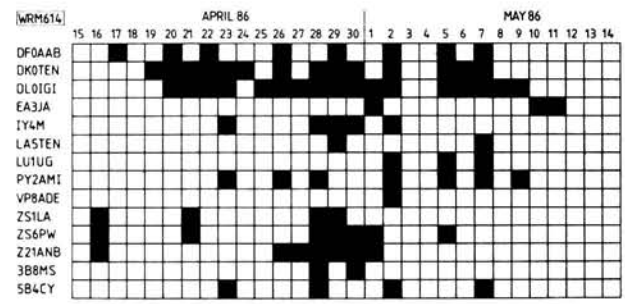


Fig. 4 ▼



a.m. mode and listen to the background noise for "whoooshing" sounds covering most of the band and then you will know that the sun is active. Make sure that the spot you choose in the 144MHz band is free of amateur transmissions. If you are not sure, check it with your b.f.o. because it will not "tweet" if it is solar noise.

The April issue of *Solar News*, the journal of the London Solar Society, contains interesting articles on aurora and the construction of a solar projection box for fixing to a telescope and a corner reflector antenna. The Society can supply solar blanks, for sunspot drawings, at £1.40 for 50 (including p&p). They are offering a revised edition of the Solar News publication, *Guide to the Sun*, for £1.60 (including p&p). Membership of the LSS is £5 per annum and all enquiries must go, with an s.a.e. to Bert Chapman, "Brindles", Mill Lane, Hooe, Battle, East Sussex TN33 9HT.

"On May 2, the signal strength of MSF, being received on a long wire antenna, faded to about zero so frequently that I was unable to identify the hourly timing markers that are usually so prominent on the trace. But, the same signal, being received on a ferrite rod antenna inside the house was not affected in this way at all," writes Henry Hatfield. He runs this experiment in conjunction with his solar observations. Henry added an interesting point, "I read in the papers that the radioactive cloud from Chernobyl was over England on this day and I wondered whether the long wire reception of MSF was, "recording" its presence." This is an interesting thought Henry and I hope that you **DO NOT** get the chance again to test your theory! However, I know that conditions were strange that day, but what about it readers, any ideas?

The 50 and 70MHz Bands

Gordon Pheasant made a 50 to 28MHz crossband QSO with DK1PZ on April 29. Dave Coggins received c.w. signals on 50MHz, from G3OHH at 2226 on May 5 and GW3LDH at 2004 on the 6th. Dave also received various bursts of signal from the 50MHz beacons in Anglesey GB3SIX, RSGB HQ at Potters Bar GB3NHQ and Scotland GB3RMK during this period. In Epsom Downs, **Norman Hyde G2AIH** logged GB3SIX by meteor trail reflection during the early mornings on most days between April 15 and May 10. Both Norman and I copied GB3NHQ, via tropo, every day throughout this period. During a sporadic-E opening around 1800 on May 7, I received strong f.m. transmissions, with some deep and slow QSB, from eastern-European broadcast stations between 66 and 70MHz.

"A poor offering for April, 28MHz remained firmly closed," writes **Bill Kelly** from Belfast. Although he did log a few European QSOs during the sporadic-E disturbance on the 29th. From Belgium, **Filip Rogister ON1BRL** reports hearing DJ2RE, LU2BC, PY1FH and ZS6DL on the band. "There was quite a sporadic-E opening, from 1600 onwards on May 7, with stations from EA, ON, SM, SP and VO being heard or worked," writes Norman Hyde. He emphasised the fact that the Swedish stations were, "very numerous and very strong". Around 1800 on the 7th, my Tono Theta 550, copied c.w. signals from Germany, Italy, Portugal, Sweden and Yugoslavia. Dave Coggins, using a modified DNT CB receiver for 28MHz f.m. logged G0BJR, G0CGE, G0DEG, G0EHG/M, G3OTE/P, G4HZW, G4VVT/M, G4UDG and GW4ZJY/P. In Storrington, **Fred Pallant G3RNM** joined in the 28MHz contest on May 1 and worked 5 stations in the UK and at 1610 on the 2nd, he logged ZS5MY working a DF. Fred also heard several EA8s working into G around 1935 but he could not raise them. From his QTH in Maldon, Ted Owen, heard a couple of YUs in QSO at 1230 on the 9th.

Like most observers, Bill Kelly received signals from the German beacons DF0AAB Kiel on 28·277MHz, DK0TEN Konstanz on 28·257MHz and DL0IGI Mt. Predigtstuhl on 28·205MHz during the sporadic-E opening on April 29. In addition to his 28MHz beacon log Gordon Pheasant also copied signals, via meteor scatter, from DK0TEN on May 8, DL0IGI on April 18, 19 and May 8 and the Marconi beacon IY4M (Bologna 28·195MHz) on April 15 and 16. IY4M and the Norwegian beacon LA5TEN (Oslo 28·237MHz) are usually heard when sporadic-E conditions prevail. Gordon, Fred Pallant and Ted Waring all heard a new beacon, EA3JA (Barcelona, 28·247MHz) on May 1, 10 and 11 respectively. Fred also logged PY2GOB (Sao Paulo, 28·050MHz) on May 2, 5, 9 and 10.

Since first sending me reports in October 1982, Norman Hyde has heard a total of 35 international beacons, which shows the extent and importance of this service to the better understanding of propagation in general and band conditions in particular. "The 14MHz band was good and consistent almost throughout this period," writes **Len Fenelow G4ODH** from Wisbech. During the 23 days from April 15 to May 7 he logged CT3B on 18 days, LU4AA twice, OH2B on 16 days, ZS6DN/B on 6 days, 4U1UN/B on 21 days and 4X6TU/B on all days except May 1, 2 and 3. These beacons can be heard around 14·100MHz. Both **Chris van den Berg** in The Hague and I received consistent signals on most days from the RSGB beacon at Wrotham, GB3VHF, on 144·925MHz. My thanks to Chris van den Berg, Dave Coggins, Henry Hatfield, Frank Hyde, Bill Kelly, Ted Owen, Fred Pallant, Gordon Pheasant, Filip Rogister and Ted Waring, for their 28MHz logs which enabled me to prepare our monthly chart of beacons heard, Fig. 4.

Tropospheric

The average atmospheric pressure, measured at my QTH with a Short and Mason barograph (Fig. 1, TV Bands) was around 29·85in (1010mb) for the period April 15 to May 14. Although not good for v.h.f. DX, a tropospheric opening did occur while the pressure was high toward the end of April, Fig. 1. At midday on the 24th, Bill Kelly heard signals through the 144MHz repeater at Caldbeck GB3AS, R1. Then at 2130 on the 30th, he added the Ayr repeater GB3AY on R2, plus his local Northern Ireland repeaters. In Brixham, **Alan Lott G1AEU**, noted many French stations on the 144MHz band during the good conditions which prevailed between the 26th and 29th. In The Hague, Chris van den Berg received signals from the Norfolk repeater GB3NB, R1, almost daily from April 15 to May 6 when a lightning strike damaged his v.h.f. converter.

Band II

On April 25, **Harold Brodribb** in St. Leonards-on-Sea logged 5 French Culture programmes, 3 Inter and 4 Musique

between 88 and 100MHz. He gives a similar report for the 29th, plus the identification of transmissions from Caen and Paris. "A remarkable day," said Harold about May 1 because, at 0555, with his barometer at 30·2 (1022mb) and falling he heard BBC Radios Cymru and Devon and Radios 2,3 and 4 from North Hessary Tor. "This was a wonderful opening to the west and south-west from here and an excellent example of directional tropo," writes Harold. He added, "Devon and Cymru were stronger than the relatively local Radios Invicta and Kent respectively." He also received 2CR from Bournemouth at 0820. "Band II was wide open here in Dorset," remarked **Geoff Arnold G3GSR**, when we spoke on April 30. While using my Plustron on the Sussex Downs during that afternoon I tuned in several French stations around 100MHz.

At 1804 on May 1 I located continental stations on 11 spots in Band II, plus many inter-station warbles caused by BBC and continental signals mixing together. The advent of the warbles usually means DX and they usually disappear when conditions return to normal. From Macclesfield, **Phil Englehard G0DNB**, reports that some BBC and ILR stations have moved frequency from around 97MHz to between 103 and 104MHz and he is interested to see what DX will appear, during an opening, in those empty spaces. Phil's best UK DX with a portable receiver, so far, is BBC Radio 3 from Jersey and Vatican City from the Continent. Bill Kelly reports receiving strong signals from Radio Telefis Eireann and Radio Na Gaeltacha around 102MHz but the rest of the band is "stonewalled" by BBC, Belfast Downtown and RTE.

ALL REPORTS BY THE 15th PLEASE

TELEVISION

Reports as for VHF Bands, but please keep separate

by Ron Ham BRS15744

"I think that it is more interesting than normal television because you have got to sit down and search for all the different programmes and stations, instead of just switching on and finding them there," writes **Edwina Mancini**. Along with her husband, Tony, she has a great interest in the reception of long distance television signals. The Mancinis recently installed a u.h.f. antenna and now, from their QTH in Belper, they can receive S4C, Yorkshire Television and Granada from Wenvoe, Emley Moor and Winter Hill, respectively. Band IV and V DXing in the UK can be very rewarding, especially when that favourite programme is on another network outside of your normal reception area. "We are in a north-south valley rising each side to 520m a.s.l. and as we are situated at 270m a.s.l., we don't do too bad," said Tony. No doubt, like most of us, Edwina and Tony watch their barometer for indications of DX possibilities in Bands III, IV and V. I use a Short and Mason barograph (top left, Fig. 2) to record the atmospheric pressure and to provide the figures for the monthly pressure chart in *VHF Bands*.

Band I

"The Sporadic-E season started for me at 1115 on April 29 with a super opening to eastern and southern Europe," writes **Len Eastman G8UUE**, from Bristol. "It was really quite an opening on Band I," commented **Ian Davidson**, Carmarthen. "Here we go again," said **Tony Mancini**. These are typical of the remarks which I normally get at the start of a sporadic-E season.

"ARD Grunten, Kruzberg and SWF-RG1, CST RS-KH, TVP, DR Danmark and ORF-FS1, logged on the 29th in one minute flat, which demonstrates the Band I battlefield," writes **Simon Hamer**, from New Radnor. That is a good way of describing the state of Band I during an extensive sporadic-E, especially at those times when several stations are fighting for predominance on a particular channel.

Like most receivers suitable for DXTV, the rotary tuner on the Plustron TVR5D and the smaller elongated scale on the Panasonic TR1200S (both in Fig. 1) are calibrated in channel numbers. These are E2, E3 and E4 for Band I, approximately 48 to 68MHz, E5 and 12, 175-230MHz for Band III and 21-69 for the u.h.f. band. On the subject of equipment, the GEC communications receiver and two television receivers used by Ian Davidson can be seen in Fig. 3.

Although several minor events occurred between April 15 and May 14, the first major sporadic-E opening of this season manifested between 1100 and 1500 on April 29, then again to a lesser degree around 1800 on May 7. During these disturbances the chart (Fig. 1) shows the reported programmes and test-cards from stations in 16 countries. Regional transmissions were identified from Germany: Bayerisher Rundfunk, DFF-DDR F1, Grunten, Hessischer Rundfunk, Kreimberg, Kreuzberg, Saar and SWF-RG1 and from Norway: Bremanger, Gamlem, Hemnes and Melhus. "All on the 29th, were absolute perfect reception," remarked Tony Mancini, who proved this by sending a photograph of an interviewee that he saw in a Spanish regional news programme, Fig. 4. Because of their close proximity in frequency, test-cards from Austria, Fig. 5, on Ch. E2, 48·25MHz and Czechoslovakia, Fig. 6, on Ch. R1, 49·75MHz are often seen mixing together during an intense opening. The test cards in Figs. 5 and 6 were photographed in previous years by Len Eastman and **Tony Palfreyman**, respectively.

David Meredith, Dudley, using a Waltham Mini-Star 216 receiver and Band I dipole, received pictures from Czechoslovakia and Italy during the afternoon of May 11.

Programmes on a wide variety of subjects were seen in addition to such test-card idents as, DR–Denmark; JRT RTV-LJNA–Yugoslavia; NRK and NORGE–Norway; ORF-FS1–Austria; +PTT SRG1–Switzerland; RAI–Italy, RUV ISLAND–Iceland; RTBF-1–Belgium; RTP-1–Portugal; RTVE-1 and TVE–Spain; SR TV1 and TV1 SVERIGE–Sweden; TVP–Poland and YLE-1–Finland. I have included the country after each caption, for the benefit of our new DXers, so please include these and any other logos that you see in your reports.

Around 1300 on April 29 I received a "rock solid" picture on Ch. E3 of a discussion group. This was whilst using my Plustron and its rod antenna from inside my car, adding more proof of just how strong signals were that day. At 1759 on May 7 I logged an analogue clock from the USSR showing 2059, 3 hours ahead of BST, preceded by a YL announcer and followed by their news. The clock, Fig. 7, was the same as that seen previously in India by **Major Rana Roy**. Rana often logs pictures from the USSR when sporadic-E is about and has sent three photographs, Figs. 8, 9 and 10, taken from Soviet programmes that he received during the 1985 season. Russian TV signals were weak with **Gordon Pheasant** in Walsall at 1439 on May 7. Around teatime on the 9th, Simon Hamer spotted NRK showing *Dagsrevyen* (news) and a film on SVT with Swedish subtitles on Ch. E3.

	Dave Coggins	Ian Davidson	Len Eastman	Ron Ham	Simon Hamer	Tony & Edwina Mancini	David Meredith	Gordon Pheasant
Austria E2/4		X	X		X	X		X
Belgium E2							X	
Czechoslovakia R1/2		X	X	X	X	X	X	X
Denmark E3/4		X	X		X	X		X
Finland E3					X			
Germany E2/3	X	X	X		X	X		X
Iceland E4						X		
Italy IB					X		X	X
Norway E3/4		X				X		
Poland R1/2		X	X	X	X	X		X
Portugal E3						X		X
Spain E2/3/4	X		X		X	X	X	X
Sweden E2/3/4		X	X			X		X
Switzerland E2					X	X		
USSR R1/2				X	X			X
Yugoslavia E2/3		X	X		X	X		X

Fig. 1

Tropospheric

Although the unsettled weather over the UK between April 15 and May 14 was not good for Bands III, IV and V DXing, **Harold Brodribb**, St. Leonards-on-Sea, received negative pictures from France on several v.h.f. and u.h.f. channels on April 15, 29 and 30 and May 1. He identified signals from Abbeville, Neufchatel and Rouen during his DXing periods on the latter three days. At 1500 on the 15th he used his Plustron TVR5D, portable, about 13km away from his home QTH and received strong negative pictures from Boulogne on

Fig. 2

Fig. 3

Fig. 4

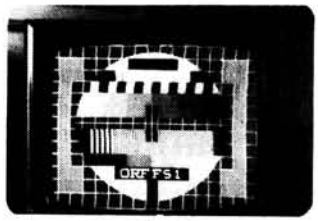


Fig. 5

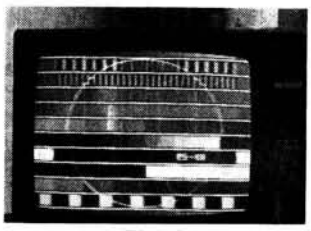


Fig. 6

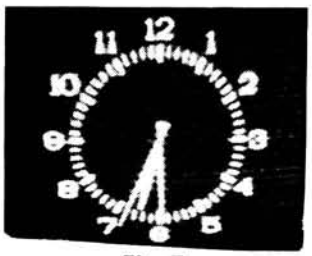


Fig. 7

Fig. 8

Fig. 9

Fig. 10

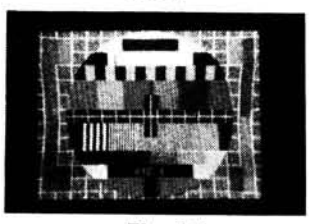


Fig. 11

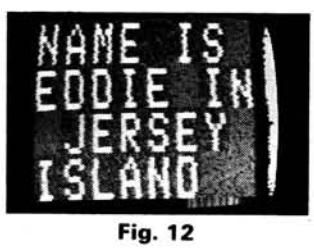


Fig. 12

Fig. 13

Chs. 29, 34 and 37, which he cannot receive at home.

During the evening of April 29 I noticed some co-channel interference on the u.h.f. band and logged strong negative pictures from France on Ch. F5 in Band III. This tropo-opening continued through the night because early the following morning, Harold logged good pictures from S4C and BBC 2 (Wenvoe), on Chs. 47 and 51 respectively. On April 27, Simon Hamer, watched Bulmers football cup final on RTE-1 and a programme *MT USA* (American film clips) on RTE-2, while out portable on Penyfforest Hill, a local high spot. From that location Simon can normally receive u.h.f. pictures from Crystal Palace, Hannington and Rowridge. Signals from Radio Telefis Eireann, Fig. 11, have also been received during previous openings by Len Eastman, from his home QTH in Bristol. May I remind newcomers, that patterns on the household u.h.f. pictures can be a warning that there is DX about in Band III as well.

SSTV

"April has not been over busy with SSTV for me," writes **Les Curno**, from Bude. Although he did copy pictures, around 14·230MHz, from DJ0AU, EA3SY, LZ1OW, LZ1WN, LZ2DV, SP2JPG, SP3ZAH and 5B4MD, all new ones for him. He also logged the captions, "CQ CONTEST LZ2DV", "JA2HY DE HA0DG", "KA7JS DE EA7UH", "OH7XP DE YT2A" and a very interesting one at 1745 on the 21st, "CQ CQ DE 9K2DZ QRZ". These new stations increased Lester's SSTV countries score to 32. "A lot of regular stations were busy with G4GOZ and G4PJT on quite often and GJ4YCR sending excellent quality video into my Yaesu FRG-7 and Scarab/Spectrum combination," said Lester. He recently took his slow-scan gear to the local radio club and fascinated members by replaying tapes of previously recorded pictures.

Some while back **Alan Sancto** received SSTV pictures from Jersey (Fig. 12) and G4GOZ (Fig 13), using his home-brew WCY gear, at his QTH in Germany. During this period **Richard Thurlow G3WW**, March, using a recently home-brewed full-size G5RV antenna exchanged first-time pictures with DF7DT, DK6DW (his very first on SSTV), EA4DYU and G3WOT. "Do not be put off if stations announce that they are about to transmit colour SSTV and you only have a black and white monitor," writes Richard, in a message for newcomers to the mode. He adds, "If the station transmits three frames of red, then three of green and then three of blue, you will be able to receive them all in various shades of black and white." On May 5, Richard exchanged Robot 12 and 36 seconds colour pictures with G3CDK, G3OQD and GJ4YCR and reported that on the 7th, GJ4YCR swapped pictures with AZ1ARU/P, who, after QSYing 5kHz because of QRM, also answered a call from Richard. "Through the good offices of a Peterborough s.w.l., who has built the WCY SSTV converter, I was able to visit the British Amateur Television Club's Exhibition/Rally, at Crick, on May 4, and was delighted to meet prominent active SSTVers and see G3CCH demonstrate his latest colour converter and G1OHZ showing his latest Volker-Wraase SC-1." said Richard.

THE BRITISH AMATEUR TELEVISION CLUB

D. Lawton, "Grenehurst", Pinewood Road, High Wycombe, Bucks HP12 4DD.

MW BROADCAST BAND DX

Reports to: Brian Oddy G3FEX, Three Corners, Merryfield Way, Storrington, W. Sussex RH20 4NS

by Brian Oddy G3FEX

The MW Reflex receiver design, sent along to me by **John Ratcliffe** of Southport, Queensland, Australia last year, has proved to be extremely popular with *PW* readers from all over the World. Numerous l.w., m.w. and s.w. experimental versions are now undergoing field trials! Most readers who have built the set agree that the performance is excellent, despite the fact that very few components are actually used in its construction!

Among the experimenters who have written to me about the set this month, is **Frank Gregory** of Walton-on-Thames, who has sent along photographs of his "lab breadboard" version, which uses a tag strip and an earth bus bar running from one end to the other of the board to support the components and ensures short decoupling capacitor leads (Fig. 1). A three-gang variable capacitor was used to test the set and an experimental feedback loop, controlled by the Philips trimmer,

was added to the design. A 100μF capacitor has also been wired across the supply, to stabilise the circuit. Frank says that it works well and many Russian and German stations are being received—he is now interested in its s.w. potential!

John Ratcliffe mentioned in his monthly report that he has been using his version on m.w. to receive DX from Radio Tahiti on 675kHz which is well over 8000km east of him! He says "there must be some limit to the performance one can get out of two transistors, so I have been testing an emitter follower stage at the collector of Tr2 to improve the match between the output and my headphones!"

If you are experimenting with this little receiver, please send along the results you obtain for inclusion in this series, for it is by the exchange of ideas that all *PW* readers can benefit!

DX Report

Note: All frequencies in kHz: Time in UTC (GMT)

Transatlantic DX: At his listening post in Stamford, Lincolnshire **Philip Hodgson** decided to check the m.w. band for transatlantic DX for the first time ever and was well pleased with the results. The first signals to be heard were from VOCM of St. John's, Newfoundland broadcasting News in English on 590 just after midnight. A little later, at 0045, the announcement "The Great Music Station . . . 93 CJYQ" was received from CJYQ 930, also of St. John's! Signals received from the USA included WMRE of Boston, 1510 which broadcast a station ident, followed by a sports commentary; WHN from New York 1050 with Country style music; WCAU of Philadelphia 1210 with pop music—American style—and WINS of New York on 1010.

An interesting echo effect station ident and music was clearly heard from Radio Globo, Brazil S. America 1220 and at 0115, Spanish music from Radio Tijuana, Mexico 1470 made a pleasant ending for Philip's first m.w. DX session!

George Morley of Redhill, Surrey says "I couldn't sleep, so I decided to get up at 0330 to have a look at the band"—Old Timers like George must have a sixth sense, for DX conditions were good that night! CJYQ was coming in well on 930 and soon two other signals were received from Newfoundland, namely CKYQ of Grand Bank 610 and CBN of St. John's on 640. A station broadcasting a programme in French on 1280 was identified as CKCV, located in Quebec. CFGM of Richmond Hill, Ontario on 1320 and another Quebec station, CKLM of Laval on 1570 were also logged. Signals received from the USA were WHDH of Boston, Mass 850; New York's WHN 1050, WINS 1010 and WQXR 1560; also WCAU of Philadelphia 1210 and from Pittsburg, KDKA on 1020.

A very impressive log by anyone's standard, has been sent along by **Paul Logan** of Co. Fermanagh, N. Ireland. In addition to Canadian VOCM 590, CKYQ 610 and CJYQ 930, Paul heard three more Newfoundland stations—CKCM 620 & CIYQ 680 from Grand Falls and CKVO of Clarenville 710. Three stations from Nova Scotia—CJFX of Antigonish 580, CJCH 920 & CHNS 960 both from Halifax and two from Moncton, New Brunswick—CBA 1070 and CKCW 1220 were also logged.

From the USA, Paul noted WHN 1050, WINS 1010 and WQXR 1560 from New York; WBAL from Baltimore 1090; WCAU Philadelphia 1210 and Boston's "memory" station WMRE 1510 in his log. DX stations logged from the Caribbean area were ZDK Radio, Antigua 1100; Radio Caraibes, Roseau Dominica 1210 and Caribbean Beacon, Anguilla 1610 and from S. America included Radio Vision, Caracas Venezuela 950; Radio Globo from San Paulo, Brazil 1100 and from Rio 1220; Radio Iracema Fortaleza, Brazil 1300 and Radio Liberacion, Carupano Venezuela 1470.

Although ball games are frequently mentioned by **Bill Kelly** of Belfast in the remarks section of his interesting DX log, also detailed are a number of other items which Bill has been hearing from Canada and the USA; these include "Let it be me"—a listeners' record request programme broadcast by WQXR of New York on 1560 at 0020, a round up of Sports News at 0420 from CBNA 600 of St. Anthony, Newfoundland and a talk (plus adverts!) on 1500 from Washington's WTOP at 0345. A very good signal from CJYQ 930—usually playing "pop" records—was logged on several nights at 0130. Two Newfoundland stations in Grand Bank—CKCM 620, which broadcasts a good deal of pop music around 0130 and CKYQ 610, which often relays sports events/ball games around 0530—were also mentioned by Bill, who not only looks for the DX but takes a real interest in the programme content too! S. American stations logged were Venezuela's Radio Vision 950 and Radio Viberacion 1470; Brazil's Radio Globo 1220 and from Anguilla, the Caribbean Beacon 1610.

Other DX: Reception from RAI Radio-1 Naples, Italy 657 and Leningrad, USSR 1494 was good enough for **Alan Jarvis** of Cardiff, S. Wales to hear their signals clearly indoors on his novel Realistic "Headphone Radio" from Tandy—this has the receiver and a very directional antenna actually built into the headphones and by simply turning the head, unwanted stations can be nulled out! RTE-1 from Tullamore, S. Ireland on 567 was also received by Alan using this little set, so next time you are in a town with a Tandy shop, have a good look at this unusual design!

Using his Yaesu FRG-8800 receiver plus a 25m wire antenna Alan listened one morning between 0800 and 1230 to RTE-1 from Cork on 729 and to RTE-2 from Athlone 612 and Cork 1278. Later, between 2100 and 2330 he logged RAI Naples, Italy 657; RNE-1 Barcelona 738; Radio Moscow 1323 and 1494; TWR Radio Monte Carlo, Monaco 1467 and BRT Belgium 1512—a popular programme called *Radio World,* which **Tommy Dougan** of Belfast and **Wyn Mainwaring G8AWT** of Cowes I.O.W. both mention in their letters, can be heard on Sunday evenings from BRT. **Robert Taylor** of Edinburgh, Scotland is a regular listener to the *DX Circle* programme broadcast on Tuesday evenings by DLF Cologne, W. Germany on 1269.

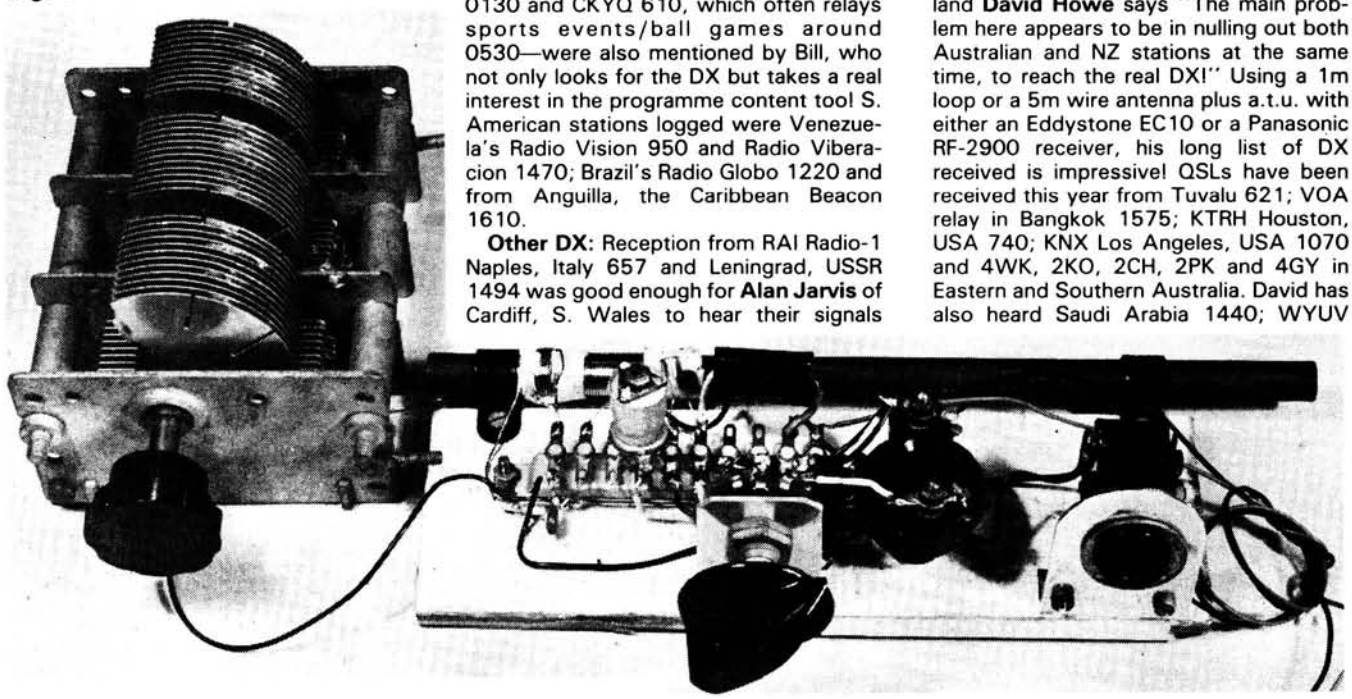
In their search for DX during the night, Bill Kelly and George Morley logged three stations in Algeria, namely, Ain Beida 531, Les Trembles 549 and Algiers 891—in addition, Batra-2 from Egypt was noted by George and Bill heard both Spanish at 0200 and French at 0320 on 621—possibly Radio Espania via RNE1 Tenerife, Canary Is and Radio France National, Lyon. A Russian programme via Krasnodar, USSR 1089 at 0430 was also received by Bill.

At his location in Nuneaton, Warwickshire **Roy Spencer**, uses an indoor loop antenna with his DX400 receiver when checking the m.w. band. His latest log includes AFN Stuttgart, Germany 1143 and Manx Radio, Isle of Man 1368—an attractive QSL card is sent to listeners by this station to confirm reception reports.

Tim Shirley of Bristol, Avon has been taking a look at the l.w. band with his new Trio R600 receiver and listened during the evening to the transmitter in Kaliningrad, USSR 171 (Radio Moscow Media 1); Konstantinow, Poland 227 (Radio Warsaw Prog. 1); Kalundborg, Denmark 245 (Prog. 1); Topolna, Czechoslovakia 272 (Hvezda Prog.) and Minsk, USSR 281 (Radio Moscow Prog. 1).

Reporting from Christchurch, New Zealand **David Howe** says "The main problem here appears to be in nulling out both Australian and NZ stations at the same time, to reach the real DX!" Using a 1m loop or a 5m wire antenna plus a.t.u. with either an Eddystone EC10 or a Panasonic RF-2900 receiver, his long list of DX received is impressive! QSLs have been received this year from Tuvalu 621; VOA relay in Bangkok 1575; KTRH Houston, USA 740; KNX Los Angeles, USA 1070 and 4WK, 2KO, 2CH, 2PK and 4GY in Eastern and Southern Australia. David has also heard Saudi Arabia 1440; WYUV

Fig. 1



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Freq (kHz)	Station		Roy Spencer, Nuneaton	Bill Kelly, Belfast	Alan Jarvis, Cardiff	Alex Mackow, N. Italy	Anthony Beldon, Barnsley	John Sheridan, Derby	Tim Shirley, Bristol	Simon Hamer, New Radnor
603	Invicta Sound	IBA			X			X		
630	Radio Bedfordshire	BBC			X		X	X		
666	Devonair Radio	IBA			X					
666	Radio York	BBC						X		
756	Radio Shropshire	BBC			X			X		
774	Radio Leeds	BBC						X		
774	Severn Sound	IBA	X		X					
792	Chiltern Radio	IBA			X			X		
801	Radio Devon	BBC			X			X		
828	2CR	IBA			X					
828	Radio WM	BBC						X		
828	Chilton Radio	IBA			X					
837	Radio Leicester	BBC						X		
855	Radio Norfolk	BBC					X	X		
855	Radio Lancashire	BBC					X	X		
873	Radio Norfolk	BBC					X	X		
954	Devonair Radio	IBA			X					
954	Radio Wyvern	IBA			X			X		
990	Radio Devon	BBC			X					
990	Beacon Radio	IBA						X		
999	Radio Solent	BBC			X					
999	Radio Trent	IBA						X		
1026	Downtown Radio	IBA								X
1026	Radio Jersey	BBC								X
1026	Radio Cambridgeshire	BBC						X		
1035	Radio Sheffield	BBC						X		
1107	Radio Northampton	BBC						X		
1116	Radio Guernsey	BBC			X					X
1152	LBC	IBA				X				X
1152	BRMB	IBA			X					
1152	Piccadilly Radio	IBA					X			
1161	Radio Broadland	IBA			X					
1161	Viking Radio	IBA						X		
1161	GWR	IBA			X					

Freq (kHz)	Station		Roy Spencer, Nuneaton	Bill Kelly, Belfast	Alan Jarvis, Cardiff	Alex Mackow, N. Italy	Anthony Beldon, Barnsley	John Sheridan, Derby	Tim Shirley, Bristol	Simon Hamer, New Radnor
1161	Radio Bedfordshire	BBC						X		
1170	Swansea Sound	IBA			X					
1170	Radio Tees	IBA					X			
1170	Signal Radio	IBA						X		
1242	Invicta Sound	IBA						X		
1251	Saxon Radio	IBA	X					X		
1260	GWR	IBA			X					
1260	Leicester Sound	IBA					X	X		
1278	Pennine Radio	IBA						X		
1305	Red Dragon	IBA	X		X				X	
1305	Radio Hallam	IBA						X		
1323	Radio Bristol	BBC			X			X		
1323	Southern Sound	IBA						X		
1332	Hereward Radio	IBA					X			
1359	Red Dragon	IBA			X					
1359	Mercia Sound	IBA						X		
1368	Radio Lincolnshire	BBC						X		
1431	Essex Radio	IBA			X					
1431	Radio 210	IBA			X					
1449	Radio Cambridgeshire	BBC						X		
1458	Radio WM	BBC						X		
1458	Radio Newcastle	BBC								X
1476	County Sound	IBA			X			X		
1485	Radio Merseyside	BBC						X		
1485	Radio Humberside	BBC						X		
1503	Radio Stoke-on-Trent	BBC					X	X		
1521	Radio Mercury	IBA			X					
1521	Radio Nottingham	BBC						X		
1530	Pennine Radio	IBA						X		
1530	Radio Wyvern	IBA			X			X		
1548	Radio Bristol	BBC			X					
1548	Radio Forth	IBA	X	X						
1548	Radio Hallam	IBA						X		
1557	Hereward Radio	IBA			X			X		
1584	Radio Nottingham	BBC						X		

American Samoa 648; 2AP Western Samoa 540; Caribbean Beacon, Anguilla 690; KDAY Los Angeles, USA 1580; KROW Reno 780; 7RPH Hobart, Tasmania 1620 (500 watts) and 3WL Victoria, Australia 1602 (200 watts)—he says "these stations are not terribly rare DX in this country, but I think they will give some idea of what is available to a beginner such as myself with some fairly unspectacular equipment."

Writing from Victoria, Australia **Lewis Jenkins** says ". . . it is relatively easy in the early morning, after the local national stations have closed down, to receive the New Zealand nationals around 600-800kHz with a good transistor portable radio i.e. one with an r.f. stage"—Lewis is going to build the reflex receiver which John Ratcliffe used recently to hear Radio Tahiti 675 at 0730 and Radio Fiji Suva on 635 at 1900, so his next log will be very interesting!

Local Radio DX

One of the most surprising reports this time came from **Alex Mackow** of Harlesdon, London who went to Northern Italy on a ski-ing holiday. He says "I was amazed to hear LBC on 1152kHz coming in with a very good signal after 2300 local time!" Roy Spencer says "Radio Forth, 1548—a real surprise, as I was looking for another station! This is the first time that I have heard this one."

Simon Hamer of New Radnor, Wales has been busy again and says "Here's a log of a few harder DX catches!" A Vega Selena 215 receiver with ferrite rod antenna was used by **Anthony Beldon** of Barnsley, Yorkshire to pull in some distant stations. "I do find that the daytime is the best . . . stations heard were collecting during the morning" says Alan Jarvis. An RCA AR88D enabled **John Sheridan** of Mapperly Village, Derbyshire to compile his extensive list for the Charts!

QSL Addresses

BBC Radio Lancashire, King Street, Blackburn, BB2 2EA

BBC Radio Sussex, Marlborough Place, Brighton, BN1 1TU

BBC Radio Oxford, 242/254 Banbury Road, Oxford, OX2 7DW

ALL REPORTS BY THE 15th PLEASE

SW BROADCAST BANDS

Reports as for Medium Wave DX, but please keep separate

by Brian Oddy G3FEX

For the Newcomer SWL

Some of the more expensive receivers available to the s.w.l. have numerous controls and among these is usually a multi-position switch marked MODE, which selects CW, AM, LSB and USB—so what exactly do these terms mean?

The CW position is normally used for the reception of an unmodulated or keyed carrier wave, e.g. Morse code. In order to receive this type of signal, it is necessary to mix it with an oscillator operating at the receiver **Intermediate Frequency** or i.f. Called a **Beat Frequency Oscillator** or b.f.o., it is usually adjusted to operate about 800Hz above or below the receiver i.f. to result in an 800Hz audible beat note with the incoming signal—see December 1985 *PW*, pages 66/67, for the basic principles of a Superhet receiver.

The AM position is used to select the reception mode required for Broadcast Station reception. These use a form of modulation at the transmitter known as **Amplitude Modulation**, or a.m. The gen-

A pennant/sticker from Radio Canada International sent in by Leo Gieske of Randburg, South Africa

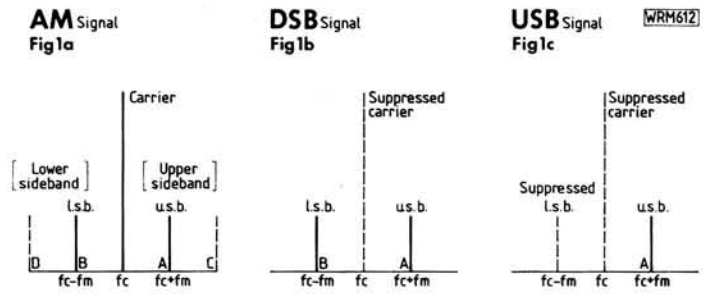

Fig. 1: Note carrier f_c remains constant in frequency. Sidebands consist of $f_c + f_{m1}$ where f_{m1} = modulating frequency. For example: Let f_c = 9MHz and f_{m1} = 2kHz, $f_c + f_{m1}$ = 9·002MHz (A) and $f_c - f_{m1}$ = 8·998MHz (B) If f_{m1} moves to 4kHz $f_c + f_{m2}$ = 9·004MHz (C) and $f_c - f_{m2}$ = 8·996MHz (D)

eral principles of a.m. were discussed in the November 1985 *PW*, pages 70 & 71, and readers would be well advised to re-read those pages—photocopies are available from the *PW* Office in Poole, if needed.

The LSB and USB positions of the mode switch are concerned with the reception of **Lower Sideband** or l.s.b. and **Upper Sideband** or u.s.b. signals, which have not been previously discussed in this series.

The November article stated that if an r.f. carrier wave (f_c) is modulated by an a.f. signal (f_m) in an **Amplitude Modulation** or a.m. system, then in addition to the carrier, two new sets of frequencies are produced above and below the carrier, namely, $f_c + f_m$, called the **Upper Sideband** or u.s.b. and $f_c - f_m$, called the **Lower Sideband** or l.s.b.

The u.s.b. and l.s.b. in relation to the carrier at 100 percent modulation is shown in Fig. 1(a). The important things to note are:

(a) The carrier is constant in frequency.
(b) The sideband frequencies move further away from the carrier as the audio frequency is increased and move nearer to the carrier as the audio frequency is reduced.
(c) The sidebands both contain identical information and are in fact "mirror images" of each other.
(d) The carrier conveys no intelligence and is used purely as a reference to the sidebands.

Since the detector stage of an a.m. receiver recovers the original modulation signal by beating the sidebands and carrier together, it follows from (c) previously, that only one sideband and the carrier are really necessary! It is also interesting to note that the greatest amount of power radiated by the antenna is that in the carrier itself, which contains no useful information other than as a reference for the sidebands. A great saving in transmitter power would be obtained if the carrier could be eliminated at the transmitter and generated instead at the receiving end, to enable the sideband information devoid of its reference signal to be demodulated.

The removal of the carrier is relatively simple and is accomplished by the use of a special modulator circuit, called a **Balanced Modulator**. The sideband relationships with the carrier eliminated is shown in Fig. 1(b)—such a signal is referred to as a **Double Sideband Suppressed Carrier** or d.s.b.s.c. signal.

By eliminating one of the sidebands a further reduction in transmitter power can be accomplished and Fig. 1(c) shows the lower sideband suppressed—such a signal is called a **Single Sideband** or s.s.b. signal. Suppression of the unwanted sideband can be effected by one of three methods:

(a) By removing it with a sharply tuned Crystal or Mechanical filter—called the **Filter System**.
(b) By phasing it out—called the **Phasing System**.
(c) By a special means of generating the signal—called **The Third Method**.

With the advent of excellent modern crystal filter designs the other two methods have, in general, fallen by the wayside.

Returning now to our receiver s.s.b. switch positions marked u.s.b. and l.s.b., here narrow i.f. filters are brought into use to improve selectivity and a circuit called a **Product Detector** re-inserts the missing carrier; however, very careful tuning is necessary to ensure that the re-inserted carrier has the correct relationship with the sideband being received—usually within a few tens of hertz—otherwise the pitch of the demodulated signal will be incorrect.

Although s.s.b. signals are in the main used by Commercial and Radio Amateur Stations, Broadcast Band s.w.l.s who own receivers equipped for s.s.b. reception may well take advantage of them, by receiving a.m. signals in the u.s.b. or l.s.b. mode to eliminate interference on the unwanted sideband—this can be a most useful technique, but care is needed to ensure that the locally generated carrier in the receiver is zero beat with the incoming carrier of the station concerned.

In view of all this, why are Broadcast Stations still using a.m. The main reason is that Broadcasters are anxious to provide a service which can be received on simple and inexpensive s.w. receivers—an a.m. signal can be detected by even a one-transistor or one-valve set! The cost of a suitable receiver for s.s.b. reception—which would remain locked to an s.s.b. signal for a long period of time—would be much higher.

Conditions on 25 and 21MHz Bands

Note: Frequencies in MHz. Time in UTC = (GMT)

Because of the low sunspot numbers just now, the 25MHz (11m) band is virtually dead, so let us move on to the 21MHz (13m) band where things are a good deal more interesting!

One of the most frequently reported stations on the 21MHz band is UAE Radio Dubai and **John Ratcliffe** of Southport, Queensland, Australia, has been listening to their transmission on 21·700, which is beamed to Australia at 0530—usually there is slow fading present, but the readability is good. Later, **Darren Taplin** has been hearing their broadcast to Europe at 1030 on 21·605 in Tunbridge Wells, Kent—he uses a DX150A receiver, plus 25m wire antenna. **Stuart Brooks** of Carluke, Scotland, enjoys their programmes on 21·605 in English at 1330. Extracts from his log includes REE Spain, which beams to the Middle East and Asia from 0600 on 21·595 and moves to 21·575 from 0930; Radio Cairo, Egypt 21·465 with their Asian service at 1130; Radio Moscow 21·475 at 1000; Radio Nederlands via their Madagascar relay, 21·485 in Dutch at 1000 and English on 21·480 at 1130; the Asian service of Radio Liberty at 1300 on 21·510 and the BBC Ascension Island relay 21·660 from 1100.

John Parry G4AKX of Northwich, Cheshire, has been hearing Vatican Radio, which beams to Africa on 21·485 with programmes in French and English from 1000. In a first report from Johannesburg, S. Africa, **Simon Illingworth** mentions Vatican Radio in his log! Simon says "The BBC take the prize for having the best signals here. These can usually be heard from 1200 on 21·470 and 21·710 and sometimes on 21·660MHz." Other stations mentioned were Radio Moscow, with three 21MHz frequencies; AFRTS on 21·670 beaming to Asia from the Philippines until 1400; Radio Prague which beams to Africa from 1400 on 21·505 and UAE Radio Dubai!

Radio RSA Johannesburg, S. Africa, is usually a very good signal here around 1430 and is mentioned in a number of reports—**Neil Dove** of Lockerby, Scotland, listened to a talk about African Trade at 1440 and quoted a SINPO rating of 55444 in his log! **Fred Pallant G3RNM** of Storrington, Sussex, also enjoys their programmes, especially *Sunday Magazine* and *Africa Today* at 1500.

At his listening post in Selangor, Malaysia, **Mat Jusoh** has been hearing the News and Current Affairs from the USA at 1200 via the Tinang, Philippines, relay station of AFRTS, which broadcasts on 21·670 in English from 0100 to 1400—relay stations were discussed on pages 66 & 67 of the June 1986 *PW* and this is an example of a relay station which s.w.l.s in Europe can treat as DX!

Philip Rambaut of Macclesfield, Cheshire has reminded me that for those of you with suitable receivers, an example of s.s.b. broadcasting may be found on 13m by tuning to the s.w. station in Varbergh, Sweden, which radiates the Swedish home service on 21·555MHz between 0900 & 1600 and runs a peak power of 100kW. Stuart Brooks logged this station at 1300 recently—please send your reports and comments about it along to me, for inclusion in this series.

The 17 and 15MHz Bands

Although the 17MHz (16m) band conditions are unreliable, some interesting sta-

tions can usually be found there. **George Morley** of Redhill, Surrey, has been listening to Radio Australia 17·715—frequently weak around 0800 and to Radio Pakistan, Islamabad 17·660—usually a very strong signal at 1100. Radio Cairo, Egypt 17·670 at 1400; Radio Jamahiriyah, Tripoli 17·895 at 1500 and Tangier, Morocco 17·815 at 1900 were all noted in his log.

Some of the other stations to be found on this band include Radio Moscow 17·555 at 0850; All India Radio, New Delhi 17·875 at 1030; HCJB Quito, Ecuador 17·790 from 1800; Radio DW, Cologne 17·810 via their relay in Antigua at 2100 and Radio Netherlands via their Bonaire, Netherlands Antilles, relay on 17·605 at 2112—all logged by Philip Rambaut. **Alan Williams** of Helston, Cornwall—who has changed his receivers to a Vef 204 and a Vega Sapphire Mk1—noted that UAE Radio Dubai 17·775 is often a good signal at 1400.

Neil Dove has been hearing Family Radio, WYFR which beams to Europe at 1600 on 17·845 from a transmitter in Okeechobee, Florida, USA—their programmes called *Open Forum* may be of interest to listeners. Radio Surinam Int., which is relayed to Europe via RNB Brasilia on 17·755, was also noted in his log. **Derek Thomley** of Birmingham says that their broadcast at 1730 is usually a good signal in the UK—this is in Dutch with English segments.

Over in Belfast, N. Ireland, **Tommy Dougan** listened three times during one morning to a cricket commentary from Radio Pakistan on 17·660. He logged Radio Bangladesh 17·653 at 1230; Radio Algiers, Algeria 17·745 broadcasting in French at 1910 and listened to the News and Sport from RCI Montreal, Canada 17·820 at 1900—this is always a popular station with s.w.l.s although reception is often better on 15MHz (19m) where conditions are somewhat more stable, in fact **Jon Snooks** of Andover, Hampshire, logged their transmissions on 15·105 at 2040 and 15·150 at 2105 as SIO 555! Radio Moscow seems to dominate this band around 0815 and Jon noted them on 15·475 to Europe; 15·490, 15·500 and 15·540 to the Middle East; 15·510 and 15·520 to Asia!

Tim Shirley of Bristol has been searching for DX on 19m with his new Trio R600 receiver and outdoor 21m wire antenna. He was delighted to hear signals from Radio Japan, Tokyo, via their Gabon relay

*—No time given
**—Heard between 1900 and 2000

Freq (MHz)	Station	Location	Mat Jusoh (Malaysia)	Bill Kelly	Tim Shirley	Neil Dove	Philip Rambaut	John Parry G4AKX	Albert Fisher	George Morley	John Sadler	Stuart Brooks	Phil Johnson
2·485	Australian BC	Darwin	1940										
3·220	Radio Diff TV	Togo		0615									
3·220	CPBS-1 Beijing	China			1512								
3·223	Swaziland	S. Africa		0245									
3·250	SABC Radio Orion	S. Africa		0405		2135							
3·270	SWABC Windhoek	Namibia	2130		1927								
3·320	Radio RSA	S. Africa					1730						
3·915	BBC Kranji	Singapore					1730						
3·990	BBC Cyprus	Cyprus			0318								
4·055	Kalinin	USSR						1835					
4·220	Xinjiang PBS Urumqi	China			1515								
4·660	Houa Phan	Laos			2300								
4·725	BBS Rangoon	Burma			1445								
4·770	FRCN Kaduna	Nigeria		0515				1835					
4·780	Petrozavodsk	USSR				1900							
4·785	Azerbaijani Radio	Baku							**				
4·795	Douala	Cameroon											*
4·805	Radio Capital Caracas	Venezuela								0614			
4·810	Radio San Martin Tarapoto	Peru			0443								
4·810	Armenian Radio	Yerivan							**				
4·820	La Voz Evangelica	Honduras		0415									
4·820	Khanty-Mansiysk	USSR							**				
4·820	Radio Botswana	Botswana				1910							
4·832	Radio Reloj	Costa Rica								0620			
4·853	Sana	Yemen			0314								
4·865	Lanzhou Gansu	China			1440								
4·890	ORST Dakar	Senegal		2115									
4·895	Turkman Radio	Ashkhabad							**				
4·910	Radio Zambia	Zambia								1800			
4·930	Ashkhabad	USSR				2110							
4·940	Radio Kiev, Ukraine	USSR				2050							
4·945	Caracol Neiva	Colombia								0530			
4·945	Radio Nacional Port Velho	Brazil										0100	
4·975	Radio Timbira Sao Luiz	Brazil								2135			
4·990	Yerevan	USSR				2050							
4·990	FRCN Lagos	Nigeria				2130					2215		
5·005	Bata	Equatorial Guinea				2120							
5·010	Radio Garoua	Cameroon		0435									
5·027	Radio Uganda	Uganda				1930							
5·047	Radio Togo	Lome			0532								

Fig. 2: A photograph of Albert Fisher G4VBH of Heston, Hounslow

15·235 from 0700 and from KTWR(TWR) Agana, Guam 15·115 with SINPO 55555 at 0830! He QSLed KYOI Saipan, N. Mariana Isles 15·190—the Super Rock station—and was pleased to receive their QSL and some colourful postcards in just two weeks!

In Whiston, Merseyside **Phil Johnson** has been hearing Radio Korea Seoul, S. Korea—audible most days from 1100 on 15·575 and to Radio Bangladesh, Dhaka on 15·525, which beams to Europe at 1230. Signals from the Voice of Vietnam, mentioned by **Julian Wood** of Buckie, Scotland, and others, are beamed to Europe at 1800 on 15·010. Using a Yaesu FRG-7700 receiver, Julian also listened to AFRTS from Greenville, USA 15·430 at 2150.

The Voice of Free China Taipei, Taiwan, was mentioned in several logs and **Keith Wakelin** of Hull found their talk about Free China interesting. Their programmes can be heard in English on 15·440—via their relay in Okeechobee, Florida at 2057 in the UK.

Up in Edinburgh **Robert Taylor** is still amazed at the performance of his Toshiba RP-F11L receiver—with just the telescopic whip as an antenna his logs are pretty impressive! On 19m he listened to Radio Bucharest 15·250 at 1300; RCI Montreal, Canada 15·325 at 1445; Radio Portugal, Lisbon 15·250 with an interesting Philatelic programme at 1800; REE Madrid, Spain 15·375 at 1830 and to VOA from Greenville, USA, which beams to Europe at 1800 on 15·205. Every Sunday morning, VOA has a Space programme and invites s.w.l.s to send in questions to be answered "over the air"—**Peter Jones** of Abertillery is a keen listener to this series and using a Yaesu FRG-7 receiver, he has received the answers to six of his questions so far!

The Voice of the Andes—HCJB Quito, Ecuador, can usually be heard on this band in the evening and **Craige Harris** of Laceby has been enjoying their programmes at 2130 on 15·270 and has now received an attractive QSL! Their s.w.l. *DX Party Line* programme on Saturdays is always full of interest—however, a tape recorder may come in handy here! RAE Buenos Aires, Argentina, can also be received in the UK in the evening and **Alex Mackow** of Harlesden, London, has heard them for the first time on 15·345 at 2100 and is now awaiting their QSL!

The 11, 9, 7 and 6MHz Bands

These bands contain the bulk of the signals heard on the s.w. bands and are for many *PW* readers, the hub of DXing activity! Conditions on these bands have been fairly reliable both during the day and at night.

Some idea of the signals present on the 11MHz (25m) band in the evening can be

ascertained from **David King's** log from Plymouth, Devon. Using a Yaesu FRG-7700/FRT-7700 combination plus 20m wire antenna he received AIR New Delhi, India 11·620 at 2030; Radio RSA Johannesburg, S. Africa 11·900 at 2100; WRNO New Orleans, USA 11·705 at 2119; Radio Nederlands (via Flevo) 11·740 at 2120; RSI Stockholm, Sweden 11·845 at 2125; RCI Montreal, Canada 11·945 at 2130; HCJB Quito, Ecuador 11·745 at 2150; VOFC Taipei, Taiwan 11·860 at 2248 and the Voice of Vietnam, Hanoi 10·040 at 2030. A similar receiving set-up is used by **Alan Curry** of Stockton-on-Tees, who heard Radio Kuwait on 11·675 at 1844; RAI Rome, Italy 11·800 at 2030 and WRNO as above.

Radio Australia can be received well in the early morning on the 9MHz (31m) band and **Len Eastman G8UUE** of Bristol, **Alan Hollingworth** of Southsea and **John Kempster** of London have all been enjoying their programmes, which can be found on 9·655 from 0700. Earlier, John logged Radio Polonia, Warsaw 9·675 from 0600; Vatican Radio, Rome 9·645 at 0620; Radio Austria, Vienna 9·685 at 0630 and VOA via Tangier, Morocco 9·650 at 0653—all broadcasting to Europe.

Late at night, **John Sadler** of Bishops Stortford has been monitoring this band on his DX400 receiver. He logged Radio Cairo, Egypt 9·805 at 2200; Radio Japan, Tokyo via Moyabi, Gabon 9·645 from 2300; Voice of Turkey, Ankara 9·560 at 2340; RCI Montreal, Canada 9·755 at 0000; Radio DW Cologne, W. Germany via Kigali, Rwanda 9·640 at 0005; Radio RSA Johannesburg, S. Africa 9·585 at 0425; HCJB Quito, Ecuador 9·870 at 0430.

Most of the 7MHz (41m) stations reported last month are still being heard and many Broadcasters make extensive use of this band. However, at least two stations operate in the exclusive section of the 40m Amateur Band (7·000 to 7·100MHz). These are Radio Tirana, Albania on 7·035, 7·065, 7·075, 7·080 or 7·090—noted by Robert Taylor and Radio Beijing, China on 7·010, 7·035, 7·050, 7·055, 7·065, 7·080 or 7·095—noted by **Bill Kelly** of Belfast. When checking the 41m band, you might like to listen out for the warble of the Bokamakarie bird from Radio RSA Johannesburg, S. Africa, which Bill heard on 7·270 at the start of their transmission at 1455.

It is not always obvious when relay stations are being used by Broadcasters and writing from Motherwell, **James Sneddon** says he received Radio Earth Int. direct from the USA on 7·295 one Sunday morning at 0845. It's an easy mistake for any newcomer s.w.l, for in fact their programme is broadcast via Radio Milano, Italy. VOA Washington, USA make extensive use of relay stations and **Al Dupres** tunes his Yaesu FRG-8800 receiver to their relay in Kavala, Greece on 7·205, when he returns home from work at ILR Red Dragon Radio in Cardiff at 0130, because he enjoys their programme *VOA Morning*!

Many of the stations on the 41m band can also be found on the 6MHz (49m) band—for example, **Maurice Andries** of Dendermonde, Belgium, mentions that RBI Berlin, Germany, broadcast to Europe at 1515 on 7·295 and their programme can also be heard on 6·115. **Donald Wood** of Kingston upon Thames enjoys *Media Network*, broadcast by Radio Nederlands 5·955 on Thursdays at 1130. Radio Australia, noted by Len Eastman, is a very good signal in the late afternoons on 6·035 and logged too by **Anthony Beldon** of Barnsley on 6·060 at 1700. **Michael Hill** of Stockton-on-Tees has received a QSL from Radio Vilnius, Lithuania, USSR, which beams to Europe on 6·100 at 2130.

The 5, 4, 3 and 2MHz Bands

There is certainly plenty to interest the dedicated s.w.l. on these bands and activity seems to be on the increase!

Pictured at the controls of his station G4VBH in Heston, Hounslow (Fig. 2) **Albert Fisher** spent many years with the BBC Monitoring Service as part of his BBC career before he retired, so his expertise now enables him to enjoy s.w.l.ing to the full! Albert uses the general coverage receiver in his Yaesu FT-757GX for s.w.l.ing and is especially interested in the Tropical bands. He has been attempting to compile a computer file from the Tropical band reports in *PW* during recent months, but has found difficulty in correlating the information due to the lack of times being quoted. Well space is always a problem here, but this month I have introduced a new brief format, which will be expanded as time goes on.

Fred Pallant G3RNM mentioned that he found the band didn't open and come alive until 2000 when the first signal he hears is Zaire on 5·006.

Station Addresses

Radio Mauritius, MBC Broadcasting House, Forest Side, Mauritius.

Radio Ouagadougou, Boite Postale 7029, Ouagadougou, Burkina Faso.

Voice of Kenya, PO Box 30456, Nairobi, Kenya.

NEWS EXTRA

Plug-Makers Please Note

A significant change has been made to the British Standard for 13A plugs which now specifies insulating sleeving on the line and neutral pins. This has been done to prevent the risk of electric shock to users (particularly small children) caused by physical contact with the pins during insertion or removal of the plug.

Details of the new requirements, including additional tests, have been published as an amendment (AMD 5052) to BS 1363 ***13A Fused plugs and switched and unswitched socket outlets.*** Since the amended standard is likely to become mandatory under new Government regulations now being considered, some manufacturers may need to modify their plug designs.

Young Scientists Visit No. 10

Three of the top young scientists called into No. 10 Downing Street on their way to the finals of the European Philips Contest for Young Scentists and Inventors.

The photograph shows (l–r) Mr Ric Foot (director of UK Corporate relations, Philips Electronics), Andrew Randle, The Prime Minister, Stuart Quick and Andrew Johnson.

The three young scientists flew to Oslo in May to compete in the finals. As well as the chance to win a share of £12 000 worth of prizes they were able to discuss their work with top European scientists during their five days in Norway.

Andrew and Stuart developed a cellular-based radio computer teledata and information processing system with a speed of transmission 30 times faster than present comparable systems. Andrew designed and built a television satellite receiving dish that could pick up 25 different channels worldwide.

The sponsors of the contest, Philips, were so impressed with the runners-up that even they got taken on a 2-day visit to Eindhoven. There they visited the Evoluon, Philips futuristic technology exhibition building shaped like a flying saucer.

Philips have sponsored this contest now since 1968 and more than a dozen countries enter each year.

Details of the PW PCB Service can be found on page 51 of the July 1986 issue.
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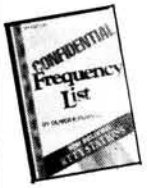

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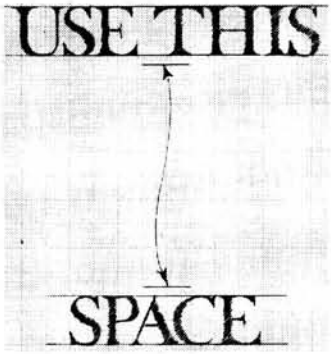

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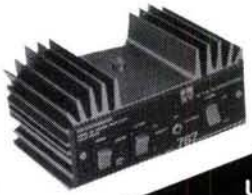

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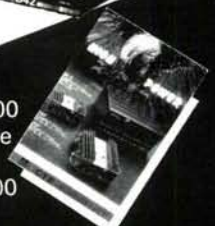

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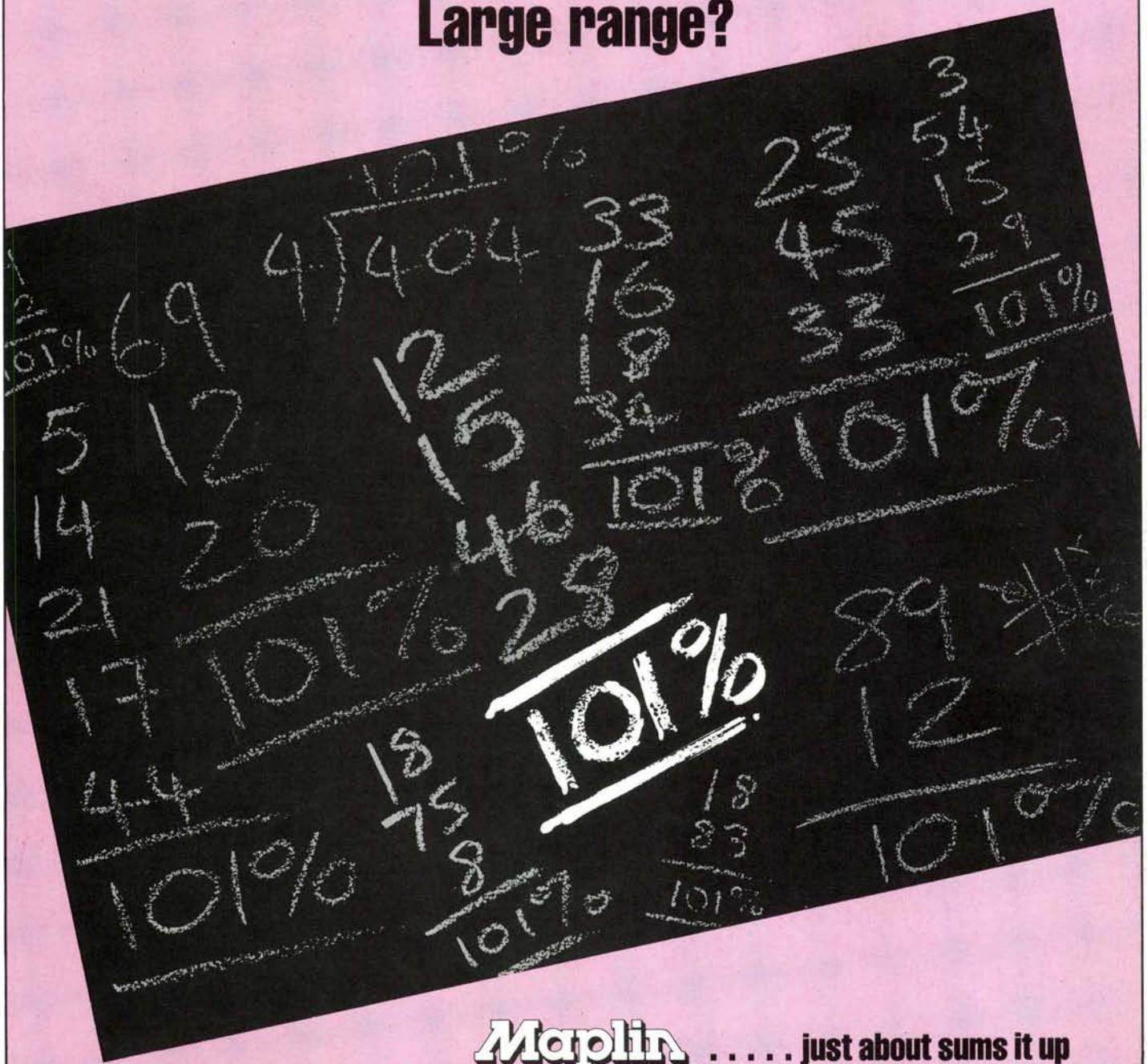

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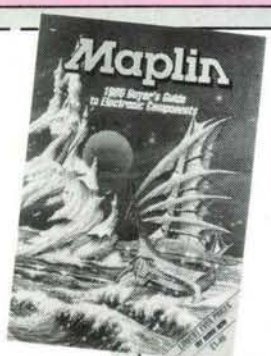

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