NEW STYLE

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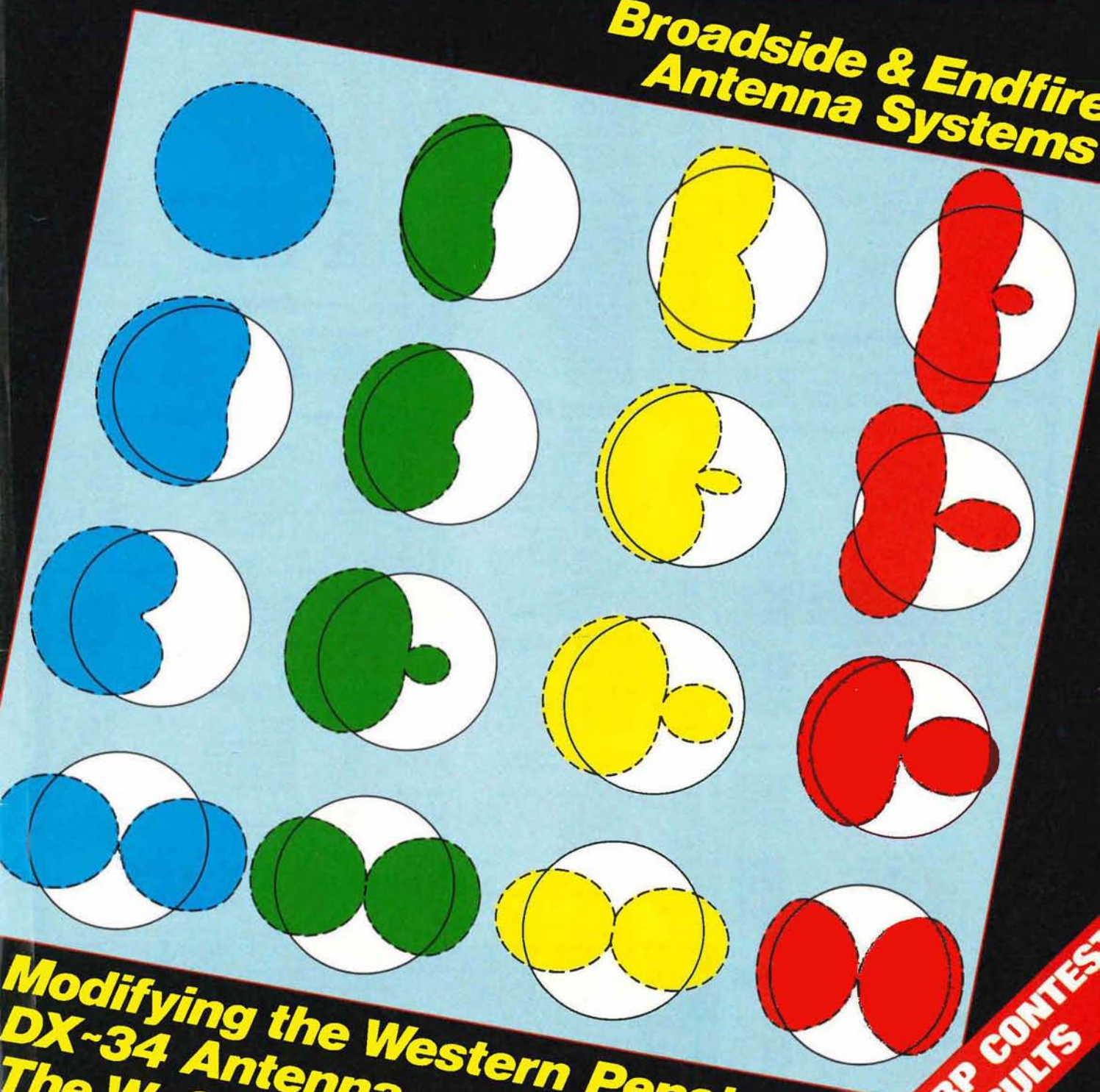

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Trio

TS930S	9 Band TX General Cov RX	1295.00	(—)
TS830S	160-10m Transceiver 9 Bands	832.75	(—)
AT230	All Band ATU/Power Meter	157.99	(2.00)
SP230	External Speaker Unit	47.73	(1.50)
TS530S	160m-10m Transceiver	698.00	(—)
TS430S	160m-10m Transceiver	720.00	(—)
PS430	Matching Power Supply	138.00	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	13.17	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
TS130S	8 Band 200W Pep Transceiver	633.06	(—)
SP120	Base Station External Speaker	30.74	(1.50)
AT130	100W Antenna Tuner	108.62	(1.50)
MC50	Dual Impedance Desk Microphone	36.19	(1.50)
MC35S	Fist Microphone 50K ohm IMP	17.01	(1.00)
LF30A	HF Low Pass Filter 1kW	24.68	(1.00)
TR7930	2M FM Mobile	329.00	(—)
TR9130	2M Multimode	499.00	(—)
TW4000A	2M/70cm mobile	522.00	(—)
TM201A	2M 25W mobile	296.00	(—)
TM401A	7cms FM 12W	316.00	(—)
TR2500	2M FM Synthesised Handheld	258.00	(—)
TR3500	70cm Handheld	270.00	(—)
TR2600	New 2M FM Synthesised Handheld	275.00	(—)
ST2	Base Stand	60.36	(1.50)
SC4	Soft Case	15.92	(1.00)
SMC25	Speaker Mike	18.66	(1.00)
PB25	Spare Battery Pack	29.10	(1.00)
MS1	Mobile Stand	37.31	(1.00)
R600	Gen. Cov. Receiver	299.52	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	479.47	(—)
HC10	Digital Station World Time Clock	78.99	(1.50)
HS5	Deluxe Headphones	26.88	(1.00)
SP40	Mobile External Speaker	16.46	(1.00)

NEW MODELS

TH21E/41E	2M/70cm Mini-Handhelds	170.00/199.00
TM211E/411E	2M/70cm FM Mobiles	365.00/399.00
TS711E/811E	2M/70cm base stations	768.00/895.00
TR3600	70CM Handheld	292.00
TS940S	9 Band TX General Cov RX	1695.00

Linear Amps

TONO (G series)

2M40G	2m, 1-3W in, 20-35W out, preamp	101.81	(2.00)
2M90G	2m, 10-15W in, 70-90W out, preamp	161.20	(2.00)
2M130G	2m, 10-15W in, 110-130W out, preamp	159.00	(2.50)
4M70G	70cms, 10-15W in, 40-60W out, preamp	219.74	(2.00)

TOKYO HIPOWER AMPS. NOW BACK IN STOCK

MICROWAVE MODULES

MML144/30-LS	inc preamp (1/3 w i/p)	82.90	(2.00)
MML144/50-S	inc preamp, switchable	92.00	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	149.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML144/200S	inc preamp (3/10/25 i/p)	299.00	(2.50)
MML432/30L	inc preamp (1/3w i/p)	145.00	(2.00)
MML432/50	inc preamp (10w i/p)	129.95	(2.00)
MML432/100	linear (10w i/p)	299.00	(2.50)

B.N.O.S.

LPM 144-1-100	2m, 1W in, 100W out, preamp	181.00	(2.50)
LPM 144-3-100	2m, 3W in, 100W out, preamp	181.00	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	157.00	(2.50)
LPM 144-25-160	2m, 25W in, 160W out, preamp	217.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	247.00	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	247.00	(2.50)
LP 144-3-50	2MN 50W out, preamp	108.00	(2.50)
LP 144-10-50	2M 10W in, preamp	108.00	(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

SP45	130-470MHz PWR/SWR	69.00	(1.50)
SP10X	1.8-150MHz PWR/SWR	34.00	(1.50)
SP200	1.8-160MHz PWR/SWR	89.00	(1.50)
SP250	1.8-60MHz PWR/SWR	65.00	(1.50)
SP300	1.8-500MHz PWR/SWR	129.00	(1.50)
SP350	1.8-500MHz PWR/SWR	79.00	(1.50)
SP400	130-500MHz PWR/SWR	89.00	(1.50)

NEW RANGE OF WELZ METERS NOW AVAILABLE

TOYO

T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(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)
AOR2001	VHF/UHF Continuous Coverage	345.00	(2.50)
FDK RX40	141.00-180.000 MHz	159.00	(2.00)

Icom Products

IC751	HF Transceiver	1299.00	(—)
IC745	HF Transceiver	899.00	(—)
IC735	New HF Transceiver	849.00	(—)
PS15	P.S. Unit	145.00	(4.00)
PS30	Systems p.s.u. 25A	297.85	(—)
SM6	Base microphone for 751/745	40.25	(1.00)
IC290D	2m 25w M/Mode	479.00	(—)
IC290E	10w Multi-Mode Mobile	449.00	(—)
IC271E	2m 25w M/Mode Base Stn.	729.00	(—)
IC271H	100W version of above	899.00	(—)
IC25H	2m 45w FM	359.00	(—)
IC27E	25W FM mobile	379.00	(—)
IC45E	70c 10w FM	345.00	(—)
IC47E	25w 70cm FM mobile	469.00	(—)
ICBU1	B/U Supply for 25/45/290	29.90	(1.00)
ICR70	General Coverage Receiver	629.00	(—)
ICR71	General Coverage Receiver	729.00	(—)
IC02E	2m H/Held	269.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	79.35	(2.00)
IC4E	70cm H/Held	259.00	(—)
IC04E	70cm handheld	279.00	(—)
BC35	Base Charger	62.10	(1.00)
HM9	Speaker mic	18.56	(1.00)
IC3	Carry Case	5.50	(1.00)
ICBP3	Std Battery Pack	27.50	(1.00)
BP5	High Power Battery Pack	52.80	(1.00)
CP1	Car Charging Lead	5.50	(1.00)
DC1	12v Adaptor	13.75	(1.00)

Mutek Products

SLNA 50	50MHz Switched preamp	44.90	(1.50)
SLNA 144s	144MHz Low noise switched preamp	39.95	(1.50)
SLNA 145sb	Preamp intended for 290	29.90	(1.50)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	79.90	(1.50)
RPCB 251ub	Front end IC251/211	84.90	(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	89.90	(1.50)
TVHF 230c	2M-FM Transverter	334.90	(5.00)
LBPF 144v	Bandpass Filter	22.40	(1.50)
LBPF 432u	Bandpass Filter	22.40	(1.50)
TVVF 50c	6M Transverter	199.90	(2.50)
GLNA 433e	70cm Pre-amp	79.90	(2.50)
TVVF 144a	2M Transverter	239.90	(2.50)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	29.90	(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	33.90	(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 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	329.00	(2.50)

MICROWAVE MODULES

MM2001	RTTY to TV converter	189.00	(2.00)
MM4001	RTTY terminal	269.00	(2.00)
MM4001KB	RTTY term with keyboard	299.00	(2.00)

BENCHER

BY1	Squeeze Key, Black base	53.95	(1.50)
BY2	Squeeze Key, Chrome base	69.95	(1.50)

HI-MOUND MORSE KEYS

HK702	Up down keyer marble base	30.95	(1.50)
HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	15.49	(1.50)
HK706	Up down keyer	16.96	(1.50)
HK708	Up down keyer	14.95	(1.50)
HK802	Up down solid brass	86.30	(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	82.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1450.00	(—)
SP980	Speaker	78.95	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	150.00	(5.00)
FC700	Tuner	105.00	(2.00)
FT77s	10w. version	449.00	(—)
FMU77	FM Board for FT77	28.35	(1.00)
FT757GX	HF Transceiver	739.00	(—)
FC757	Auto A.T.U.	255.00	(2.00)
FP757HD	Heavy Duty PSU	175.00	(2.00)
FP757GX	Switched Mode PSU	160.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	315.00	(—)
FT290	With Mutek front end fitted	345.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
MMB11	Mobile Bracket	30.00	(1.00)
NC11	Charger	11.50	(1.00)
CSC1	Carrying Case	5.00	(1.00)
YHA15	2m Helical	7.65	(1.00)
YHA44D	70cm ½wave	9.95	(1.00)
YM49	Speaker Mike	20.20	(1.00)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	195.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	239.00	(—)
MMB10	Mobile Bracket	8.80	(1.00)
NC9C	Charger	9.60	(1.00)
NC8	Base/station Charger	64.80	(2.00)
PA3	Car Adaptor/Charger	18.00	(1.00)
FNB2	Spare Battery Pack	27.02	(1.00)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	775.00	(—)
430/726	70cm Module for above	255.00	(2.50)
FRT7700RX	A.T.U.	49.85	(1.50)
MH1B8	Hand 600 8pin mic	15.70	(1.00)
MD1B8	Desk 600 8pin mic	64.80	(1.00)
MF1A3B	Boom mobile mic	18.00	(1.00)
YH77	Lightweight phones	14.95	(1.00)
YH55	Padded phones	15.35	(1.00)
YH1	L/weight Mobile H/set-Boom mic	14.95	(1.00)
SB1	PTT Switch Box 208/708	15.70	(1.00)
SB2	PTT Switch Box 290/790	13.80	(1.00)
SB10	PTT Switch Box 270/2700	14.95	(1.00)
QTR24D	World Time Clock	33.35	(1.00)
FF501DX	Low Pass Filter	29.90	(1.00)

NEW MODELS

FRG8800	HF Receiver	475.00	(—)
FRV8800	Convertor 118-175 for above	80.00	(1.50)
FT703R	70cm H/Held	235.00	(—)
FT709R	70cm H/Held	259.00	(—)
FT270R	2m 25W F.M.	315.00	(—)
FT270RH	2m 45W F.M.	365.00	(—)
FT2700R	2m/70cm/25W/25W	499.00	(—)
FRG 9600	60-905MHz Scanning RX	449.00	(—)

Power Supplies

DRAE			BNOS		
4 amp	40.50	(2.00)	6 amp	58.00	(2.50)
6 amp	63.00	(2.50)	12 amp	99.00	(3.00)
12 amp	86.50	(3.00)	25 amp	148.00	(4.00)
24 amp	125.00	(4.00)	40 amp	296.00	(4.00)

Aerial Rotators

FU200	Light Duty	49.95	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	22.95	(1.00)
Welz	2 way 'n' Skts	41.90	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(1.00)
T100	100W Dummy load	35.20	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	69.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)
ALTAI	KDM6 Dip Meter	68.60	(1.50)

TOKYO HI-POWER

HC200	10-80 HF Tuner	82.50	(2.00)
HC400	10-160 HF Tuner	176.00	(3.00)

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Practical Wireless
The Radio Magazine

VOL 61 NOVEMBER 1985 NO. 11 ISSUE 944

THIS MONTH

33

RESULTS

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We are sorry that pressure on editorial space means we can't bring you the promised article on using your FET-DIP Oscillator this month.

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I ENCLOSE £1 PLEASE SEND ME CATALOGUE & ANTENNA BOOK.

You don't need a 1750 Hz tone to gain access to the fastest mail order service for all radio amateurs and short wave listeners. With a copy of the LOWE ELECTRONICS catalogue and antenna book in the shack (send £1 for your copy) the best in amateur radio is quickly available.

LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret Drive. Street Parking is available outside the shop and afterwards the Botanical gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

For South Coast radio amateurs there's a LOWE ELECTRONICS' shop in Bournemouth. It's manager is Colin G3XAS. The shop's address is 27 Gillam Road, Northbourne, Bournemouth, that's the north side of town, just off Wimborne Road (the telephone number is 0202 577760). Easy to find, the shop has free street parking immediately outside.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01-429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 10p. There is also free street parking outside the shop.

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

Finally, here in Matlock. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

TRIO
TS940S

hf transceiver
with general coverage receiver

The TRIO TS940S is a first class competition HF transceiver designed for SSB, CW, AM, FM and FSK operation on all amateur bands from 160 to 10 metres. The transceiver incorporates a 150 KHz to 30 MHz general coverage receiver having an excellent dynamic range (typically 102 dB on 20 metres, 50 KHz spacing, 500 Hz CW bandwidth). Designed to cope with today's band conditions and with the serious DX'er/contest operator in mind, the TS940S has a comprehensive range of front panel receiver controls;

SSB IF slope tuning; operating in both LSB and USB modes, front panel controls allow the independent adjustment of either the high or low frequency slopes of the IF passband.

CW VBT (variable bandwidth tuning); allows the passband width to be varied within the range of the control without affecting the centre frequency.

IF notch filter; provides in the order of 40 dB attenuation to the interfering signal.

AF tune; active filtering reduces interfering signals and white noise whilst operating in the CW mode.

Narrow/wide filter selection; a selection of filters, both 8.83 and 455 KHz are available for the operator who requires maximum selectivity control. The TS940S comes with both 2.7 KHz SSB filters (8.83 and 455 KHz) and the 6 KHz AM filter (455 KHz) built-in.

CW variable pitch; dual mode noise blanker and separate RIT/XIT controls complete the facilities.

To aid serious operating on both amateur and broadcast frequencies, the TS940S has;

A **large heavy diecast knob** with a moulded rubber cover which when rotated at normal tuning speeds results in frequency steps of 10 Hz. Rotation of the tuning knob in excess of 2 to 3 revolutions per second results in the step size and tuning rate being increased accordingly.

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

In addition to instant access to each amateur band using the **band select keypad,** the same keys can be used to directly enter any frequency within the operating range of the transceiver. Once entered, the VFO can be used to tune away from the selected frequency. Truly flexible operating in the TRIO tradition.

The TS940S has two VFOs, front panel switches enable split frequency operation, both VFOs to be quickly put on the same frequency and the reversal of the transmit and receive frequencies during split frequency operation.

40 memory channels, each of which remember both frequency and mode are available. Frequencies can be easily transferred from memory to either VFO. Memory information is backed up by an internally fitted lithium battery. The transceiver operating system is held permanently in ROM and is not dependent upon the back-up supply.

The transceiver will **scan both memory channels and between user programmed freuquency limits** as set in memories 9 and 0.

Accurate and quick frequency readout is ensured by the use of a large fluorescent tube digital display combined with an analogue sub-scale. The analogue display can be switched to read a 1 MHz or 100 KHz span, tuning in either 20 KHz or 2 KHz steps.

A feature new to HF transceivers is a green back-lit dot matrix LCD which shows graphically VBT and IF slope tuning positions, can be used to review the frequencies stored in the 40 memory channels and other VFO, will provide information on the automatic sequence of operations when using the internal (optional) tuning unit, and when selected, displays both the time and owner programmed on/off switching times.

In addition, **full or semi break-in keying** on CW, a 28 volt solid state final amplifier stage, an RF speech processor coupled to the rig's ability to monitor its own transmitted audio and all mode squelch add up to give the TRIO TS940S even greater versatility of operation.

For those with failing sight or a blind operator the TS940S is a dream come true; not only is the operating mode identified by the appropriate CW letter sent in tone (F for FM, U for upper side band etc.) but, when fitted with the VS1 board (optional), a digitally encoded girl's voice will announce the operating frequency.

Combine the comprehensive receiver controls, advanced operating features and an ergonomically designed front panel and there is little more to say, except that, once again, TRIO have produced the worlds finest HF rig, tomorrow's transceiver today, the TS940S!

TS940S HF Transceiver ..... **£1695.00 inc VAT**
AT940 Automatic ATU..... **£195.00 inc VAT**
SP940 Speaker with filters ..... **£69.13 inc VAT**

TS430S

The TS430S combines the facilities of a solid state HF transceiver with those of a general coverage receiver. It's the ideal rig for the radio amateur who not only wants to communicate with his fellows but also enjoys listening to the world. As an amateur band transceiver the rig covers top band to ten metres, as a short wave receiver coverage is from 150KHz to 30MHz. Operating on AM, FM, USB, LSB and CW the TS430S is extremely compact and, as such, is the perfect transceiver for mobile, portable or base station operation.

TS430S HF transceiver with general coverage receiver **£720.00 inc VAT**

TW4000A

Taking into account the amount of activity on the 2 metre FM channels it is not surprising that many people have turned their attention to the wide open spaces of 70 centimetres. With the TW4000A, TRIO have produced a dual band FM transceiver that gives its owner the best of both worlds. Facilities include 10 memories, two VFO's, priority channel, full repeater operation, band scan and memory scan. In memory scan mode the rig can be instructed to look for either 2 metre or 70 centimetre signals. The transceiver produces 25 watt RF output on both bands and comes complete with mobile mount and microphone. For greater safety whilst mobile the optional VS1 board will announce frequency, memory channel and whether or not the rig is set on repeater shift.
TW4000A dual band FM mobile ..... **£522.00 inc VAT**

R2000

The amateur bands are only a very small part of the radio spectrum, many other transmissions are available for the short wave listener. Broadcast stations provide an alternative source of current information both political and regarding the life style of the country. The R2000 covers from 150 KHz to 30 MHz, fitted with the optional VC10 internal converter it covers, in addition, frequencies from 118 to 174 MHz so giving access to amateur two metre transmissions (am, fm, ssb and cw) plus much more. Equipped with 10 memories, memory scan and programmable scan the R2000 provides in one rig the perfect receiver.

R2000 General coverage receiver ..... **£479.47 inc VAT**
VC10 Internal VHF converter ..... **£128.36 inc VAT**

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FM2033

144 MHz, 12VDC Transceiver. 25W/5W Hi/Lo (both adjustable). Compact $2^{2}/_{16}$" × 6⅜" × $7^{3}/_{16}$". 12½ KHz steps (100 fast QSY). Amber LCD Sunlight View, Side Lit. Display; 100's of Hz or channel number. Sensitivity <0.2μV for 12dB SINAD. Single knob frequency control "Dial". Endless or non-endless dial options RIT; 1 KHz steps, V.F.O. + memory. Two 5 slot memories A, B, A+B, A×B. 11th memory instant "call" channel. Memories simplex or duplex channels. Band scanning, programmable limits. Scan halts squelch + centre zero. Pause on scan halt for 3 seconds. Scan/tune/RIT from microphone ±600 KHz split, plus cross memory. Repeater input listen by pressing "dial". Setable; steps, tone, splits, limits. Simple controls for safe mobile operation. C/W mobile mount, mic and handbook.

KDK **£239 inc VAT**

SMALL ON SIZE

FT 2700RH £499 inc VAT FVS-1 £24.15 inc VAT

The FT2700RH, virtually two transceivers in one case, is designed to be the ultimate in convenience, for FM mobile or base station operation, on the 144 *and* 430MHz bands. Using Yaesu's new one piece die-cast aluminium chassis concept, the FT2700RH provides 25 Watts continuous output on either band, for full duplex (or simplex!) operation whilst obtaining optimum circuit shielding and efficient heat dissipation.

Two 4-bit CPU's provide convenient control together with simple operation of the dual VFO's, 10 channel memory with back up and two calling frequencies.

Dual, receiver front ends, local synthesisers, IF's and transmitter RF stages make this the first mobile transceiver capable of *true* full duplex cross-band operation.

Comprehensive scanning features include "PMS" (programmable memory scan) which permits continuous or skip-scanning between two memory channels in the same band. A MHz 'stepping' switch is fitted for quick transition from one band to another. Priority channel monitoring is available whilst on the same or another band!

Independently programmable transmit and receive frequencies, standard repeater shifts (with reverse facility), offers total freedom of operation.

The large green back-lit dimmable LCD offers an aesthetically pleasing and easy to read display of the complete operating status of the transceiver, including memory and reverse repeater indications at a glance. The PO/S meter incorporated in the main display is a distinctive graphical two colour type. (Optional Voice Synthesiser available, see FT270R/RH text.)

The Yaesu FT726R has been designed and built for the discerning VHF and UHF operator. Up to three modules can be simultaneously installed giving pushbutton band selection. Choose between 6M, 2M, 70cms and 10, 12, 15M.

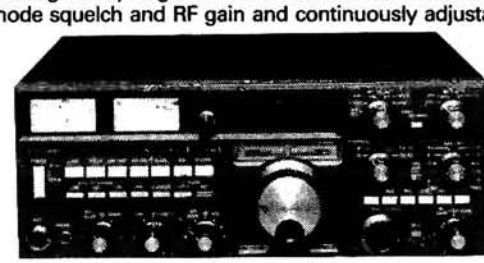
SSB (with fully adjustable speech processor), FM and CW (optional 600Hz CW filter available) are standard. The CW filter combined with Yaesu's excellent IF shift/width system enables optimum receive performance despite today's crowded bands.

An 8 bit NMOS microprocessor offers a level of control hither to unsurpassed, dual VFO's – 20Hz step tuning, standard repeater shifts including reverse, bush button band selection and 25/12.5KHz FM channel tuning knob.

The eleven memory channels store mode as well as frequency and can be scanned for busy or clear, stop or pause, even on different bands. Programmable limited band scan between memories is provided as well as priority channel checking. All the memories and both VFO's are protected against power failure by a lithium cell.

With the optional "plug-in" satellite IF unit installed, full crossband duplex capability is available with independent tuning and mode selection, as well as full metering of both transmit and receive parameters (power O/P and signal strength).

An LED display plus two digit clarifier display are provided with large digits for easy reading at any angle. Standard features also include selectable AGC and noise blanker, all mode squelch and RF gain and continuously adjustable transmitter output power.



FT726R(2) £775 inc VAT

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LARGE ON OUTPUT

FT270R
£315 inc VAT
FT270RH
£365 inc VAT

The FT270R/RH is constructed on a unique massive diecast aluminium ducted heatsink which enables significantly larger output powers to be obtained from a transceiver substantially smaller than any similar radio to date. The FT270RH, with fan assisted cooling provides 45W RF output whilst the conventional R version offers 25W. Both FT270R and RH are fitted with a "low" power switch which provides around 10% of full output.

High visibility back-lit LCD, with large 5mm digits, provide a readout of frequency and all important transceiver functions. Pleasant green illumination and newly developed wide angle LCD ensure easy visibility day or night from most angles.

The dual 4-bit microprocessors provide maximum ease of use combined with an extremely wide range of operating functions. Dual VFO's, ten memories and programmable band scan limits are all easily selectable from the front panel.

The FT270R/RH can memorise a number of scanning parameters for maximising performance. Upper and lower limits may be set (for quick scanning of the band). The ten memories may be scanned for a busy channel or for monitoring a priority channel. The scanning can be either manually or carrier controlled.

For easier and safer 'eyes on the road' mobile operation an optional voice synthesiser (FVS-1) is available to give an audible indication of frequency, memory channels and VFO selections at the touch of a convenient microphone mounted button. The FVS-1 is of course ideal for those with impaired vision.

The FT757GX is the latest in a long line of superb HF transceivers from Yaesu. The transceiver covers all the amateur bands with a full 0.5-30MHz continuous coverage receiver. Dual VFO's and eight memories all controlled by three microprocessors allow quick and accurate control of all the main functions.

All modes SSB, CW, AM and FM are included as standard along with a 600Hz CW filter, iambic keyer with dot-dash memory, 25KHz marker, noise blanker, AF speech processor and IF shift/width filters. Top panel switch selectable semi-break in or QSK is available for CW operation.

The Yaesu CAT (computer aided transceiver) system is fitted to enable external control of VFO frequency and memory functions from a personal computer via an interface unit for customised band scanning and control of the memories and VFO's.

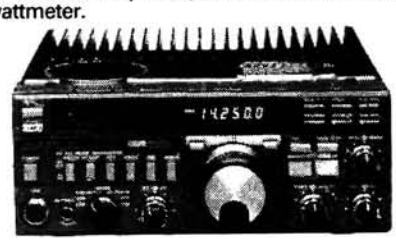
The remarkable new heatsink design includes a quiet cooling fan with a new duct-flow cooling system incorporating the heatsink into the body of the radio. This gives forced air circulation allowing 100W PEP continuous output at 100% duty cycle in all modes.

The high performance general coverage receiver with Yaesu's unsurpassed IF shift/width system, switchable AGC and 20dB attenuator, combined with the switchable, RF preamp provides the FT757GX with a dynamic range in excess of 100dB in CW narrow.

All the presettable controls and connectors are conveniently located on the transceiver rear panel including VOX gain, anti-trip and delay, AM carrier and SSB processor levels, 25KHz marker switch, ext spkr and Hi Z AF outputs, patch input and external ALC, remote controller I/O port and band data for optional microprocessor automatic ATU.

The optional FC757AT is a fully microprocessor controlled antenna tuner which gives fast, reliable automatic tuning of a broad range of SWR's, with manual override for that particularly 'difficult' aerial. Also included is a dummy load, automatic SWR calculating system and meter and a dual range RF wattmeter.

FT757GX
£739 inc VAT



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IC-3200E Dual-band

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

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

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

IC-735, The Complete HF Radio

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

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

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

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

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

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IC-290D/290E

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz. (25KHz option).

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1 KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW, Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with IC-HM10 and HM11 microphones. Digital frequency display, Hi/Low power switch Optional Nicad battery system allows retention of memory.

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Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

IC-271 & 471

ICOM can introduce you to a whole new world via the world-communications satellite OSCAR. Did you know that you can Tx to OSCAR on the 430-440 MHz IC-471 and Rx on the 2m IC-271.

By making simple modifications, you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift. The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON E12 5EQ.

This range includes the IC 271E-25W, 271H-100W and the 70cm versions IC-471E-25W and 471H-75W r f. output. The 271E has an optional switchable front-end pre-amp. The 271H can use the pre-amp AG-25, with the 471E and 471H using the AG35 mast-head pre-amp. Other options include internal switch-mode PSU's: the 271E and 471E use the PS25 and the 271H and 471H use the PS35.

Also available are the SM6 desk microphone and a speech synthesizer that announces the displayed frequency. what more could you ask for?

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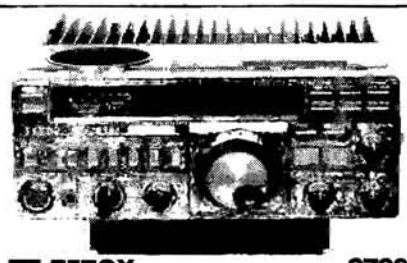

FT-757GX **£739**

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DUAL BANDER

FT-2700RH **£499**

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FVS-1	Voice synthesiser module	20.70
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FVS-1	Voice synthesiser 270R/270RH	20.70
YHA-44	¼ wave helical antenna	7.65

FT-726R **£775**

YH-1	Headset mic	14.
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FT-9 **£1,4**

YHA-44D	½ DC gounded antenna	9
YM-24A	Spkr mic	23
PA-3	DC adaptor	18
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FRV-7700/E	VHF converter	49
FRV-7700/F	VHF converter	49
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FRA-7700	Active antenna	43
FF-5	Filter	10

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MML144/100HS	inc preamp (25w l/p)	149.95
MML144/100LS	inc preamp (1/3w l/p)	169.95
MML144/200S	inc preamp (3/10/25 l/p)	299.00
MML432/30L	inc preamp (1/3w l/p)	145.00
MML432/50	inc preamp (10w l/p)	129.95
MML432/100	linear (10w l/p)	299.00
B.N.O.S.		
LPM 144-1-100	2m, 1W in, 100W out, preamp	181.00
LPM 144-3-100	2m, 3W in, 100W out, preamp	181.00
LPM 144-10-100	2m, 10W in, 100W out, preamp	197.00
LPM 144-25-160	2m, 25W in, 160W out, preamp	217.00
LPM 144-3-180	2m, 3W in, 180W out, preamp	247.00
LPM 144-10-180	2m, 10W in, 180W out, preamp	247.00
LP 144-3-50	2M, 3W out, preamp	108.00
LP 144-10-50	2M, 10W out, preamp	108.00
LPM 432-1-50	70cm, 1W in, 50W out, preamp	197.00
LPM 432-3-50	70cm, 3W in, 50W out, preamp	197.00
LPM 432-10-50	70cm, 10W in, 50W out, preamp	167.00

FRG-8800 **£475**

TOKYO HY POWER

ATU's		
HC-200	HF bands ATU 200W PEP	82.95
HC-400L	HF bands ATU 350W PEP	175.75
LINEARS VHF		
HL-30V	30W 2m linear 0.5-3W input	45.00
HL-35V	VHF linear 0.5-5W (3W in 30W out)	69.95
HL-82V	85W 2m linear 10W input	144.49
HL-110V	110W 2m linear	204.98
HL-160V	160W 2m linear 10W input	244.52
HL-160V25	160W 2m linear 25W input	209.75
LINEAR UHF		
HL-20U	20W 70cm linear	82.90
HL-45U	45W 70cm linear 10W input	152.76
HL-90U	90W 70cm linear 10W input	268.59
PREAMPS		
HRA-2	2m mast head pre-amp	94.99
HRA-7	70cm mast head pre-amp	103.29

SENSATIONAL SHOW OFFER – FT203R

Superb 2 metre handheld could be yours if you are the lucky owner of the winning receipt. Conditions of entry all purchases of £50 and over. The winning receipt will be drawn at the show by:

Richard Ganderton
Assistant Editor of
Practical Wireless

ICOM PRODUCTS

IC751	HF Transceiver	1299.00
IC745	HF Transceiver	899.00
IC735	New HF Transceiver	849.00
PS15	P.S. Unit	145.00
PS30	Systems p.s.u. 25A	297.85
SM6	Base microphone for 751/745	40.25
IC290D	2m 25W M/Mode	479.00
IC290E	10W Multi-Mode Mobile	449.00
IC271E	2m 25W M/Mode Base Stn.	729.00
IC271H	100W version of above	899.00
IC25H	2m 45W FM	359.00
IC27E	25W FM mobile	379.00
IC45E	70cm 10W FM	345.00
IC47E	25W 70cm FM mobile	469.00
ICBU1	B/U supply for 25/45/290	29.90
ICR70	General Coverage Receiver	629.00
ICR71	General Coverage Receiver	729.00
IC02E	2m H/Held	269.00
IC2E	2m H/Held	199.00
ML1	2m 10W Linear	79.35
IC4E	70cm H/Held	259.00
IC04E	70cm Handheld	279.00
BC35	Base Charger	62.10
HM9	Speaker mic	18.56
IC3	Carry Case	5.50
ICBP3	Std Battery Pack	27.50
BP5	High Power Battery Pack	52.80
CP1	Car Charging Lead	5.50
DC1	12v Adaptor	13.75

DATONG PRODUCTS

PC1	Gen. Cov. Con	137.40
VLF	Very low frequency conv.	29.90
FL2	Multi-mode audio filter	89.70
FL3	Audio filter for receivers	129.00
ASP/P	r.f. speech clipper for Trio	82.80
ASP/A	r.f. speech clipper for Yaesu	82.80
ASP	As above with 6 pin conn	89.70
D75	Manual RF speech clipper	56.35
D70	Morse Tutor	56.35
MK	Keyboard morse sender	137.40
RFA	RF switched pre-amp	33.90
AD270-MPU	Active dipole with mains p.s.u.	51.75
AD370-MPU	Active dipole with mains p.s.u.	69.00
MPU	Mains power unit	6.90
DC144/28	2m converter	39.67
PTS1	Tone squelch unit	45.00
ANF	Automatic notch filter	67.85
SRB2	Auto Woodpecker blanker	85.25

SWR/PWR METERS

WELZ		
SP15	1.8-160MHz PWR/SWR	49.00
SP45	130-470MHz PWR/SWR	69.00
SP10X	1.8-150MHz PWR/SWR	34.00
SP200	1.8-160MHz PWR/SWR	89.00
SP250	1.8-60MHz PWR/SWR	65.00
SP300	1.8-500MHz PWR/SWR	129.00
SP350	1.8-500MHz PWR/SWR	79.00
SP400	130-500MHz PWR/SWR	89.00
SP600	1.8-500MHz PWR/SWR	106.00
TOYO		
T430	144/432 120W	44.65
T435	144/432 200W	49.35
HI-MOUND MORSE KEYS		
HK702	Up down keyer marble base	30.95
HK703	Up down keyer	29.35
HK704	Up down keyer	19.95
HK705	Up down keyer	15.49
HK706	Up down keyer	16.96
HK708	Up down keyer	14.95
HK802	Up down solid brass	36.30
HK808	Up down keyer	39.95
MK704	Twin paddle keyer	13.50
MK705	Twin paddle keyer marble base	25.65
KENPRO		
KP100	Squeeze CMOS 230/13.8v	82.50
KP200	Memory 4096 Multi channel	169.50

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Cirkit & WPO COMMUNICATIONS

are pleased to announced that Cirkit Distribution will now be responsible for the Marketing & Distribution of many of the kits currently available from WPO Communications. Listed below are all the kits currently available from both sources – please order from the correct address!

FROM CIRKIT

DSB80 – QRP CW/DSB transceiver for 80 or 160m. High sensitivity receiver, 2W CW or PEP Tx output. Complete kit of parts with all hardware, pcb, components and 5 digit DFM. Stock No 41-02502 **£85.00**

DSB2 – QRP CW DSB transceiver for either 160, 80, 30 or 20m with Minisynth PLL VFO and on-board Active Filter. Complete with punched case and all hardware, pcb's and components for DSB2 and Minisynth.

Stock No 41-02605 (160m)	**£91.50**	41-02606 (80m)	**£91.50**
41-02607 (30m)	**£91.50**	41-02608 (20m)	**£91.50**
DSB2 DFM for 20 and 30m		41-02604	**£36.00**

MINISYNTH VFO – miniature PLL synthesised VFO for 20,30,80 or 160m (direct conversion) or 10, 20 and 160m (10.7MHz i.f.). High level output for direct drive of DBM's (SBL1 etc) 800Hz offset for CW. Kit includes pcb and all components. **£31 each.** Please state i.f./ Band.

2 METRE TALKBOX – The popular alternative to high priced 2m 'Black Boxes'. RX – 6 channel low noise design with 3 chamber helical filter, sensitivity better than 0.25uV for 10dB quieting. TX – 1W o/p into 50 ohms with dedicated speech processor ic. Complete kits with pcb's and all components (no xtals). Stock No 41-02802 **£69.95**

VHF MINISYNTH – PLL VFO offering full coverage of the 2 metre band, with 600kHz offsets for Repeater use etc, on Tx and Rx depending on xtals installed. Complete with kit pcb and all components (no xtals). Stock No 41-02803 **£38.50**

ACTIVE FILTER – SSB/CW filter to enhance performance of the DSB80 or any other receiver. 11 poles of filtering in 7 selectable positions. Kit includes pcb and all components. Stock No 41-02900 **£18.25**

SPEECH PROCESSOR – Audio speech processor with VOGAD, clipping and filtering circuits to enhance the copy of your signal. Suitable for FM, AM, SSB or CB. Kit includes pcb and all components. Stock No 41-02901 **£13.90**

Prices include VAT. Post & packing 60p per order. Full details of these and all other Cirkit kits in the AUTUMN 85 Catalogue price £1.15.

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micron

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ALPHA – our 40W+ SSB/CW Monoband Transceiver for 160 or 20m. Usable as a Mobile or Base rig, it comes complete with all components, Case/hardware, Digital Display and comprehensive instructions at **£179.95** inc.

MICRON MATCH ATU – developed from the MICRON ATU, complete with case, connectors and suitable for up to 20W or SWL Transmatch type. **£39.95** inc.

OTHER KITS – RF Broadband preamp 1.8-30MHz, **£15.** Talking Frequency Meter for Blind ops at **£179.** UNIVERSAL MORSE MEMORY (see PW Review) at **£52.45** (either std or MS version available). For more details of all kits please send 40p in stamps. Allow up to 28 days for delivery. Export a pleasure.

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★ ALL UNITS HAVE RF RELAY CHANGEOVER + SWITCHABLE SSB/FM HANG TIME.

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	ORDER CODE	PRICE
25W FM/CW	U25F	£79.50
15W FM/CW/SSB/AM	U15L	£69.50
15W FM/CW	U15F	£59.50

VHF UNITS (144-149MHz)

	ORDER CODE	PRICE
45 FM/CW	V45F	£62.30
35 FM/CW/SSB/AM	V35L	£59.50
25 FM/CW	V25F	£48.50
15 FM/CW/SSB/AM	V15L	£49.50
15 FM/CW	V15F	£39.50

All units use Toshiba or Mitsubishi RF power modules as used in all new VHF/UHF radios.

Quality British construction. Real Value for money.

IF YOU REQUIRE A DRIVE LEVEL OTHER THAN 1-3 WATTS PLEASE STATE AT TIME OF ORDERING. PLEASE ADD £2.50 POST + PACKING. TELEPHONE ORDERS ON VISA + ACCESS CARDS. PLEASE MAKE CHEQUES PAYABLE TO R. WITHERS COMMS.

RF HAVE APPOINTED R.W.C. AS THEIR SOLE DISTRIBUTORS FOR THESE FANTASTIC NEW PRODUCTS FOR 1985

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★ MEASURES ONLY 5½"×¾"

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★ EVERY BOARD FACTORY TESTED

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★ KITS NOW AVAILABLE £17.50 + £1.00 p&p. Also for DNT/ LCL @ £12.95.

★ COVERS 29.3-29.690MHz on most CB sets – sorry not multi-modes.

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★ NOTE: WE CAN FIT THE BOARD FOR £19.50 PLUS BOARD, BUT ENCOURAGE YOU TO FIT IT YOURSELF.

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WOOD & DOUGLAS

★ 1250DC50 DOWNCONVERTER – THE MARKET LEADER ★

Specification:

Input frequency range	: 1240-1325 MHz
Intermediate frequency	: 50 MHz nominal
Local oscillator injection	: 1190-1325 MHz
Conversion gain	: > 25 dB; 30 dB typical
First RF stage	: MGF 1100 Ga As FET
Mixer type	: Discrete Schottky ring
Post mixer processing	: SL560c amplifier
Operating voltage	: 11.5-14.0 Volts
Operating current	: 80 mA nominal
Internal stabilisation	: 8.5v; 5.5v rails
External connections	: AFC input Supply input Tuning voltage input 8.5v rail output
RF Connections	: BNC

★ NEW PRODUCTS FOR FM TV ★

VP/D1 Pre-Emphasis/De-emphasis (CCIR)
Improve your video quality with this low-cost add-on board. May be wired for transmit or receive use. Includes amplification to compensate for attenuation of CCIR network.

SCT2 Transmit Sound Modulator
Generates FM sound sub-carrier which is then combined with composite video to drive UFM01. Requires 350mV RMS AF input. Specify 5.5MHz or 6.0MHz.

SCR2 Receive Sound Demodulator
Takes FM sub-carrier for VIDIF board and provides two squelched audio outputs, 600 ohm and 8 ohm, independently adjustable. Specify 5.5MHz or 6.0MHz.

Package Prices		Kit
1. 500mW TV Transmit	(70FM05T4 + TVM1 + BPF433)	40.00
2. 500mW TV Transceive	(As 1 above plus TVIP2 + PSI 433)	65.00
3. 10W TV Transmit	(As 1 above plus 70FM10 + BDX35)	75.00
4. 10W TV Transceive	(As 2 above plus 70FM10 + BDX35)	100.00
5. 70cms 500mW FM Transceive	(70'T4 + 70'R5 + SSR1 + BPF)	80.00
6. 70cms 10W FM Transceive	(As 5 above plus 70FM10)	115.00
7. 2M Linear/Pre-amp 10W	(144PA4/S + 144LIN10B)	45.00
8. 2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25B)	48.00
2M Linear/Pre-amp 25W	(144PA4/S + 144LIN25C)	51.00
9. 70cms Synthesised 10W Transceive	(R5+SY+AX+MOD+SSR+70FM10)	165.00
10. 2M Synthesised 10W Transceive	(R5+SY+SY2T+SSR+144FM10A)	125.00
11. 2M Crystal Controlled 10W Transceiver	(R5+T3+BPF+144FM10+SSR)	95.00
12. 70cms Linear/Pre-amp	(70LIN10+70PA2/S)	47.00
13. 24cms FMTV Receive, video out (Kit)	(VIDIF, 1250DC50 Boxed)	105.00
14. 24cms FMTV Receive, video out (Ass)	(VIDIF, 1250DC50 Boxed)	120.00
15. 24cms FMTV Receive, Ch 36 out (Kit)	(VIDIF, TVMOD1, 1250DC50 Boxed)	110.00
16. 24cms FMTV Receive, Ch 36 out (Ass)	(VIDIF, TVMOD1, 1250DC50 Boxed)	126.00
17. 24cms FMTV Transmit (Kit)	(UFMO1, 70LIN3/LT, 70FM10, WDV400/1200 Boxed)	140.00
18. 24cms FMTV Transmit (Ass)	(UFMO1. 70LIN3/LT, WDV400/1200 Boxed)	170.00

FM TV MODULES		ASS	KIT
50mW 420MHz Source (Video Input)	UFM01	30.10	22.75
50MHz i.f. Processor	VIDIF	58.20	40.90
Varactor Multiplier (Boxed)	WDV400/1200	63.95	40.90
1250MHz Downconverter (50MHz i.f.) (Boxed)	1250DC50	69.95	—
1250MHz Masthead Pre-amplifier	1250PA2/S	T.B.C.	—
Transmit Sound Modulator	SCT-2	8.00	—
Receive Sound De-Modulator	SCR-2	11.75	—
Pre-emphasis/De-emphasis	VP/D1	T.B.C.	—
AM TV Products			
Receiver Converter (Ch 36 Output)	TVUP2	28.75	23.95
Pattern Generator (Mains PSU)	TVPG1	48.50	39.40
TV MOdulator (For Transmission)	TVM1	10.35	6.05
Ch 36 Modulator (For TV Injection)	TVMOD1	10.15	5.75

★ ★ ★

Details of these and other new products are included in our 1985 catalogue. This will be posted to your on receipt of an A5 stamped self addressed envelope. Kits are usually available by return of post but please allow 28 days for any unforseen shortages. Place your order by post or by telephone useing your credit card. Please include £1.00 to cover order handling and postage.
Our products are kits or assembled kits consisting of circuit board and all components to mount on the board. We do not include external hardware such as boxes, connectors, etc.
If your purchase does not work when assembled then apart from being surprised we will offer to service the module for a small charge depending on the complexity of the project. So please remember . . .

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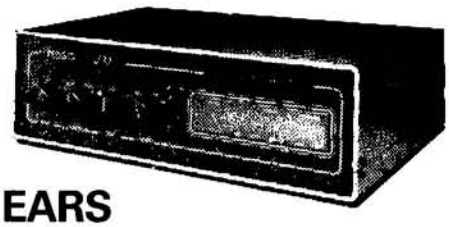


LINEARS

D200 2 MTR 500W SSB **£699**

D200S 2 MTR 750W SSB **£799**

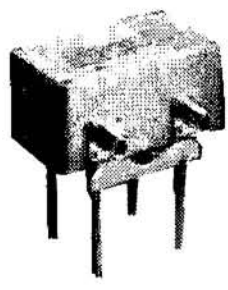
D70 70 CMS 550W SSB **£799**

PRE-AMPS – NEW MODELS

MODEL	FREQ.	NOISE	GAIN	POWER	PRICE
EVV1296S	1.25-1.3GHz	0.7-0.9	16-19dB	100W	£139
EVV1296C	1.25-1.3GHz	0.9-1.2	16-18dB	100W	£119
EVV1296	1.25-1.3GHz	1.9-2.1	14-17dB	100W	£100
EVV700	430-440MHz	0.5-0.9	15-18dB	500W PEP	£90
EVV2000FB	144-146	0.6-0.9	16-18dB	1000KW PEP	£90
EVV200FB	144-146	0.6-0.9	16-18dB	700W PEP	£80
EVV2000GAAS	144-146	0.6-0.8	16-18dB	1KW PEP	£90
EVV200GAAS	144-146	0.6-1	16-18dB	700W PEP	£80
EV2GAAS	144-146	0.6-0.9	15-18dB	100W PEP	£60
VV INTERFACE FOR ABOVE PRE-AMPS					£20

RECEIVE PRE-AMPS

MODEL	FREQUENCY	NOISE	GAIN	PRICE
EWPA 560	50-600-1GHz		16.5dB-1dB	£60
IP3 order	+18dBM			
ERPA 1296	1.25-1.30	0.8	17-18dB	£70
ERPA 435	430-440	0.5	15-18dB	£60
ERPA 144	144-146	0.7	16-18dB	£60



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60-89, 118-174, 380-495, 800-950MHz. 5-10-12·5 25KC steps complete with mount, NiCad charger and antenna
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ICOM R71

100KC-30MHz
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GEN. COV.

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+ OPTIONAL FRV8800 CONVERTOR
GEN. COV.

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An excellent hand-held scanner
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138-174MHz
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TRIO-KENWOOD R600

TRIO-KENWOOD R2000

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IC-735

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+ FC757 ATU

TRIO-KENWOOD TS-940

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IC4E 70CMS ● IC04E
+ ALL ICOM ACCESSORIES

TRIO
KENWOOD
TH-21
TH-41

YAESU
FT
209
709

YAESU
FT
203R
703

MOBILE TRANSCEIVERS

YAESU	FT290R	SEE US
	FT2700R	AT THE
	FT270R	SHOW FOR
	FT270RH	PRICES
ICOM	IC290E	410.00
	IC290D	450.00
	IC490E	495.00
	IC505	310.00
TRIO	TW4000	
	TR9130	470.00
	TR50	495.00

LATEST NEWS

ICOM R7000
SCANNING RECEIVER
25MHz-2GHz
FULL SSB, AM, FM & MEMORIES

APPROXIMATELY £700.00
Now full range of MUTEK products stocked

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 glassfibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £90 + £4 p&p
See Review in August Issue p.15

SEE US AT LEICESTER (GRANBY HALLS) FOR OUR SPECIAL SHOW OFFERS

MET

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POWER HANDLING UP TO 1KW
·7 to ·9dB NOISE 15 to 19dB GAIN
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D200 2MTR. 300w F.M. 550w SSB	£699
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D70 70cms 325w F.M. 500w SSB	£799

NEW MODEL DUE SOON
1296 MHz. 1w-in-10w-out.

TALK TO THE REST . . . THEN TALK TO US FOR THE BEST PRICES

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

Phone Patch

Sir: During the last two weeks I have been unfortunate enough to be the first person on the scene of two serious road traffic accidents. Both accidents were in remote rural areas with no telephone nearby. I was able to use my 144MHz radio to call for assistance and this was rapidly at hand. It was indeed fortunate that both incidents took place during the early evening when there were a number of amateurs able to assist at once.

Turn the clock back to a wet night last March in California (yes it does rain there!) and a similar situation when I encountered a six-car pile-up which blocked the road at 3am I was immediately able to summon help through the phone patch on the local repeater and as a result two critically injured people are alive today. I subsequently found that the nearest phone was ten miles away and as a stranger to the road I would have had difficulty in finding it. Consider the implications if this had happened at 3am in the UK and nobody was listening.

A number of repeaters are currently being fitted with phone lines to enable the RSGB headline news to be read. This is an ideal opportunity for phone patch facilities to be installed on an experimental basis. This might only save one life but this would surely be worth it.

P. L. Crosland G6JNS
Worcester

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.

Novice Licence

Sir: After 37 years of pursuing a novice amateur radio licence for the UK, the RSGB have now changed their minds on the issue. The new aim is first the introduction of an "Intermediate" licence, requiring the present RAE plus 5 w.p.m. Morse. This would be followed later by a higher level RAE. The present RAE would also remain.

At a time when amateur radio is in world-wide decline and few young people are being attracted into the hobby, preferring computing or CB, all the RSGB Council can think of is to introduce élitism. Most RSGB Council members, being highly qualified professionals, would have no trouble passing a higher level exam, but it will do nothing for the future of the hobby.

Anyone who claims that a novice licence is a no-test licence has obviously not studied the proposal, which is based on the American Novice level. The case today for a novice amateur radio licence could not be stronger. The present RAE is, to use an analogy, producing people who know how the car works but are unable to drive. Already over 30 countries have a Novice class of amateur radio licence. All those who support a Novice licence for the UK should write to the Department of Trade and Industry, Radio Regulatory Department, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

Ian Abel G3ZHI
Secretary
Amateur Radio Novice Licence Campaign

Radio Investigation Service

Sir: There is a rumour about that the radio amateur licence fee is to be increased once again! Surely it should be coming DOWN now that the Radio Investigation Service, freely available for

PW COMMENT

Communication

THERE HAS BEEN SOME SPECULATION regarding the future effect of the new *Interception of Communications Act** on radio enthusiasts.

It seems that the effect will be fairly minimal, since the Act deals only with the interception of communications sent by post or by means of a public telecommunications system. Just what constitutes a public telecommunications system is laid down in the *Telecommunications Act 1984*, occupying in all nearly four pages. In simple terms, it is (as the name implies) a system offering telecommunications facilities to the general public. In other words, something like the BT telephone system, or a cellular radio system.

On this basis, the new Act's effect on radio eavesdropping will be limited to public radio-telephone systems, including point-to-point links, cellular radio, carphones, trainphones, ship-to-shore services and the like, and to cordless telephones. It should be remembered though, that listening to any radio signals other than those from licensed amateur stations and authorised broadcasting stations, is illegal under the Wireless Telegraphy Acts unless you have a licence or letter of authority to cover the radio service concerned.

Although our recent readership survey showed that a majority of those completing the questionnaire think the RSGB is doing a good job for amateur radio, there is a significant ground-swell of dissatisfaction with the Society at present. We know that at least one motion of no-confidence in RSGB Council had been submitted for consideration at the forthcoming Annual General Meeting, and it is obviously important that a good representative cross-section of the membership should be there to join in the debate and to vote for the future direction of amateur radio in the UK.

Just how good a job the RSGB really is doing is not easy to assess. Certainly its most obvious shortcoming is the reluctance to communicate details of its operations on behalf of all UK radio amateurs to the membership at large—a strange trait in a communications-based organisation. Agreed, far more is made public nowadays than just a couple of years ago, but somehow the brief reports on Council meetings published in *Radio Communication* convey the impression that they hide more than they reveal. I know I am not alone in this feeling, and that this air of secrecy does nothing to enhance the RSGB's reputation with members, or with the many other radio amateurs who ideally should belong to the national society but feel the subscription not worth while.

The next Annual General Meeting takes place on 7 December 1985 beginning at 2pm at the Institution of Electrical Engineers, Savoy Place, London WC2. Obviously there would not be room for a very big percentage of the total membership, but it is vital that as many as can attend should do so. Don't leave everything to the vocal minority, of whatever persuasion.

**Interception of Communications Act 1985, ISBN 0 10 545685 3 HMSO £2.30.*

over half a century, has been virtually "privatised". In future it is to cost the owners of television sets the sum of £21 to get advice on their interference problems, whilst the users of business radios will be charged at a "commercial rate", whatever that might mean.

In 1983–84, the RIS cost £8.9 million, of which £7.1 million was spent on remedying interference, and £800 000 on enforcement. Truly staggering figures, which are now to be saved under the new arrangements. Whenever the amateur licence fee was raised in the past, it was always pointed out that this was due to rising costs — especially those of running the RIS, towards which a large proportion of the fee was channelled. So, without this annual cost, can we now gleefully anticipate a hefty REDUCTION in our licence fee? No prizes for the answer!

Douglas Byrne G3KPO
Ryde, IoW

EMP

Sir: Who is M. J. Darby? Is the name a cover for a member of Minister Heseltine's black propaganda department? The central section of his article (*Communications and Nuclear Explosions,* August *PW*) was technically fascinating but was it intended that getting us engrossed in that would make us subliminally accept his beginning and end?

In the introduction we are asked to believe that the basis of the problem can be demonstrated in the picture of us trying to start our cars on "the morning after" as if all was otherwise normal. No-one will be trying to start a car immediately and if Mr. Darby hopes the "authorities" will be capable of starting any sort of reconstruction then he is very naive and should proceed to study the other effects of nuclear warfare.

His belief that it is "vital" that military communications are "hardened" against e.m.p. is a farce. Who cares whether the Generals could communicate when they move into nuclear war?—I don't! So angry am I at Mr. Darby's easy acceptance of their priorities that I here issue a public call for members of RAYNET to refuse to involve themselves in the Government's Civil Defence exercises in preparation for nuclear war.

Michael A. Lacey
Reading, Berks.

BOOKSHELF

COMPUTER & TELECOMMUNICATIONS HANDBOOK by Jeff Maynard. Published by Collins Professional & Technical Books
238 pages, 156 x 234mm (hardback). Price £12.00
ISBN 0 246 12253 6

This really is a book for the professionals and university students, as its relevance for the hobbyist is somewhat limited. It is packed with information that would normally take the reader a great deal of time, trouble and probably money to collect.

For the radio enthusiast such information as signal reporting codes, international frequency allocations, international callsigns, world TV systems and Morse code tables would be useful, especially all in the one book. The professional computer programmer or analyst etc., would be able to use such information as the character codes, the octal to decimal tables, the hexadecimal to decimal (and vice versa) tables, the data systems standards and the symbol charts as just a small part of the available data.

The most obvious strength of this book is the fact that a vast amount of data is available in a single source. The Contents and Index are both well documented making the book very easy to use.

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", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** 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 for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. The printed circuit boards are available from Albol Electronic and Mechanical Products Ltd, 3 Crown Buildings, Crown Street, London SE5 0JR. Tel: 01-703 2311/2312; Proto Design, 14 Downham Road, Ramsden Heath, Billericay, Essex CM11 1PU. Tel: 0268 710722; Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage, Herts. Tel: 0438 312566.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype.

SUBSCRIPTIONS

Subscriptions are available at £13 per annum to UK addresses and £15 overseas, from **"Practical Wireless" Subscription Department, Oakfield House, 35 Perrymount Road, Haywards Heath, West Sussex RH16 3DH.** Airmail rates for overseas subscriptions can be quoted on request.

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 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 the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

CW Radio Bulletin UK3KP

In September last year, Pat Gowen G3IOR visited the Soviet Union for talks and discussions on mutual amateur-radio satellite interests at the Central Radio Club in Moscow. In addition to satellite matters, a number of projects and experiments were discovered that will be of general interest in a wider context. One of these is a fully automatic multi-frequency beacon and bulletin system, designed and built by a club group effort.

Amateur radio club-station UK3KP of *Komsomolskaya Pravda*, a popular Russian newspaper, has its station and HQ located at Universal Locator KO85VS in Moscow. It has a large membership of keen technical enthusiasts, who collectively decided upon a project to create a multi-band system that would act both as a beacon and as a source of updated and topical amateur radio news of national and international interest. The aim and intentions of the project are to:

1. Convey information of amateur radio from and to the amateurs of the world.
2. Provide media information for other newspapers and periodicals about amateur radio, such items as young pioneer activities, contest information, rules and results, etc.
3. Give information and reports of DX-peditions, etc.
4. Detail the locations, dates and contents of technical exhibitions, rallies, meetings, etc.
5. List amateur-satellite news and activities, orbital data, schedules, etc., in liaison with the AMSAT Europe Net, USSR Sputnik Net, the RS3A command station, etc.
6. Indicate updated propagation forecasts and studies of h.f. conditions, solar activity, etc.
7. Provide information and guidance on v.h.f., u.h.f., and s.h.f. propagational events, tropospheric data, sporadic E probability, auroral warning, meteor scatter periods, and general studies on related phenomena.
8. Provide detailed information on v.h.f. and u.h.f. receiver circuitry, antenna parameters and feeds, and test-range measurements.
9. Transmit educational programmes in Morse code for training and speed assimilation.

The apparatus (Fig. 1) consists of eight solid-state transmitters on the frequencies, 1·877, 3·633, 7·067, 14·337, 28·751, 144·140, 432·153 and 1296·459MHz. All the h.f. transmitters have 10 watts output, whilst all the v.h.f. and u.h.f. transmitters put out 5 watts. The 1·80, 3·5, 7 and 14MHz band transmissions are individually matched and fed into a horizontally-polarised delta loop, 80 metres long. The 28MHz transmission is radiated from a 10 metre long vertically-polarised delta-loop. The 144MHz transmitter feeds an F9FT 9-element horizontally-polarised Yagi, beamed at 15 degrees azimuth, whilst both the 432 and 1296MHz outputs are fed into omni-directional, horizontally-polarised crossed-dipoles.

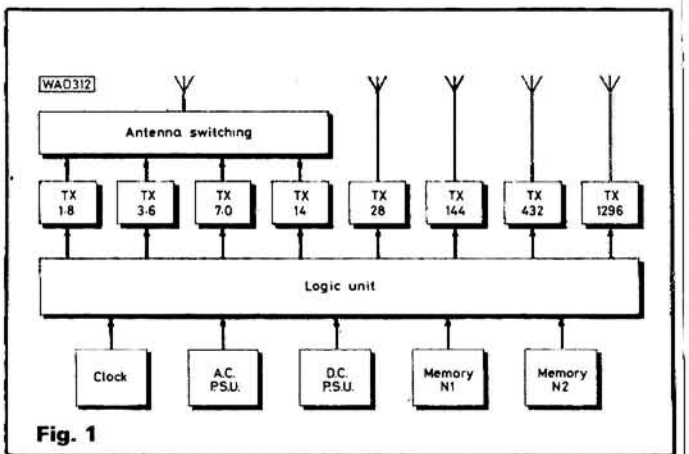


Fig. 1

System Details

The general housing includes the antenna switching unit, logic unit, memory banks N1 and N2, a 220V 50Hz a.c. mains power supply, and a battery back-up supply for emergency use. The entire sequence switching is controlled automatically from a simple domestic electronic clock, and has an accuracy of better than a second per day.

The sequence of the time controlled transmissions with the N1 programme is shown in Fig. 2. MSK is Moscow time, which is three hours ahead of UTC (GMT) in winter, and four hours ahead of UTC (GMT) in Summer Time.

On the v.h.f. and u.h.f. frequencies programme N1 transmits each hour, for 24 hours per day. The first frame of N1 take some three to four minutes of transmission time, then the remainder of the hour is filled with programme N2. This sequence for the v.h.f./u.h.f. transmissions, each acting as a twin-programme beacon, is shown in Fig. 3.

The system has been under test since its installation in August 1984, and was switched to full-time operational status with a full programme schedule in early June 1985. It is possible that a few minor changes may be made to the exact frequencies and timing schedules before the format is finalised, in order to ensure full mutual compatibility.

The long-term plans of the UK3KP club are to develop the system to use computers, with RTTY and voice synthesis, and to link the system with amateur-radio satellites. It is planned to link the command line by both telephone and v.h.f./u.h.f. links, and to increase the memory and experimental capacity with high-speed digital transmission systems. Reports of reception, suggestions and ideas on the UK3KP transmissions and evaluations would be greatly appreciated, and may be sent via Radio Bulletin UK3KP, PO Box 88, Moscow, USSR. They will all be acknowledged and QSL'd 100 per cent.

Acknowledgements

The writer wishes to acknowledge the help and advice of those who designed and built the system, viz. RW3DR, UW3EH, UA3CR, and the many other members of UK3KP who assisted in the project and its explanation.

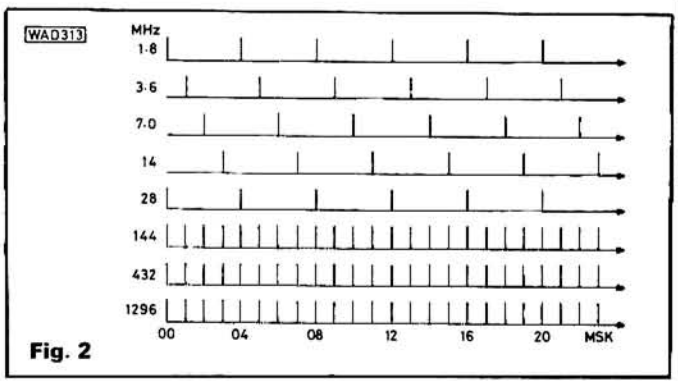


Fig. 2

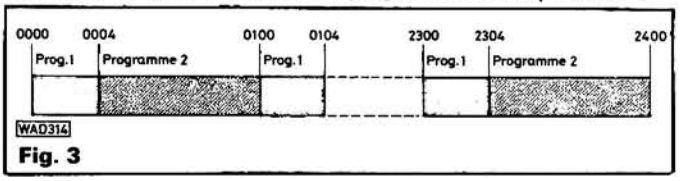


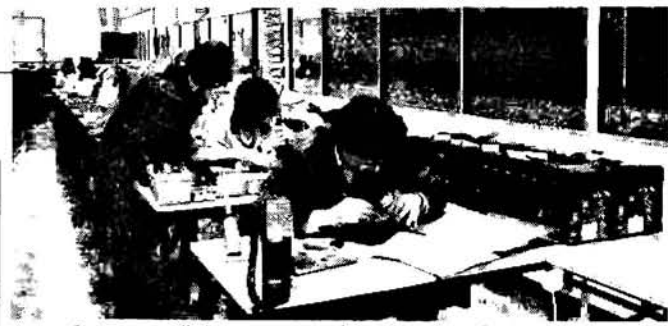
Fig. 3

NEWS

British Cellular

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

Transportable Vodafones are being produced at Racal Seaton Ltd, Devon. They were the first UK factory to win BABT approval to



manufacture cellular subscriber equipment. The photograph shows part of the Seaton factory.

Base station equipment is being assembled at Racal Carlton Ltd, Nottinghamshire.

Our Apologies . . .

To *PW* readers who went along to the Red Rose Rally at Haydock Park on August 18 hoping to see us there. Unfortunately, the car containing all our exhibition stock was the object of the attentions of a light-fingered gent (?) the night before in the hotel car-park.

Hopefully, you caught up with us at Telford, Lincoln or Dundee during September. Otherwise you'll find us at the Welsh Amateur Radio Convention on October 6 at the Oakdale Community College, Blackwood, Gwent (doors open 10 am); at the Great Lumley Rally, also on October 6, at the Community Centre, Great Lumley, near Chester-le-Street, Co. Durham, commencing at 11 am; and at the Leicester Amateur Radio Show, at the Granby Halls on October 25/26 (doors open 10 am).

Looking a little further to the future, we plan to be at the first St. Albans (Verulam) Christmas Rally, at St. Albans City Hall on December 1, doors open 11 am.

For the benefit of aspiring Class A Licensees, BT Morse Tests will be available at Blackwood and at Leicester. Further details from Gavin Williams G3YCP, BT Radio Station, Worston Lane, Highbridge, Somerset.

Members and friends from Ballymena Amateur Radio Club, GI3FFF, on Rathlin Island with the special event station GB2MRI between 7 and 11 August '85.
The photograph shows (l–r): GI3RNY, Graham Williamson, GI4KUM, GI4OZT, GI3UHL, GI4TOR, GI4VJZ, GI4OUE, Hugh Kemahan, GI4HCN, GI1KLH, GI4DCC, GI4CRL and GI4POV (back row).
Seamus Hannaway, Samuel Chesney, GI4MFM, John Chesney, GI4OCV, Sean Hannaway and Edwin McAteer.

Mobile Rallies

2 November 1985
The Fifth North Devon Radio Rally is to be held in Bradworthy Memorial Hall (near Holsworthy) on Saturday November 2. It opens from 10.30am to 5pm with talk-in provided on S22. All the usual features including Bring and Buy.

2 March 1986
The Doncaster Amateur Radio Rally will be held in the Adwick Leisure Centre, Welfare Road, Woodlands, Doncaster. Doors open at 11am (10.30am for disabled) and the admission fee is 50p. Many trade stands as well as Bring and Buy etc. Talk-in is provided on v.h.f. and u.h.f. and refreshments and bar are available. Further details from G8XTU QTHR or Tel: Doncaster 531365 or Doncaster 539446 ext 38.

16 March 1986
The South Essex ARS are holding their first mobile Rally at The Paddocks Community Centre, Canvey Island, Essex. Further details from G4FMK QTHR.

Telecommunications Wiring Booklet

The Office of Telecommunications (OFTEL) has published an explanatory booklet entitled *Telecommunications Wiring in Business Premises and Homes.*

The booklet sets out and explains the basic rules for the installation of telecommunications wiring on customers' premises and domestic homes. It also illustrates which apparatus and wiring remain the responsibility of the Public Telecommunications Operator and which can be the customer's responsibility. Copies of the booklet can be obtained, free, from: **Office of Telecommunications, Atlantic House, Holborn Viaduct, London EC1N 2HQ.**

New 50MHz Beacon

A new 50MHz beacon became operational during late August. Located at the IBA TV transmitter site at Rosemarkie (National grid ref: NH 762623) on the edge of the Moray Firth, GB3RMK the third UK 50MHz beacon, can be found on 50·060MHz.

Departures

Eagle-eyed readers may have noticed several changes in the staff listed on our Contents page this month. We bid farewell to two long-serving members—Alan Martin G8ZPW, News and Production Editor, who is taking up another post within IPC Magazines, and Dennis Brough, our Advertisement Manager, who will soon be enjoying early retirement. We thank them both for their past efforts on behalf of *PW.*

Taking over the hot seat in the Ad. Department is Roger Hall G4TNT, formerly Senior Sales Executive.

Auroral Predictions

The August 85 edition of Cambridge Kits *Kit News* contains details of their comprehensive range of budget price radio related projects. VHF DX addicts will be interested in the 10–150kHz v.l.f. receiver which can be used to provide advance warning of v.h.f. auroral conditions. The principle is that solar flare activity leads to auroral events with a time lag of 30 hours, which is the time taken by ionised particles to travel from the sun to earth. By monitoring a known constant source of radio signals, such as OMA in Czechoslovakia (50kHz), it is possible to observe the direct effect of solar flares—a sudden change to night-time signal levels. Some 30 hours later look out for possible auroral activity. Cambridge suggest the receiver is interfaced with a tape recorder and interval timer, allowing real time compression so that a day's recordings can be quickly scanned for tell-tale signs of flare activity. Best DX so far reported includes Gorki, USSR on 25kHz, NAA Cutler, Maine 17·8kHz and Annapolis, Maryland 21·4kHz—typical ranges of 3000km. For further details of this and other items from the range send an s.a.e. (2 IRCs for overseas readers) to: *Free Kit News, Cambridge Kits, 45(P) Old Lane, Milton, Cambridge CB4 4BS.*

Cirkit Market WPO

Occasionally this job has its rewards in that a p.r. man picks up the tab for allowing me to try some exotic food while he tries to convince me that his client's news is worthy of the entire editorial content of *PW*. One such rare occasion took place in a Japanese restaurant in London with a dozen or so of us sitting on the floor eating raw fish and other such oriental delights—all to tell us that Cirkit have now taken over the marketing of the WPO Communications range of amateur kits. "Wopo", as he is known in amateur circles, produces a range of kits and modules aimed mainly at the radio amateur and initially his 25 most popular kits will be stocked by Cirkit. The remaining kits and modules in the WP range will be carried from next January.

For full details, lists and prices contact either **WPO Communications, 20 Farnham Avenue, Hassocks, West Sussex, BN6 8NS. Tel: (07918) 6149** or **Cirkit Holdings plc, Park Lane, Broxbourne, Herts. EN10 7NQ. Tel: (0992) 444111.**

Down-converters

If you are into satellite TV then this new product from Holland will be of interest.

It is a low-noise down-converter for the 10·95 to 11·70GHz satellite TV band and is made by Tratec. Using surface mounted component technology to give stable operation and long life the EDC-752 will work over a temperature range of −30 to +60 degree Celsius with local frequency stability of ± 1·5MHz and ± 1dB gain stability. The input v.s.w.r. is quoted at 1·5 max. and the noise figure variation is 2·2dB typical. The only other information we have is that the price is around $595 ex-works Veenendaal. Contact Mr. K. van der Schaaff **PO Box 385 3900AJ, Veenendaal, Holland. Tel: 31838521984.**

CW Decoder

Are you trying to use your home computer to decode c.w. signals from your receiver? If you are then B&J Telecommunications have just the unit for you. Their new CDU947 board is a c.w. tone decoder which provides t.t.l. output signals from the audio input from the receiver.

The unit uses the XR2211 data p.l.l. chip and the necessary 5V to operate it is obtained directly from the computer's power rails. The port used on the computer obviously depends on both the type of computer and the program being used but B&J suggest G4BMK programs will use the Centronics or parallel printer port.

For the technically minded minimum audio input is better than 10mV. Internal limiting clamps the input levels to a maximum of 600mV. Bandwidth is 200Hz centred on 850Hz.

The price of the CDU947 is £15.50 inc. postage from **B&J Communications, 9 Queens Walk, Thornbury, Nr. Bristol, Avon, BS12 1SR. Tel: (0454) 416381.**

Prestel on Amstrad

The Amstrad 464 computer seems to be getting its fair share of coverage in this lot of products. Skywave Software have just released their add-on unit to allow 464 users to run the machine on Prestel. Full details will be given in next months review of Prestel hardware. If you cannot wait until then try **Skywave Software, 73 Curzon Road, Boscombe, Bournemouth, BH1 4PW. Tel: (0202) 302385.**

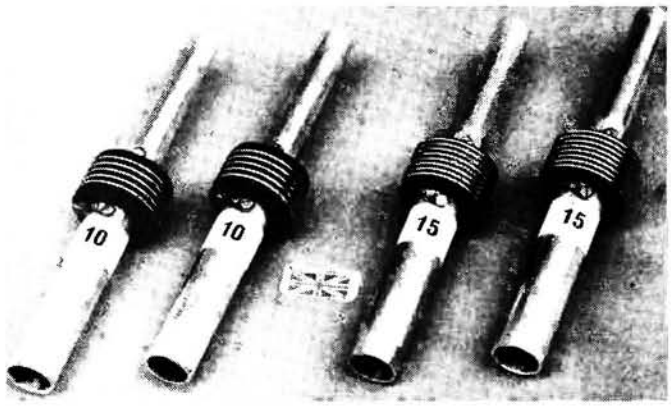
Chisel or Screwdriver

Come on now—hands up all of you who have used a screwdriver as a chisel or scraper. Shame on you!

Well now you can buy the Chisel Driver—the ideal answer to those who use a screwdriver as a universal chisel, scraper, paint tin opener etc. The blade is designed like a chisel and is claimed to be tough enough to withstand the roughest use. Price is £3.99 inc. VAT. **Thunder Screw Anchors Ltd., Victoria Way, Burgess Hill, West Sussex RH15 9NF Tel: (0446) 5701.**

Traps

G2DYM Aerials have added two new traps to their range. The new versions cover the 21 and 28MHz amateur bands and have 150mm of aluminium tube at each end to facilitate the construction of two or three element tri-banders, tri-bander dipoles and trap verticals either a quarterwave or halfwave in height. Either version will set you back £10.00 each (£1.00 p. and p.). Kits of two, four, eight or twelve traps can be supplied at £19.50, £19.50, £75.00 and £110.00 respectively plus of course post and packing at £1.50 for two or four traps, £2.00 for eight and £3.00 for twelve. Orders to **G2DYM Aerials, "Cobhamden Castle" Uplowman, Nr. Tiverton, Devon. Tel: 039 86 215.**



Monitor Receiver

This will give you a sneak preview of the latest communications receiver from AOR. The AR-2002 will be reviewed in our December issue so for full details you will have to be patient and wait until then, but to whet your appetite the coverage is 25 to 550MHz and 800 to 1300MHz with both push-button and stepping knob control of frequency from the front panel. A socket for an optional RS232 interface is provided on the rear panel. Price is given as £375 inc. VAT (carriage £7) from **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (0629) 2430.**

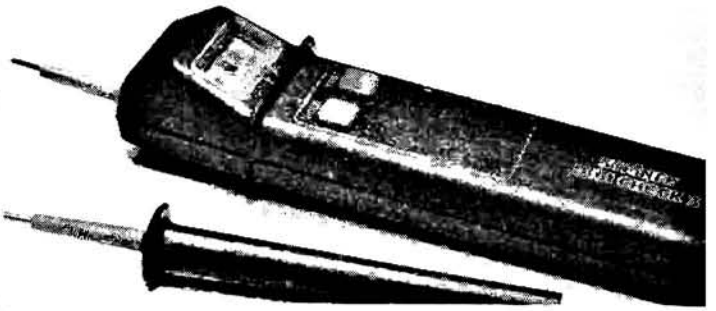
PRODUCTS

. . . compiled by G8VFH

Amstrad RTTY

Scarab Systems have produced RTTY programs for two of the computers popular with our readers. The programs are for the Commodore 64 and Amstrad 464.

Scarab reckon that their Amstrad RTTY program is the best that they have produced for any machine. It has the usual Scarab features such as Instantaneous Transmit Mode, auto CARRIAGE RETURN/LINE FEED and a real time clock. The program also features several features new to Scarab including on-screen menu display, large QSO buffer, 10K memory storage and a screen divided into "windows". The instructions provided with the software, which is recorded four times onto a standard cassette, are easily understood and cover all the points of using the program. Further details of this program and other Scarab Systems products direct from **Scarab Systems, 39 Stafford Street, Gillingham, Kent ME7 5EN Tel: (0634) 570441.**



Intelligent Tester

The Steinel Digi-Check 3 uses a built-in microprocessor to provide a simple to use but very sophisticated hand-held universal voltage tester. The instrument is autoranging with polarity and d.c./a.c. sensing automatically performed. The measured voltage, sampled every 200ms, is displayed on a $3\frac{1}{2}$ digit l.c.d. **Steinel UK Ltd., 17 Reddicap Trading Estate, Sutton Coldfield, West Midlands B75 7BU. Tel: 021-378 2820.**

Philips Attack

Philips have decided that the time is now right for an attack on the short wave listening market. They are introducing two competitively priced receivers with continuous electronic tuning from 150kHz to 30MHz. Also covered are the broadcast v.h.f. f.m. and marine bands.

The D2935, pictured here, is the cheaper of the two models and is priced at around £169. The more expensive model, the D2999, will set you back £299 which buys you automatic search, three speed electronic tuner, switchable audio bandwidth and digital field strength meter. Operating from either batteries or mains, both models have digital displays, push-button keyboard for frequency entry and nine memories.

Philips reckon that these two new models will bring the power available to the radio amateur onto the beach and will be in demand world-wide.

BOOKSHELF

CABLE TELEVISION by Jeff Maynard. Published by Collins Professional & Technical Books
218 pages. 152 x 232mm. Price £12.95
ISBN 0 00 383016 0

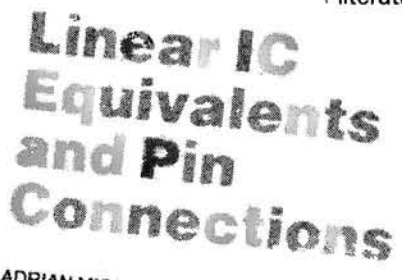
Cable TV has been given a rough ride in the UK, where the existing broadcast standards are of high quality. Jeff Maynard examines all aspects of Cable TV, providing a detailed technical insight as well as a comprehensive catalogue of its applications.

What emerges is a realisation that the fledgling piped films of today's systems will pave the way for the interlinked information networks of the future.

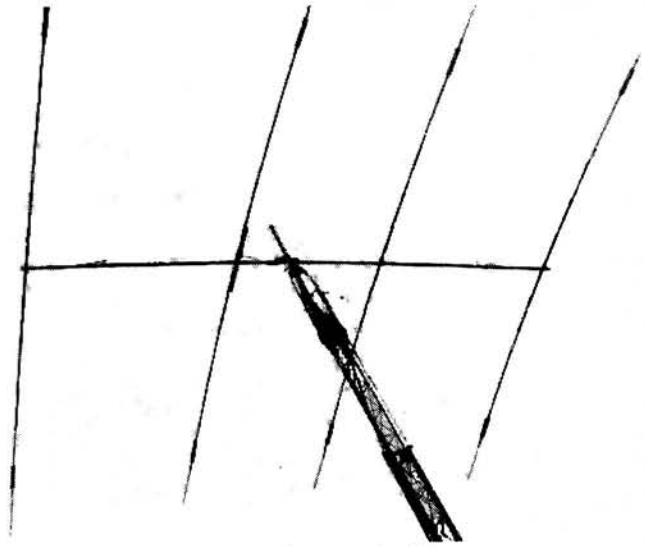
LINEAR IC EQUIVALENTS AND PIN CONNECTIONS by Adrian Michaels. Published by Bernard Babani (publishing Ltd.
247 pages. 194 x 264mm. Price £4.95
ISBN 0 85934 116 X

This book is the "sister" publication to Digital IC Equivalents and Pin Connections (also £4.95). Where possible each i.c. has as many as seven pieces of information in the equivalents table. They are the original type number, country of origin, manufactures, European type, American type and Japanese type. The equivalents table takes up some 157 pages of the book.

The following section contains pin connection details. Of course, the Introduction of the book warns before making a final replacement choice you should consult the appropriate manufacturers literature.



Modifying the Western Penetrator DX-34 Antenna



The DX34 Antenna in its standard form supported by a P60 Versatower

The DX34 is a four element trapped beam for 14, 21 and 28MHz, manufactured by Western Electronics (UK) Ltd. I purchased my original DX34 back in 1978, and after assembling it as per the instruction book, had very successful results with it.

The circumstances which led to the modifications about to be described were quite tragic in terms of amateur radio. During the 1983 CQ WW CW Contest a bad storm with exceptionally high winds brought my tower down, and with it the DX34. While I was waiting for the insurance claim to go through, I made a study of the various antenna books with a view to trying to improve the overall efficiency of the new DX34, in particular on 14MHz.

The standard DX34 has a 6·4m boom and the spacing between the elements as described in the instruction book is set out as in Fig. 1. The antenna is very broad-band and I had an s.w.r. of less than 1·8:1 over the whole of the 14 and 21MHz bands. In addition I was able to use both the c.w. and s.s.b. portions of the 28MHz band without any problems. The antenna was usually used at a height of 14m and it was interesting to see what could be worked with the antenna with just 5W input.

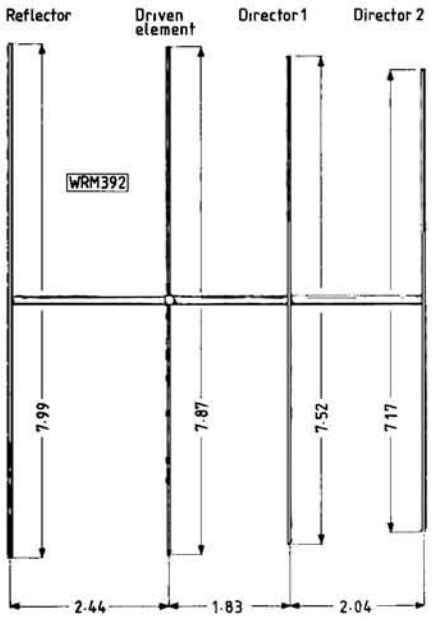


Fig. 1: The standard DX34 Antenna as described in the instruction book

Milliwatts

QRP can be very useful when testing antennas. If you manage to work DX through pile-ups and obtain good results in contests, then the antenna is obviously working properly. The results I have achieved with QRP, in addition to proving that high power is not necessary to work DX, have also proved that the DX34 is basically a very good antenna. The real test for the antenna came when I became interested in working DX with milliwatt power levels. I had modified my Ten-Tec 509 Argonaut so I could alter the voltage applied to the r.f. board containing the p.a. By measuring the voltage and the current I was able to monitor my input power, and have the ability to quickly switch from one power level to another.

I found that I was able to work some interesting DX with very low power levels, including stations in the USA on several occasions with power levels down to 5mW.

The factor which enabled DX to be worked whilst "milliwatting" was primarily the antenna, as any transmitter can be adjusted to run at low power levels, but not every antenna can radiate efficiently. I must confess to having spent some considerable time adjusting the elements of the DX34 for the best s.w.r. on each band, and also to removing everything in the feed line between the transmitter and the antenna, to minimise any insertion loss, etc., but the results still speak very highly for the performance of the antenna.

The one thing that I was never really able to understand was that all my best "milliwatting" achievements had been accomplished on 21 and 28MHz. The s.w.r. was as good on 14MHz as it was on the other bands, but I was never able to establish a QSO with the USA whilst using less than 150mW input, whereas on both of the other bands I had been able to go right down to 5mW. I eventually put it down to the fact that 14MHz was not such a good band for "milliwatting" as 21 and 28MHz.

As a result of studying the available antenna books dealing with beams, I came to the conclusion that the gain and overall efficiency of my new DX34 could be improved by lengthening the boom and increasing the spacing between the elements.

Compromise

Element spacing on a four element beam has to be a compromise between what is best for radiation resistance, forward gain and front to back ratio. Generally close spacing is undesirable because of the low radiation resistance, and the best compromise is for element spacing in the region of 0·2λ, with the alternative of going larger rather than smaller. Table 1 sets out the element spacing for the DX34 in its standard form. It will be noticed that only one of the figures exceeds the recommended 0·2λ figure, and the 14MHz figure was very low indeed. Could this be the reason that I had not been able to go milliwatting on 14MHz? I decided to find out.

When the new DX34 arrived I added an additional 2·1m section to the boom, making a total boom length

of 8·5m. The DX34 boom is constructed in 2·1m sections, which lock together, and the extra section was salvaged from the damaged beam. With 8·5m of boom available I decided to try and opt for the 0·2λ spacing on 21MHz, as that was the middle of the three bands covered by the beam. I could not quite achieve this whilst using the same spacing between all of the elements (as recommended in the W6SAI *Beam Antenna Handbook*), and so I slightly reduced the spacing between the reflector and the driven element to 2·7m, which allowed 2·9m between the driven element and director 1 and between director 1 and director 2. This is equal to 0·2λ on 21MHz and Table 1 shows how this element spacing comes out on the other bands.

The 28MHz figure for element spacing of 0·25λ whilst being quite high, is still within the recommended distance, whilst 14MHz being lower was a big improvement on the figure for the standard beam. This is the disadvantage in using trap beams, as there has to be some sort of compromise between the three bands.

The antenna was assembled, put onto the tower, and raised to the 14m level. Due to the longer boom I attached two guys above the beam from the top of the mast, to each end of the boom. This ensured the boom did not droop and held the antenna more rigid. The photograph shows the modified beam on my tower.

Some s.w.r. checks were carried out, and the bandwidth was even better than it had been previously, due no doubt to the wider spacing of the elements. The whole of the 14 and 21MHz bands and 28.000 to 28.600 of the 28MHz band was below 1·7:1. I was primarily interested in the c.w. portions of the band, and the s.w.r. was below 1·2:1 on each band throughout these segments.

Tests were conducted with a local station and several DX stations on 14MHz, and the front to back ratio appeared to be approximately 20dB. This figure is about average, but what was quite outstanding was the front to side ratio. Judging from the signal reports I was receiving and giving, the forward gain of the beam was also very high, and a significant improvement over the first one.

Tests

To ensure the antenna was working and to confirm my initial tests, I again turned to my Argonaut and "milliwatting". It was the ARRL CW Contest week-end and 28MHz was open to the USA. I adjusted the Argonaut for 5mW input and called K1RX. He came straight back and gave me the usual 599 contest report. Nothing much wrong with that. Just to make sure I also called K1DG and K4VX, and received the usual 599 reports from them. Now down to 21MHz, and there was KN3O, 599PA was the reply to my 5mW call, so the antenna was working efficiently on that band.

Now for the big test, 14MHz and a 5mW call to W2VJN. He did not hear me, as he continued calling QRZ Contest. Several more negative calls later and I decided to slightly increase the power to 5mW output. I called him again and 599NJ was the reply. I was very satisfied, as I had accomplished what I had set out to do, and improve the 14MHz performance of the antenna. 14MHz was not quite as good as 21 and 28MHz, but it was a very big improvement over the old beam on which I had never been able to work the USA with less than 150mW.

Since then a good deal of DX has been worked with milliwatts on 14MHz, and I put this down solely to the modification done to the antenna. With the decline in sunspots over the next few years, and a decrease in the number of occasions when 21 and 28MHz is open, it means that I shall be able to continue my milliwatting on 14MHz.

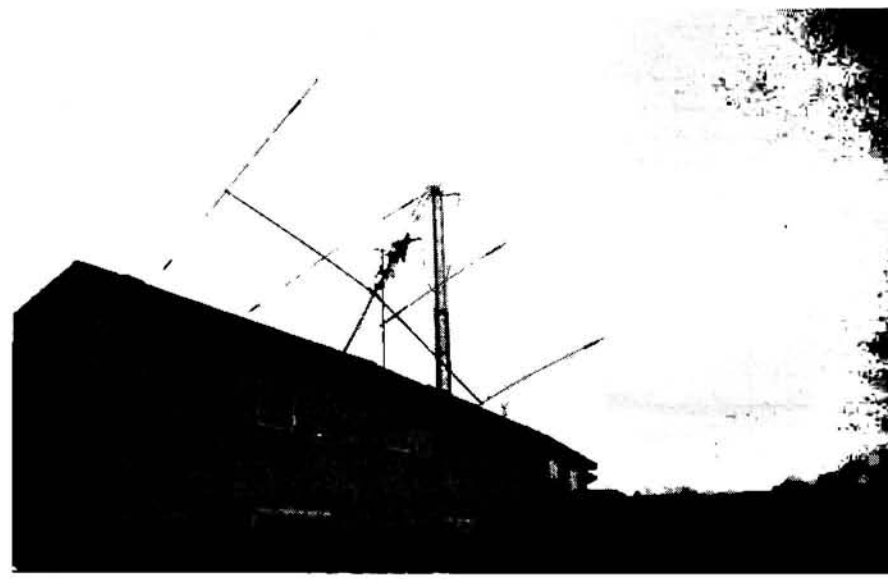
Whether you are a QRPer or not, an efficient antenna should be the aim of every amateur. Antennas have a big advantage over linear amplifiers for making your signal louder, in that they also work in reverse and enhance the incoming signal. The difference that the modifications have made to the standard DX34 when combined with the different element spacing is so dramatic that it may be worth DX33 owners considering a similar modification, if they cannot afford the full conversion to the DX34. It may well be that a modified DX33 is as good as a standard DX34! I regard the modification as one of my better investments in amateur radio. *PW*

TABLE 1

	Element Spacing (λ)		
	Reflector to Driven Ele.	Driven Ele. to Director 1	Director 1 to Director 2
14MHz	0·11 *0·13*	0·08 *0·14*	0·09 *0·14*
21MHz	0·17 *0·19*	0·13 *0·20*	0·14 *0·20*
28MHz	0·2 *0·25*	0·17 *0·27*	0·19 *0·27*
Spacing (m)	2·53 *2·74*	1·83 *2·90*	2·04 *2·90*

The roman figures relate to the standard DX34, *the italic figures to the modified DX34.*

The modified DS34 with the lengthened boom and altered element spacing



The sight that I woke up to on the Sunday of the 1983 CQ WW CW Contest. The top section of the tower had completely buckled over

PW REVIEW

This month we look at the top-of-the-range h.f. transceiver from the Trio-Kenwood Corporation. Circuit description and comprehensive laboratory tests were compiled by Jack Ashbourne. Air-testing and cross-checks on the main lab tests were carried out by Geoff Arnold G3GSR on a second sample of the rig.

The Trio TS-940S HF Transceiver

The TS-940S is a synthesised transceiver with all frequency and mode settings controlled by a central microprocessor. The main tuning dial drives an optical shaft encoder, which feeds tuning pulses to the microprocessor, which in turn controls the p.l.l. synthesiser system and the front-panel display. All internal frequencies in the receive and transmit sections are generated from one standard oscillator, so this determines the frequency stability of the rig. It may be replaced with an optional temperature compensated oscillator.

The receiver section gives general coverage from 30kHz to 30MHz, and uses a high first i.f. at 45·05MHz to give good image rejection performance. A series of 8 band-pass input filters provide attenuation of strong out-of-band signals, and reduce even-order intermodulation effects. A 20kHz crystal filter at 45·05MHz ensures good dynamic range before conversion to the second i.f. at 8·83MHz where further crystal filters provide the main selectivity for a.m., c.w. and s.s.b. operation. A third conversion to a 455kHz i.f. feeds the f.m. detector via a limiting amplifier and a ceramic filter. The a.m., c.w. and s.s.b. signals have further filtering at 455kHz and, by manipulation of the third conversion frequency, the 8·83 and 455 filters achieve variable-bandwidth tuning and s.s.b. slope tuning.

Final conversion is to an i.f. of 100kHz where a tunable notch filter can be switched in, if desired, before the a.m. and s.s.b. detectors.

The transmitter section is essentially the receiver in reverse. In s.s.b. and a.m. modes, the carrier is generated, modulated and filtered at 455kHz, converted first to 8·83MHz, then to 45·05MHz, and finally to the desired transmit frequency. On c.w. and f.m. the carrier starts at 8·83MHz, and f.m. is achieved by modulating the conversion oscillator to 45·05MHz.

The transmit signal is amplified by a broad-band, 100W linear power amplifier, then fed through switched low-pass filters to remove harmonics.

Transmitter Performance

The transmitter in the TS-940S will operate in the same modes as the receiver, s.s.b., c.w., a.m. and f.m. Output power is adjustable from about 10 watts to over 100 watts, and additionally a transverter output is available, bypassing the power amplifier, giving up to 50mW of output. Transmitter controls include selection of manual transmit or VOX, c.w. full or semi break-in operation, microphone gain, output power, and speech processor. Controls under a separate sliding cover on the top case allow for adjustment of VOX gain and delay, f.m. microphone gain and a.m. and c.w. carrier level.

The receiver S-meter also operates as a multi-function meter to monitor transmitter operation: p.a. voltage and current, output power and v.s.w.r., a.l.c. level and speech compressor operation. The power meter and v.s.w.r. meter are usefully calibrated and proved particularly accurate.

Transmitter performance was checked on c.w. mode for output power, harmonic content and spurious outputs, although in this aspect performance is identical in c.w. and f.m. modes. Harmonic content was predominantly 3rd overtone on most bands, and this was generally more than 60dB below carrier level (dBc), and did not rise above −50dBc. Second harmonic was also suppressed better than 60dB in most bands, and only rose in the 18MHz (17m) and 24MHz (12m) bands, and then to no worse than 50dB. Non-harmonic output is always difficult to measure since levels tend to be very dependent on the exact tuned frequency. The levels quoted in the result table are for the frequencies quoted, but tests were also made whilst tuning through the bands, and only rarely did signals rise above −60dBc.

Frequency responses in all modes show very good flatness, and steep treble roll-off, which is required to stop signal spreading. On s.s.b., carrier and unwanted sideband suppression were excellent at typically −70dBc. Deviation on f.m. was limited to a maximum value of 5·1kHz, though this was achieved with 20dB overdrive at the mic input, and in normal use deviation is unlikely to exceed about 4kHz.

Two-tone intermodulation performance measurements produced 3rd and 5th order products about 35dB

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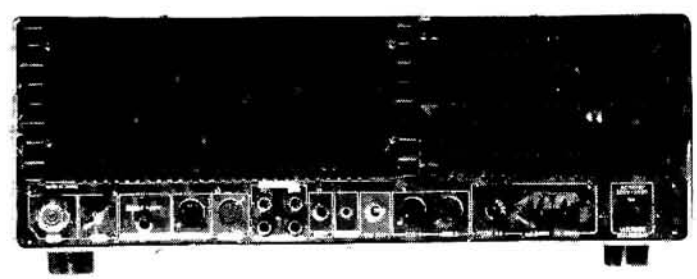

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below wanted signal with a p.e.p. of 100 watts. This figure is good for the broad-band semiconductor p.a. stage, and is due in part to the high voltage supply (28V) from which the amplifier operates.

The transverter output gives a very clean signal up to levels of about 50mW. The test results are at an output of 20mW, which has proved suitable for use with several popular transverters, and show intermodulation products to be very well suppressed at –49dBc. Users should, however, avoid overdriving this output since the a.l.c. system only operates on the main p.a. output.

Receiver Performance

The tests, for reasons of time and space, cover only basic receiver performance, and neglect the many facilities available on the TS-940S. These are provided for tailoring the receiver's response to the reception conditions, and can greatly enhance the capture of signals plagued by interference. Their effectiveness can only really be judged by using the receiver on-air, but a brief description is not out of place here.

In s.s.b. mode, the upper and lower slope-tune controls independently adjust the high and low filter cut-off frequencies without affecting receiver tuning. Interfering signals can often be rejected by reducing the filter passband slightly at the appropriate edge. The effects of slope tuning to the s.s.b. frequency response can be seen on the receiver audio response graphs.

In a.m. and c.w. modes, the variable bandwidth tuning (VBT) control has a similar effect, but alters both slopes of the filter to keep the centre frequency constant. A tunable i.f. notch filter is very effective at removing continuous heterodynes in these modes, and is sharp enough to have minimal effect on a.m. sound quality. Further signal processing can be done in c.w. mode with a tunable audio peaking circuit, and a control to adjust the resolved pitch of the c.w. signal after the filter.

Available in a.m., s.s.b. and c.w. modes is the noise blanker. This detects fast, high-level pulses on the signal, and mutes the receiver for a short time (about 1ms) during the pulse. It is effective for removing electrical and ignition interference, and has an adjustable threshold of operation. The muting time can be increased to several milliseconds to improve the suppression of "woodpecker" interference.

The tests carried out on the receiver section of the TS-940S fall into three main categories:

Sensitivity—a measure of the weakest signal resolvable.

Selectivity and dynamic range—how much the sensitivity is compromised by strong signals close to the signal being received.

Audio performance, frequency response and distortion—the quality of reproduction of a received signal.

Notes on test methods

Transmitter Tests

The majority of transmitter tests are straightforward, requiring the transceiver output to be monitored with a power meter, modulation meter and spectrum analyser. Audio to the transceiver is applied through the microphone input from one or two sinewave oscillators and attenuators.

Transmit frequency response tests on a.m. and s.s.b. were carried out at 10W output power so that transmitter a.l.c. was not active.

Receiver Tests

Sensitivity, response and distortion tests on the receiver use a low-noise r.f. signal generator connected to the antenna input, and an audio power meter and SINAD meter connected to the external loudspeaker output. Sensitivity is measured with a 1kHz audio signal, and the SINAD meter used to determine signal-to-noise ratios. Distortion levels are also measured with the SINAD meter, at an audio output of 100mW and an r.f. input to give about S9 + 20dB indication on the signal meter.

Frequency response in a.m. and f.m. modes is measured by varying the r.f. generator modulation frequency and using the audio power meter to determine level. The s.s.b. response is measured by adjusting the r.f. generator frequency and level for a constant audio output. This overcomes receiver a.g.c. action.

Blocking and reciprocal mixing is measured by introducing two unmodulated r.f. signals into the receiver through a combining unit. One signal, the wanted signal, is set at a level to give 10dB s/n ratio at the output of the receiver with the other signal switched off. The unwanted signal is then applied at the required separation from the wanted signal, and its level increased until the receiver output s/n ratio is degraded by 3dB. The unwanted signal rejection ratio is calculated as the difference between wanted and unwanted signal levels, plus 10dB.

It is important that the unwanted signal is produced by a low-noise generator, or a generator followed by a narrow bandwidth crystal filter. For the main tests a Hewlett Packard 8640B cavity-tuned signal generator was used, followed by a 3kHz bandwidth filter with 100dB attenuation at 3kHz from the centre frequency.

Adjacent channel rejection on f.m. is measured in a similar way, with two signal sources. The wanted signal is modulated at 1kHz at the normal deviation (1·5 or 3kHz), and its level adjusted to give 12dB SINAD at the receiver output. The unwanted signal, at the adjacent channel frequency, is modulated at 400Hz with the same deviation, and its level increased until the SINAD is degraded to 6dB. The difference in signal levels gives the adjacent channel rejection.

Two-tone intermodulation tests are difficult on high dynamic range receivers since the intermodulation products are often masked by noise generated from reciprocal mixing. Many quoted intermodulation figures are somewhat optimistic due to this effect, or due to the onset of receiver a.g.c. action during the test. The method used in these tests largely overcomes both problems, and results in figures that may be lower than other published figures.

Two r.f. signal sources, A and B, are fed through low-pass filters and attenuators into a combining unit and then into the receiver antenna socket. The filters ensure a harmonic content below –80dBc in the signal. The frequency separation of the signals is set to the required value, and the receiver tuned to resolve the intermodulation product nearest to signal A at 1kHz. The levels of the sources are then reduced equally until the signal at the receiver output is equal to the noise. (3dB s/n ratio.)

Signal source B is then re-tuned to the receiver's carrier frequency, and its level reduced to give a 1kHz signal at 3dB s/n at the receiver output. Signal A is still present at the previous level.

The intermodulation-free dynamic range is given by the difference in levels of sources A and B. The intercept point can be calculated by halving the dynamic range, and adding the result to the level of signal A at the antenna socket of the receiver. (Figures in decibels.)

Sensitivity is really a measure of the noise generated within a receiver. If this noise is at a lower level than noise received by an antenna connected to the receiver, then improving sensitivity will not have any real effect on the performance of the antenna and receiver as a system. The noise received by an antenna depends on its nature and location, and also on the frequency in question. In the h.f. bands, city and urban areas are considerably more noisy than rural areas, and noise levels increase in the lower half of the spectrum, below 14MHz.

The TS-940S sensitivity results in receiver noise well below antenna noise at 14MHz, and despite a slight fall in sensitivity towards 28MHz, its performance is still good in the 10m band. Below 1·5MHz, a 20dB attenuator is inserted in the antenna to better match the dynamic range to strong signals in the broadcast band. Sensitivity on 1·8MHz (160m) may be a little too good, and the switched attenuator may be needed to remove effects of strong broadcast signals at the h.f. end of the medium wave band.

★ MAKER'S SPECIFICATIONS

TRANSMITTER

Frequency coverage: 1·8–2·0MHz (160m)
3·5–4·0MHz (80m)
7·0–7·3MHz (40m)
10·1–10·15MHz (30m)
14·0–14·35MHz (20m)
18·068–18·168MHz (17m)
21·0–21·45MHz (15m)
24·89–24·99MHz (12m)
28·0–29·7MHz (10m)

Modes: c.w. (A1A)
u.s.b./l.s.b. (J3E)
a.m. (A3E) a.f.s.k. (J1B)
f.m. (F3E)

Power output: c.w., s.s.b., f.s.k., f.m. 250W p.e.p.
a.m. 140W

Carrier suppression: 40dB or more

Unwanted sideband: Better than –50dB

Harmonics: –40dB or better

3rd Order i.m.d.: –37dB or better (ref. single tone)

Frequency stability: $\pm 10\times10^{-6}$ (–10°C to +50°C)

Max. deviation (f.m.): ±5kHz

FSK Shift: 170Hz

Antenna impedance: 50Ω unbalanced

Microphone impedance: 500Ω–50kΩ

Audio response (s.s.b.): 400–2600Hz at –6dB

RECEIVER

Frequency coverage: 150kHz–30MHz

RIT/XIT range: ±9·99kHz

Intermediate frequencies: See text

Sensitivity (min): Input for 10dB S/N:

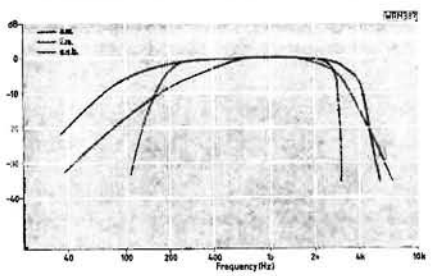
Mode	<500kHz	0·5–1·8MHz	>1·8MHz
c.w., s.s.b., f.s.k.	1µV	4µV	0·2µV
a.m.	10µV	32µV	2µV
f.m. (12dB SINAD)	—	—	0·5µV

★ OUR LAB TESTS

TRANSMITTER

Outputs in c.w./f.m. modes:

Freq. (MHz)	Max. Output (W)	Spurious Outputs at 100W (dBc) Harmonics 2nd	3rd	5th	Other
1·9	118	–70	–72	–86	–67 at ±160kHz
3·6	120	–60	–52	–67	–68 7th harmonic
7·0	118	–58	–59	–59	—
10·1	114	–69	–49	—	—
14·2	112	–61	–56	–77	–64 at ±2·5MHz
18·1	110	–49	–55	–71	–63 at ±10MHz
21·2	110	–63	–61	–73	–63 at ±2·5MHz
24·9	108	–50	–70	–77	–62 at ±4·9MHz
28·0	104	–62	–74	–69	—
29·7	106	–68	–66	–68	–54 at ±1MHz



Transmitter audio response

2-Tone intermodulation products: (100W p.e.p. at 14·2MHz u.s.b. using 700Hz and 1200Hz tones):
3rd Order –34dBc/–39dBc
5th Order –36dBc
7th Order –43dBc
9th Order –47dBc

Frequency Response: (to –6dB points)
s.s.b. 270Hz–2·8kHz
Carrier Suppression >70dB
Unwanted Sideband Suppression >70dB
a.m. 100Hz–4·0kHz
f.m. 190Hz–3·0kHz (with 750µs de-emphasis)
Max. deviation 5·1kHz

Power meter accuracy: (at 14·2MHz)

Indicated (W)	Measured (W)
5	5·1
10	9·8
50	52
100	106

Transverter output: (20mW at 28·0MHz u.s.b.)
2nd harmonic: –45dBc
3rd harmonic: –64dBc
l.o. at 73MHz: –56dBc
Others all below –60dBc, and below –70dBc within 5MHz of carrier
3rd order i.m.d. –49dBc

RECEIVER

Sensitivity (10dB s/n)

c.w./s.s.b.

Freq. (MHz)	Input (µV)
1·9	0.09
3·6	0·09
7·0	0·10
10·1	0·08
14·2	0·11
18·1	0·11
21·2	0·11
24·9	0·14
28·0	0·14
29·7	0·16

a.m. (70% mod.)

Freq. (MHz)	Input (µV)
1·25	3·20
4·95	0·29
6·10	0·31
7·25	0·37
9·60	0·31
11·70	0·37
13·60	0·37
15·30	0·40
17·70	0·40
21·60	0·40
25·60	0·45

f.m. (3kHz deviation)

Freq. (MHz)	Input (µV)
28·0	0·30
30·0	0·33

for 12dB SINAD

S-Meter calibration: (At 14·2MHz u.s.b.)

Reading	Input required µV	dBµV
S1	1·2	2
S3	3·6	11
S5	12	22
S7	26	28
S9	60	36
S9+20	420	52
S9+40	3·4mV	71
S9+60	45mV	93

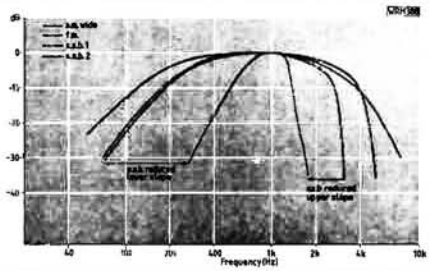
Squelch sensitivity: 0·32μV or less
Image rejection: 80dB or more } 1·8–30MHz
I.F. rejection: 70dB or more }
Selectivity:

Mode (Bandwidth)	–6dB	–60dB
c.w., s.s.b., f.s.k., a.m. (N)	2·4kHz	3·6kHz
a.m. (W)	6kHz	15kHz
f.m.	12kHz	22kHz

Notch filter: 40dB or more
Audio output: 1·5W in 8Ω with 10% t.h.d.

GENERAL

Power requirements: 120/220/240V a.c., 50/60Hz
Max. 510VA transmit
80VA receive
Dimensions: W409 x H154 x D420mm overall
Weight: 18·5kg approx.



Receiver audio response

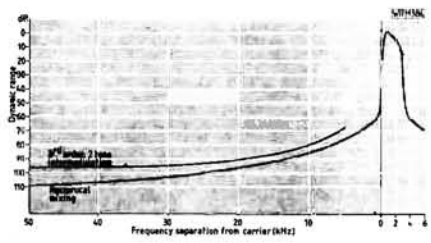
Audio output: 2·9W into 8Ω with 5% t.h.d.
Frequency response: (to –6dB points)
s.s.b. 230Hz–2·36kHz
620Hz–1·34kHz*
a.m. 160Hz–3·30kHz
f.m. 240Hz–2·80kHz (with 750μs de-emphasis)
* s.s.b. SLOPE tune controls centred.

Detector distortion: (at 1kHz)

s.s.b.	a.m.		f.m.	
<1% t.h.d.	% mod.	% t.h.d.	deviation (kHz)	% t.h.d.
	30	<1	2	<1
	70	6·3	3	1·2
	90	11·2	4	1·4

Squelch threshold: s.s.b. 0·2–0·85μV
a.m. 0·11–9·00μV
f.m. 0·14–1·4μV

AGC: 1dB gain reduction threshold: 1·5μV (s.s.b./c.w.)
Audio dynamic range: 37dB



Receiver dynamic range

3rd Order i.m.d.: (at 14·2MHz u.s.b.)

Signal separation from carrier (kHz)	Intercept point (dBm)	Dynamic range (dB)
100/200	+6	95
50/100	+6	95
20/40	+2	90
10/20	–6	80
5/10	–30	67

Blocking and reciprocal mixing: (at 14·2MHz u.s.b.)

Offset from carrier (kHz)	Signal rejection ratio (dB)
500	126
200	123
100	117
50	108
20	95
10	84
5	73

SSB Filter selectivity: –6dB 2·29kHz
–60dB 4·25kHz
Shape factor 1·86

F.M. Adjacent channel rejection:

Channel separation (kHz)	Deviation (kHz)	Signal rejection (dB)
10	1·5	27
12·5	1·5	61
25	3	75

Spurious signals: (30kHz-30MHz u.s.b.)

Number of signals	Equivalent antenna input level
8	0·1–0·2μV
6	0·2–0·5μV
2	0·5–1·0μV
None	above 1μV

No signals exceeding 0·1μV were found below 9·0MHz, nor in any amateur band except 28MHz.

I.F. rejection: 1st i.f. (45·05MHz) >83dB
2nd i.f. (8·83MHz) >105dB

Image rejection: >115dB for 1st and 2nd i.f.s

Spurious response rejection: >96dB at ±70kHz from resolved carrier
>85dB at half 1st i.f. (22·525MHz)

Frequency stability: Drift +55Hz in first half-hour; +22Hz in next 2 hours at 30MHz.
(Amount of drift proportional to tuned frequency)

Transmit/receive switching times: (c.w./s.s.b.)
From key-down: 90% TX power in 12ms
10% RX audio in 0ms
From key-up: 10% TX power in 10ms
90% RX audio in 32ms

Cross-checks by G3GSR on receiver sensitivity, squelch threshold and output and on transmitter harmonic and 3rd order intermodulation distortion, made on a second TS-940S, differed by 1dB or less from Jack Ashbourne's results. The S-meters differed by between 2 and 6dB across the range. (See *S-meters, Fact or Fiction? PW*, July 1985)

Sensitivity on f.m. is not quite as good, and whilst it is very suitable for use with v.h.f. or u.h.f. transverters (which have extra front-end gain), it may not give ultimate performance in the 10m band.

The selectivity of a receiver determines its ability to resolve weak signals in the presence of stronger signals that are close in frequency. The selectivity is usefully measured by dynamic range, which to be meaningful needs to be specified for signals of a known separation. Selectivity is compromised by three factors within a receiver: poor filter shape, reciprocal mixing and blocking.

The TS-940S receiver has excellent filter performance, blocking was not found at any time during the tests. Its selectivity is limited by reciprocal mixing, which is where noise sidebands on the local oscillator signal are mixed into the i.f. passband by strong, off-tune signals, and the sensitivity of the receiver is impaired.

The reciprocal mixing performance is shown on the dynamic range graph, and a figure of about 85dB at 10kHz will cope with most amateur band conditions, but may give slight problems in a crowded broadcast band. The dynamic range graph also shows the two-tone (intermodulation-free) dynamic range of the receiver. Intermodulation products are signals that are produced by overload conditions in the front-end and mixers of a receiver due to two strong signals at the antenna. The two-tone dynamic range of greater than 90dB at 20kHz tone separation is very good, and no problems should be experienced with intermodulation in normal use.

On f.m., selectivity (adjacent channel rejection) is very good for 12·5 and 25kHz channelling, and the rig should prove excellent with a transverter for use on v.h.f. and u.h.f. bands. The filters fitted are somewhat too wide for the 10kHz channels used on 29MHz, but nearly 30dB rejection will still be usable.

Audio performance of the receiver was very good in all aspects except a.m. detector performance. Filter responses are flat and free from ripple, and high frequency cut-off is sharp, although not quite enough on f.m. possibly. The sound on s.s.b. and f.m. is very clean, but a.m. detector distortion is slightly high, particularly at low frequencies and high modulation levels. Lowe Electronics, the importers of the TS-940S, provide a modification which replaces the a.m. detector and also improves the reciprocal mixing by some 12dB, making the receiver ideal for broadcast band DXing as well as amateur operation.

It must be appreciated that the sort of facilities offered on the receiver will enhance its usefulness in resolving signals, but will not compensate for deficiencies in basic receiver performance. Happily, the TS-940S gives a good account of itself at all levels, and should be ranked with the best of receivers available on the amateur market today.

Modifications

The TS-940S is endowed with an excellent general coverage receiver which many people will want to use for broadcast band listening. A set of modifications has been devised by Lowe Electronics to enhance the receiver performance for the committed DXer listening to weak a.m. signals in crowded broadcast bands. The modifications involve the following:

1. The p.l.l. synthesiser noise is reduced by additional filters, so that the reciprocal mixing dynamic range is increased. This means that very strong signals close to a weak signal will produce less interference; in effect, the receiver selectivity is improved.
2. A new a.m. detector circuit is fitted, giving very low distortion even at high modulation levels. This makes even Radio 1 bearable for a short time.
3. The 6kHz a.m. filter is fitted, and with the VBT control, the receiver bandwidth can be varied from about 3·5 to 6·5kHz. The WIDE/NARROW filter switch now bypasses the filter, giving about 10kHz bandwidth for quality reception where interference is not a problem.
4. The AGC OFF/FAST/SLOW switch is made to operate in all modes, so that the receiver's a.g.c. response can best be tailored to listening conditions.

The modifications will be carried out in the Lowe Electronics' workshop, and the receiver performance thoroughly checked and adjustments made if necessary. The cost of the modification to a new TS-940S is £98.50 which includes the YK-88A-1 AM crystal filter. Rigs already purchased can be modified for the same cost, plus carriage. The cost of the a.m. filter can be deducted if this is fitted.

Results On the Air

Some 36 pages of the TS-940 user's handbook are devoted to describing the controls, indicators and operation. Obviously we cannot begin to do justice to them here. Our photographs should reveal the comprehensive facilities offered, but nothing can replace an opportunity to see and handle the rig at a rally or in a Trio stockist's showroom.

Perhaps the most outstanding and unusual feature is the display system. The main digital frequency readout is supplemented by an analogue frequency display, which can portray a range of 100kHz or 1MHz at will. An entirely separate liquid crystal display can be switched to any one of four functions: clock/timer settings; a graphic indication of the settings of the SLOPE or VBT variable filter controls; frequency and mode of the idle v.f.o. and of any of the 40 memory channels; operating state of the optional internal automatic antenna tuning unit.

Contacts on c.w. and s.s.b. produced

The front-panel layout of controls is impressive

▶ 57

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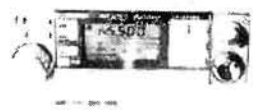

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At ARROW ELECTRONICS (MIDLANDS) Tel: 0858 62827 you will find Alan G4TZY who will be pleased to assist you. Alan lives at 33 Fairway, Market Harborough, Leics, but please telephone first.

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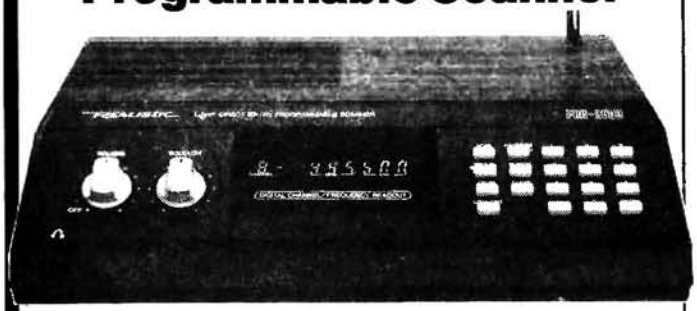

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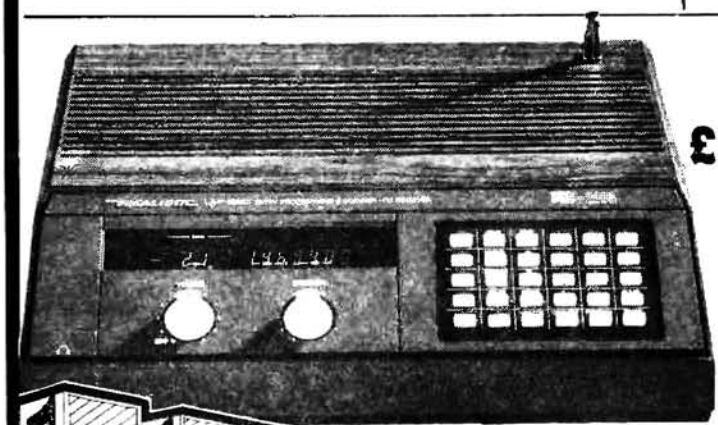

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PRESTEL

What has Prestel got to offer the radio enthusiast? Dick Ganderton G8VFH takes a look at the ever-expanding world of information over your telephone line.*

At first glance the idea of a radio amateur using the telephone system to receive and exchange information may seem strange. Why pay BT for the privilege of using their equipment when you could use your radio gear for the same purpose—after all if you can send it down the telephone lines then you most definitely can transmit it on any of the amateur bands.

For most people Prestel conjures up visions of expensive equipment and ever-mounting bills. However, things would appear to have changed. The advent of the home microcomputer has provided the means of accessing a whole range of databases and bulletin boards. All that is needed to turn your micro into a data terminal is a BT approved modem to couple your computer into the telephone network, together with the matching software.

The pricing structure of Prestel is now much more attractive with the actual "on-line" charges outside "working hours" being free. Of course you have to pay a subscription, but for private users this is only £6.50 per quarter, along with a local telephone call charge. This means that after 18.00 on weekdays, 13.00 on Saturdays and all day Sundays you can use Prestel for the grand sum of 40p per hour.

Microcomputing

However, most radio amateurs would probably join Micronet 800 as well. This is a rapidly expanding and changing system which has been set up especially for the home micro user. Of course membership is extra to your Prestel and costs another £10.00 per quarter, bringing the quarterly subscription up to £16.50.

Just what do you get for your money? It would take an article much, much longer than we have room for in *PW* to even touch on the fringes of what is available to the home computer owner with a modem and software to drive it. If you have a modem and software it is possible to access the Prestel computer on a limited basis without actually being a subscriber. By using 4444444444 as the Customer Identity number and 4444 as the Personal Password you can get a free demonstration of what Prestel is capable of. The only snag is that it seems that the actual local telephone number to access the computer itself is a closely guarded secret not available even to the BT operator or to Directory Enquiries! Of course after you have logged on keying 9 gives you a complete directory of Prestel local telephone numbers! To give you a taster some pages from the demo programme are reproduced here —not in glorious colour as you would see them on the screen but in simple mono without the elaborate graphics.

Gallery

One very interesting feature of Micronet 800 is the Gallery. Here subscribers "rent" pages on which they can put whatever information they want—within certain "decency" limits of course. Several blocks of Gallery pages are rented by radio amateurs who provide news services and information aimed at introducing the hobby to newcomers. A couple of pages from G4AVV's "magazine" are reproduced here. Looking at these you will note that the RSGB is "experimenting" with Prestel.

Mailboxes

All Prestel subscribers are issued with a Mailbox Number which can be used by other subscribers as an address for electronic mail. Those readers who look carefully at the contents page of

*Prestel is the registered trademark of British Telecommunications' viewdata service

The four "pages" on the left should give you an idea of the scope of Micronet 800 and Prestel. They were taken from the demonstration suite on Prestel and Micronet 800 using a Tandy TRS80 Color Graphic printer/plotter and unfortunately do not show the colour graphics used by Prestel and Micronet 800

Two of the Gallery pages on Micronet 800. The Gallery is an experimental concept being tried out on Micronet 800. Here are two pages from G4AVV's section which is aimed at providing information on amateur radio. These two pages were chosen as they show the other amateur radio activity on Prestel

PW will have noticed that we now have a Prestel number and you may use this number to send us messages, news items, requests for subscriptions, etc. This is a very useful part of the Prestel service and a look at the directory of subscribers under the heading G shows that over 130 radio amateurs have taken the trouble to ask for a second directory entry under their callsign.

Bulletin Boards

These are not connected with Prestel in any manner, but are privately run and maintained. There would seem to be a growing band of dedicated "bulletin boarders" who must spend a small fortune on long-distance telephone calls to bulletin boards around the UK. One new bulletin board of interest to radio amateurs is "Skytel" on 0202 304851 operated by Skywave Software. Other useful bulletin boards are Maptel run by Maplin Electronics (0702 552941), Hamnet (0482 497150 evenings) and React (0376 518818). RSGB are also experimenting with a Prestel "look-a-like" on 0707 57477 during the evening only. Bulletin boards usually run at 300 baud while Prestel runs at 1200/75, so if you want to use bulletin boards make sure that you buy a modem capable of both speeds.

Next month we will be looking at the hardware and software needed to get going on Prestel or similar systems.

NEWS EXTRA

Special Event Stations

October 12

Angelika Voss GOCCI has organised a special event station under the callsign GB4URC which will be on the air between 1000 and 1600 local time. Using both h.f. and 144MHz they hope to contact as many stations as possible and thereby raise funds for the rebuilding of the Lion Walk United Reformed Church.

People are sought who would be prepared to sponsor the station based on the total number of QSOs completed. Anyone who can help can contact Angelika by writing to PO Box 49 Colchester, Essex or Tel: 0206 396610

October 25/26

As part of the Marlborough Brandt Group One World Week GB40WW will be on the air on h.f., 144 and 430MHz. It is hoped to contact stations in The Gambia (Marlborough has a link with a village—Gunjar—there). Special QSL cards are available for all contacts. The station will be situated in St. John's School, Stedman Building, Marlborough, Wiltshire.

IBA Data Tests

During August this year IBA engineers mounted a field test involving the transmission of data information using sub-carriers on the LBC v.h.f. f.m. transmitters. Two different types of "auxiliary data systems" were evaluated using a format not unlike Oracle teletext.

Early results indicate that few listeners noticed the presence of the additional data, part of which was based on the EBU endorsed "Radio Data System" (RDS) which is intended to provide new facilities for listeners including channel ident, automatic receiver switching, etc. The second system would provide data for specified sections of the public through subscription services.

Broadside and Endfire Antenna Systems

F. C. JUDD, G2BCX, commences a comprehensive examination of phased antenna techniques

Radiation from an antenna depends on the electrostatic and magnetic fields produced by current flowing in the antenna elements. However, radiation is not always equal in all directions around antennas except in the case of single quarter or half-wave verticals, or vertical colinear systems, from which radiation in the *horizontal* plane only is equal in all directions—hence the term "omni-directional".

Nevertheless, radiation in the *vertical* plane from an omni-directional antenna may vary considerably depending on the conductivity of the ground beneath, the height of the antenna above ground and/or whether it is used with an artificial ground or ground-plane.

There are, however, certain antenna systems consisting of two or more suitably spaced driven radiators in which the currents flowing have a specific phase difference with respect to each other. The method enables various patterns of radiation directivity in the horizontal plane to be obtained. Such antennas may be operated in vertical or horizontal mode, i.e. to provide vertical or horizontally polarised radiation and are generally referred to as *endfire* or *broadside* arrays.

Basic Principle

The basic principle of endfire and broadside arrays is best explained by first assuming the use of two quarter-wave ($\lambda/4$) vertical radiators, each driven with r.f. Antennas of this nature are usually called "active" arrays to differentiate them from "parasitic" arrays such as the Yagi in which there is normally only one driven element, the rest being excited by mutual coupling. The spacing between the two driven radiators may vary between $\lambda/8$ and λ and the phase angle of the current in one of the radiators with respect to the other may be zero (driven in phase) or 45, 90, 135 or 180 degrees. For the last mentioned the currents in each radiator would be in opposite phase. For the time being we will ignore the vertical angle radiation, i.e. the angle of radiation with respect to ground.

Endfire Condition

A basic arrangement of $\lambda/4$ vertical radiators spaced a distance of $d\lambda$ apart is shown in Fig. 1.1(a). If, for example, the distance $d\lambda$ between them is $\lambda/8$ and each antenna driven in phase opposition, that is with a phase difference in the currents in each radiator of 180 degrees, then the system becomes an *endfire* array because maximum radiation is in line with the radiators in two directions as shown in Fig. 1.1(b). The gain in *each main lobe* with respect to that from a single radiator is in the region of 3 to 4dB. Fig. 1.1(b).

Another example of endfire radiation, again using two vertical radiators, is illustrated in Fig. 1.1(c). In this case the spacing is also $\lambda/8$ but the phase difference between the currents flowing in each radiator is 135 degrees, thus producing a uni-directional cardioid (heart shaped) radiation pattern, Fig. 1.1(c). This particular combination of spacing and phasing is the basis of the two-element ZL Special and others, as will be illustrated later.

Broadside Condition

The principle of radiator spacing and phasing is the same except that instead of maximum radiation being in directions in line with the radiators it is *broadside* to them. An example is shown in Fig. 1.1(d) where the spacing between the radiators is $\lambda/2$ and the currents flowing in each are "in phase". Gain in each main lobe is about 4dB over that from a single radiator.

GH Brown Patterns

The 40 different radiation patterns obtainable with various double radiator broadside and endfire arrays are classic and illustrated in Fig. 1.2.[1,2] In some cases the spacing and phasing is such that radiation is very little different to that which could otherwise be obtained from a single radiator. Note that in the examples given, including those in Fig. 1.2, the polarisation of the radiation is vertical—we shall be deal-

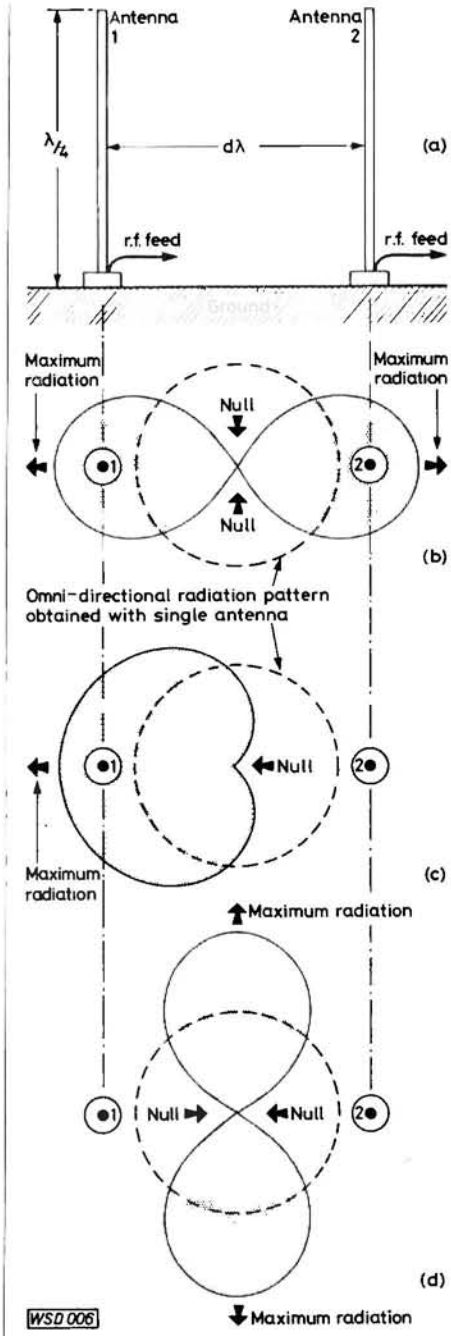

Fig. 1.1: The basic antenna arrangement is shown in (a). In (b) $d\lambda = \lambda/8$ and each antenna is driven in phase opposition (a phase difference of 180 degrees), in (c) $d = \lambda/8$ but the phase difference is 135 degrees. A $d\lambda$ of $\lambda/2$ is shown in (d) and the antennas are fed in-phase

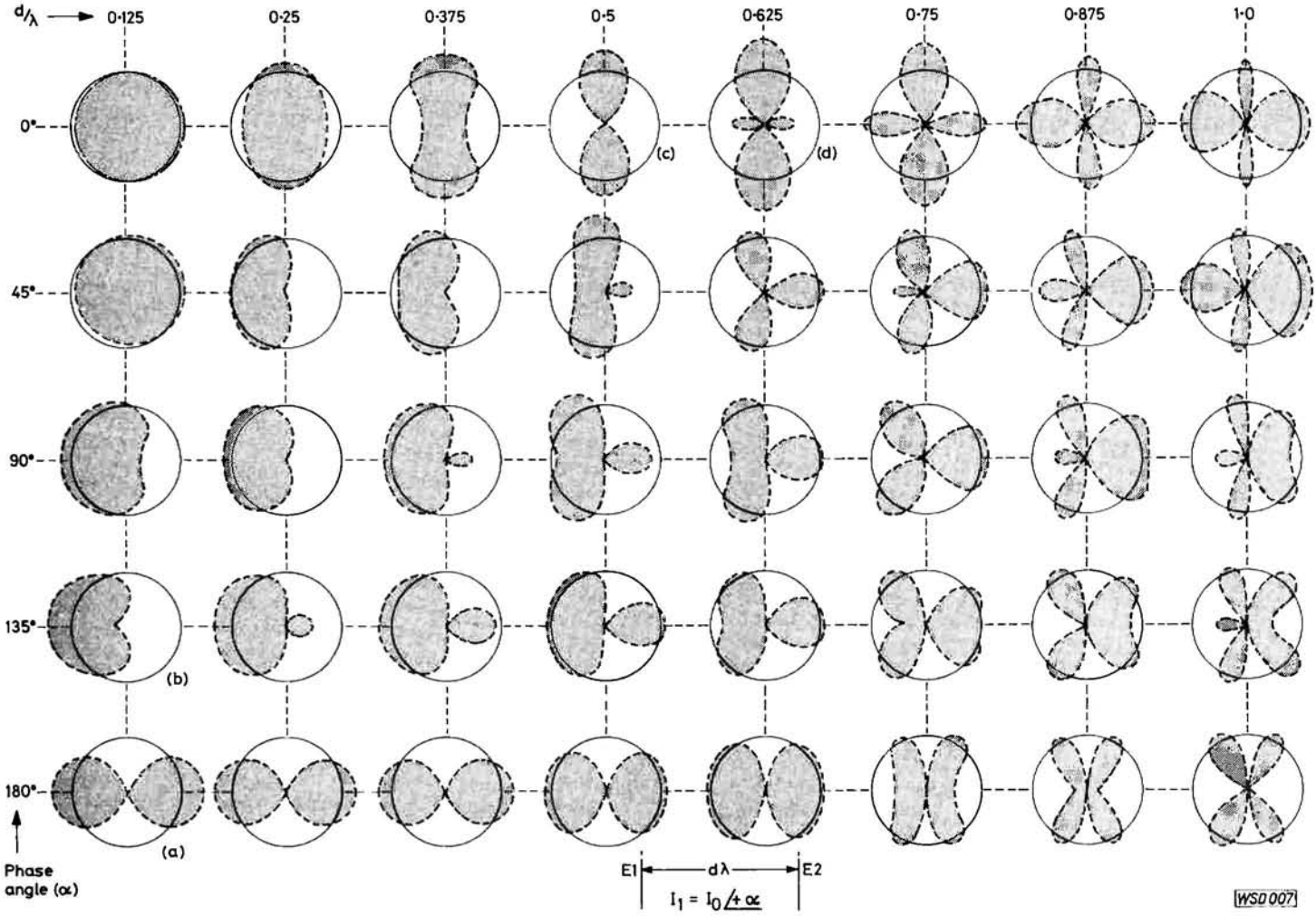

Fig. 1.2: The classic G. H. Brown radiation patterns with two spaced and driven radiators with various phase relationships between the currents flowing in each. (See text with reference to those marked (a), (b), (c) and (d))

ing with horizontal systems later. Some of the patterns in Fig. 1.2 are partially broadside and endfire and particularly so when the radiators are widely spaced. The most useful applications are marked in Fig. 1.2 as (a), (b), (c) and (d). Pattern (a) with close spacing (λ/8) and with currents in the radiators in phase opposition (180 degrees) provides the greatest gain in each direction for an endfire system. Pattern (b) provides the greatest gain for a unidirectional (cardioid) pattern, with close spacing and 135 degrees phase difference between the currents flowing in each radiator. This is the basis of most antennas with cardioid radiation patterns in the vertical mode. Pattern (d) will give a slightly greater gain (spacing 5λ/8) with radiators driven "in phase" and whilst providing "broadside" bi-directional radiation, there are two small (endfire) side lobes at 90 degrees to the main lobes. Other endfire and broadside arrays can be devised and one particular broadside array that has proved popular, particularly for the 14MHz band, is known as the "Bobtail" antenna, consisting of three vertical phased radiators. Further details later.

There are also commercially available versions of vertical arrays such as those by Telex/Hygain, the phasing of which can be changed to obtain alternative directivity, for example, broadside to endfire[3]. Some details of these will also be given in this series.

Notes: In the so-called "broadside" case there are always two major lobes broadside to the array[4], although with large spacings between the radiators there may be two narrow endfire lobes of equal magnitude, as can be seen in some of the patterns shown in Fig. 1.2 where the spacing is at one wavelength. For the endfire case the pattern is always *zero radiation broadside.* The maximum radiation is always endfire if the spacing between the radiators is λ/2 or less. However, for greater spacings the maximum radiation is, in general, not endfire. Since spacing of λ/2 or less is of principle interest, antennas based on this are always endfire types.

Practical Broadside and Endfire Systems

The preceding explanation using the G. H. Brown patterns, Fig. 1.2, derived from two vertical λ/4 radiators has been given to provide some understanding of how the spacing and phasing of two driven elements can provide specific patterns of directivity. Whilst λ/4 radiators can be used in broadside or endfire working systems the most popular application is in horizontal arrays with λ/2 *elements* which offer considerable scope for experiment. Although there are a number of well known systems of this nature described in the text books[5] it is only fair to point out that in some cases a considerable amount of space may be required for some of the larger arrays, particularly those intended for use on the lower h.f. bands.

Broadside Arrays with Parallel λ/2 Elements

To obtain broadside directivity with parallel λ/2 elements, the currents flowing in each must be in phase. Arrays of this nature can theoretically have any number of elements but construction and available space usually limits the number of elements to two, especially for amateur bands below 28MHz. This applies particularly when horizontal polarisation is required, although four or more elements may be used conveniently for v.h.f.

The power gain of a parallel element broadside array depends on spacing between the elements as well as the number of elements. Gain versus spacing with two-element arrays is shown

in the graph, Fig. 1.3, greatest gain being obtained when the spacing is in the region of 0·7λ. Higher gain factors are possible with more than two elements as shown in Table 1.1 which assumes that the elements are all in the same plane.

TABLE 1.1

Number of parallel elements	Gain (dB) with λ/2 spacing	Gain (dB) with 3λ/4 spacing
3	5	7
4	6	8·5
5	7	10
6	8	11

Two-element Broadside Arrays

Each element or radiator in a broadside array must be connected by transmission lines so that r.f. power is in the correct phase in each element. Two methods are illustrated in Fig. 1.4. That designated (a) has the main transmission line connected to the centre of the phasing line. The two sections of this line AB and AC are in parallel with respect to the main transmission line so the currents in the phasing line flow in opposite directions with respect to the feed point at A. This brings the currents in the two radiating elements "in phase".

The phasing line can be any length to meet the spacing required between the driven elements. The feed impedance at A will be below 100Ω and assuming that the phasing line itself is at least λ/2 long, its impedance will be about 600Ω.

The arrangement designated (b) has the main transmission line connected at the junction between the lower driven element and the crossed over phasing line. The crossover is necessary to retain the correct phasing in both radiating elements. In each case the arrows in the diagrams show the direction of the currents flowing in the elements of both systems. The phasing line for the (b) system must be an electrical λ/2, which with open line wires is virtually equal to the natural wavelength. If the velocity factor of the phasing line were much less than 1, the gain of the antenna would be affected. The arrays shown in Fig. 1.4 may be used either horizonally or vertically and the "free-space" directivity pattern is similar to that shown in Fig. 1.1.

The second part of this series will deal with two-element endfire arrays and the way in which both broadside and endfire systems are used in practice.

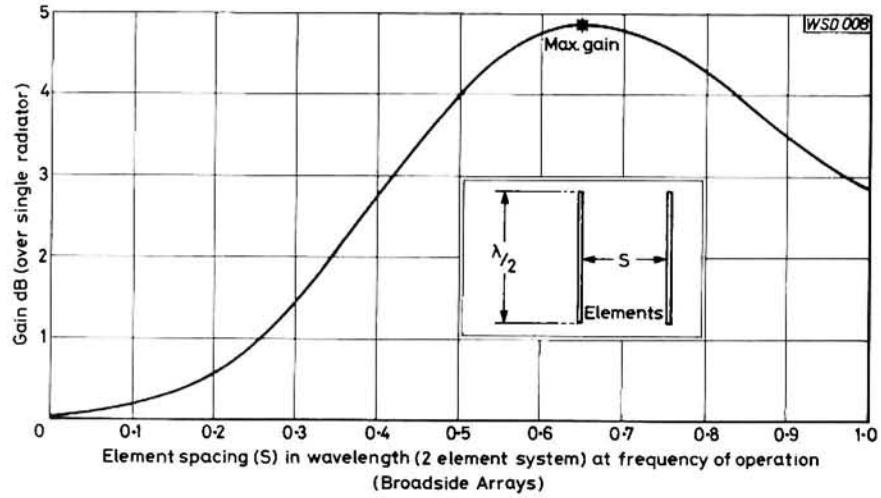

Fig. 1.3: Gain versus element spacing for two-element broadside arrays

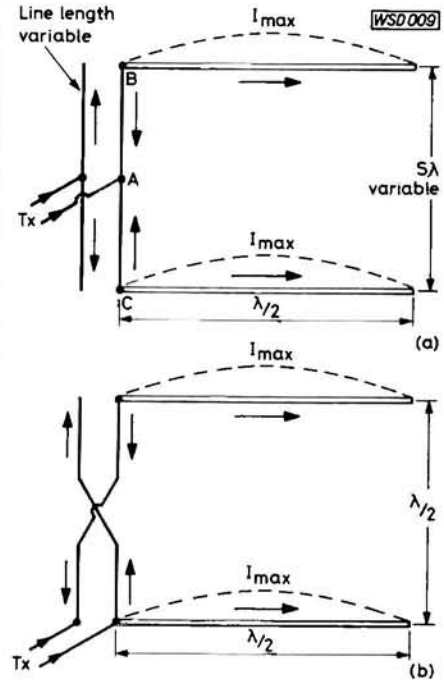

Fig. 1.4: (a) Method of feeding a two half-wave element broadside array so as to obtain current in the radiators in-phase as the arrow indicates (b) an alternative feed method

References

1) *Henneys Radio Engineering Handbook*—3rd Edition Terman, 1941.
2) G. H. Brown. *Proc. I.R.E.* Jan, 1937.
3) *Telex Communications Engineering Report* (Amateur Phasing) PN 801774 9600 Aldrich Ave. South, Minneapolis, MN 55420, USA.
4) *Antennas* J. D. Kraus—McGraw Hill Book Co. Inc. 1950.
5) *The ARRL Antenna Handbook.* ARRL. USA.

THE PRACTICAL WIRELESS

Reader Questionnaire

As promised in our June issue, we are publishing here a run-down of the results of the *PW 1985 Reader Questionnaire*, with comparative figures for the USA taken from *73 Magazine*, and for Japan where a similar questionnaire appeared in *CQ Ham Radio*.

All results are given as a percentage. The **BOLD** figures are the UK results in each case. The *ITALIC* figures are the results of the United States survey, and the PLAIN figures are the results of the Japanese survey. A dash (—) means the question wasn't asked, a zero (0) means "Less than 1%". The comments (rude or otherwise) after each set of results are entirely my own!

Our thanks go to everyone who completed and returned our questionnaire. I hope you'll find that the results make interesting reading.

Geoff Arnold
Editor

BACKGROUND

1. Do you hold a current UK amateur transmitting licence?

Yes	**75**		
No	**25**		

100% licensed in US, 97% in Japan.

2. Which class of licence do you have?

Class A	**53**		
Class B	**47**		

Not too different from overall UK split of amateur licensees.

3. How long have you had a licence?

1 year or less	**15**	*2*	1
1–5 years	**56**	*31*	43
6–10 years	**9**	*13*	30
11–20 years	**9**	*32*	22
21 years or more	**11**	*22*	4

Clear evidence of the ex-CBer boom in UK.

4. How old are you?

15 and under	**1**	*3*	1
16–21	**7**	*5*	9
22–39	**41**	*27*	60
40–59*	**36**	*38*	26
60 and over	**16**	*27*	4

** Age 40–55 in Japan, where common retiring age is 55.*

5. About how many hours a week do you devote to amateur radio? (round up to nearest hour)

Up to 1 hour	**4**	*8*	42
2–5 hours	**32**	*35*	35
6–10 hours	**33**	*33*	15
11–20 hours	**21**	*19*	6
21 hours or more	**10**	*5*	2

The UK amateur takes his hobby pretty seriously!

For questions 6, 7 and 8, the US and Japanese readers were asked to name their favourite single band or mode. This obviously produces a different slant to the answers, but we felt the single choice was too difficult for many people to answer sensibly.

6. Which h.f. amateur band(s) do you use most often?

1·8MHz	**10**	—	1
3·5MHz	**33**	*17*	3
7MHz	**16**	*25*	21
10MHz	**4**	—	1
14MHz	**34**	*21*	3
21MHz	**13**	*24*	25
28MHz	**15**		3
Do not operate h.f.	**36**	*13*	43

An interesting pattern, this. Geography obviously plays a big part, but why such a big thumbs-down for 20m in Japan?

7. Which v.h.f./u.h.f. amateur band(s) do you use most?

50/70MHz	**2**	*2*	11
144MHz	**72**	*74*	68
430MHz	**18**	*4**	16
1200MHz or higher	**2**		1
Do not operate v.h.f./u.h.f.	**19**	*14*	4

** 6% of US amateurs use their 220MHz band. An obvious runaway for 2m all round.*

8. Which mode(s) do you use most?

a.m./s.s.b.	**63**	*42*	31
c.w.	**25**	*18*	5
f.m.	**54**	*31*	63
RTTY	**14**	*5*	0
SSTV	**1**	*	0
TV	**3**	*	0

**In the US, "other" modes polled 4%. In Japan 1% favour FAX.*

9. How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazines, club or society dues, and other incidental expenses).

£0–£50	**15**	*51*	60
£51–£250	**41**		
£251–£500	**21**	*30*	20
£501–£1000	**15**	*13*	13
£1001–£2500	**6**	*4*	5
£2501+	**1**	*2*	2

The price-bands in Japan converted at about 70% of the Sterling figures shown. For the US, $1 is assumed to equal £1.

SOCIAL CHARACTERISTICS

10. Has amateur radio influenced your choice of career?

Greatly	**10**	*24*	28
Somewhat	**17**	*22*	65
Not at all	**73**	*54*	7

Though many UK amateurs are employed in electronic/radio engineering, for most their career obviously influenced their choice of hobby, rather than the other way round.

11. How old were you when you first became interested in the radio hobby?*

15 years or younger	**56**	*13*	13
16–21 years	**20**	*50*	24
22–39 years	**17**	*21*	53
40–59 years	**5**	*11*	10
60 and over	**1**	*5*	0

**In the US and Japan readers were asked when they became a ham, not quite the same thing.*

12. Should the licensing body increase the speed on amateur c.w. examinations?

Yes	**9**	*13*	27
No	**87**	*87*	57

Not much doubt about this one in the UK.

13. Do you own a home computer?

Yes	**60**	*55*	23
No	**40**	*45*	74

Thank you, Sir Clive!

14. Do you think radio amateurs, compared to computer hobbyists, are:

More technically inclined in their hobby	**57**	*26*	37
Less technically inclined in their hobby	**3**	*38*	15
Both are about equally skilled in their hobby	**39**	*36*	45

The more general availability of ready-to-go home computer packages in the UK has probably influenced this one.

15. Do you think that home computing is siphoning people (including youngsters) away from amateur radio?

Yes	**29**	*60*	23
No	**69**	*40*	74

A reassuring answer for the UK but I'm not sure it's true.

16. Should the Radio Amateurs Examination System remain as it is?

Yes	**71**	—	62
No	**27**	—	36

No equivalent to this question in the US survey. The CGLI gets a healthy pass mark, though it's by no means unanimous.

17. Should amateur licences have a minimum age requirement?

Yes	**89**	*45*	17
No	**9**	*55*	83

The US and Japan have no minimum age limit.

18. Do you think that radio amateurs should be subject to periodic retesting?

Yes	**21**	*6*	19
No	**79**	*94*	81

We're not quite so sure in the UK.

OPERATING HABITS

19. If amateurs were restricted to data communication only (no phone or c.w. operation) in all amateur bands, would you still continue with amateur radio as a hobby?

Yes	**41**	*43*	43
No	**56**	*57*	57

The US question related to the 220MHz band only, proposing a digital class licence. I'm surprised (and impressed) by the UK and the Japanese response.

20. Have you ever used a personal computer in conjunction with your amateur radio activities?

Yes	**49**	*70*	20
No	**49**	*30*	79

You can't get much more evenly divided than that!

21. Is it time to completely deregulate amateur radio by having the licensing authority turn over all responsibility for amateur operation to the amateur community?

Yes	**19**	*55*	47
No	**78**	*45*	51

We trust ourselves even less than the Americans and Japanese.

22. What do you think about exchanging QSL cards?

Like it a lot	**17**	—	26
Like it	**38**	—	43
Neither like nor dislike	**40**	—	24
Don't like it	**3**	—	7
Dislike it a lot	**1**	—	0

A popular occupation.

23. Do you think that c.w. sub-bands should be:

Abolished / Reduced in size	**3 / 5**	*61*	16
Left as now / Increased in size	**79 / 10**	*39*	79

The US and Japanese amateurs were given only two options: Abolish or reduce—Yes or No? *For the UK, c.w. rules!*

24. Do you think that DX nets have a place in amateur radio?

Yes	**78**	*34*	56
No	**20**	*66*	40

Our lower output power limit probably affects this one.

25. Do you think that nets in general have a place in amateur radio?

Yes	**88**	*70*	34
No	**10**	*30*	50

We do like a natter.

26. If, while tuning across a band, you heard a net called "Jammers International" in progress would you:

Jam it	**0**	*8*	1
Ignore it	**43**	*13*	59
Complain to the licensing authority or some other organisation	**23**	*63*	10
Listen to it	**33**	*15*	28
Join it	**0**	*1*	—

Well done, you Gs . . .

27. If required, could you solidly copy c.w. at the speed at which you were licensed?

Yes	**85**	*70*	18
No	**14**	*30*	46

. no need to get that pleased with yourselves, though.

28. If required, could you now pass the Radio Amateurs Examination?

Yes	**65**	*72*	63
No	**6**	*28*	34
Don't know	**29**	—	—

Well, 25% of our readers were unlicensed.

29. Do you think your national Radio Society affects amateur radio in a positive manner?

Yes	**79**	*37*	68
No	**18**	*63*	32

There's a moral here somewhere.

30. Do you ever speak to foreign, non-English-speaking amateurs in their own language?

Often	**3**	*2*	2
Sometimes	**8**	*16*	21
I attempt it	**19**	*25*	5
Rarely	**11**	*5*	21
Never	**51**	*52*	51

The Japanese were asked about use of any foreign language other *than English. It's good to see that almost half the amateurs in each country were prepared to have a go.*

31. Do you solder together your own coaxial connectors?

Yes	**94**	*95*	93
No	**4**	*5*	7

Very creditable.

32. Is your antenna system mounted on your:

House	**65**	*93*	74
Tower/mast	**37**	*7*	26
I only operate mobile/portable	**4**	—	

The tower/mast salesmen must be doing a better job in the UK.

33. Have you ever designed or made your own antenna?

Designed and made	**42**	*4*	49
Made from a published design	**49**	—	—
Never	**13**	*96*	51

CQ Ham Radio *wondered about the definition of "design".*

34. What do you think of contesting?

Like it a lot	**8**	*10*	10
Like it	**20**	*25*	38
Neither like nor dislike it	**48**	*11*	28
Don't like it	**15**	*23*	19
Dislike it a lot	**8**	*31*	0

Surprising. I wonder what the results would be if the question was split into h.f. and v.h.f./u.h.f.?

35. What do you think of DXing?

Like it a lot	**37**	*35*	40
Like it	**38**	*27*	35
Neither like nor dislike it	**22**	*12*	19
Don't like it	**1**	*12*	6
Dislike it a lot	**0**	*14*	0

I wonder why the US figures are so different at the bottom end.

36. What do you think of repeaters?

A very good idea	**34**	*35*	24
A good idea	**31**	*10*	37
Acceptable	**26**	*35*	29
Not a good idea	**4**	*12*	9
Totally against them	**3**	*8*	1

The anti-repeater lobby gets short shrift.

37. If you heard an emergency net in progress, would you:

Join in immediately and offer to help	**9**	*64*	79
Listen, in case your help was needed / Ignore it	**86 / 1**	*36*	21

What eminently sensible chaps we British are!

38. Do you use CB radio?

Used it in the past	**33**
Use it now	**20**
Never used it	**47**

Not too popular with our readers.

39. Do you think that there should be some form of novice licence in the UK?

Yes, for c.w. only	**19**
Yes, for phone only	**8**
Yes, for phone and c.w.	**15**
No	**57**

Two thirds of licensees and nearly a third of non licensees are against a Novice licence.

40. Do you construct your own radio equipment or accessories (excluding antennas)?

Yes	**78**
No	**22**
(If "YES", How?)	
From your own designs	**33**
From designs published in books or magazines	**88**

Component suppliers please note.

41. How would you describe your expertise in radio/electronics?

Beginner	**27**
Average	**55**
Advanced	**18**

42. How many radio rallies/exhibitions do you visit each year?

None	**21**
1	**23**
2 or 3	**41**
4 or more	**13**

We're a gregarious lot.

43. Which of these radio clubs/societies, if any, do you belong to?

AMSAT	**7**
BARTG	**9**
BATC	**3**
DXAGB	**0**
G-QRP	**9**
RAYNET	**12**
RSGB	**61**
Local radio society	**45**
None of these	**24**

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Have Yaesu FC-707 a.t.u. and dummy load, Sanko XL400S Super 8 sound camera with zoom and macro and Sanyo SHV2000 portable 8mm and Super 8mm sound projector with built-in screen. Would exchange for h.f. linear, 430MHz base station, home computer or w.h.y. G4NJP QTHR. Tel: 0262 673635. *A326*

Have Icom 290E, HM10, SM5 mics, mobile mount, 9-element Tonna, all in v.g.w.o. and valued about £290. Would exchange for h.f. rig—FT-101B, FT-101E, 707 or similar, w.h.y.? London area and swapper collects if possible. Tel: 01-200 3825. *A328*

Have plug in coils range AA, BB, CC, DD and a tatty cabinet etc., for an Eddystone 358X receiver. Would exchange for early wireless magazines etc., w.h.y. A. J. Humphriss. Tel: Warwick 400876. *A312*

Have Vibroplex paddle. Would exchange for a Vibroplex bug-any model. Cash adjstment if necessary. John Moran EI8DL, 1 Connolly Crescent, Longford, Rep of Ireland. Tel: 353-43 46761. *A315*

Have Omega Speedmaster watch, flight qualified by NASA, cost £345. Would exchange for 144MHz gear. Tel: Swansea 467384. *A319*

Have Sony ICF7600D, Sony ICF2001. Datong FL1 audio filter, SEM Ezitune, all in mint condition. Would exchange for Heathkit amateur bands or general coverage receiver. KW receiver also considered. N. Cameron EI4DZ, 16 St. Mary's Crescent, Westport, Co. Mayo. Eire. *A331*

Have Commodore 64 plus disc drives. Also have basic extension cartridge with joystick, books and software. All boxed as new. Would exchange for Yaesu FRG-7700 MEM with a.t.u. or v.h.f. converter. Billy, 9 South Road, Port Glasgow PA14 5TA. Tel: 0475 45009. *A332*

Have Murphy CBH1500 base station CB rig, with mic, built-in s.w.r. meter etc. Boxed as new. Also have Modulator Saturn base CB antenna (never used), Micronta 27-range analogue multimeter (hardly used), Polaroid 600 camera (unwanted gift) and some ZX81 spares. Would exchange for 48K Spectrum or similar computer. G. Johnson, 95a Coventry Road, Nuneaton, Warwickshire CB10 7AA. Tel: 0203 341368 after 5pm. *A343*

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RESULTS RESULTS RESULTS

RESULTS RESULTS RESULTS

by Neill Taylor G4HLX

The third *Practical Wireless* 144MHz QRP contest, on June 16, again attracted a large entry, 199 logs having been received, 151 of them from portable stations. The scale of this event is now well established, and there can have been few of the accessible hill-tops in England and Wales which were not occupied by at least one station. The logs show that in addition to those actually entering the contest there were many other portable stations active for part of the day, just giving away points and enjoying the high level of QRP activity.

The overall winners, for the second successive year, are the Bug Bashers Contest Group, comprising G4VXE, G8TFI, GW4TTU and GW5NF, operating under the callsign GW4VXE/P. A change of site this year took them to a spot south of Hay-on-Wye, in the most popular locator IO82KA, in which no less than four separate portable stations were sited! Whilst the other three stations were grouped together on the mountain summits, GW4VXE/P were a little further north, making up for the lower altitude with a most impressive array of antennas: eight 9-element Yagis in a stacked/bayed formation (yes, eight!). "We heard that various groups would be using four Yagis this year, so we decided to go mad! There will not be sixteen 9-eles next year, though."

Of the 78 single operator stations, the leader was Christopher Foster, GW6MKR/P (last year's 2nd placed single op.) on Pen-y-Gadair Fawr, also in the Black Mountains, a little to the south of the stations mentioned above.

We have become accustomed to seeing Welsh stations in the top positions in the results, but this year the leading Scottish station, that of the Ayr Amateur Radio Group, GM4PPT/P, is in fourth place. Their activity from "Beneraird", a hill south of Girvan, gives them a result superior to that of any English station. The best result from England is that of G1FBH/P, the "SNAFU" Contest Group (Situation Normal—All Frequencies Unusable), on Firle Beacon in East Sussex. In EI/GI, the leading entry is from Joe Bingham, GI4TAJ/P, single operator at the standing stones near Larne.

Of the 48 fixed stations, the leader is the single operator station of Ian Mitchell, G0BUK at Hastings in East Sussex.

Certificates are awarded to all the above mentioned, plus those in second and third place in both single and multi-operator category (see table) and, of course, the winner's cup to the Bug Bashers group. This year we are also awarding a certificate to the leading station in each locator square. To lead in a square in which the number of entrants is high is a considerable achievement. Conversely, stations in the out-lying areas with a low amateur population may find it more difficult to reach very high scores, though their effort is no less commendable. Thus all square-leaders are receiving certificates, even in squares with one or two entrants, in the hope that this policy may encourage activity in these areas in future years.

The positions of all 199 stations are shown in the table—a detailed results list is available on receipt of a large s.a.e. at the Poole Offices. Those entrants who have already submitted envelopes will receive the results shortly.

Certificate Winners

Overall Winners	Bug Bashers Contest Group	GW4VXE/P
Runners-up	Glamorgan CG / Hillingdon ARC	GW1DXY/P
3rd Place	Guildford & District Radio Soc.	GW6GS/P
Leading Single Operator	Christopher Foster	GW6MKR/P
Runner-up Single Operator	Michael Ryder	GW6DTD/P
3rd Placed Single Operator	Dave Warburton	G6LKB/P
Leading Fixed Station	Ian Mitchell	G0BUK
Leading English Station	SNAFU Contest Group	G1FBH/P
Leading Scottish Station	Ayr ARG "A" Team	GM4PPT/P
Leading Irish Station	Joe Bingham	GI4TAJ/P

Also leading stations in each locator square—see separate table.

The Logs

The standard of entries this year was again generally high, although as usual a substantial number of stations lost points due to logging errors. Many stations presented their entries as neat and clear logs which were straightforward to check. On the other hand, a few seem bent on making the adjudicator's job as hard as possible.

One particular misdemeanour which causes extra work during checking is the omission of the check list of squares worked (required by Rule 6h). Another is neglecting to underline or highlight the first contact in each square (Rule 5). These tasks are simple matters for an entrant with a single log to deal with, but are unwelcome chores for the adjudicator with almost 200 logs on his hands. Entrants who have broken both of these rules have had their final score reduced by 5 per cent as a penalty.

Several stations (only one of which submitted an entry) were heard to change their callsign each time they changed operators. While not actually prohibited by the rules (it will be next year!), this can cause confusion where duplicate contacts are concerned. Valuable time may be lost when it becomes necessary to explain to a caller that he has already worked the station, under a different callsign.

The adoption of the new locator system seems to have gone very smoothly, and it appears that there were less errors in the locators sent than in previous years, presumably because all stations had to work out theirs from scratch, and have done so carefully. One notable exception was spotted by, amongst others, G0AZT/P: "One station gave a locator that placed him 80km into the English channel".

Only one group, GW4VXE/P, grumbled about the locator system itself. They find it "more cumbersome and less accurate than the old system", and believe that operators have only "grudgingly adopted the IARU locator", there being "considerable justified opposition to it". If this is so, the other 198 entrants have not voiced their opposition! Debate over the system may continue, but for the purposes of this contest, there is little doubt that it works well and has been generally well received by entrants.

One contentious point in the rules was the requirement for a full 6-digit universal locator to have been received for a square to count as a multiplier. GM6FPX/P suggests "both QRA and new locator system to count for multipliers", and G4WBR says the rule "seems illogical as the major squares are concurrent". The reason for this rule was simply that without it some contestants would have attempted to claim the same square as two multipliers—once in each system (e.g. claim both YL and IO81 as separate squares). A couple of entrants tried to do this anyway!

Conditions

Both weather and propagation conditions were unexceptional, although with the usual geographic variations. No-one reported extreme weather, although it seems to have been acceptable for portable activity in most areas. "*PW* always seems to pick the right weather," says G8DDY/P on the Isle of Wight, while "the weather left a bit to be desired" at G4RSB/P near Sheffield, which summarises many of the comments on this subject.

Most entrants were agreed that propagation was poor compared with previous years, typical comments being "very disappointed with band conditions"

Pos.	Call	Points
1	GW4VXE/P	14 246
2	GW1DXY/P	12 792
3	GW6GS/P	10 044
4	GM4PPT/P	9256
5	G1FBH/P	8672
6	GW6GW/P	7772
7	GW6MKR/P	7700
8	GW6DTD/P	7452
9	G3UAX/P	7020
10	G4WET/P	6960
11	G4XPS/P	6696
12	G6ZME/P	6600
13	G6LKB/P	6554
14	G4RLF/P	6480
15	G4BWD/P	6399
16	G4SKA/P	6292
17	G6NEX/P	6275
18	G8PRF/P	6162
19	G0BSU/P	6120
20	G4MWC/P	6000
21	GM4RAH/P	5724
22	GW4ARC/P	5496
23	GM0BQM/P	5448
24	G4LRP/P	5145
25	GW4ZTR/P	5082
26	GW4XGA/P	5016
27	GW4ARI/P	4800
28	G4WIK/P	4752
29	G0AOZ/P	4600
30	GW4NDH/P	4550
31	GW4WVB/P	4320
32	G6OYL/P	4301
33	G0AYN/P	4225
34	G6PXN/P	4158
35	G6VWH/P	3960
36	G0BPS/P	3749
37	G4SFQ/A	3618
38	G0BUK	3588
39	G4RSB/P	3564
40	G4VRY/P	3465
41	G4GTT	3410
42	G4ETW/P	3363
43	G0BWC/P	3287
44	G8CYW/P	3266
45	G4RS/P	3240
46	G3WTP/P	3197
47	G6ZUL/P	3116
48	GW4ZUL/P	3088
49	G4MDP/P	3077
50	G6XYL/P	3075
51	G4VKE/P	3058
52	G4GXP/P	3056
53	G4VAT/P	3024
54	G8DDY/P	3006
55	G4XPE/P	2975
56	G4INL/P	2928
57	GM6FPX/P	2790
58	G1CPP/P	2752
59	G4URT/P	2740
60	G8SDS/P	2686
61	G4THI/P	2669
62	G6ABB/P	2640
63	G4SJK/P	2599
64	G6HEL/P	2520
65	G2XV/A	2500
66	GW4NVA/P	2420
67	G4WFR	2394
68	G6TWW/P	2268
69	G4YGW/P	2193
70	G4YPT/P	2144
71	G1EME/P	2115
72	G3SVC/P	2106
73	G6PHF/P	2080
74	G4OJD	2069
75	G4SLH/P	2052
76	GI4TAJ/P	2037
77	G1AGM/P	2006
78	G4YTC/P	2002
79	G1EFC/P	1972
80	G6ZPN	1936
81	G1BRS	1904
82	G4WZA/P	1872
83	G8VVY/P	1860
84	G6YZR/P	1853
85	GW4LWD/P	1820
86	G0AAM/P	1806
87	G3BPK/P	1768
88	G3YLE/P	1728
89	G4XQW/P	1708
90	G4ZVS/P	1694
91	G8WY/P	1677
92	G3CAR/P	1666
93	G4LRC/P	1640
94	G3FJE/P	1616
95	GW1DTA/P	1596
96	G1FVR	1575
97	G4WOX/P	1566
98	GW1LHY/P	1530
99	GW1HGV/P	1500
100	G4UXY/P	1484
101	G6SRS/P	1482
102	G0AZP	1470
103	G1GVA/P	1428
	G4FOX	1428
105	G4NAV/P	1410
106	G6LOH	1386
107	G0ACK/P	1380
108	G4KGB	1378
109	GJ6OZB	1370
110	G4YYE	1368
111	G4RSE/P	1339
112	G6TPL	1332
113	G4ZPP/A	1316
114	G4WBM/P	1287
115	G6CSY/P	1284
116	G6MWS/P	1224
	G3XZW/P	1224
118	G0BNC/P	1222
119	G4ZOZ/P	1210
120	G6IEK/P	1204
121	G6XUV/P	1185
122	G4WBR	1176
123	GW6JBN/P	1168
124	G1IPA	1139
125	G1CSM/P	1092
126	G1FAR	1064
127	EI4FO/P	1056
128	G6UKX/P	1032
129	G1JJA	1020
130	G0ANX/P	1014
131	G6XYI/P	1012
132	G1MPW/P	994
133	GM4LAA/P	990
134	G1IZK	988
135	G4WGE/A	979
136	GM4SOY/P	975
	G1GFZ/P	975
138	G0ABS/P	948
139	G1EZS	910
140	G4UOL/P	891
141	G1HJX	871
142	GW3POM	868
143	G0BTE	848
144	G2HR	846
145	G1LVY/A	828
146	G4WCK/P	816
147	G4WXN/P	810
148	G4UGC/P	792
149	G1GNC	784
150	G1MBC/P	770
	GM1DSK/P	770
152	GM4RGS/P	767
153	G4WRD	752
154	GM1KTM/P	742
155	G0BRY	737
156	GI4KKK/P	730
157	G6PGT	715
158	GW6XPY/P	714
159	G4SKG/P	672
160	G1JKX/P	650
161	G4BGH/P	636
162	G0AZT/P	627
163	G1DWQ	624
164	G4FVK	616
	G1DPT/P	616
166	G4ZYR/A	602
167	GM4WMN/P	585
168	G1BEK	583
169	G6NZG	561
170	GM4YWU/P	560
171	G1INL	546
172	GW8IPT/P	517
173	G6ZVB	500
174	G6MKS/P	494
175	GI8YWR/P	476
176	GM4ZUK	468
177	G6UTC/P	423
178	G1NCG/P	410
179	G4ZQN/P	387
180	G8GFF	351
181	G4UZB	342
182	G1GVC	333
183	G6BJR/P	324
184	G8VEL	315
185	G6ZRM/P	312
186	G8SRL	297
187	GJ8ZRE/M	279
	GM6MGS/P	279
189	G1AMX	253
190	G6RZZ	192
191	G2DHV/P	180
192	GM1JPJ/P	154
193	G6ZGD	144
194	GM3NHQ/P	133
195	G1KVY/P	102
196	G1GPY/P	75
197	G1JND/P	48
198	GM6GJZ	30
199	G4OED	18

(GM4RAH/P), "conditions seemed somewhat down and we found it a bit of a struggle" (G4WET/P), "conditions can be best described as dire!" (G4URT/P).

Despite this, some good distances were worked, and many. like G1JJA, were "very pleased with what was achieved with 3 watts". The highlight for some was a brief opening to central Europe at around 0930GMT, presumably by sporadic-E. "Imagine our surprise when OE1DR answered our call," says G4YTC/P, "it totally devastated our system for a moment." At least they made the QSO. unlike GW4VXE/P, in whose log a comment at 0931 reads "OK2SBL called—not worked due to operator's state of shock!"

Signals

The assessment of the quality of radiated signals always seems a somewhat subjective matter, and one in which a consensus of opinion is rare. However, there does seem to be a general view that, as GW1DTA/P notes, it was "nice to hear cleaner signals this time". "We did not suffer so much this year from wide signals," says GM4RGS/P. Again, excessive compression of speech seems to have been the chief evil, "speech processors were very much in evidence, resulting in some 'horrible' and broad signals," remarks GM1KTM/P.

More significant is a welcome trend towards criticism of one's own receiver, rather than of the other station's transmitter. Several stations admit to severe receiver front-end problems, for example G8VEL, who "lost some time at the beginning as the front end was desensitising due to a newly fitted pre-amp".

It is. of course, difficult to tell if the general improvement in reports of signal quality, mentioned above, is actually due to cleaner transmissions, or to better (more bomb-proof) receiver front ends. Maybe more groups are deciding to leave their high gain pre-amps at home, or at least to tame them by reducing the gain to the minimum required. The message does seem to be slowly getting through, although a few stations still seem to take the attitude "our receiver does not overload", which, of course, can only be true of a real receiver if it is switched off!

This year the adjudicator's own station used a simple procedure to assess the power output level of many of the stations worked. The technique, based on reciprocal reception of signals at very weak levels, is not highly accurate, but is sufficient to ensure that power is roughly within the 3W limit. It did successfully spot a few higher power signals which all turned out to be from non-competitors, but all contest entrants which were tested were believed to be genuinely QRP.

A few entrants have their suspicions raised by how strong a signal sounds. This can never be a good guide to the power output of a station heard, as if a signal is "very strong", the perception of its strength is little altered by a substantial change in power output. For example, a "very strong" signal, received at S9+50dB if running 30W, would still be a "very strong" S9+40dB at 3W, and in fact would be a "strong" S9 if power were reduced to 300 microwatts! It is at the weak end of the range that power changes become noticeable: a station running 30W and being received at a readable 6dB signal-to-noise would disappear altogether if he dropped power to 3W.

Hectic

"The climb up that damn hill was a killer," remarks G6TWW/P, a comment echoed by GM6FPX/P. Several entrants have mentioned the effort which goes into a successful station, not only hill-climbing but also organisational effort: GM6FPX/P found it "the most incredibly hectic weekend I have ever spent". G0ANX/P found that there was "more effort involved than I at first thought".

There is also no clear optimal number in a team: "It's a strain trying to operate for such a long period as a single operator" (G1GVA/P); "a lot of work for just two of you" (G1EFC/P); "hard work for four persons in a mountain tent" (G0AYN/P). Any advance?

Not everyone finds the preparation so hectic, G8VVY/P believes that "the 3W limit and 8 hour operating time are ideal, the lazy operator can leave everything to the last minute in preparation".

Strange but Harmless

Portable stations on hilltops are often sited near popular walks used by the general public, and several stations report having had visitors. "I poked my head out of the tent to find 70 walkers sat outside eating their lunch . . . I was suddenly the focus of their attention" (GW4ARI/P). "Several people stopped to enquire what was going on" at G1EME/P, "most, obviously, thought we were strange but harmless".

This was not the view, apparently, taken by the detectives who visited GM4RGS a few days after the contest, "enquiring as to what I was doing with a rotating antenna"

on a site overlooking a US base. "Apparently we had been reported by an MOD policeman as a suspicious lot".

At G4YTC/P, "a large collection of people gathered around a memorial stone about 12m away and proceeded to conduct a memorial service, "complete with the national anthem from a cassette player . . . we felt it only right to cease operating."

Other stations suffered interruptions, too. GM6FPX/P "got buzzed by a small plane. He came in so low that a couple of feet to the right and his undercarriage would have had some extra metal work." Operators at G8VVY/P were alarmed when "a slightly irate farmer appeared . . . we'd erected the antenna mast in the wrong field". G1IPA reports that "my wife made me switch off the rig so that I could mow both the lawns."

Next Year

As usual, many favourable comments about the contest in general were received, for which the adjudicator is grateful—it keeps up morale during the long process of cross-checking the logs. "Many of us consider it our favourite contest," says G6IEK/P.

For next year's event, we shall accept the advice of GW4ZTR/P: "don't change any of the rules too much". A few minor changes may be required, but there were very few grumbles about the rules this time.

A few stations in the far-flung corners of these Isles feel that the scoring system is weighted against them: "we feel that we are at a large disadvantage this far north of the border due to the lower density of the amateur population" (GM4RGS/P). This is undoubtedly true, although it is hard to see how any changes in the scoring system could significantly change things. GM1KTM/P feels that the present system "removes the incentive to work long distances". Many stations in the south, however, would have been only too keen to work up to the northerly squares if propagation had allowed, but with the band conditions as they were, even offering large cash prizes for contacts with IO86 square would have made little difference to the logs of stations there!

The contacts × squares scoring system is undoubtedly very popular for its simplicity and general fairness—it is here to stay. We hope that we have this year offered some reward for the efforts of those stations located in the out-lying areas by awarding certificates to the leading station in each locator square.

It just remains to extend thanks to all those who submitted entries and comments, and to PE1EWR and G2HIF/P for their useful check-logs, and finally to fix the date for next year's event. Two entrants think they have already guessed it: "I have just booked June 15 as part of my holiday ready for next year" (G0BPS/P and a similar comment from GM6GJZ).

They are quite right, the fourth *PW* 144MHz QRP Contest will take place 0900–1700GMT on Sunday 15 June 1986.

Leading Stations in Each Locator Square

Square	Name	Callsign	No. entrants in square
IN89	Kenneth Kirk-Bayley	GJ6OZB	2
IO62	John Murphy	EI4FO/P	1
IO64	Philip Pollock & others	GI8YWR/P	1
IO70	Bideford Bay Radio Club	G6XYL/P	3
IO71	Gower Peninsula CG	GW1DTA/P	2
IO72	Robert Chappell	GW6XPY/P	1
IO73	David Iles	GW4XGA/P	1
IO74	Joe Bingham	GI4TAJ/P	2
IO75	Ayr ARG "A" Team	GM4PPT/P	3
IO76	Big Ben Contest Group	GM6FPX/P	1
IO80	South Dorset Radio Soc.	G8SDS/P	9
IO81	Glamorgan CG / Hillingdon ARC	GW1DXY/P	16
IO82	Bug Bashers Contest Group	GW4VXE/P	19
IO83	R. Thawley & M. Hallsworth	G0BSU/P	10
IO84	Dave Warburton	G6LKB/P	9
IO85	P. Robertson & D. Taylor	GM4RAH/P	2
IO86	D. Keay & M. Clark	GM1DSK/P	6
IO87	Allan Duncan	GM4ZUK	2
IO90	The Horsham Ale Men	G4LRP/P	7
IO91	Roger Stansfield & others	G3UAX/P	33
IO92	Triple B Contest Group	G4WET/P	19
IO93	Oldham ARC Contest Group	G4XPS/P	16
IO94	D. J. Bryan	G4VRY/P	3
IO95	Hillbilly Contest Group	G1JKX/P	2
IO97	Radio Whisky Contest Group	GM6MGS/P	1
JO00	SNAFU Contest Group	G1FBH/P	5
JO01	Dick Pascoe	G0BPS/P	14
JO02	Steve Fletcher & Ray Baker	G4SFQ/A	7
JO03	Louth & District ARS	G4LRC/P	2

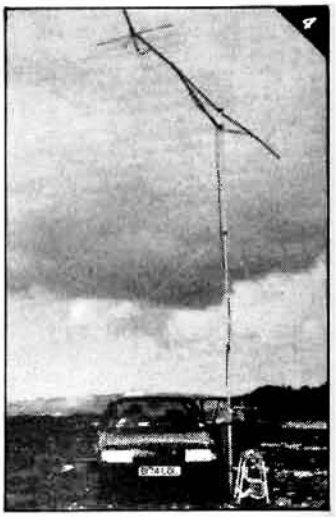
Leading Multi-Operator Stations

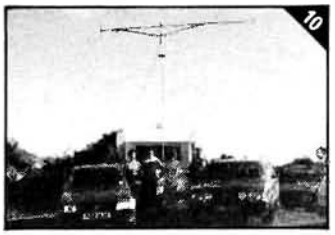
Pos.	Name	Callsign	Score	QSOs	Squs	Loc	Antenna	asl (m)	TX/RX
1	Bug Bashers Contest Group	GW4VXE/P	14 246	419	34	IO82KA	8 × 9Y	480	FT-225RD
2	Glamorgan CG / Hillingdon ARC	GW1DXY/P	12 792	328	39	IO81FR	4 × 17Y	600	IC-271E
3	Guildford & District RS	GW6GS/P	10 044	324	31	IO82KA	9Y	700	IC-271E
4	Ayr ARG "A" Team	GM4PPT/P	9256	356	26	IO75PB	4 × 9Y	440	FT-290R
5	SNAFU Contest Group	G1FBH/P	8672	271	32	JO00BT	17Y	220	TR-9130
6	Blackwood & District ARS	GW6GW/P	7772	268	29	IO81KS	4 × 9Y	580	FT-726R
9	Roger Stansfield & others	G3UAX/P	7020	260	27	IO91GI	4 × 9Y	300	TR-9000
10	Triple B Contest Group	G4WET/P	6960	290	24	IO92CA	4 × 14Y	305	IC-271E
11	Oldham ARC Contest Group	G4XPS/P	6696	279	24	IO93AO	17Y	580	FT-290R
12	Telford & District ARS	G6ZME/P	6600	264	25	IO82ON	2 × 13Y	490	FT-225RD

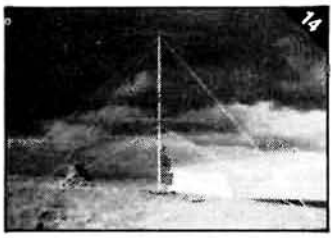
Leading Single-Operator Stations

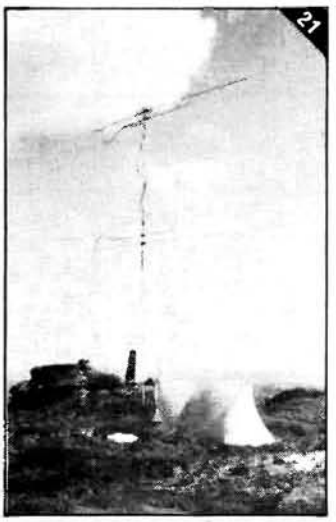
Pos.	Name	Callsign	Score	QSOs	Squs	Loc	Antenna	asl (m)	TX/RX
7	Christopher Foster	GW6MKR/P	7700	275	28	IO81KW	10/10Y	800	FT-290R
8	Michael Ryder	GW6DTD/P	7452	324	23	IO82KW	13Y	385	FT-290R
13	Dave Warburton	G6LKB/P	6554	226	29	IO84KG	17Y	290	FT-290R
14	Martyn Wright	G4RLF/P	6480	240	27	IO81XA	6Q	240	IC-211E
26	David Iles	GW4XGA/P	5016	228	22	IO73XC	5Y	1000	FT-290R
27	Tim Raven	GW4ARI/P	4800	192	25	IO82KA	2 × 8Y	690	IC-202S
36	Dick Pascoe	G0BPS/P	3749	163	23	JO01NB	19Y	160	FT-221R
38	Ian Mitchell	G0BUK	3588	156	23	JO00GV	14Y	130	IC-251E
40	D. J. Bryan	G4VRY/P	3465	165	21	IO94MJ	17Y	410	IC-260
48	Stephen Cocks	GW4ZUL/P	3088	193	16	IO81LQ	6Y	305	IC-202

VHF QRP CONTEST GALLERY

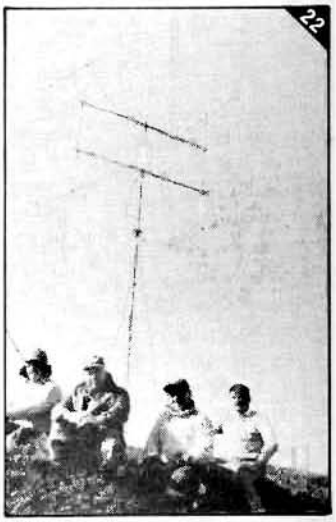








1: GW6XPY/P on Shell Island, Llanbedr, Gwynedd
2: G1CPP/P at Cannock Chase in Staffordshire
3: G6SRS/P Stourbridge and District ARS at Shatterford
4: G8DDY/P on St. Boniface Down, Isle of Wight
5: G6UKX/P at Caesars Camp, Bourley Hill in Surrey
6: GW4ARI/P on route to his site on the Twmpa
7: G6TWW/P on Pitch Hill at Shere, Surrey.
8: G6UKX/P at Ceasars Camp, Bourley Hill in Surrey
9: G4YTC/P on Rough Tor, North Cornwall
10: G6PXN/P the Windmill Radio Club, on Gentleshaw Hill
11: GM4YWU/P at Nether-Tulloch farm in Kincardineshire
12: G4UXY/P in the Chiltern Hills near Tring, Herts
13: GM6FPX/P The Big Ben Contest Group at Ben Lomond
14: GW4ARI/P at his site on the Twmpa, in Powys
15: G4WIK/P the Devizes and District ARC at Tan Hill
16: G4URT/P at Brightling in Sussex
17: GM6FPX/P The Big Ben Contest Group at Ben Lomond
18: G6PXN/P the Windmill Radio Club on Gentleshaw Hill
19: GW1LHY/P on Hay Bluff in Powys
20: GM6FPX/P the 'plane that buzzed the antennas
21: G0AYN/P on Lad Law near Burnley, Lancs
22: GM4PPT/P Ayr ARG, the leading Scottish station, near Girvan



Weather Satellites

In the third part of this series Terry Weatherley G3WDI looks at various ways of displaying picture information

The previous articles in this series looked at the polar orbiting satellites and the geostationary satellite Meteosat, as well as some of the pictures that have been received from them. These pictures were produced using various types of display equipment. In this article we will look at what is required to receive the signal, the signal characteristics and some of the ways of turning this signal into a viewable picture.

Signals from the polar orbiting satellites are transmitted in the 136–138MHz satellite band. They are close enough to the 144MHz (2m) amateur band to allow similar receiving techniques to be employed. Indeed, initial experiments could be carried out using 144MHz band antennas and a retuned 144MHz band converter. The power out from the satellite is 5 watts and is right-hand circular. This is significantly higher power than the OSCAR series thus high gain directional antennas are not really necessary. OSCAR enthusiasts attempt to access the satellite when it is at extreme range (for best DX) while the weather picture enthusiast is more interested in pictures of the UK. This situation occurs when the satellite is close in a near overhead orbit. It follows then that an omni-directional antenna and a pre-amp are all that is required and the problem of tracking the satellite is avoided.

A useful home-brew design for such an antenna was published by J. Osborne in *Wireless World* in 1972. This consisted of a pair of crossed dipoles with a quarter-wave delay in one element together with reflectors 0·3 wavelengths below. The dimensions are shown in Fig. 3.1. The *Satellite Experimenters Handbook* (ARRL) details a simple ground plane built on an SO239 chassis mounting connector. While the dimensions given are for the 144MHz band this can be optimised for 137·5MHz with a little experimentation. I use one such design here, loft mounted together with a low noise pre-amp and it gives excellent coverage. Signals are received when the satellite is over the Sahara and are lost over north-west Greenland. This antenna is detailed in Fig. 3.2.

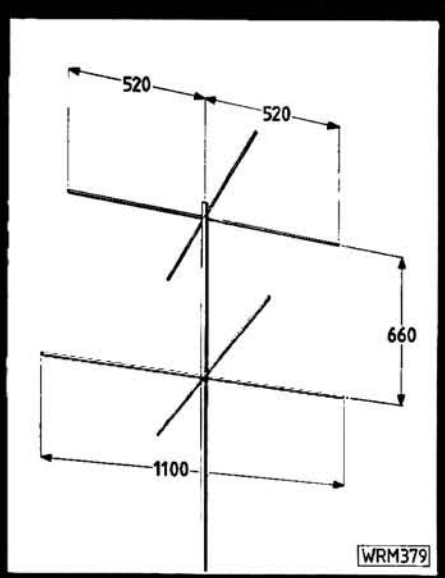
Frequency of transmission	137·5MHz
Satellite transmitter power	5 watts
Satellite e.i.r.p.	37dBm
Polarisation	r.h.c.p.
Transmitted bandwidth	±17kHz
Maximum Doppler shift	±4kHz

Table 1

Until recently there were not many easily available receivers which covered 136–138MHz. The usual way of receiving the satellite signal was to use a converter. The most common system in use today is the Microwave Modules converter, used outboard of an h.f. receiver. The characteristics of the transmitted signal are shown in Table 1. It will be seen that the f.m. deviation is ±17kHz and this together with a Doppler shift of ±4kHz shows that an i.f. bandwidth in excess of 34kHz is required for modulation. The recommended i.f. bandwidth is thus 50kHz.

However, in practice inexpensive receivers with 30kHz i.f.s can be used if the i.f. roll-off is gradual and plenty of r.f. amplification is used. In the early days modified "taxi" receivers were used as i.f.s and I have obtained some success slope detecting the f.m. signal on an a.m. receiver. Good modern receivers with steep sided i.f. filters at 30kHz have not been so useful.

At the present time there are a number of "purpose-designed" receivers available. An inexpensive single channel receiver is available from Timestep Electronics which together with the same firm's pre-amp gives a good account of itself. They also produce a scanner with digital readout which is used together with the single channel receiver board. Cirkit have produced a weather satellite receiver kit with provision for six crystal channels on the printed circuit board. Both receivers were reviewed in the Remote Imaging Group's newsletter published recently. (Reference will be made later to the Remote Imaging Group.) Microwave Modules, as part of their complete system, produce a receiver for 136–138MHz. The AR2001 scanning receiver covers this range of frequencies and has been used successfully. It is possible to modify the UOSAT receiver published in *Radio & Electronics World* a while back by changing the filters and the crystals. A scanner certainly takes the maths out of weather satellite watching — it can be left on all day and it will pick up all possible transmissions including those Russian satellites that transmit irregularly.



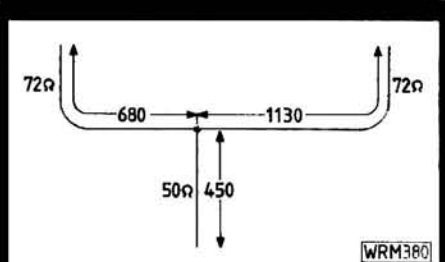
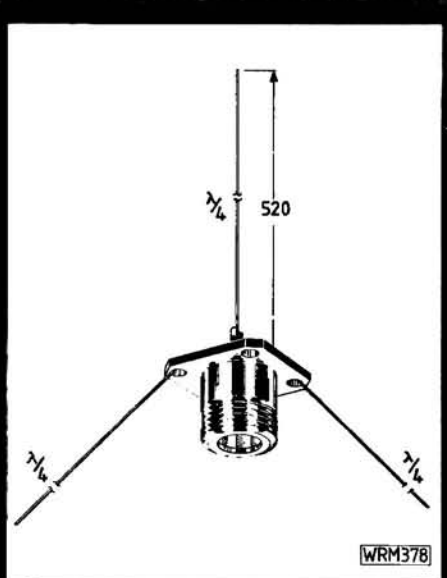


Fig 3.1: ◀ A pair of crossed dipoles mounted above reflector elements. Circular polarisation is obtained by using a coaxial phasing harness as shown above

Fig. 3.2: ▶ A simple ground-plane built on an SO239 chassis mounting connector—note the dimensions given are for the 144MHz band



What's Up There?

At the present time, weather satellites have been heard on the following frequencies:

137·13MHz	MET-30 (Irregular)
137·30MHz	Meteor
137·40MHz	Meteors & COSMOS 1500/1602
137·50MHz	NOAA 6 & NOAA 8
137·62MHz	NOAA 9
137·85MHz	Meteor

The transmitted signal consists of an audio signal with a 240Hz sub-carrier. This sub-carrier is modulated with the picture information. The modulation varies from 5 per cent for black level to 90 per cent for white in the case of the NOAAs, while the black level is 100 per cent for the Meteors. Intermediate grey-scale values are transmitted at intermediate sub-carrier levels. White in the infra-red channel represents cold objects (clouds) while black represents warm objects (land). The NOAA transmissions interlace the visible light transmissions with the infra red. This is shown clearly on the accompanying oscillograph (Fig. 3.3). The first part of the trace is the infra-red information, while the second part is the visible light information. It can be seen that the infra-red signal is more heavily modulated with little dynamic range when compared to the visible light signal. Circuits have been published, notably by Brush and Bayliss, to expand the contrast of the infra-red portion of the signal. The second oscillograph (Fig. 3.4) is of a Meteor signal. Here the numerous sync pulses at the picture edge can be seen together with the stepped grey scale. It will also be seen that the dynamic range of the signal is low. The grey scale wedge can be seen more clearly in oscillograph 3 (Fig. 3.5).

Once the signal has been received one soon learns to recognise the "lub-dub" note of a weather satellite signal. The 136–138MHz band contains many other satellite signals which could be confusing for the beginner but it's really a case of once heard never forgotten.

Once the signal has been received and recognised as a weather satellite signal, attention can be turned to ways of displaying the picture. The simplest method is to use an oscilloscope with the timebase set to 4Hz. The received signal is applied to the Z input of the 'scope and this modulates the brightness of the trace. A simple RC network is applied to the Y input causing the trace to "scan" the face of the oscilloscope tube in about 6–7 minutes. The picture is built up line by line. If the free running time base causes the picture to drift the trace can be triggered from a 2400Hz crystal source. The picture is recorded in a darkened room using a Polaroid camera for instant viewing or 35mm film for later processing. This was the method that "got me into" weather satellites in the late sixties. Methods familiar to SSTVers can also be used.

A very long persistence tube 5FP7 was a favourite or an ex-radar tube (which was the basis of my next receiver). It was based upon a design by WB8DQT and published first in *73* magazine and later in the *Weather Satellite Handbook*. This was a simple effective design using 741s to deflect the trace and a single 741 to process the signal. The coils from old 90 degree TV tubes were also a much sought after prize. This was certainly an area where home-brew ruled supreme. In a dark room a complete picture could be dimly seen on the face of the tube but the photographic results were very good for their time. The photograph shown in Fig. 3.6 is of ice covered Greenland and an associated depression, it was received from NOAA 5 using this system.

Designs were published for the facsimile machines, notably by Kennedy in the UK, WB8DQT in the States and *VHF Communications* in Germany. Results from these machines were excellent. Pictures showed good grey-scales and excellent resolution. One such picture, Fig. 3.7, taken from a homebuilt machine based on the *VHF Communications* design by G8LOK, is

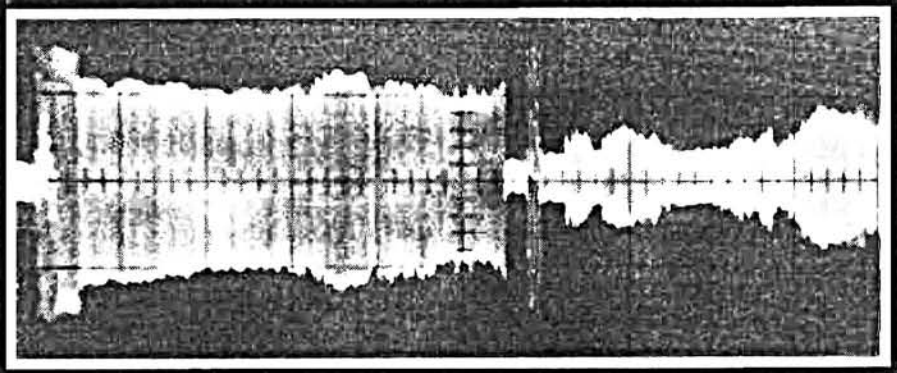


Fig. 3.3 ▲

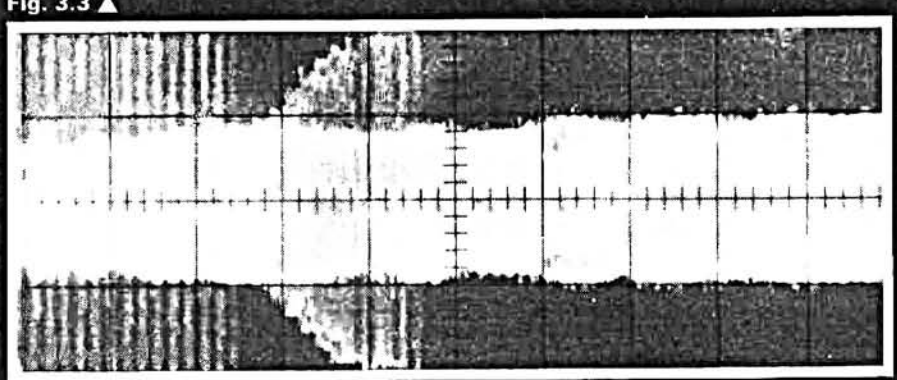


Fig. 3.4 ▲

▼ Fig. 3.5

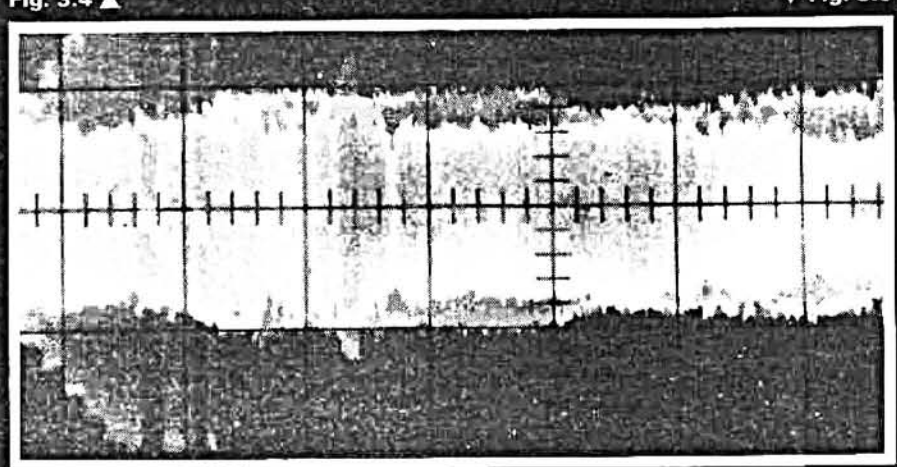


Fig. 3.6

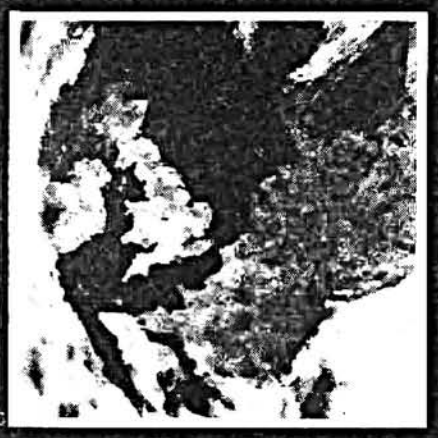


Fig. 3.7

Fig. 3.8

shown here. It is true to say that these FAX pictures showed the quality of the pictures transmitted by the polar orbiters which was only hinted at by the long persistence tube. It takes a fair amount of mechanical skill to produce a photographic FAX machine and the glow modulator tube used is scarce and expensive but the results are certainly very worthwhile. Designs for FAX machines using electrostatic paper have appeared from time to time but the main drawback of these systems is the unpleasant smell given off by the paper as the picture is burnt in.

Occasionally surplus Muirhead machines appear on the amateur market and it is possible to modify these for the display of satellite pictures. Some machines were specifically made for satellite reception, particularly the D9005/1 and /1A. These machines come as three units: one 19in rack unit houses the power supply while another unit houses the display electronics and the writing unit is the third. The writing unit contains the helix and the 9in paper roll used for printing. The process uses electro-sensitive paper. The paper is damp and when a current is passed through it the paper darkens. The intensity of the darkening depends on the current passed. When built these machines were designed to print pictures from ESSA-9. This satellite, it will be remembered from Part 1, produced discrete 240 line per minute pictures over a period of three minutes. This standard is very similar to the standard of the present day geostationary satellite Meteosat and can be used without modification to receive such pictures. The 240 line per minute rate is suitable to receive the NOAA pictures giving the operator a choice of full width infra-red or visible light pictures but the paper is taken through the machine too quickly to produce a distortion free picture. The picture shows great distortion in the vertical direction. On inspection it can be seen that the paper is drawn through the machine by two rollers. The amount of paper taken through depends on the circumference of the roller. To obtain the correct speed a new roller was made—half the diameter. A new pressure roller of twice the diameter was also needed. The net result was that the paper was taken through at the correct speed and good pictures were obtained, see Fig. 3.8. Paper for these machines is still available from Muirhead Ltd. as are writing edges.

A number of Rank Xerox FAX machines are presently being made available to members of the British Amateur Teleprinter Group (BARTG). At first sight these appear to be suitable for conversion for weather satellite reception. Enthusiasts interested in this method of picture display would do well to join BARTG and watch the columns of the Group's newsletter *Datacom*.

Until recently a FAX machine was the most sophisticated method of picture display. The time involved in building such a machine from the initial circuit diagram to the finished result was a major investment but the results made it worthwhile. Today, the scene is changing and the "framestore" which captures the picture and stores it in dynamic RAM to replay it in fast scan on the TV screen has come to the fore (Fig. 3.9).

This dramatic development is the result of the falling cost of large RAM i.c.s. A few years ago 1K RAM cost over £1 an i.c., but recently 64K RAM i.c.s can be bought for as little as 73p. Thus the six 64K RAM i.c.s needed for such a device are no longer a major investment. In a future article I will be looking at the framestore method of displaying weather pictures. The home computer is also playing its part in the picture area and in my next article I will be looking at a system based on the BBC-B computer which together with an inexpensive interface can produce impressive results.

The whole earth picture (Fig. 3.10) taken from Meteosat on my BBC-B computer gives a taste of what can be done with this system. The resolution and grey scale are not good but the way is opened up for computer processing of a picture and extracting much more information than at first appears.

Reference has been made to the Remote Imaging Group (RIG). This is a newly formed organisation for everyone interested in weather satellites. They plan to issue bi-monthly newsletters. The first two should be out by the time this article appears. The newsletters contain a wealth of information together with up to date information and orbital predictions for the weather satellites. The current subscription is £2. Information can be obtained from the secretary: Phil Seaford, 12 Jupiter Drive, Leighton Buzzard, Beds LU7 8XA. A stamped addressed envelope would be appreciated.

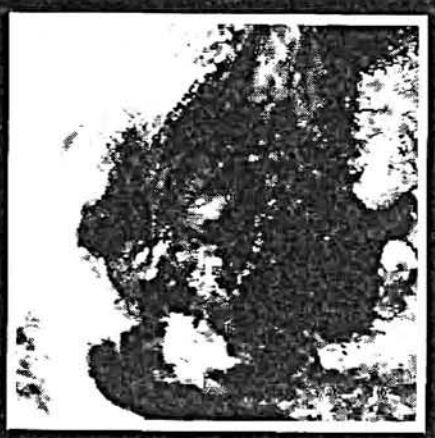


Fig. 3.9

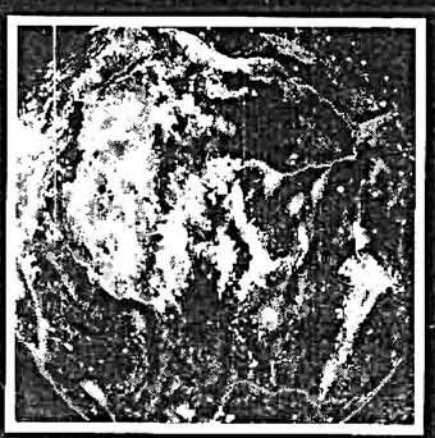


Fig. 3.10

References

Fixed Aerial for Satellite Reception. *Wireless World*, July 1972.
Contrast Expansion Processor. *Wireless World*, December 1973.
The Satellite Experimenters Handbook. ARRL.

Next month will look at a system based on the BBC-B computer

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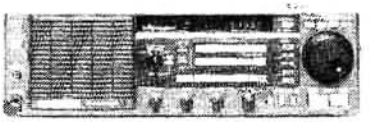

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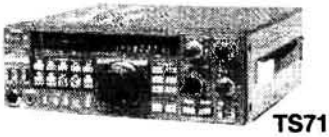

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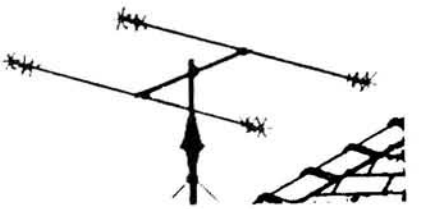

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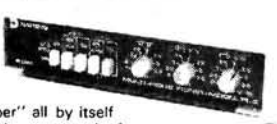

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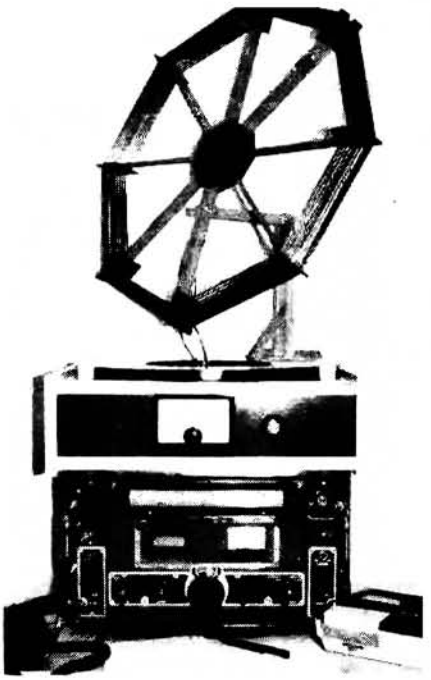
ECL86	0.90	N78	9.90	UF85	0.95	6AM5	4.20	6J5GT	0.90	12Y4	0.70
EF37A	2.15	OA2	0.70	UL84	0.95	6AM6	1.50	6J6	0.65	13D3	2.80
EF39	1.50	OB2	0.80	UM180	0.90	6AN8A	2.50	6J6W	0.90	13D5	0.90
EF80	0.65	PCL82	0.95	UM84	0.70	6AQ4	3.40	6FH8	17.80	19AQ5	0.85
EF83	1.75	PCL84	0.90	UY82	0.70	6AQ5	1.30	6K7	1.45	18G3	11.50
EF85	0.60	PCL86	0.75	UY85	0.85	6AQ5W	2.20	6JE6C	5.50	19G6	10.35
EF86	1.25	PCL805/85	0.95	VR105/30	1.25	6AS6	1.15	6JS6C	5.90	19H5	39.55
EF89	1.60	PD500/510	6.90	VR150/30	1.35	6AT6	0.90	6KD6	5.50	20D1	0.80
EF91	1.60	PFL200	1.10	X66	0.95	6AU6	0.60	6L6M	4.60	20E1	1.30
EF92	1.50		2.80*	X61M	1.70	6AV6	1.25	6L6GC	3.70	20P1	0.65
EF95	0.65	PL36	1.10	Z759	19.00	6AX4GT	1.30	6L6GT	1.95	25L6GT	0.95
EF96	0.60	PL81	0.85	Z749	0.75	6AX5GT	1.30	6L18	0.70	25Z4G	0.75
FF183	0.80	PL82	0.70	Z800U	3.45	6BA6		6LD20	0.70	35W4	0.80
EF184	0.80	PL83	0.60	Z801U	3.75		0.70/1.20*	8Q7G	1.30	85A2	1.40
EF312	0.75	PL84	0.95	Z803U	16.00	6BE6	0.60/1.20*	6SA7	1.80		2.55*
EFL200	1.85	PL504	1.00	Z900T	2.45	6BG6G	1.60	6SG7	1.50	807	1.60/2.40*
EL32	1.10	PL508	2.40	1A3	1.40	6BJ6	1.30	6SJ7	1.50	813	19.32
EL34	1.80/3.50*	PL509	5.80	1L4	0.50	6BQ7A	0.85	6SK7	1.40		69.50*
EL37	5.20	PL519	5.80	1R5	0.80	6BR7	4.80	6SR7	4.60	8298	24.00
EL82	0.70	PL802(SE)	2.95	1S4	0.60	6BW6	6.20	6SL7GT	0.85	832A	8.90
EL84	0.80	PY80	0.70	1S5	0.65	6BW7	1.80	6SN7GT	0.80	866A	3.80
EL86	0.95	PY81/800	0.85	1T4	0.65	6C4	0.50	6SQ7	0.95	86SE	6.25
EL90	1.00	PY82	0.65	1U4	0.80	6C6	0.55	6V6G	1.50	931A	19.80
EL91	6.50	PY88	0.60	1X2B	1.40	6CH6	8.20	6V6GT	0.95	954	1.20
EL95	0.80	PY500A	2.10	2X2A	2.50	6CL6	2.75	6X4	0.95	955	1.20
EL504	1.70	QQV03/10	5.95	3A4	0.70	6CW4	8.65	6X5GT	0.65	956	1.20
EL509	5.85		10.10*	3AT2	2.40	6CX8	4.60	6Y6G	0.90	5763	4.80
EL519	6.90	QQV03 20A		3B28	12.00	6CY5	1.15	6Z4	0.70	6060	1.95
EL821	8.20		27.50		19.50*	6D6	1.50	9D6	2.90	6080	5.30
EL822	9.95	QQV03-25A		3D6	0.60	6F6	1.60	11E2	19.50	6146	6.80
ELL80(SE)	4.50		36.50	3E29	19.00	6F6GB	1.10	12A6	1.00	6146B	6.80
EM80	0.85	QQV06/40A		3S4	0.60	6F7	2.80	12AT6	0.70	6360	2.85
EM87	2.50		28.50/49.50*	4B32	18.25	6FH8	17.80	12AT7	0.85	6550	8.05

VALVES AND TRANSISTORS Telephone enquiries for valves, transistors, etc. Retail 7493934, trade and export 743 0899. **POSTAGE:** £1-£3 50p; £3 £5 60p; £5-£10 80p; £10-£15 £1.00; £15-£20 £1.50; over £20 £2.00. Same day despatch. VAT included. Mimimum order £1.00.

COLOMOR (ELECTRONICS LTD.) 170 Goldhawk Rd, London W12
Tel: 01-743 0899 or 01-749 3934. **Open Monday to Friday 9 a.m.-5.30 p.m.** PW

The W-Q MW Loop

In this article G. S. Maynard focuses on a medium wave DXing antenna developed during five years of spare time activity. He outlines the design and construction of an efficient 635mm octagonal loop, which features dial-drive tuning, switch-selectable bandwidth and an integral, variable output amplifier.



Design Pointers

Two important advantages of high *Q* loop windings are narrowed bandwidth reception and reduced winding noise. Where DXing passbands less than 6kHz are acceptable, an increase in *Q* allows slightly smaller wound area without degradation of signal to noise ratio. The "W" form described here was developed as a method of decreasing losses by allowing more, closely coupled, paralleled turns to form a low capacitance, low resistance winding—20pF, 0·4Ω and 1·9MHz series resonant frequency.

Loop construction was determined by a listed set of requirements. These were that:

a) it should be no larger than is necessary for DX-bandwidth reception of distant background noise,
b) it must be free to rotate about both horizontal and vertical axes for nulling either ground or skywave signals.
c) with a sturdy insulating frame it should approximate to a circular shape to reduce peripheral losses and create an even flux distribution,
d) it must possess a high inductance to capacitance ratio for maximum *Q* performance,
e) if wound with Litz wire or many paralleled strands of enamelled copper wire then the effective resistance should be reduced,
f) to minimise dielectric losses it should be tuned with an air-spaced variable capacitor keeping connections short and physically isolated,
g) by avoiding asymmetrical (spiral) construction and side-by-side (solenoid) windings a more uniform energy coupling between all turns should be achieved,
h) grounding the loop winding via a centre tap reduces electrostatic pick-up and generates a differential output,
i) to ensure balanced tuning use a dual-gang variable capacitor with the fixed vanes connected one set to each winding end, and the moving vanes to the ground; this obviates hand capacity problems,
j) to avoid introducing unnecessary losses by using a receiver coupling winding, a very high impedance loop matching amplifier with short, fine interconnecting wires should be used
k) for local reception series resistance should be added at the winding centre to broaden bandwidth and reduce gain; switch wiring here does not upset the high *Q* response.

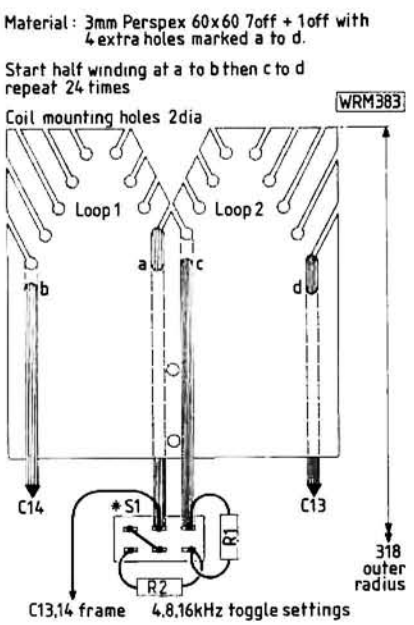


Fig. 1: Details of the Perspex formers on which the two halves of the loop are wound. Note that the unusual switch S1 is mounted as close as possible to the loop

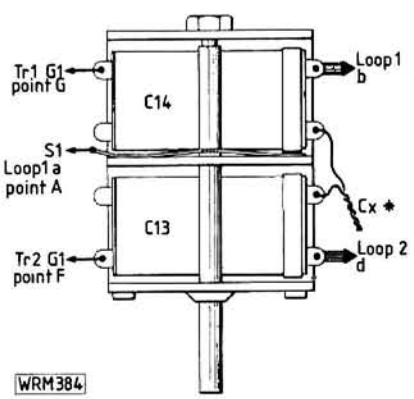


Fig. 2: Connections to the two-gang tuning capacitor C13,14. Cx is a "fiddle" capacitor made by twisting together two lengths of insulated flex

The Loop

This comprises two halves each of 9 turns, wound over eight "W" shaped Perspex supports (cut and drilled as shown in Fig. 1) and mounted on wooden limbs at 318mm outer radius. Twenty five separate overwinds of 32 s.w.g. enamelled copper wire (455g) are alternately wound on from central anchor points to simultaneously build up each half of the winding. Loose wire ends are taped to the central hub until they fill anchor holes and become firmly held. The bandwidth switch is mounted close to the anchoring support (Fig. 1), with resistors R1, R2 and mid-winding ends soldered directly to it.

The outer winding ends are swept down to the tuning capacitor, C13,14, in their multi-strand form without running close to supports or any other wires. They allow for vertical loop rotation with respect to tuning components, dial etc. and up to 45 degree tilting each way about a pivot 100mm below the loop centre. When used with its matching amplifier this loop tunes from 510 to 1630kHz, and offers choice of three bandwidth settings —approximately 4, 8 and 16kHz.

To reduce station cramping at higher frequencies the recommended dual-gang variable capacitor is an "H" law, broadcast band component by Jackson Brothers. Trimming is necessary to limit h.f. range at 1630kHz, and this is done by twisting together two 50mm lengths of 32 s.w.g. enamelled copper wire, soldered one each to the tuning capacitor fixed vanes. The J B dual-ratio dial drive eases tuning and provides space for dry transfer scale markings. See Table 1 for "H" law tuning calibration using the manufacturers 0 to 100 dial scale.

A brief mathematical comparison illustrates the performance relative to that of the standard 1016mm square 7 turn design. Since

$$\text{Loop Voltage} \propto \frac{\text{Area} \times \text{Turns} \times \sqrt{(\text{Inductance}/\text{Capacitance})}}{\text{Effective Resistance}}$$

then

$$V_W = C \times \left(\frac{2{\cdot}8 \times 10^5 \times 18 \times \sqrt{340/260}}{0{\cdot}4\Omega + 635\text{mm loss resistance}} \right)$$

and

$$V_{\square} = C \times \left(\frac{1{\cdot}03 \times 10^6 \times 7 \times \sqrt{170/520}}{1{\cdot}2\Omega + 1016\text{mm loss resistance}} \right)$$

C being determined by field strength and frequency. With its much reduced losses the "W" loop has a sensitivity advantage. Higher inductance to capacitance ratio with lower effective resistance confers improved selectivity, while an increased product of wound area and Q with lower ohmic resistance enhances signal to noise ratio.

Dial	kHz	m
0	1630	184
7·5	1500	200
13	1400	
19	1300	
26	1200	250
32·5	1100	
40	1000	300
48	900	
52·5		350
58	800	
63		400
68·5	700	
72·5		450
82	600	500
91		550
100	510	588

Table 1. Tuning Calibration

On a personal note, I had been chasing DX using either a 1524mm 8 turn, roof space mounted spiral, or a free standing, 889mm, 13 turn spiral-solenoid-spiral mix. These were dismantled however when weak carrier listening tests showed that although the larger loops developed increased terminal voltage their overall signal to noise ratios were not better.

Amplifier Design

Work with differential matching amplifier and Q-multiplier circuits showed individual advantages and prompted a design that combined their good points. The resulting Q-amplifier compensates for some winding losses by using field effect transistor capacitance to generate minute amounts of stable positive feedback.

During development the following points were listed:

1) input devices must not have any deleterious effect upon winding characteristics, especially at higher frequencies,
2) with a "W" loop the input stage need not be differential but must be symmetrical and gain balanced.
3) gain at 500kHz should be higher than at 1·5MHz to compensate for loss in Q as tuning capacitance increases,
4) to prevent reactive loads from overloading output devices amplifier output should be 75Ω resistive.
5) to minimise harmonic distortion the output stage should operate in Class A push-pull,
6) there must be sufficient dynamic range to cover any signal between background noise levels and powerful local stations,
7) a variable output attenuator would prevent strong-signal receiver overload,
8) performance should be repeatable and independent of device tolerances.

The Circuit

The symmetrical circuit employed is shown in Fig. 3. Oppositely phased signals are amplified by separate but identical stages and then combined at the push-pull output transformer. Here resistance coupling avoids reactive shunting of output devices by transformer, coaxial cable or load.

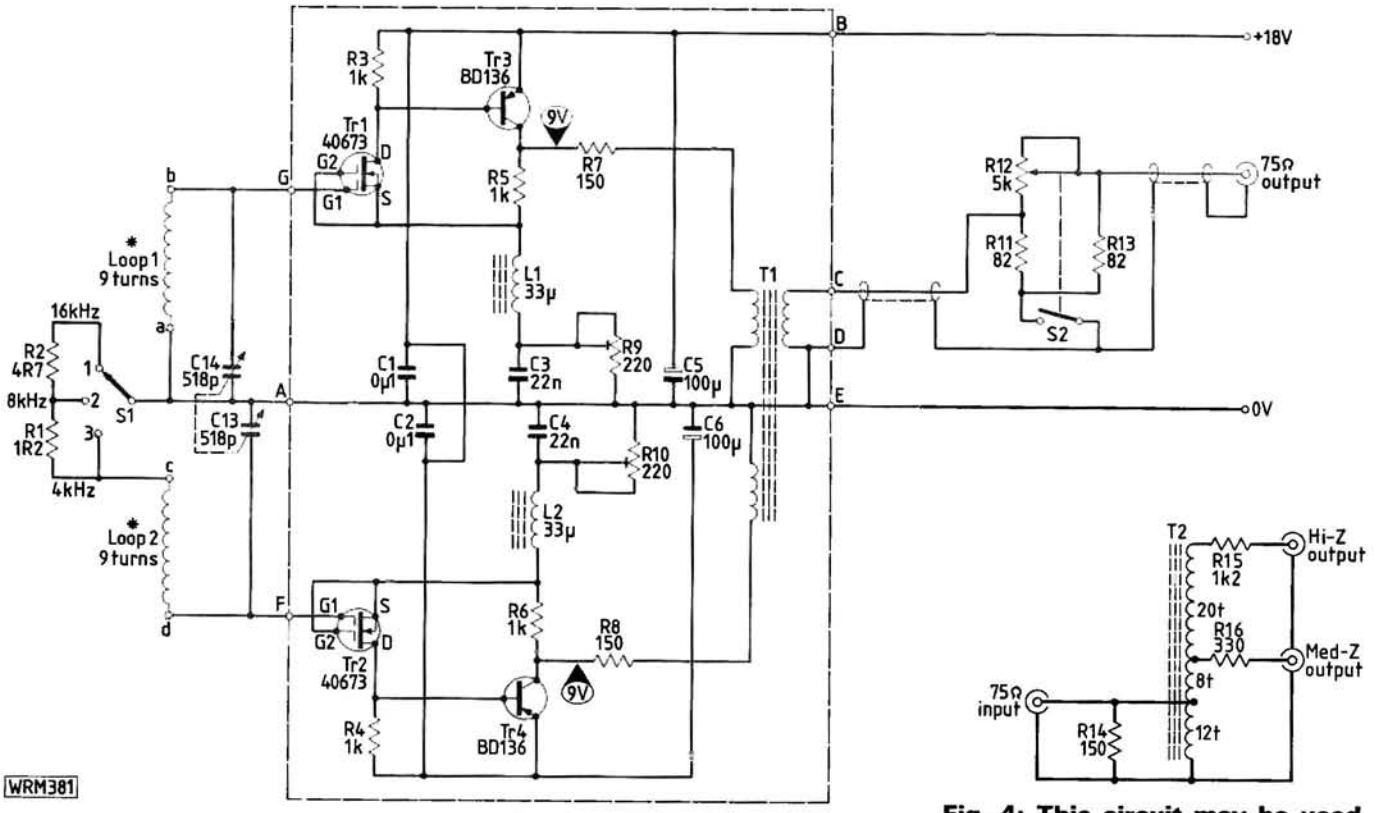


Fig. 3: The complete circuit diagram of the amplifier used with the W-Q MW Loop antenna

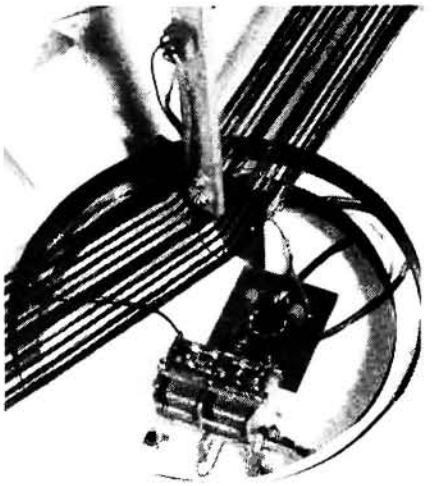
Fig. 4: This circuit may be used with high input impedance receivers. Details are given in the text

The input m.o.s.f.e.t.s operate in a common source current output mode, with gain-limiting source feedback voltage. Two advantages of this arrangement help maintain loop Q and satisfy requirement (1) above; these are (i) internal $C_{D\text{-}G}$ m.o.s.f.e.t. capacitance does not introduce degenerative feedback, and (ii) being in phase with signal appearing on the m.o.s.f.e.t. gates, overall negative feedback at the sources tends towards positive feedback at the loop via $C_{S\text{-}G}$ m.o.s.f.e.t. capacitance.

With the loop centre tap at ground potential signal is fed to Tr1 and Tr2 gates using short lengths of 32 s.w.g. enamelled copper wire. Each m.o.s.-f.e.t. has individual self-bias pre-set resistors R9,10, and is directly coupled to the output transistors Tr3,4. R9,10 must be set to mid position before assembly and carefully adjusted to bias Tr3,4 collectors at half supply potential before use. R5,6 and L1,2 define the gain characteristic outlined in (3) above, and introduce loop feedback via the m.o.s.f.e.t.s.

The toroidal output transformer is a home made, 8 turn, trifilar wound 1:1:1 component. Thread three 508mm lengths of 20 s.w.g. enamelled copper wire through the ferrite core and wind them side-by-side from the centre outwards. Winding ends should pass neatly through the printed circuit board as illustrated in Fig. 5. **If they don't—rewind!**

When turned OFF and at minimum resistance the output potentiometer R12 has no effect. When turned ON and advanced track resistance in series with an 82Ω resistor R13, introduces variable 6 to 42dB attenuation as shown in Table 2.



Close-up details of the start and end of the two loops together with switch S1 and the tuning capacitors and p.c.b. fitted into the centre of the rotating system

Amplifier construction should not present any problems using the illustrated p.c.b. If necessary 0·1in matrix board can be used by copying layout

OFF	−10dB	−20dB	−30dB	−40dB
0	90	160	220	280

Table 2. Output Calibration Attenuation v. Rotation

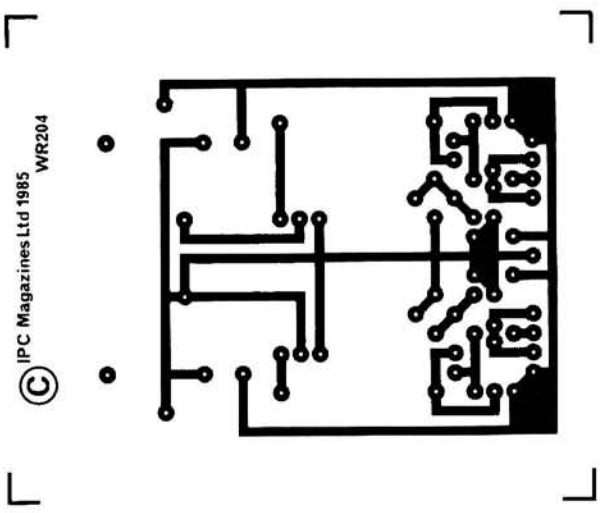
and using point to point wiring. For termination and output potentiometer connection solder lengths of wire and 75Ω coaxial cable to the Veropins.

Mount the finished assembly close to the tuning capacitor and check that both 32 s.w.g. gate wires are grounded via the loop before applying power. A 12V 85mA supply is satisfactory for reception at quiet locations, but 18V at 125mA will be necessary in areas that are permeated by high field strengths. Fig. 6 shows the simple, remote 18V d.c., mains powered supply used with prototypes.

The recommended dial drive and tuning variable are not normal "off the shelf" items. However the following companies will order them for you: Electrovalue, 28 St. Judes Road, Englefield Green, Egham, Surrey, TW20 0HB; Bi-Pak Semiconductors, PO Box 6, 63a High Street, Ware, Herts.; Cirkit, Park Lane, Broxbourne, Herts.; John Moxham 22 Whiting Road, Windmill Hill, Glastonbury, Somerset. The unusual single pole three way toggle switch is available from Electrovalue.

By all means try the circuit using equivalent parts from the spares box, but use those listed for published performance.

Finish construction by making a rotatable winding support upon a tuner-amplifier housing. Photographs show my own "W-Q" loop in use with a 1953, type 1017, Marconi Mercury receiver, cassette recorder and phones. All antenna and receiver controls can be adjusted from the listening position.



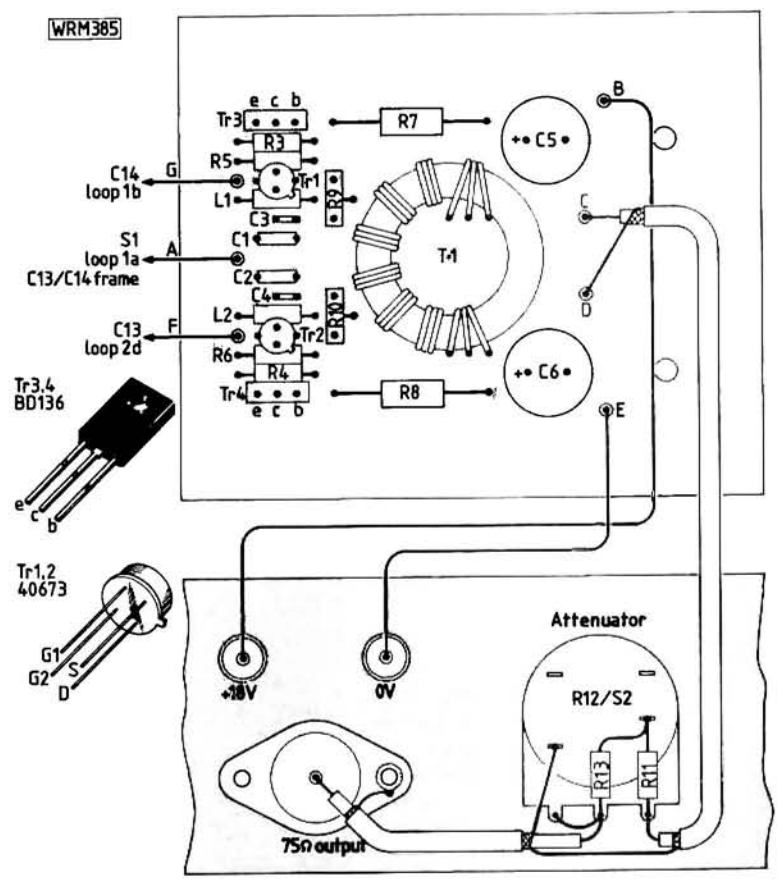
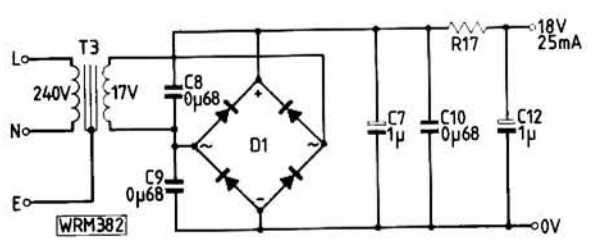


Fig. 5: Full size p.c.b. track pattern and component layout for the amplifier. Fig. 6: (Below) The circuit of a suitable power supply



Application

When the 635mm "W" loop and *Q* amplifier are used together, tuned *Q* rises and amplifier gain falls with increasing frequency to form a constant bandwidth, constant sensitivity medium wave antenna. The 4kHz setting is useful for weak or interchannel signals degraded by noise and sideband splatter, while 8 and 16kHz bandwidths allow broader response for speech and music listening. Balanced design ensures electrostatic interference rejection and an axial nulling capability that, by virtue of dual axis rotation, can be accurately aligned with any unwanted signal without recourse to zero cleaning methods. Note however, the total cancellation of an unwanted signal is not always possible because cyclically varying ionospheric reflection components can not be matched by stable receiving apparatus.

With the output attenuator switched OFF amplified signal may be fed to any receiver that has 75Ω input termination. If strong signals overload receiver circuitry the potentiometer may be turned ON and advanced for increasing attenuation. Sets that use internal ferrite rods; casseivers, radiograms etc., may be fed via 75Ω coaxial cable to a ten turn winding on the rod or to twenty turns of thick wire wound over the cabinet as if around the rod. The potentiometer should be rotated fully clockwise then turned back as little as necessary, loop adjustment being made to compensate for any direct pick up that results from incomplete rod screening. For valve sets, car radios and other receivers that have higher impedance inputs, the circuit of Fig. 4 may be used. Keep this toroidal transformer close to the receiver, feed via coaxial cable and adjust the potentiometer as necessary. Do not connect the low impedance output directly to a medium or high impedance input as front end blocking is likely to occur.

This "W-Q" loop tunes more sharply and produces higher output than other loop plus differential matching amplifier set ups, even though both types of amplifier have similar gain. For example here in Gl-land, using the narrow bandwidth setting and a 75Ω load resistor, RTL on 1440kHz has produced oscilloscope traces up to 1V r.m.s. Local stations produce greater outputs, hence the three position switch and output attenuator, and, with DX signals coming out about 100μV r.m.s. many insensitive receivers can give equitable performance.

Notes

The limiting factor for any good receiving system should be distant electromagnetic noise, and since this antenna is quiet down to rural levels then little improvement in useable sensitivity will result from larger wound area.

If the low-loss "W" loop is used with conventional matching amplifier circuits it will work less well than outlined above. Similarly the *Q* amplifier will perform little better than a d.m.a. when connected to square shaped or conventionally wound loops. Each design relies upon the efficiency of the other for good performance, and only then can improved capabilities be realised.

Without winding or amplifier changes 1·6 to 1·8MHz may be tuned using a metal 25 + 25pF dual-gang, or 1·8 to 1·9MHz with a 5pF ceramic trimmer. For 1·6 to 2·0MHz Top Band cover an 8 + 8 turn winding (as "W" loop but with both outer turns omitted) may be tuned using a 30 + 30pF ceramic dual-gang capacitor. Try changing the value of L1,2 from 33 to 47μH to increase loop feedback and give this 16 turn version a tuning characteristic commensurate with s.s.b. transmission. Both "W" loops have winding lengths of 0·2 times their natural resonant wavelength—unusually high for a compact design.

Although very satisfied with this antenna I am not about to hang up my soldering iron. Medium wave work continues with development of a phase amplitude mixer (p.a.m.) which simplifies generation of the cardiod directional response and allows alternative use of null patterns by shifting them relative to loop position. This project is approaching completion and should be finished very soon—although my XYL says she'll put a &!?* loop on my headstone when I pass on.

My thanks go to Brian Russel and Janis Ziedainis for information, suggestions and encouragement. The following list of reference publications should be of interest to other broadcast band DXers.

Further Reading

1. Interference Prevention, *Practical Wireless* March 1945
2. DXers MW Loop Aerial, S. A. Mooney G3FZX. *PW* April 1973
3. The Loop Aerial Revived, R. E. Schemel, *Wireless World* July 1979
4. MW/LW Loop Aerials, Charles Molloy G8BUS, *PW* November 1979
5. Q-Multiplier and Spiral Loop Antenna, G. S. Maynard, *PW* March 1981
6. MW Loop Differential Amplifer, S. Whitt, *PW* February 1983
7. *The ARRL Antenna Handbook*
8. *Dial Search*, G. Wilcox, 9 Thurrock Close, Eastbourne BN20 9NF

★COMPONENTS

Resistors

¼W 5% Carbon Film

1·2Ω	1	R1
4·7Ω	1	R2
10Ω	1	R17
82Ω	2	R11,13
150Ω	1	R14
330Ω	1	R16
1kΩ	4	R3,4,5,6
1·2kΩ	1	R15

1W 5% Carbon Film

150Ω	2	R7,8

Potentiometers

Min. Vertical Preset

220Ω	2	R9,10

Carbon Track with Switch

5kΩ log	1	R12+S2

Capacitors

Ceramic disc

22nF	2	C3,4
0·1μF	2	C1,2

Polyester Layer

0·68μF	4	C8,9,10,11

Electrolytic p.c.b. type

100μF 25V	2	C5,6

Electrolytic, Axial Leads

1μF 25V	2	C7,12

Airspaced Variable (Jackson 4507/H/2/518)

518 + 518pF	1	C13,14

Semiconductors

Diodes

1A bridge	1	D1

Transistors

BD136	2	Tr3,4
40673	2	Tr1,2

Wound Components

Choke 250mW 10%

33μH 0·92Ω	2	L1,2 (Siemens)

Ferrite Ring Core

N30 25·3mm	2	T1,2 (Siemens KO618X830)

Mains Transformer

17V 1A	1	T3

Miscellaneous

Enamelled copper wire 32 s.w.g. 455g; 20 s.w.g. 1·5m; Dial drive 36:6:1 Jackson 4103/A; Toggle switch 1p3w (Electrovalue S7211); Coaxial connectors; Printed circuit board; Perspex sheet 3mm thick; Timber, screws, etc.

CLUB NEWS

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

Avon

South Bristol ARC: Len Baker G4RZY (Bristol 834282). Meets Wednesdays, 7.30pm at the Whitchurch Folkhouse, East Dundry Road, Whitchurch, Bristol. October 9 is High Speed Morse with G3XED & G4TXW, the 16th is computer night and the 30th is G8VPG of the Bristol RSGB Group. October 27 is the Radio Rummage at the Youth Centre, Hareclive Avenue, Hartcliffe, from 10am to 4pm. Talk-in on S22 & SU8 with trade stands and second hand gear, etc., Mike Ward G1LDJ (Bristol 667179) has details.

Bedfordshire

Dunstable Down RC: Phil Morris G6EES (Dunstable 607623). Meets Fridays, 8pm at Chews House, High Street South, Dunstable. October 11 is an open meeting with equipment demos, the 25th is G8VR on Improving 144MHz DX and November 8 is G3OSS on Receiver Design.
Leighton Linslade RC: Ian Jardine G1ACQ (Leighton Buzzard 376741). Meets 1st & 3rd Mondays, 7.30pm in Room A64, Vandyke Community College, Vandyke Road, Leighton Buzzard.
Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm at the Church Hall, Ampthill Road, Shefford. October 10 is Interference Forum chaired by G3UFB (RSGB e.m.c. committee member), the 17th is a computer demo, the 24th is G8AFN on Satellites and the 31st is G8OFA on 10GHz Operation.

Berkshire

Reading & District ARC: Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading. Meets alternate Tuesdays, 8pm at the White Horse, Peppard Road, Emmer Green, Reading. October 5 is a junk sale/bring-and-buy and the 29th is G3VZV on 1·3GHz TV Repeaters.

Buckinghamshire

Maidenhead & District RC: Bob Fowler G3IQF (Marlow 6421). Meets 1st Thursdays and 3rd Tuesdays, 7.30pm at the Red Cross Hall, The Crescent, Maidenhead.

Cambridgeshire

Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848). Meets 4th Thursday, 7.30pm at the Southfield Junior School, Stanground, Peterborough (during termtime). October 24 is G4HPE on The Sharp End of Broadcasting.

Cheshire

South Cheshire ARS: Nick Gutten G6IGW (Crewe 60062). Meets 2nd and 4th Mondays, 8pm at the Victoria Club, Gatefield Street, Crewe. October 14 is the AGM.
Chester & District RS: Alan Warne G4EZO (Chester 40055). Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm at the Chester RUFC, Hare Lane, Vicars Cross, Chester. October 8 is a surplus gear sale, the 15th is Underground Communications, the 24th is G4JMF on The Marine Radio Licence and Marine Operating with the 29th a hot-pot supper. Code tuition is available before each meeting.

Clywd

Alyn & Deeside ARS: Tony Jones GW1CEV, 53 Central Drive, Shotton, Deeside. Meets alternate Mondays, 8pm at the Shotton Social Club, Shotton Lane, Shotton. October 14 is G8OJQ on the club project, a signal injector.
Rhyl & District ARC: Melfyn Allington GW1AKT (Nantglyn 469). Meets 1st and 3rd Mondays, 7.30pm in the Mona Hotel, Market Street, Rhyl. October 7 is a film show with a junk sale on the 21st.

Cornwall

Cornish RAC: N. Pascoe G4USB (Falmouth 40367). Meets 1st Thursday (and 2nd Monday for computer club) at the Church Hall, Treleigh. October 14 is the computer section with G4BHC on AMTOR and November 7 is the general club meeting.

Cumbria

Carlisle & District ARS: Tony Leach G4WOQ (Scotby 500). Meets Mondays, 7pm in the Scout Hut, Trinity School, Carlisle—except Bank Holidays when it's the Grosvenor Hotel.
Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith. Meets 3rd Thursday, 7.30pm in the Kings Arms, Temple Sowerby (on the A66). October 17 is a visit to Radio Carlise.
Westmorland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal. Meets 2nd Tuesday, 8pm at the Strickland Arms, Sizergh, nr Kendal.

Derbyshire

Glossop & District AR Group: G. Sims G4GNQ, 85 Surrey Street, Glossop. Meets last Thursday, 8pm in the Nags Head, Charleston Road, Glossop.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Friday, 7.30pm in the Cavalier Inn, West Street, Axminster. October 4 is the AGM
Exeter ARS: Roger Tipper G4KXR (Exeter 68065). Meets Mondays in the Exeter Community Centre, St. Davids Hill, Exeter. October 14 is the AGM.
Exmouth ARC: Des Thompson, Four Winds, 131 St. Johns Road, Exmouth. Meets alternate Wednesdays, 7.30pm at the Scouts Hut, Marpool Hill, Exmouth. October meetings are on the 9th and 23rd.
Tiverton (SW) RC: G.W. Draper G4ZNV (Copplestone 235). Meets Tuesdays, 7 30pm in the Half Moon, Fore Street, Tiverton.

Dorset

Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Wednesday at Poole College, North Road, Poole. October 30 is on 50MHz Operation and Techniques.

Dumfries & Galloway

Maxwelltown ARC: Trig Rodgers GM4NNC, 5 Elder Avenue, Lincluden, Dumfries. Meets 1st and 3rd Wednesdays, 8pm at the Tam O'-Shanter Inn, Dumfries. October 16 is the AGM.

Essex

Braintree & District ARS: David Willicombe G6CJA (Braintree 45058). Meets 1st and 3rd Mondays, 7.30pm in the Braintree CC, Victoria Street, Braintree. October 7 is JOTA planning and the 21st a construction contest.
Havering & District RC: D. St. J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm at Fairkytes Arts Centre, Billet Lane, Hornchurch. October 16 is the constructors competition judging and the 30th is G3RWL on OSCAR Satellites.

Greater Manchester

Trafford ARC: Graham Oldfield (061-748 9804). Meets Thursdays, 7.30pm at the 9th Urmston Scout Group HQ, Bradfield Road, Urmston.

Gwent

Abergavenny & Nevill Hall ARC: J. B. Davies GW4XQH (Abergavenny 4655). Meets Thursdays, 7.30pm in Pen-y-Fal Hospital, above Male Ward 2.

Gwynedd

Merion ARS: Ken Judge GW4KEV, Tyddyn Mawr, Arthog. Meets 1st Thursday, 7.30pm in the Dolserau Hall Hotel, Dolgellau.

Hampshire

Amateur Radio & Computer Club: Trevor Tugwell (Locks Heath 81032). Meets 1st Friday, 8pm in the Crown, Bishop's Waltham. Next meetings are October 4 and November 1. Sunday net is on 144·550MHz at 8pm.
Basingstoke ARC: Dave Burleigh GWWIZ (Tadley 5185). Meets 1st Monday, 7.30pm at the Forest Rings CC, Sycamore Way, Winklebury, Basingstoke. October 7 is the AGM and November 4 is constructors competition judging.
Binstead ARS: A. F. Knight G4RTT (IoW 295951). Meets Wednesdays. 7.30pm at the 1st Ryde/Binstead Scout HQ, Binstead, IoW.
Fareham & District ARC: Brian Davey G4ITG (Fareham 234904). Meets Wednesdays, 7.30pm at the Porchester CC, Westlands Grove, Porchester. October 9 is Davtrend demonstrating their equipment and the 23rd is G3CCB on End-fed Antennas.
Farnborough & District RS: Peter Taylor (Farnborough 837581). Meets 2nd & 4th Wednes-

days, 7.30pm at the Railway Enthusiasts Club, Access Road, Farnborough. October 11 is a film show and the 23rd a surplus equipment sale.

Three Counties ARC: K. D. Tupman G6WWE (Petersfield 66489). Meets alternate Wednesdays in the Railway Hotel, Liphook. October 16 is G4JXO on Interference and the 30th is h.f. and v.h.f. stations on the air.

Hereford & Worcester

Droitwich ARC: Gordon Taylor G4HFP (Stourport-on-Severn 3818). Meets 2nd and 4th Mondays, 8pm in the Scout HQ, Union Lane, Droitwich.

Worcester & District ARC: D. W. Batchelor G4RBD (Worcester 641733). Meets 1st and 3rd Mondays, 8pm in the Oddfellows Hall, New Street, Worcester. Informal gatherings on Mondays. November 4 is G4BBR on AMSAT.

Hertfordshire

Cheshunt & District ARC: Roger Frisby G4OAA (Hoddesdon 464795). Meets Wednesdays, 8pm in the Church Room, Church Lane, Wormley.

Welwyn Hatfield ARC: Dave Fairbanks G0AII (Welwyn Garden City 26138). Meets 1st and 3rd Mondays, 8pm at the Knightsfield Scout HQ, Welwyn Garden City Morse classes held Thursdays. October 7 is G0AII on Radio Controlled Aircraft and the 21st is an RSGB video.

Humberside

Grimsby ARS: George Smith (Grimsby 887720). Meets Thursdays, 7pm at the Cromwell Social Club, Cromwell Road, Grimsby. October 10 is a computer evening and the 17th a junk sale.

Hornsea ARC: N. A. Bedford G4NJP, 39 Hamilton Road, Bridlington. Meets Wednesdays, 8pm at the Mill, Atwick Road, Hornsea October 20 is "Elhoex '85" (an exhibition) and the 25th is the AGM.

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesday, 8.30pm at St. Marks Church Hall, Biggin Hill. October 15 is a rep from BT on Cellular Radio.

Dartford Heath DF Club: Peter Sharman G8DYF (Greenhithe 844467). Meets Tuesdays prior to the "hunt", 9pm at the Horse and Groom, Leyton Cross, nr Dartford Heath. October 12 and 26 are the next "hunts".

Hilderstone RS: Annette Penfold G0BEX (Canterbury 812723). Meets Fridays, 7.30pm at the Hilderstone AEC, St. Peters, Broadstairs.

West Kent ARS: Nigel Peacock G4KIU (Tunbridge Wells 33586). Meets Fridays, 8pm at the AEC Annex, Quarry Road, Tunbridge Wells. November 1 is a slide and video show of the club's expedition to the west coast of Eire.

Maidstone ARS: Graham Edy G4AXD (Maidstone 29462). Meets Fridays, 7.30pm at the YMCA Sportscentre, Melrose Close, Cripple Street, Maidstone. October 11 is G3REM on Vehicle Suppression and the 25th is G8UFJ on the Microprocessor Control of Aircraft.

Lancashire

Bury RS: Brian Tyldsley G4TBT (Burnley 24254). Meets Tuesdays, 8pm at the Mosses CC, Cecil Street, Bury. October 8 is G3RJV to judge the construction contest and talk on QRP.

Fylde ARS: H. M. Fenton G8GG (Lytham St. Annes 725717). Meets 1st and 3rd Tuesdays, 7.30pm at the Kite Club, Blackpool Airport. October 15 is the RSGB video *Further Thoughts on Propagation by G3IOR.*

Oldham ARC: Fiona Butterworth G4SPX, 26 Torwood Road, Chadderton, Oldham. Meets Thursdays, 8.30pm at the Moorside Conservative Club, Ripponden Road, Moorside.

Preston ARS: George Earnshaw G3ZXC (Preston 718175). Meets 2nd and 4th Thursdays, 7.45pm at the Lonsdale Club, Fulwood. October 10 is G4PLB on the WAB Award and the 24th is the *Secret Listeners* video.

Rossendale Valley RC: Lee Standley G1EIU (Rossendale 214411). Meets Thursdays, 8pm in the Bishops Blaize Hotel, Rawtenstall, on the A56.

Thornton Cleveleys ARS: Mrs E. E. Milne G4WIC (Thornton Cleveleys 821827). Meets Mondays, 7.45pm at the 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool. October 7 is a guest speaker from NORWEB on Power You Can Rely On, the 21st is the AGM and the 28th is G3AQW on Antennas.

Lincolnshire

Stamford & District ARS: M. B. Rochester G6ZCY (Oakham 55334). Meets 2nd and 4th Wednesdays in the Anchor, Stamford.

London

Acton, Brentford & Chiswick ARC: W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3 8LB. Meets 3rd Tuesdays, 7.30pm in the Chiswick Town Hall. High Road, Chiswick W4. October 15 is G3IGM on Impedance Matching.

Grafton RS: John Kaine G4RPK, 74 Camden Mews, London NW1. Meets 2nd and 4th Fridays, 8pm at the Five Bells, East End Road, East Finchley, London. RAE and code classes now being run.

Wimbledon & District ARS: George Cripps G3DWW (01-540 2180). Meets 2nd and last Fridays, 8pm at the St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. October 11 is the AGM and the 25th is G4FFU on Cellular Radio.

Merseyside

Wirral ARS: Cedric Cawthorne G4KPY (051-625 7311). Meets 1st and 3rd Wednesdays, 7.45pm at the Parish Hall, Heswell, Wirral. October 16 is the AGM.

Middlesex

Echelford ARS: Peter Coleson G4VAZ (Sunbury 83823). Meets 2nd Monday and last Thursday, 7.30pm at the Hall, St Martins Court, Kingston Crescent, Ashford. October 14 is G3VPK lecturing.

Edgware & District RS: John Cobley (Hatfield 64342). Meets 2nd and 4th Thursday, 8pm at the Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. October 24 is a film show.

Radio Society of Harrow: Alison Wilson G6NDJ (Rickmansworth 53642). Meets Fridays, 8pm at the Harrow Arts Centre, High Road, Harrow Weald (talk-in on RB14). October 11 is 3·5MHz activity night, the 18th is a CEGB rep on Making Electricity, the 25th is a 14MHz activity night and November 1 is G4ZES on Astronomy for Amateurs.

Nottinghamshire

Mansfield ARS: Angela Fisher G1DZH (Mansfield 652812). Meets 1st Friday and 3rd Tuesday at the Victoria Social Club, Mansfield. October 4 is G3AMY on antennas in confined spaces, the 15th is the club constructional project for judging next April.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets Tuesdays, 7.30pm at the Sub Aqua Club, The Maltkins, Gateford Road, Worksop. October 18 is a club visit to the Maltby Club for a quiz and the 29th is the return match.

Shropshire

Salop ARS: John Orrells G6DQY (Shrewsbury 260668). Meets Thursdays, 8pm at the Olde Bucks Head, Frankwell. October 10 is the AGM.

Telford & District ARS: Tom Crosbie G6PZZ (Telford 597506). Meets Wednesdays, 8pm at the Dawley Bank CC, Bank Road, Dawley. October 9 is a VHF NFD video by G8YLQ, the 16th is G4AZV on Generating s.s.b. and the 23rd is the club station on the air.

Somerset

Street & District ARS: Colin Webber G4SCD (Street 45145). Meets 1st Tuesday, 7pm at Strode College, Street. November 5 is a talk on Computing in Amateur Radio.

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm at the Recreation Centre, Chilton Grove, Yeovil. October 10 is the QRP Convention, the 17th is G3MYM on Profile of the Ionosphere, the 24th is Capacitance and November 7 is the Inverse Square Law of Radio Wave Propagation.

Staffordshire

Stafford & District ARS: A. C. Bairstow G4RSW (Stafford 46306). Meets Tuesdays, 8pm at the Coach and Horses, Mold, Weston (on the A51).

Suffolk

Ipswich RC: Jack Toothill G4IFF (Ipswich 44047). Meets 2nd and last Wednesday, 8pm at the Rose and Crown, 77 Norwich Road, Ipswich. October 9 is a special Morse session, the 19/20th is Jamboree-on-the-air and the 30th a bring and buy sale.

Surrey

Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam. Meets 3rd Friday, 7.30pm at the Downs LT Club, Holland Avenue, Cheam. October 18 is Charles Newton G2FKZ on Propagation Matters.

Thames Valley ARTS: P. F. Scott Dickenson G6VFP, Ninicsu, 18 Pennington Drive, Weybridge. Meets 1st Tuesday, 8pm at the Thames Ditton Library, Watts Road, Giggshill, Thames Ditton.

Sussex

Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesday and 3rd Thursday, 7.30pm at the Fernleigh Centre, 40 North Street, Chichester. October 17 is a junk sale with the JOTA station being on air on the 19/20th from the 12th Chichester Scout HQ, Sherbourne Road.

Southdown ARS: R. Wilson G1BAB (Eastbourne 890234). Meets 1st Monday, 7.30pm at the Chaseley Home, Southcliffe, Eastbourne, and Tuesdays and Fridays, 7.30pm at the Wealdon DC Offices, Vicarage Fields, Hailsham. October 7 is a surplus equipment sale and November 4 is G8FCD on Weather Satellites.

Worthing & District ARC: Roy Jones G4SWH, WADARC, POB 599, Worthing. Meets Wednesdays, 7.30pm at the Lancing Parish Hall, South Street, Lancing. October 9 is a discussion of club affairs and the 16th is Cmdr Hatfield on Spectroheliography.

Warwickshire

Stratford upon Avon & District ARC: David Boocock G8OVC (S.u.A 750584). Meets 2nd and 4th Mondays, 7.30pm at the Baptist Church, Payton Street, S.u.A. October 14 is G0AJB on The History of Computers and the 28th is a test equipment night.

West Midlands

South Birmingham RS: Tim Scrimshaw G8RGQ (021-459 8312). Meets at 7.45pm in the West Heath CC, Hamstead House, Fairfax Road, West Heath. November 6 is the AGM.

Coventry ARS: Robin Tew G4JDO (Coventry 73999). Meets Fridays, 8pm at the Baden Powell House, 121 St Nicholas Street, Radford, Coventry. October 4 is the AGM, the 11th and 25th are nights on the air, the 18th is a quiz session and November 1 is a film show.

West Bromwich Central RC: John Bates G6ZLW (021-553 0531). Meets Sundays, 8pm at the Hop and Barleycorn, Dartmouth Street, West Bromwich.

Willenhall and District ARS: John Phillips G4UPF (Wolverhampton 782076). Meets Wednesdays, 8pm at the Saracens Head, Bloxwich Road South, Willenhall, in the external amenities room.

Wolverhampton ARS: Keith Jenkinson G1OIA (Wolverhampton 24870). Meets Tuesdays, 7.30pm at the Wolverhampton Electricity S & SC, St Marks Road, Chapel Ash, Wolverhampton. First 30 minutes are for code practice. October 8 is a discussion night, the 15th is Tom Douglas G3BA on Clandestine Radio as a PoW, the 22nd is a film show and the 27th is a d.f. hunt on 144MHz—11am at Tettenhall Rock.

Wigtownshire

Wigtownshire ARC: Gerry Maxwell GM4BAE (Stranraer 2876). Meets Thursdays, 7.30pm at the Stranraer CC, Lewis Street, Stranraer.

Wiltshire

Blackmore Vale ARS: M. R. Bailey, 11 Brines Orchard, Templecombe, Somerset. Meets 2nd and 4th Tuesday at the Bell and Crown, Zeals. October 8 is G3WRV on How to Make Cheap Crystal Filters.

Devizes & District ARC: Peter Greed G3MQD, 18 Nursteed Park, Devizes. Meets Fridays, 8pm at the Devizes FC Social Club, Devizes.

Trowbridge & District ARC: Gerry Callaghan G4SPE (Westbury 4532). Meets 4th Tuesday, 8pm at the Southwick Village Hall, nr Trowbridge.

Yorkshire

Pontefract & District ARS: Colin Mills G0AAO (Pontefract 43101). Meets Thursdays, 8pm at the Carleton CC, Pontefract. Informal meetings on Mondays with code classes. October 19/20 is the GB2AS JOTA station on the air and the 24th is G3SVW with a talk and slide show.

Todmorden & District ARS: J. Gamble G6MDB (Todmorden 2494). Meets 1st and 3rd Mondays, 8pm in the Queens Hotel, Todmorden. October 7 is a talk on Constructional Matters (the start of the annual constructors contest) and the 21st is a junk sale.

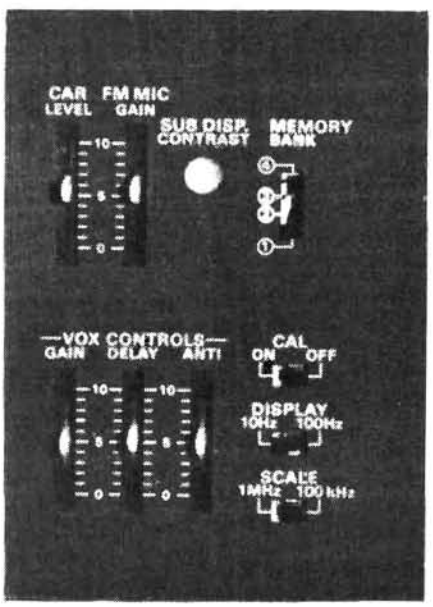
Wakefield & District RS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm at the Ossett CC, Prospect Road, Ossett. October 15 is the Aerial Circus video and the 29th is a pie and pea supper at the Rose and Crown, Methley.

Cover Date	Deadline	For events from early
January '86	Oct 15	December
February '86	Nov 15	January '86
March '86	Dec 15	February '86

30 ▶

very complimentary comments on signal quality, and the c.w. full break-in facility was effectively proved. The p.a. cooling fan is quiet, yet according to the handbook it is powerful enough to permit full-power continuous transmission on f.s.k. for up to one hour!

All controls operate smoothly and effectively with only a couple of nasties. The first is something you'd no doubt get used to in time—the keypad for direct frequency entry doubles up as the amateur band selector pad. Every time I wanted to enter a frequency including the digit "7" I found myself punching the "7MHz" button, which is the digit "3". Silly, I know, but there it is!



Less-frequently used controls are hidden under a door in the transceiver top cover

The second criticism is more serious, and is something which apparently does not lend itself to a simple solution. The normal tuning rate of the main tuning control knob is 10kHz per revolution, but this rate increases progressively if the knob is turned faster, a very nice feature. What is not so nice is that when you select a.m. the tuning rate is increased automatically by a factor of 10. This makes tuning on the shortwave broadcast bands quite touchy, more like a down-market broadcast receiver than an up-market communications receiver. Please Mr. Trio-Kenwood, find some way of getting round this.

The Trio TS-940S in its basic form is priced at around £1695. Our thanks go to **Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE. Telephone 0629 2430,** for making the review samples available. ***PW***

EAVESDROPPINGS

"You're 5 and 9 but I'm sorry I can't copy you . . ."

. . . heard on 3·5MHz by M. Probert

. . . "thanks for the QSO old man, as the Dutch Elm beetle said —see you further down the log!"

. . . heard by G3TZG on 144MHz

G1 . . .—"My wife does not like me playing radio, so I've had to set up my shack in the greenhouse!"
G4 . . .—"Never mind, at least the greenhouse is good for propagation."

. . . heard by G4WFS

F1 . . .—"Your QTH locator is Boston Kilo 14 Charlie QSL?"
F6 . . .—"Negative, negative, Bravo Kilo, Bravo Kilo."

. . . heard on VHF, NFD by G3JMA

. . . "thanks for the fb 579 report om. Would you pse repeat my report?"

. . . heard by 9J2BO

ERRORS & UPDATES

PW Meon, October 1985

The winding details of inductor L3 are the same as L10 shown in Fig. 3. The formula for output impedance should read:
RL = $(V_{cc}-V_{ce})^2/2PO$ producing a result of approximately 140 ohms for the 2N3866

Computing in Radio, Spring 1985

It has been brought to our notice that the article entitled *FORTH for the Radio Amateur*, which appeared in our May 1985 issue, was originally written by Robert L. Kurtz W6PRO and published in *Kilobaud* magazine in November 1978. We apologise to Robert L. Kurtz and to the publishers of *Kilobaud* for this infringement of their copyright.

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

In the August/September issue of the Wirral ARS newsletter G2HOF discusses the question of noise in making a DX contact on the h.f. bands. As he says this subject is seldom mentioned in amateur literature. Apart from the well-known interference from domestic and industrial electrical equipment the main source of QRN is from lightning strikes. In the UK we have relatively few thunderstorms compared with the tropical regions of the world where lightning strikes are a virtually continuous phenomenon.

These strikes produce QRN that is propagated, says G2HOF, over long distances by the ionosphere in one or more hops just like a radio signal. The months of June, July and August are the worst months for us for static when the storms are following the sun which is then in the northern hemisphere. The worst storm areas are around Malaya, East Africa and southern Mexico, the main thunderstorm belt lying from the equator to 30 degrees north and occurring mostly in the late afternoon and evening.

G2HOF says that the noise level in these areas is around 6dB or more higher than that which we will experience in the UK so that although we may be getting a DX station 5 and 9 it may well be impossible for the DX station to copy us because of the high noise level. G2HOF gives the field strengths required in the UK for good reception of s.s.b. signals at noon and midnight on the h.f. bands, in microvolts/metre (μV/m).

Band (MHz)	Noon (μV/m)	Midnight (μV/m)
1·8	0·07	40
3·8	0·15	15
7	0·90	10
14	3·00	5
21	1·00	0·1
28	0·60	0·6

It is worth mentioning that at around 25MHz the noise penetrates the layers of the ionosphere so that it is not reflected or heard in the UK. The noise heard on the 28MHz band is extra-terrestrial and is constant at about 0·5μV/m.

Regular contributor Andy Durrant of Aldershot, Hants, looks with pride on his new FRG-8800 receiver and FRT-7700 a.t.u.

The formula given by G2HOF to decide whether our distant friend can hear our signals, using a beam antenna, is:

$$E(max) = \frac{138}{d} \times \sqrt{WG}\ \mu V/m$$

with the power "W" in kilowatts and "G" the numerical gain of the beam, and "d" in miles.

The field strengths given in the table are good for the north temperate zone but for tropical area reception they need to be increased by at least 6dB in order to ensure a proper QSO.

DX Bands

An interesting letter this month from **John Kojan**, ex-W8NHZ, now retired to St Cyprien in France, who I hope will contribute to this column in the future. John runs an FRG-7700 and a.t.u. plus end-fed wire 15m long in the loft. He's managed to log 141 countries so far but blames the present low in the sunspot cycle for not doing better.

D.R. Degg of Stoke-on-Trent has a Realistic DX-300 and inverted-V to an a.t.u. and sends his first log after an absence of a couple of years. Sticking to the 14MHz band he caught DW0JBW, YS6VM, 4N5SF, A6UBL, C30BB, HW4PY (special event station), 3X0HAB (QSL DL8CM).

A welcome to the column for **Graham Powell** (Pontypridd, Mid-Glam) who runs a Trio R2000, KX3 a.t.u. and 20m-long wire, and who has now deserted the BC bands. Only catch of note on 7MHz was LA1EKO on the Ekofisk oil field. On 14MHz A71AD, SV0DH/5, YI1BGD, 5H3BH, 9U5JB and VE3KFE/4U on the Golan Heights. Up to 21MHz and just 5Z4DU and CE5CQD.

From the *RSGB News Bulletin* I learn that a group of young licensed RSGB members will form a DXpedition to Guernsey during the half-term hols October 19 to 27 which will include operation in the CQ WW DX 'phone contest. More on this from GU4WTN, aged 17, on 0481 65633.

From Weymouth in Dorset **Mike Willgoss G4XRR** reports on his 28MHz activities using a Yaesu FT-902 transceiver running a 100W plus, sometimes, an FL-2100 400W linear, plus two-element Avanti quad antenna. He, too, finds the band becoming more and more deserted. He did manage QSOs with PY5EG, CT1KN, PY2ZJ, CX4HS, C53BI, LU7HJM and NP4NU/DL. Gotaways included A71AD, ZP5RH and IS0XRI.

Another newcomer to s.w.l.ing is **Tom Street** of London N4 who realises he will need something better than a Vega 206 receiver fed from a wire connected to a metal roller shutter if he is going to copy any decent DX!. He fitted a home-brew b.f.o. and managed to copy plenty of Europeans. He expects to have an R-2000 'ere long.

More from **Dick Stanbridge BRS31879** of Leiston, Suffolk, who has an R-2000, AT1000 a.t.u. and half-size G5RV plus an active antenna from Datong. CW on Top Band brought UQ2GMB, UB4WEU, UA2FF, UA1WDR and UR1RWX. A good catch on 7MHz was ZL4IG plus HK1JPE and LU9VAJ all on s.s.b., with ZS6QU on c.w. On the 10MHz band, on c.w. were VK2BKH, J28EI, ZS6CEV and FG5XC. Only stations worthy of note on 14MHz were AL7FG and KH6IJ on s.s.b.

Andy Durrant has now moved to Aldershot and is only three minutes walking distance from his job! His AR88 has been retired and he now has an FRG-8800 and FRT-7700 a.t.u. with an inverted-V antenna. Just off the top edge of 3·8MHz he logged N2RM and VE2EQ. Between about 7·05 and 7·1MHz he came up with IV3FIY/5N4, J5WAD in Guinea Bissau, TZ6FW (QSL DL4BC), YB4FW (QSL POB 50, Banka) and HK3HMA. The 14MHz seemed to do best for Andy with T77F, TR8AH, TU2CJ, TZ6FE, V3CRQ, YI1BGD (QSL POB 5864 Baghdad), 5B4MF, 5Z4MR, 7X2LS, 9H3EC on Comino Island, between Malta and Gozo, QSL HB9CQK, 9U5CK, AJ6NQ, KL7NT, KV4AM, N5CJB/5N1 with cards to K4ZKG, SV0DH/5 on Rhodes, and SW2QM/P. Up to 21MHz and CE4EBL, C53FX, LU1HE and PP2ZDD.

From Grimsby **Melvyn Dunn BRS86500** reports, on 14MHz, YI1BGD, AP2SQ, 5Z4DJ, PJ2HB (QSL POB 3052 Curacao), HI8HMS. A good one on 7MHz was TA1E, plus YV5DPO and HK6IDN and sole catch on 3·5MHz was CR9SI for a really rare one. Melvyn has an FRG-7700 and 40m-long wire antenna. Cards of note received recently include HK4IZ, OD5AS, A71KB, FP4CJ and K7AA.

Michael Sergeant of Bolton is another new contributor and he has a DR49 receiver and 20m-long antenna. His log shows such as CX8DM, EL2BA, FM4DN, JJ2BBZ, TZ6FE, VP2EX, YI1BGD and ZS1UX, all on 14MHz s.s.b.

A good bag was OH0MA on Top Band for **Robert Parsey BRS85875** of New Malden, Surrey. This is Market Reef and a separate country from OH-land. Down to 3·5MHz or thereabouts and CR9SI, OH0MA again, YB0JH, ZL1BMU at around 0500Z, ZS3GB (QSL POB 1165, Tsumeb 9000). The 7MHz band was pretty flat with just C30CAK (QSL F6BOC) and FM5WD (QSL W3HNK) and sole entry on 21MHz was ZD8KM with cards to G3IFB.

Phil Dykes G4XYX of Poole, Dorset continues to find stuff on 28MHz with his QRP modified CB rig running around 10W p.e.p. and a dipole, like CE3HFI, LU1BSN, LZ2SC, OH1QZ and WB2MAN, all between lunch time and 2300Z. On 7MHz with between 1 and 3W of c.w. to a dipole "bent around the garden" Phil worked plenty of Europeans including EA3LL, EI3FP, HB9AFZ, LA4CAA, SM5OMP, SP4JAE and UQ2GMI.

Some more QSL info picked up from here and there includes T30AT on Kiribati (QSL G4GED), FO0ASJ (QSL N5DD), FO0FB

(QSL WB6GFJ), ZK1CY (QSL W6KNH).

From Tonyrefail, Mid Glam, **Tom Blamey BRS87461** sends a mainly 14MHz log using an Icom IC-720A, Amtech 200 a.t.u. and 22m-long antenna. His catches include CE3CH, CX4AB, C53EK, DF1NH/OHO, EL2FM, FM5WD, HK7HFY, JW6WDA (QSL LA5NM), KL7LF, KP2AH, TU4BI, VP8LP, YI1BGD, ZD8KM (QSL G3IFB) and 8R1RPN. On 21MHz Tom logged just VP8QP and TZ6FS with cards to DL4BC. Sole station of note in the QRM of the 7MHz band was YBC .√R

Keep on sending in your logs remembering the monthly deadline for copy is the 15th of every month, for stuff heard or worked in the preceding month. When you've got your camera out don't forget a shot of the shack or rig will be very welcome.

VHF Forum

There is a rapidly increasing interest by amateurs in communication via meteor scatter propagation although this mode has been used by commercial interests and the military for many years. As is fairly well known the earth travels through a lot of debris in space together with periodical meteor showers of varying density.

A radio signal sent into space will be reflected back to earth albeit in a very haphazard and unpredictable manner. The strength of these returns is very low so the prime requirements are relatively high power, efficient high-gain antennas and low noise receiving equipment. A simple example of reflection from "up there" is that often experienced, especially by amateurs who live near an airport, of a rapid flutter from signal received directly and from the reflection from a plane as the signals go in and out of phase.

Obviously m.s. signals are likely to be of very short duration and so the amateur has devised a special procedure for exchanging basic information such as signal strength and location. This is well described in the RSGB's book *Amateur Radio Operators Manual*. The m.s. effect is variable depending upon the frequency in use but 144MHz is probably the most popular band at the moment. The 432MHz is becoming more used as suitable equipment comes on to the market, and the new 50MHz allocation will also be good for m.s. operation.

The various meteor showers represent peak periods of activity for m.s. enthusiasts. As the meteors pass into the earth's atmosphere they are burnt up producing small patches of ionisation which can reflect radio signals. The earth passes through these meteor showers regularly every year as the earth orbits around the sun. But the intensity of the showers can vary considerably every year, being associated with well-known comets.

Some amateurs use very sophisticated equipment for m.s. work sometimes with antennas of 100 elements or more producing high gain figures. Mast-top pre-amplifiers are a necessity and sometimes the 144MHz signal is converted at the antenna to another lower frequency, such as 28MHz, so avoiding losses in the coaxial cable between the antenna and the receiver, or transceiver in the shack. The main frequencies in use on v.h.f. are 144·100MHz and 144·400MHz, for c.w. and s.s.b., known as the reference frequencies, which should be avoided by other band users.

There seems to have been little sporadic-E or tropospheric activity in recent times on 144MHz. The only DX of note here in southern England was EA1CYE who peaked to 57 when a high pressure area from the s.w. extended into northern France.

Readers are invited to send in reports of their activity on the VHF/UHF bands remembering the deadlines for copy as shown in Club News.

RTTY

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

by Ron Ham BRS15744

"The British Amateur Radio Teleprinter Group has published the summer 1985 issue of its magazine *DATACOM*. It is another large edition, with 120 pages of news, views and technical articles on all aspects of RTTY, AMTOR, Packet Radio and FAX," writes BARTG Publicity Manager, **Ian Wade G3NRW**, QTHR

This issue contains full technical and constructional details of the ST5C Terminal Unit which connects between a transceiver and a home computer and converts received RTTY or AMTOR tones to t.t.l. levels suitable for input to the computer. In the reverse direction, the ST5C provides a tone generator which accepts t.t.l. input levels from the computer and converts them to audio tone for input to the transmitter. "Many of these units are now in regular use and are particularly suited to handling weak, noisy signals under heavy interference. BARTG supplies p.c.b.s and kits for the ST5C, together with complete ready-to-go units which are fully built and aligned for immediate use," says Ian.

DATACOM, published quarterly by BARTG, is supplied free of charge to members. All details available from Mrs Pat Beedie GW6MOJ, "Ffynnonlas", Salem, Llandeilo, Dyfed, Wales SA19 6EW.

"RTTY has been open to S. America on quite a few evenings around midnight," writes **Peter Lincoln**, Aldershot. Peter is an experienced RTTY listener on the h.f. bands and is delighted to have increased his list of confirmed countries by two when he received QSL cards, in reply to his RTTY reports, from BARTG member I4JXE and ISWL member KP4BJD. Useful tips on this important subject of QSLing are given in an article, RTTY and the s.w.l, written by **Ted Double G8CDW** in the summer issue of *DATACOM*.

During the month prior to August 12, **Norman Jennings**, Rye, copied RTTY signals from forty countries on the 14MHz band, ranging from Greenland to S. America and Canada to S. Africa. Norman's pick, of a very important bunch, was HL1EJ in Korea which he received at 2132 on August 6.

Among the interesting signals that I copied were OE3HGB/YK at Camp Fauar in the Golan Heights at 2014 on July 23; a CQ at 0016 on the 29th from IKOMIL, an Italian Army Signals Corps station; "GREETINGS FROM THE AZORES ISLANDS," typed CT2CQ at 0906 on August 7 and a couple of lines of print at 0201 on the 6th which, before I lost the signal, read "BRING A FRIEND AND INTRODUCE HIM TO THE WONDERFUL WORLD OF DXING."

"RTTY has shown better results this time," said **Len Fennelow G4ODH**, Wisbech, whose computer-stored records, combined with the log of Norman Jennings and my own log were used to prepare our monthly signals-heard chart, Fig. 1. During this period, Len also received AMTOR signals from England, Germany, Guernsey and Wales on 3·5MHz, France, Germany, Holland, Italy and Switzerland on 7MHz and France, Germany, Italy, Oman, Sweden and Switzerland on 14MHz. Specials for Len this time were receiving signals from India and Oman on 14MHz RTTY and AMTOR respectively. It is interesting to see, that from a total of 933 replies to the BARTG survey question about RTTY speed used on the v.h.f. and u.h.f. bands, 543 (58 per cent) use 45 bauds and 390 (42 per cent) use 50 bauds. However, the concentration of the speeds varies throughout the UK and briefly, there are pockets of 50 baud activity in the Birmingham, Brighton, Bristol, Ipswich, Glasgow and Southampton areas.

Therefore it is important to remember that if you cannot get intelligent print from a reasonable RTTY signal, then check the speed setting of your terminal unit system.

Fig. 1 ▶

Country (Prefix)	Band (MHz) 3·5	7	14	21
Argentina (LU)			X	
Austria (OE)			X	
Azores (CT2)			X	
Belgium (ON)			X	
Bulgaria (LZ)			X	
Canada (VE)			X	
Canary Is. (EA8)			X	
Chile (CE)			X	
Cyprus (ZC, 5B)			X	
Czechoslovakia (OK)		X	X	
Denmark (OZ)			X	
Eire (EI)			X	
England (G)	X		X	
Finland (OH)			X	X
France (F)		X	X	
Gabon (TR)			X	
Germany (DF, DJ, DK, DL, DM)	X	X	X	X
Gibraltar (ZB2)			X	
Golan Heights (YK)			X	
Greenland (OX)			X	
Guatemala (TG)			X	
Holland (PA)	X	X	X	
Hungary (HA)			X	
India (VU)			X	
Israel (4X4, 4X6)			X	
Italy (I)		X	X	
Korea (HL)			X	
Kuwait (9K)			X	
Lebanon (OD)			X	
Malta (9H)			X	
Norway (LA)			X	
Oman (A4)			X	
Poland (SP)			X	
Portugal (CT1)			X	
Puerto Rico (KP4)			X	
Rumania (YO)			X	
Sardinia (IS0)			X	
Scotland (GM)	X		X	
South Africa (ZS)			X	
Spain (EA)		X	X	
Sweden (SM)		X	X	
Switzerland (HB9)	X	X	X	
Trinidad & Tobago (9Y)			X	
USA (K, N, W)			X	
USSR (UA, UB, UK, UT, UZ)			X	
Vatican City (HV)			X	
Venezuela (YV)			X	
Wales (GW)			X	
Yugoslavia (YU)			X	
Zaire (9Q5)			X	

SPACE & SATELLITES

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

by Pat Gowen G3IOR

The *Challenger* shuttle mission carrying W0ORE and W4NYZ was initially brought forward three days to July 12, but, computer command dictated that the flight was aborted only three seconds before lift-off, having detected a valve failure in the coolant system flow reduction required at launch. The flight was re-scheduled to 1923UTC on July 29 and suffered two further holds in the count-down, but finally the spaceship was permitted to soar aloft at 2000:10UTC on July 29. The problems were then not over, as one minute after launch one of the three motors shut down due to overheating, meaning an abort into a lower than scheduled orbit after fuel dumping, with a 171·8km apogee and 168·3km perigee, i.e. a 90·93 minute fairly circular 49·49 degree inclination orbit.

Despite the upsets to the planned schedule, Dr Tony England, W0ORE, came up on the third day of the mission as promised, and downlinked some excellent frames of himself and the crew in *Challenger* from orbit 47 onwards which were well received by many amateurs in the USA and Europe. Later frames sent included some of him working on the exterior of the orbiter inspecting the coating tiles for any damage. Some good views of parts of Earth from orbit were also put down, all on 145·550MHz (S22) SSTV. His signals, particularly when the attitude of the spacecraft favoured the observer, were very strong, and could be copied clearly on a hand-held receiver, with the rapid doppler shift little affecting the readability or clarity of either the voice or SSTV mode.

In the UK the first QSO was made with GW6GW, the Blackwood District School Club operated by Bryan Davies GW3KYA. The schedule had been previously arranged for orbit 47 on August 1, but the mission changes precluded the appointment. Houston telephoned Brian and re-arranged the contact for orbit 61 on August 2, and a perfect two-way voice and SSTV QSO resulted, which was copied by thousands of listeners over the whole of Britain.

Later two-way QSO's were made by WA6VIA, W5RRR, WA3NAN, W2RS, K2OIJ, K0RZ, W5LFL, G1GJY and GB3RS, and many hundreds of observers reported good voice and SSTV reception. For those desiring a QSL, send your report to: Ham in Space 51-F, American Radio Relay League, 225 Main Street, Newington, CT 06111, USA with an SAE and two IRC's if a direct return is required, otherwise via your QSL bureau. GB2RS gave twice daily updates on the Keplarian elements and passes for the mission, well presented with total accuracy, and were rewarded with one of the first downlinked SSTV pictures and a later f.m. voice QSO. WA3NAN, the club station of the NASA Goddard Spaceflight Center in Greenbelt, Maryland (the old WWV site) were on the air continuously on four bands from two hours before launch until touch-down plus 30 minutes. They were very good signals from 1000 until 1500, and again after 2000UTC, enabling many enthusiasts to copy the "shuttle audio" taken from the Tracking Data and Relay Satellites, and thus follow the fascinating experiments as they were scheduled.

While many were listening on the amateur bands, John GM4IHJ and Geoff GM6KXS were following the direct shuttle communications on 259·7MHz f.m. John, with David Anderson GM4JJJ, were particularly fascinated by the experiment of the get-away-special launched (and later retrieved by the shuttle crew) to investigate "Whistlers", "Chirps", "Sliders" and other radio emissions by its special plasma receiver listening from 0 to 30kHz and re-transmitting these on a 400·655MHz (doppler shifted +/– 10kHz) downlink. John describes the various sounds observed during the Aurora of 31 July as sounding like " . . . an aviary full of demented parrots . . ." These sounds are not normally heard on earth other than at the poles, due to the screening effect of our ionosphere, so this and many of the other successful solar related experiments will throw far more light on propagational phenomena of interest to the radio amateur.

SALYUT-7

Mark Shepherd writes from Auckland, New Zealand, to say that he can overhear the Shuttle transmissions, but is never able to detect the SALYUT-7 transmissions. The answer is given by GM4IHJ, who points out that while there are many American bases situated around the World, there are few Russian, and with the odd exception of contacts with the Antarctic research bases and specially deployed communications ships, the Soviet cosmonauts would not normally transmit over Australasia. Further, they tend to keep a "day" equating to USSR visibility times of 9-10 orbits per day, using the other periods of 5-6 orbits per day out of base range as rest time. John produces an "in-range" map (Fig. 1) that shows the areas which are likely to overhear the SALYUT, e.g. those not lined out in "shadow". The USSR command stations are located at the points marked by an asterisk "*". During October this year one may expect to copy orbits between 1700 and 1100, on 142·422MHz, slipping back by 3·6 hours each successive month. As the cosmonauts tend to use VOX, and lots of audio gain, the two-way transmissions will invariably be heard.

Further news has come in regarding the earlier boarding problems of SALYUT-7 mentioned briefly in last month's column. Contrary to Western Press reports, "Isvestia", quoting the head spokesman, said nothing about the space station being stable. He reported that the specially trained SOYUZ docking crew found Solar Panel control failure, frozen water, flat batteries and quite a few other problems. It took the new crew two days to dock manually, helped by a special laser system to enable slow approach to the toppling spacecraft. They suffered water rationing for several days until they had manually re-pressurised the system and thawed out the on-board supply. It took two weeks to re-position SALYUT-7 into the sun and replace the Solar panels before power was available for heating, systems and communications.

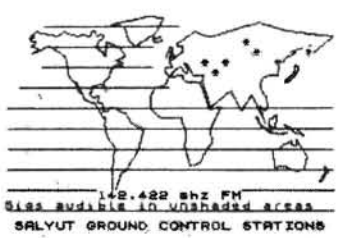


Fig. 1: Computer graphic map by GM4IHJ of areas in mutual range of SALYUT-7 with command stations marked with "*"

STS 61-A and D-1

Professor Reinhard Furrer DD6CF and Dr Ernst Messerschmidt DG2KM piloted an aircraft that took off from Cologne at 0908 on Saturday 17 August and flew for five hours over Germany. They were testing the amateur radio equipment to be used on the D-1 SPACELAB mission of Shuttle 61-A that is now postponed and scheduled for launch on 7 November this year. (Though still officially set for a 30 October lift-off.) Using downlinks of 145·575 and 145·550MHz and listening on 437·275 and 437·225MHz, and the callsign DF0LRK/AM (the first ever Aeronautical Mobile license ever issued in DL) they contacted over 200 European stations, mainly in Germany, and found the apparatus to be functioning perfectly.

On the third day of the actual space-mission itself, using the callsign DP0SL, they will be active with f.m. downlinks of 145·450, ·475, ·550 and ·575MHz (Simplex channels S18, 19, 22 and 23) and listening on f.m. uplinks of 437·125, ·175, ·225, ·275, ·325, and ·375MHz at all times when not busy with experiments. When busy, all calls will be recorded with both systems running, and a continuous low power 435MHz band beacon will be aboard to aid accurate tracking. Dr Wubbo Ockles now has his callsign—PE1LFO, and will be on the same mission.

It is understood that GB2RS on 3·650MHz and WA3NAN on 14·295MHz will be covering the mission, and W1AW will be giving regular updated bulletin transmissions, so watch the media and the AMSAT nets to keep in touch with developments.

Fig. 2: SALYUT-7 and SOYUZ/SALYUT-7/PROGRESS coupling, photographed by OH6EH at the USSR "DIPOLI" space exhibition in Helsinki last year

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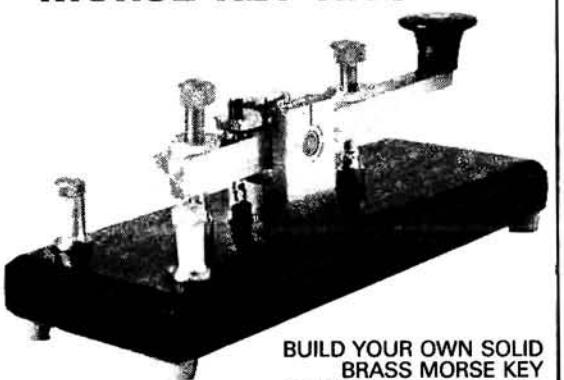

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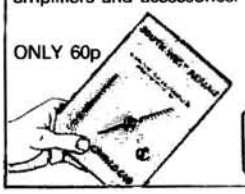

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OSCAR-10

A-O-10 was a very different satellite during the August "On at Perigee" and "Off at Apogee" schedule designed to safeguard the satellite through eclipse. Both the sensitivity and the strength of the downlink, due to the dramatically reduced path-length when the transponders were operative at Perigee were much enhanced. The numbers of new modestly powered stations heard broke all records. Another record broken was the first true OSCAR-10 mobile to mobile, by a solid QSO between G4CUO/M and G3PXT/M at 1600 on 19 August. Both David and Gordon were running some ten watts to mobile whips, and they were both on the move at the time.

9K2BZ, Abdul in Kuwait, and Flavio, C30BBO in Andorra (QSL F1EHO) have provided new countries. The HC8 Galapagos Island DX-pedition was out of range for most of Europe due to the limitation of mutual satellite range at Perigee.

RS-5, 7 and 8

The Soviet satellites had difficulties in maintaining their two days operation per week schedule during eclipse, but came back on 1 August with RS-7 (ROBOT and transponder) and RS-5 (transponder) on continuously. That was the good news! The bad news is that by the time you read this, a new eclipse will be starting!

RS-8 seems to be suffering command problems, and is on less frequently. As the battery appears to be the best of all three, and as UA3CR earlier pointed out problems in getting the satellite commanded on due to a change of command code, it would appear that the passage of this satellite through the Van Allen belt has resulted in radiation damage to the depletion layers of the transistors and i.c.s of the command receiver. This is further demonstrated by the single telemetry channel prefixed "G" frequently being run on the beacon, as this is the command reception verification indicator.

A Million more Satellites

Our item with this title run in the August *PW* attracted a considerable amount of interest, and many readers have asked what other Comet associated meteor showers can be expected and when they occur. GM4IHJ has kindly calculated a list of these, which is reproduced in Table 1. John points out that these predictions are somewhat chancy, and should be taken as a rough guide as to what is possible.

TABLE 1

Meteor Shower	Annual Date	Associated Comet	When Comet next nearest to Earth
Lyrids	21 April	1861 I	2276 and 2691
E Aquarids	5 May	Halley	1986 and 2062 (1)
Draconids	27/30 June	Pons Winnecke	1989 and 1996
B Taurids	28 June	Encke	1987 and 1991 (2)
Capcornids	18/30 July	1881X	1986 and 1994 (1)
Perseids	11 August	Swift Tuttle	2102 (2)
Giacobinids	9 October	Giacobini Zinner	1985 and 1992 (1)
Orionids	20 October	Halley	1986 and 2062 (1)
S Taurids	5 November	Enke	1987 and 1991 (2)
Bielids	14 November	Biela 1826	1985 and 1991 (1,2)
Andromedids	17/27 Nov	Biela	1985 and 1991 (1,2)
Ursids	22 December	Tuttle 1939X	1994 and 2008

(1) Indicates that a spectacular event is likely in 1985/1986.
(2) Denotes that these Comets may have broken up, but that the associated Meteor Shower may still be active. Grave doubts exist regarding the Comet associated with the Perseids shower, as it did not appear in 1982 and is lost.

Table 2. Major Satellite Frequencies

Frequency in MHz	Service	Mode(s)
29·410–29·502	Radio Sport Amateur Sats.	USB & CW
137·080	Meteosat Geostationary Weather	FM
137·15, ·3, ·4	Circular Orbit Weathersats	FM picture
137·5, ·6, ·7		FM picture
142·42	SALYUT Cosmonauts	FM voice
145·81	OSCAR-10 BEACONS	CW,RTTY,PSK
145·825	UoSAT 1 & 2	PSK & Digitalk FM
145·83–·97	OSCAR-10 Amateurs	CW,USB,SSTV,RTTY
149·2–150·3	Navigation Satellites	RTTY
166·0	Progress/Salyut supply & Ocean Recon.	—
225–400	Military Communication Sats.	—
259·4 & 296·8	Space Shuttle	—
399·98	Navigation Satellites	Dopplering carrier
435·025	UoSAT	Mainly PSK
436·04	OSCAR-10 Mode L Beacon	PSK & CW
436·15–·95	OSCAR-10 amateurs	CW,USB,SSTV,RTTY
702–726	Soviet TV Satellites	Wideband TV FM
800–1000	Soviet Molniya Communication Satellites	—

Monitoring the Space Age

Following the feedback from previously published satellite and spacecraft frequencies, and recognising that many listeners are equipped with the new wide coverage v.h.f./u.h.f. receivers, it is now possible to monitor virtually all of the non-s.h.f. orbiters, thus providing lots of scope for experimentation and learning in space activity. John Branegan provides a further table of the frequencies employed by some of the more interesting space sources.

Infinite OSCARS

It came as rather a shock to your scribe to learn that OSCAR-24 and OSCAR-30 were launched from Vandenburgh Air-Force Base in California into a Polar 90 degree inclination 1100km circular orbit in August! It can be revealed now that these are not AMSAT's, but are the property of the United States Navy, being Maritime Navigational Satellites! What's in a name?

Apologies

Finally, apologies for those who patiently await the promised "getting started" series mentioned last month. Topical news and events have exhausted the space available again this issue, but we shall try again for the December column. Just hope that nothing too interesting is happening!

VHF BANDS

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


by Ron Ham BRS15744

Whilst the sun is relatively quiet, each small event may seem trivial but could turn out to be an important factor in helping to explain another phenomenon. So it really is worth making note of each happening.

Solar

"The British Ocean Weathership *Starella*, at Station Lima (west of Scotland), reports observing an auroral glow on the horizon during the night of July 18/19," reports **Ron Livesey**. Ron is the auroral co-ordinator for the British Astronomical Association. He noticed his own magnetometer indicated a disturbed magnetic field around the 18th and 19th. He also received a report, from the Boulder observatory, that showed a minor storm on the 15th, cause unknown, "for the 17th and minor storms again on the 24th and 27th."

The picture looked even more interesting when **Len Fennelow G4ODH**, Wisbech, reported hearing weak and watery signals from the 28MHz beacon in Cyprus 5B4CY during the evening of the 14th and 16th. After I had completed the monthly beacon chart, Fig. 1, compiled from the logs of a dozen experienced observers, I noticed that the 28MHz band was dead on the 15th. Something seems to have happened around that time, so look back in your logs and let's see what we can come up with.

At 1030 on July 27, **Cmdr. Henry Hatfield**, Sevenoaks, using his spectroheliioscope, located one sunspot and three small filaments. He comments, "the sun at 136MHz has been quiet during this period." In Bristol, **Ted Waring** observed a single sunspot on July 20, August 5 and 10 then eight spots on July 30. Which was about the same number drawn by **Patrick Moore**, Selsey, through thin cloud cover, at 0950 on the 31st, Fig. 3. I recorded a

few tiny bursts of solar radio noise during my midday observations at 143MHz on August 9 and 13. In Johannesburg, Bob Anderson's solar group, using a specially adapted 60mm refractor, counted between 0 and 4 sunspots on some days between July 15 and 27. Then the number went up to 9 and 10 for the 28th and 29th and up to 18 for the last two days of the month.

Never attempt to look at the sun directly either through a telescope or with the naked eye. Either consult an experienced astronomer or have a read of the article Radio Communication and Sunspots, April 1983 *PW*.

Those of you with a computer may like the booklet, *Shortwave Software*, published by Radio Nederland Wereldomroep. PO Box 222, 1200 J.G., Hilversum, Holland. It contains a computer program listing to calculate sunrise and sunset times for any chosen area. The program I use, called Astronomer, on my 48K Spectrum is along similar lines. That is available from C.P. Software, 10 Alexandra Road, Harrogate, N. Yorkshire HG1 5JS.

The 50MHz Band

In Knutsford, **Dave Coggins** keeps a regular watch on the 50MHz (6m) band. He received s.s.b. signals from G3ZIG at 0658 on July 17, G3COJ at 0640 on the 19th, G3GLT at 0718 on the 23rd and G4CUT at 2237 on the 24th. GW3MHW was heard at 0655 on the 24th and G6XM, with some meteor pings, at 0648 on the 29th—both using c.w. Late on the 30th, there was an opening to north America and Dave logged KA4DVH, KB3QM, W2CUK, W2HRW, WB2IFC and VE4YX. He concluded his impressive list with GM4FZH at 0657 on August 6.

Gordon Pheasant G4BPY, Walsall, completed a meteor scatter QSO with LA6QBA on July 20 and a direct QSO with EI0RTS on the 29th. During the evening of the 30th he was alerted to the possibility of an opening when he heard the 28MHz Bermuda beacon VP9BA. He was proved correct later when he had crossband QSOs with K2MUB, K3ACR, W3JO and W4CKD. Direct 50MHz QSOs were made with KA4DVH, KB3QM, W2CAP, W2CUK, W2HRW, W4CKD, WD2IFC and VE1YZ. On August 1 he made a cross-band QSO with EA4CGN.

By now, Len Fennelow should have a 5-element beam operational on 50MHz, this is to replace a vertical quarter wave and therefore increase the scope of his monthly propagation reports. I find the Band I section of my combined Band I/III Yagi very useful on both the 50 and 70MHz bands.

Sporadic-E

Although the 1985 sporadic-E season is nearing its end some of the August openings seemed above average intensity, especially in the 50 to 80MHz region. At times I received very strong signals from east-European broadcast stations between 66 and 73MHz during the early mornings of August 8, 9 and 14, at midday on the 9th and 12th and the evenings of July 16-18, 21, 26 and 29 then August 6 and 14. The average number of stations heard during the events was 12, with peaks of 21 and 23 on July 29 and August 14 respectively. In St Leonards-on-Sea, **Harold Brodribb**, counted 12 such stations at 1030 on July 28 and 3 at 0850 on August 6.

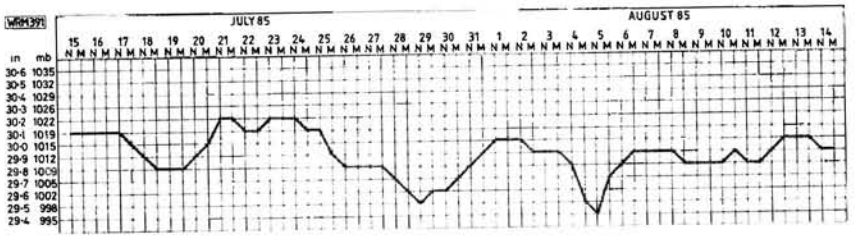


Fig. 1 ▲

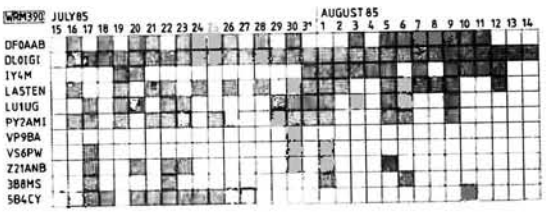
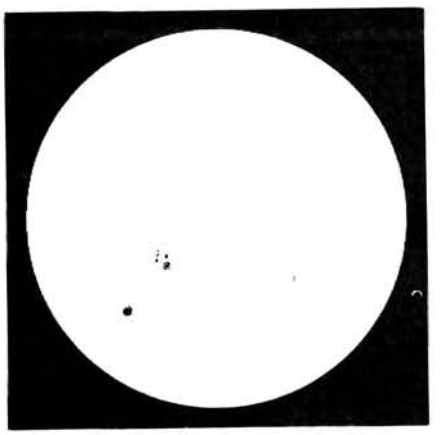


Fig. 2 ▶

Fig. 3 ▼



For these particular observations, both Harold and I use dipole antennas with ex-military v.h.f communications receivers, the RL85 and R216 respectively. However, using a domestic receiver, Harold heard for the first time at 0930 on August 6, some weak Italian voices with a hissing background on several spots in Band II between 91 and 99MHz.

The 28MHz Band

It soon became obvious from your letters that sporadic-E was the main cause of activity in the 28MHz band during the month prior to August 14

In Pontypridd, **Graham Powell** logged stations from Austria, Czechoslovakia, Germany, Italy and Spain on July 17 and he says that 4U1ITU was a good 59 plus. Graham uses a Trio R-2000 receiver, KX3 a.t.u. and long-wire antenna. During the evening of the 21st **Fred Pallant G3RNM**, Storrington, heard signals from Germany and Scandinavia. **Filip Rogister ON1BRL**, Overijse, was also listening on the evening of the 21st. He logged c.w. from the prefixes C30, DF, DK, EA, F, IT9, OH, RB5, SM, UP, YO and YU. "Some amateurs were using QRP on 28·600MHz. The most interesting signals were from HV2VO, Vatican State-operated by G4WFZ, C30BBS in Andorra (QLS via DK9FE) and ST5BC in Novadhibou, Mauritania," says Filip.

Some readers reported hearing signals from French and German stations around 28MHz on July 17 and from Dutch and Italians on the 31st.

"Conditions on 28MHz seems to be improving on average," writes **John Coulter**, Winchester. He added Germany, Hungary, Italy and Spain to his log. Coinciding with the opening on 50MHz, late on July 31, Dave Coggins put 8 stations in the USA on his score card. At 1950 on August 5, the German beacon DL0IGI was a good 589 and after a check at the c.w. end of 28MHz, I logged signals, in a short time, from DF, EA, HB9, I and YU and at 1947 on the 6th, more c.w. signals and this time from DJ, OE, OH, OZ and SM. In addition to hearing stations from Austria, Belgium, Germany and Switzerland, between 1815 and 1845 on the 6th, **Chris van den Berg**, The Hague, also logged G1GFK, G3ITH and G4UVA from England. I also use a Trio R2000 receiver and long wire antenna and I read c.w. signals on the video display above the Trio, Fig. 4, after they have been digested by the Tono 550 communications terminal.

Fig. 4: The Trio R2000 and Tono 550 used by the author

Propagation Beacons

"No doubt you are getting reports of IY4M, a ROBOT near Bologna, on about 28·195MHz," writes John Coulter, who first heard it on July 20 sending, "d- PWR 2W OUT AR IY4M QRV K." Most beacon watchers made some comment about it in their reports. "IY4M gives instructions every 20 minutes and appears to be in the business of recording calls made to it," writes Ted Waring and quotes a typical instruction. "TO STORE CALL PSE SEND IY4M ONE OR MORE TIMES—THEN UR CALL 2 TIMES AT LEAST—END WITH K-USE COMMAND QTC1 TO LIST KEYS—PSE SEND VVV BEFORE EVERY CMD." Bill Kelly heard it in Belfast and says, "This is not a regular, seems to be an experimental station," and John Coulter heard an EI calling this ROBOT at 1439 on August 9 and read the reply, "Hi

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Home Office

Directorate of Telecommunications

IY4M=PSE SEND Vs BEFORE COMMAND TO SYNC ROBOT AT UR SPEED," and at 2208 he heard a G4 send "73 AR."

Listening again at 1131 on the 10th, John logged I4UJI calling IY4M and the reply: "HR OP ROBOT TKS FER CALL NOW STORED IN MEMORY AR." My thanks to Chris van den Berg, Dave Coggins, John Coulter, Len Fennelow, Billy Kelly, Henry Hatfield, **Norman Hyde G2AIH**, Epsom Downs, **Ted Owen**, Maldon, Gordon Pheasant, Filip Rogister and Ted Waring for their diligently kept beacon logs which enabled me to compile the monthly 28MHz chart, Fig. 2.

John Coulter also logged the 14·100MHz, propagation beacons CT3B, OH2B and 4U1UN, daily between July 15 and August 12, ZS6DN almost daily from the 15th to 30th and 4X6TU from the 15th to 21st and July 31 to August 12 inclusive. A similar report came from Len Fennelow, but with the addition of W6WX/B which he received on August 6 and 8. Moving higher up the spectrum, Brian Oddy G3FEX, Storrington and I, logged the Potters Bar 50MHz beacon GB3NHQ, almost daily from July 15 to August 14. Dave Coggins heard GB3NHQ and the Anglesey beacon GB3SIX, daily throughout the period and between Dave and Norman Hyde, the Gibraltar beacon ZB2VHF was copied on August 5, 6, 7, 9, 10 and 11. Gordon Pheasant reports hearing the Cyprus beacon 5B4CY on July 16, 18 and 25 and ZB2VHF on August 5. Although v.h.f. conditions were not marvellous during the period, both Chris van den Berg and I received consistent signals each day from the RSGB's 2m beacon at Wrotham GB3VHF, 144·925MHz.

Tropospheric

The monthly atmospheric pressure chart, Fig. 1, covering the period July 15 to August 14, was compiled from the slightly rounded measurements, taken at noon and midnight, from the Short and Mason barograph installed at my QTH. In Maldon, Ted Owen's barometer peaked at 1023mb on July 21 and dipped to 990mb on August 5. In Cleveland, Paul Burnett's hand plotted chart for July 17 to 31 shows highs, well above 1015mb on days 21 and 23 to 26 inclusive. During the month, Paul G1DAT, made his first 3 GI contacts on the 144MHz band and asks if anyone can help him with an instruction book for the Lowe SRX30 receiver. "There was a nice lift on July 23 and 24," writes **Andy Stafford** G4VPM, Paignton, who received a 59+ signal on the 430MHz band from an HB9 during the morning of the 24th and he worked DF, EA, two Fs and three HB9s on 144MHz. Although conditions were poor during the 432/144MHz Low Power Contests on July 27 and 28 respectively, Andy managed to raise a few new counties on 432MHz, the best being North Humberside, and by careful tuning on 144MHz he made contact with GI4TAJ/P and GM4RZM/P.

With the exception of July 19, 22 and 29 and August 3 and 7, Chris van den Berg received signals daily, during the month prior to August 9, from the Norfolk 144MHz repeater GB3NB on R1. At 2130 on July 24, GB3VHF was well up and knocking the end stops with me and early the following morning most of the 144MHz repeater channels were still very active with signals from mobile operators and repeaters sharing the same channel some distance away.

Band II

In Cardiff on July 19, **John Berridge** listened to the news and the Tour de France from French stations around 100MHz. On July 23rd, Graham Powell, using a Grundig Satellit and dipole antenna, received France Culture and Inter, and on the 27th, from Ireland, RTE II, between 94 and 99MHz. Harold Brodribb bases his reception reports on regular signals, which he calls his "locals", the French stations at Abbeville, Rouen and sometimes Lille. "Even they have been poor, especially during the rain and low barometer," said Harold. However, on July 17, he heard six editions of France Culture, including Caen on 91·53MHz and on the 23rd and 24th he noted a collection of signals, such as French speech, Indian or Pakistani speech and music and general pop music between 104 and 107MHz.

TELEVISION

Reports as for VHF Bands, but please keep separate.

by Ron Ham BRS15744

This is no doubt the last of the major reports for the 1985 sporadic-E season which began early in May and was obviously nearing its end in mid-August. Our task now is to keep a regular watch on Band I, around the Ch. E2/R1 48·25/49·75MHz region, for infrequent winter sporadic-E and "F2" openings. These events can be very rewarding as **Len Eastman**, Bristol, showed when he received a test card from Norge Gamlem, Fig. 1, on December 23 1983.

During the period of this report sporadic-E disturbances affecting Band I, approximately 40 to 68MHz, occurred for a few hours on July 16, 17, 19, 20, 21, 24, 25, 28, 30 and 31 and August 5, 6, 7, 8, 9, 12 and 14. Thanks are due to **Mike Bennett**, Slough, **Harold Brodribb**, St. Leonards-on-Sea, **Dave Coggins**, Knutsford, **Simon Hamer**, New Radnor, **Philip Hodgson**, Stamford, **Owen Jones**, Stoke-on-Trent, **Gordon Pheasant**, Walsall, and **Neil Purling**, Hull, for their comprehensive reports on these events.

From your letters I found that television pictures, sometimes in colour, had been received from 18 countries. The countries were Austria (ORF-FS1), Czechoslovakia (CST/PRAHA/RS-KH), Denmark (DR), Finland (YLE-TV1), Germany (SWF-GRUNTEN), Holland (PTT NED-1), Hungary (MTV-1), Iceland (RUV ISLAND), Italy (RAI-1), Norway (NORGE), Poland (TVP), Portugal (RTP), Rumania (TVR BUCHARESTI), Spain (RTVE), Sweden (SVT/TV1 SVERIGE), Switzerland (+PTT-SRG1), USSR (TSS/CCCP) and Yugoslavia (JRT-BGRD).

Among the regional test cards received from Norway were, BAGN, BREMANGER, GAMLEMSVETEN, Fig. 1, GULEN, HEMNES, Fig. 2, KONGSBERG, MELHUS and STEIGEN and from Spain, AITANA-3 and SANTIAGO C. Apart from the station idents various entertainment programmes were seen including news with the familiar BPEMR, HOBOCTN and TACC COObWAET captions, TELETEXT, TELEJURNAL and TV RAKLAM. Dave Coggins saw the Hungarian MTV-1 analogue clock at 1716 on July 16. I received a strong colour test card from Spain at 0857 on the 21st with a digital clock showing 0957. Simon Hamer saw the Air India disaster off Ireland on ORF on the 17th and British Open Golf on RTVE on the 20th.

Tropospheric

During the mild tropospheric opening on July 24, I observed some co-channel interference in the u.h.f. band and in Band III. Harold Brodribb received negative pictures from France on Chs. F5, 6, 7, 9 and 10 and nine u.h.f. channels then positive pictures from Germany SWF-BADN on Ch. E8 and SWF-HGR on Ch. E9 and from Luxembourg RTL PLUS on Ch. E7. At 0748 on the 25th, Philip Hodgson, using a Plustron TVRC5D logged a test card from Belgium BRT TV1 on Ch. E10 before the disturbance died away. Earlier in the month, on the 16th, Harold received French u.h.f. TV signals and a test card from Belgium RTBF-1 WARVE on Ch. E8 at 1435 on the 22nd and 1120 on the 23rd, prior to the peak of the event. On the 21st, Simon Hamer watched *Angelus* and British Open Golf from Radio Telefis Eireann 1 and 2 respectively on their v.h.f. channels G, H and J.

Peter Lincoln has recently carried out repairs to his antenna system, upgraded his wideband u.h.f. beam from 8 to 14 elements and replaced his pre-amplifier. He says, "the results are quite impressive." Now, from his home in Aldershot, he can receive Central TV from Oxford at good strength all the time and around midnight on August 1 he received pictures from Holland on Ch. 29 or 31, Fig. 3. My thanks to **W. B. Stewart**, Lossiemouth, for explaining that the Cyrillic caption in our Fig. 11 (September issue) means, "MY PROFESSION: WORKING MAN". Also to **George Garden**, Edinburgh, for thinking of us while on holiday in Germany and taking a photograph, Fig. 4, off the hotel receiver, of an Austrian test card that we do not often see.

News from India

"On June 12, the wind speed was about 120km per hour and my Band III antenna was damaged, the steel mast was bent, Fig. 5, and on the 15th the wind speed was 150km per hour, with heavy rain and all the elements on my Band I antenna were bent backwards," writes **Maj. Rana Roy**, from India. He adds, "The transmitting antenna and the dish of our local TV station were also damaged."

During tropospheric openings on June 7 and 22, Rana received pictures from Pakistan TV, most probably from Rawalpindi, in Band III on Chs. 8 and 10, which included test cards, an announcer, an advert for sweets in Urdu and an English feature film. He also observed sporadic-E disturbances at various times on June 8, 9, 10, 16, 20, 22 and 23 when he logged pictures from China, Dubai and the USSR. At 2000 on the 16th, a religious programme from Dubia in Band I on Ch. 2 (Fig. 6) was very strong on Rana's indoor telescopic antenna. When he coupled his outside 8-element Yagi, with pre-amplifier, there was interference from a Russian station. "Between June 24 and 28, we had TVDX in Band I every day,

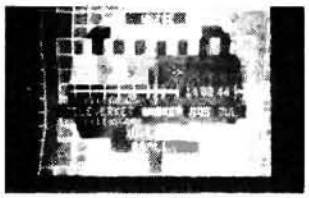

Fig. 1

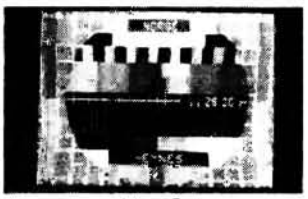

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

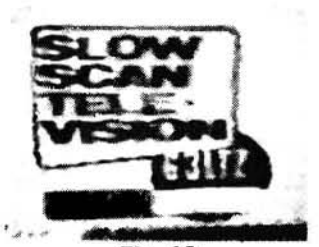

Fig. 12

mostly from Russia, when we saw documentries, social and cultural programmes, feature films, news and sport," writes Rana. He photographed the captions and people, Figs. 7, 8, 9 and 10, that he received on Soviet TV. "At 1233 on the 9th we saw a newscaster with a digital clock on his right showing 1154 and as there was a difference of 39 minutes between IST and this time, the station must be located somewhere near Afghanistan," said Rana. He also saw an educational programme from China on the 10th.

SSTV

Our congratulations to the staff at RSGB headquarters, Potters Bar, on exchanging slow scan television pictures on August 4 with the amateur station on board the space shuttle *Challenger,* and to John Nelson for his explanation of the event on ITN news the same evening.

"August has started very well with a lot of new callsigns for me," writes **Lester Curno,** Bude, having received pictures on 14·230MHz from Bulgaria, Canada VE1BZV, Holland, Hungary, Italy, Poland, Sweden, Switzerland and the USA W5ZR. In July, Lester, using a Spectrum computer with Scarab software received a faint signal from PY2OB exchanging pictures with a DL and copied the caption, "FIRST CONTACT BRAZIL" in addition to logging some excellent German and Italian pictures with little QRM and no QSB. On one occasion, because of QRM on 14MHz, both sides of a German/Italian QSO decided to QSY to the 21MHz band, 21·340MHz, and so did Lester, who then received super pictures, without interference, from the QSO.

Peter Lincoln is delighted to have received pictures on 14MHz, and confirmation, from Maurice Allenden G3LTZ, Swindon, Figs. 11 and 12. He writes, "Although not "DX", I was lucky that I tuned in when conditions were unusual because I think that his location is too far for ground wave and too near for first skip."

Between July 15 and August 14, I copied pictures from DK9NC, DJ7NW, DJ8LF and OZ1DOZ/A and incomplete callsigns, due to QRM on 14MHz, from DF, DL, I, LZ, SM and SP. Among the captions seen were "OK HEINZ QSL", "QTH NEAR HEIDELBERG", "NAME MIKE", "HEAVY QRM", "VY FINE PIC", "UR SIGS RSV599" and a picture of a possible QSL card, with OZ1DOZ to the left and above a drawing of a bi-plane.

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

The neat home-made loop antenna and amplifier designed by **Dave Mayhew** of Yapton, Sussex and pictured in the September issue of *PW On the Air*, page 54, has created a great deal of interest. Many readers would like to build a similar unit and hope that his design can be published in *Practical Wireless*. Dave has now agreed to prepare a complete constructional article and, hopefully, this will be available for publication soon.

Note: all frequencies in kHz: Time UTC (GMT)

Transatlantic DX

USA: The deterioration in conditions, mentioned in *PW On the Air* for October, has continued. **Bill Kelly** of Belfast has been checking the band for signals from the USA in the early hours and has been disappointed by the lack of stations heard; those that did put in an appearance were weak and fading and soon faded out. On two nights around 0330 Bill heard "The Memory Station" WMRE from Boston on 1510—it was a very poor signal on both days. Another one was WOR from New York on 710 at 0345: this was heard for a brief period and faded out. North Carolina was received on two nights between 0115 and 0200 with an Evangelist programme. Although Bill could hear the hymn singing, the station callsign was not discovered before it faded out! This station was on 1610 and has not been reported before. The only other station to make it "across the pond" was WHN from New York at 0320 on 1050.

Canada: Signals from Canada have been noticeably absent on the band this month. *Central and Southern America:* **Graham Powell** of Pontypridd has heard Radio Jornal do Brasil on 940, which was a good signal with a clear station identification in Portugese at 0133 on his new Trio R2000 receiver and KX-3 a.t.u., plus a long wire running east/west. Graham has been disappointed in the results so far but I am sure this is mainly band conditions.

The only other station he logged was Radio Globo on 1220 at 0100. Bill Kelly says "it is strange how this station puts in a strong signal so consistently—is it the 100kW of power which it runs or its location?" Bill heard this station during three nights of the month.

Fig. 1: One of the car stickers received by Derek Thomley from Radio Ulster

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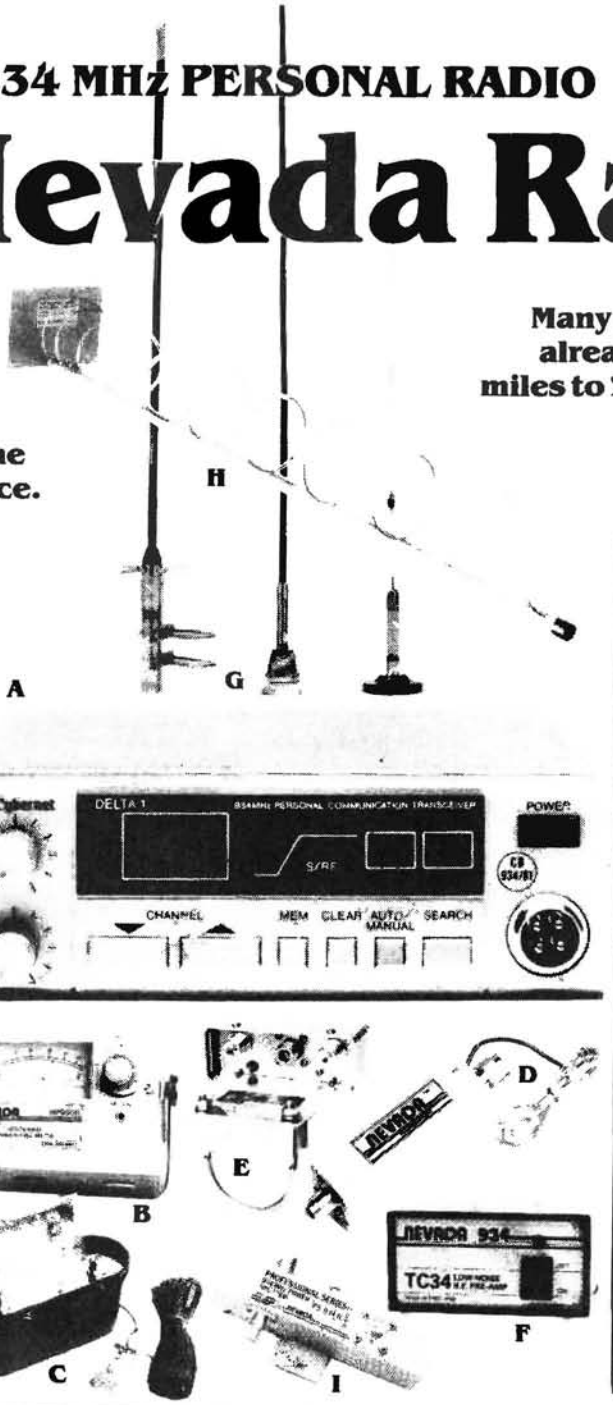

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Tel: (0733) 54979

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24 Norwich Street, Dereham, Norfolk NR19 1DG
Tel: (0362) 2488

Catswhiskers
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64 Waterloo Road, Stoke On Trent, Staffs
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203 High Street, Canvey Island, Essex.
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6 Monks Avenue, Lancing West Sussex.
Tel (0903) 753754

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82b Edgewood Road, Birmingham 45, West Midlands.
Tel: (021460) 1581

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67 Bowman Street, Darlington, Co Durham.
Tel: (0325) 59929

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125 Langwith Road, Hillstown, nr Chesterfield, Derbyshire. *Tel (0246) 826578*

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189 London Road, North End, Portsmouth Hants PO2 9AE *Tel: (0705) 662145*

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Fig. 2: Another car sticker, this time received by David Wright from Radio Shropshire

News from "Down Under"

In an interesting letter from **John Ratcliffe** of Southport, Australia, the m.w. DX situation there is revealed. Apparently, it is not possible to hear much DX until the main Australian Broadcast transmitters have closed down between 0400 and 0515 (Australian Time). Prior to this, only two DX stations can be heard and these are WBEB on 650kHz from American Samoa, after 0030 when ABC from Adelaide closes, and 2YA from Wellington, N.Z. on 560kHz: this station runs 60kW and overrides the Australian stations although it is over 3000km from Southport!

John's equipment is home-built, as mentioned in the October *On the Air* text. His antenna is 20m long and the far end of it is supported at 13m by a Gum tree. He, also, is a great believer in loop antennas, which he finds most helpful in separating the stations—a good tip, I feel, from an "old-timer" who has been busy DXing since 1923.

Other DX

Radio Sweden's new 600kW transmitter at Solvesborg is being well received on 1179kHz. **Margaret Sadler** of Leeds has been enjoying their programme *Nordic News*.

D. Degg of Stoke-on-Trent is trying out an "inverted V" wire antenna plus a.t.u. with his DX300 receiver. His log includes the BBC Radio Ulster 1kW transmitter in Enniskillen on 873, Radio Moscow 1323, AFN West Germany 873 and Radio Tirana, Albania 1395—this station has also been heard by "newcomer s.w.l." **Alan Merritt** of Abingdon at 2300.

A station announcing itself as Radio Jeddah, South Arabia, was heard by Bill Kelly on 1510 (or 1512) at 0215. Other stations in Bill's log were Norway, NRK Romdal, 630 at 2300, Radio Moscow 1494 from their Leningrad transmitter at 2320, Poland with English on 1503 from Stargard at 2245, France on 1206 at 0330 and Radio Cairo (in Arabic) 711 at 0345.

"Excellent Afro-Pop music" was how Graham Powell noted the programme from ORTS Dakar, West Africa on 765 at 2333. Also heard was Radio National Guinea 1404 at 2239, which was a good signal.

BBC Radio Ulster responded well to a QSL confirming reception by **Derek Thomley** from Birmingham of their Lisnagarvey transmitter, 1341. Their QSL consisted of a QSL letter, a BBC Engineering Handbook and several car stickers, one of which is shown in Fig. 1.

Local Radio DX

BBC Radio Shropshire is fully operational now on 756/1584kHz and **David Wright** of Telford has sent along their attractive car sticker, Fig. 2. During daylight hours David has heard BBC Radio W.M. from the Sedgley transmitter on 828 and Radio Northampton 1107; also ILR Severn Sound 774, BRMB (Birmingham) 1152, Signal Radio (Stoke) 1170, Marcher Sound (Wrexham and Deeside) 1260, Mercia Sound (Coventry) 1359 and Radio City (Liverpool) 1548.

In his search for News during the morning of the journalists' strike, **Dennis Monger** G4PCU of Mawnan Smith, Cornwall, was surprised to hear BBC Radio Jersey 1026 and Radio Guernsey 1116 signals so clearly on his Sony 2001 receiver. Prompted by this, Dennis took a further look around the band and was delighted to hear Radio Stoke-on-Trent 1503.

Bill Kelly has sent along his first Local Radio DX list to me from Belfast. Heard during the night were ILR Pennine Radio (Bradford/Huddersfield and Halifax) from their Vicars Lot transmitter 1530 at 0200 and BBC Radio Devon via their Barnstaple transmitter 801 at 0600.

Using his new FT757GX transceiver around 2000, **Albert Fisher** G4VBH of Heston, Hounslow heard BBC Radio Leicester 837, Radio Jersey 1026, Radio Northampton 1107, Radio Guernsey 1116 and Radio Oxford 1485; also, ILR Severn Sound 774 which was only just audible. Albert uses a "T" antenna tuned against ground with an a.t.u. Manx Radio 1368 was faintly received at this time too but I think this should be a better signal after dark via the sky wave.

Although **John Berridge**, of Cardiff, has no less than seven commercial receivers, he says "my old home-brew valve set beats them all!" He received the new BBC Radio Bedfordshire's Luton transmitter 630, Radio Devon (Barnstaple) 801, Radio Jersey 1026 and Radio Bristol (Mangotsfield) 1548. The ILR stations logged were Severn Sound 774, Wiltshire Radio 1161, Radio West 1260, Gwent area Broadcasting 1305 and CBC Cardiff 1359. His best DX was Radio Clyde (Glasgow) 1152.

With a Fidelity Hi-Fi Music centre (system 6-60) newcomer Alan Merritt has been busy checking out the local radio station scene. His antenna is a 10m wire only 4m high but seems to bring in ILR Devon Air Radio (Exeter/Torbay) 666, Wiltshire Radio 936, Radio Trent (Nottingham) 999, Radio West 1260, Mercia Sound (Coventry) 1359 and Radio Wyvern (Hereford/Worcester) 1530. BBC Radio Sussex 1368 was received well from their Duxhurst transmitter.

Community Radio

According to John Berridge, an experimental Community Radio Station is to be set up in the Rhondda area of South Wales in the near future. The transmitter power will be 50 watts but the exact operating frequency is not yet known.

I wait with interest to hear more from John about this test and if any other readers have any information will they please send it along to me as soon as possible.

QSL Addresses

BBC Radio Bedfordshire, P.O. Box 476, Hastings Street, Luton, Bedfordshire. LU1 5BA

BBC Radio Shropshire, 2-4, Boscoble Drive, Shrewsbury, Shropshire, SY1 3TT.

BBC Radio Guernsey, Commerce House, Les Banques, St Peter Port, Guernsey.

BBC Radio Newcastle, Crestina House, Archbold Terrace, Newcastle-upon-Tyne, NE2 1DZ.

SW BROADCAST BANDS

Reports as for Medium Wave DX but please keep separate

by Brian Oddy G3FEX

For the Newcomer SWL

Radio frequency signals use part of the electromagnetic spectrum and transmission frequencies from the very low (around 12kHz) to the extremely high (20GHz) are commonly used to convey information —see "For the Newcomer SWL" in *On the Air* September issue

By contrast, the human voice, bird calls, music and other sounds are low frequencies usually in the range 10 hertz to 20kHz and are called audio frequencies (a.f.). You will have noticed that there is an over-lap in the audio and radio frequency ranges at around 12kHz to 20kHz. It is very important to realise that, despite the frequency similarity, the nature of the two kinds of waves are quite different. Audio frequency waves consist of compressions and rarefactions of the air through which they travel, whilst radio frequency waves consist of electric and magnetic fields. (No wonder, then, that a person with good hearing cannot "hear" the 16kHz signals from GBR Rugby when driving past that station!) The speed of travel is also quite different, i.e. 1200km per hour for a.f. and 300 000km per second for r.f.!

Because audio signals cannot be transmitted over long distances it is necessary to superimpose them onto a radio-frequency "carrier" wave at a transmitting station by a process called "modulation". The combined signal is then radiated by the station's antenna, either via the ground wave or sky wave path, to the distant receiver (see October *On the Air*). Here the combined signal is "de-modulated" to separate the audio signals which are then amplified and fed to a loudspeaker or headphones.

Modulation may take various forms, for example by variation of the amplitude of the r.f. carrier wave—called **amplitude modulation** (a.m.) or, by variation of the

frequency of the r.f. carrier wave—called **frequency modulation** (f.m.). It is also possible to use the carrier to convey intelligence by keying it on and off, e.g. Morse code.

The a.m. system is the one normally used by Broadcast Stations operating in the long, medium and short wave bands. The f.m. system often employed at v.h.f. Broadcast Stations will not be considered here.

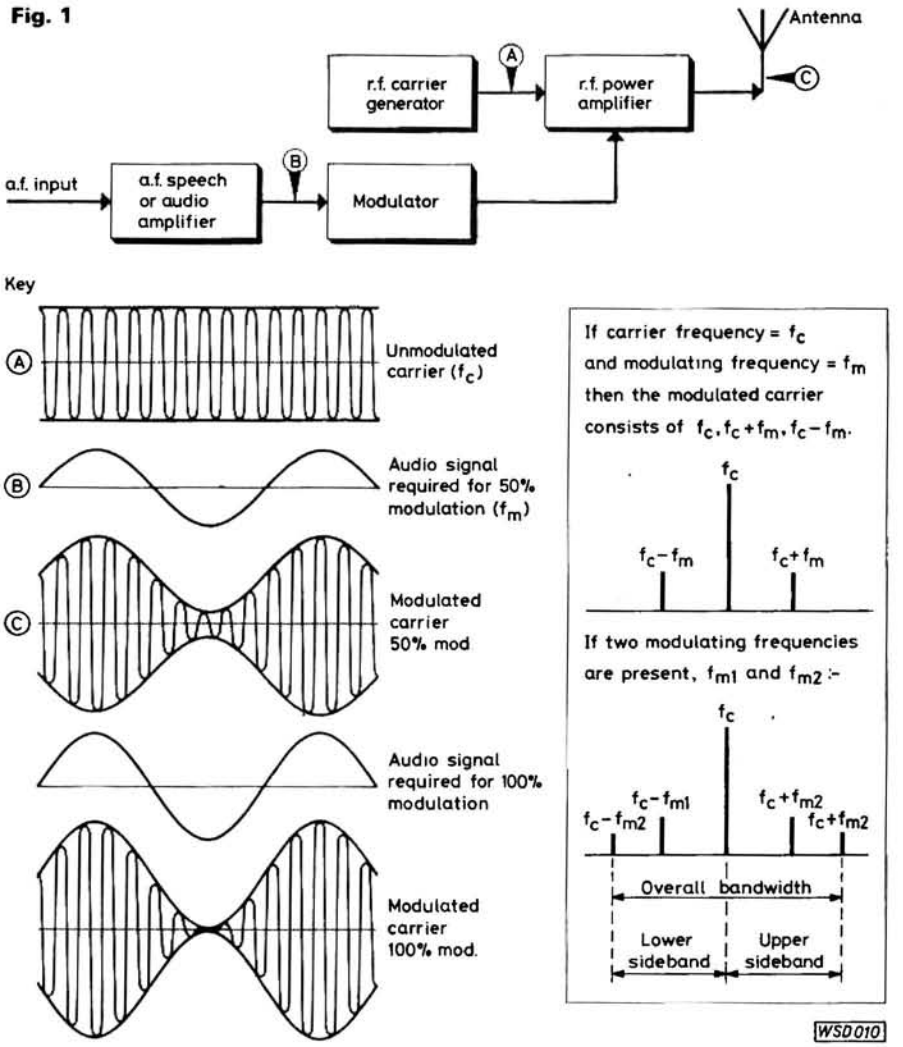
In the a.m. system, the r.f. carrier (*fc*) is combined with a modulating a.f. signal (*fm*) in a complex process which is best analysed mathematically. It can be shown that frequencies above and below the carrier are produced—these are called **side frequencies.** If the carrier (*fc*) is modulated by audio (*fm*) then *fc, fc + fm* and *fc – fm* result. Also, if more than one modulating frequency is present, then a band of frequencies results above and below the carrier. These are called the **upper and lower sidebands**.

In a practical case let us consider a carrier on 1500kHz. If the highest modulation frequency is 5kHz then the upper sideband frequency is 1500kHz + 5kHz = 1505kHz and the lower sideband frequency is 1500kHz – 5kHz = 1495kHz. An additional lower audio modulating frequency of, say, 1kHz will produce 1500kHz + 1kHz = 1501kHz and 1500kHz – 1kH = 1499kHz and these will form part of the sidebands. The overall signal will occupy a bandwidth of 1505kHz – 1495kHz = 10kHz (as seen in Fig. 1).

In order to receive a signal without distortion we must ensure that the receiver has sufficient bandwidth to accommodate the overall signal. Receiver bandwidth in simple sets is pre-determined by the manufacturer and cannot be changed. In more expensive receivers a **selectivity** control is provided which permits the bandwidth to be varied to suit reception conditions. On the crowded shortwave bands the sideband frequencies from a powerful unwanted station may tend to interfere with a signal from a wanted station. By reducing the bandwidth of the receiver, i.e. increasing the selectivity, the unwanted station's sidebands may be much reduced or eliminated. However, the wanted signal will suffer a loss of audio quality since the higher sideband frequencies associated with it will no longer be able to pass through the receiver. The effect is to improve intelligibility but reduce quality —however, there are limits as to the amount of selectivity that can be introduced because when all the high frequency sidebands have been removed the audio will consist of only the bass notes and intelligibility suffers!

The ionosphere can also introduce distortions to the sideband frequencies because the path lengths travelled by the upper and lower sideband frequencies may be slightly different. This causes delays in the arrival of the components of the signal —**phase errors**—at the listener's antenna and the result is a form of distortion of the audio, called **phase distortion.** This is most noticeable during periods of fading of the transmitted signal. The type of fading when this occurs is called **selective fading.** Try looking for a signal which is fading on the shortwave bands to see if you can detect this phase distortion!

Fig. 1



Conditions on the HF Bands

Note: Frequencies in MHz: Times UTC = GMT

The 26MHz (11m) and 21MHz (13m) Bands: Conditions on 11m have remained very poor. The BBC has continued to use 25·650 between 0900 and 1330 but there have been no reports of reception of these signals from *PW* readers living outside the UK.

Bill Kelly of Belfast has carried out a special listening watch on this band and confirms that, apart from the BBC transmissions, the band is dead.

In contrast, however, the 13m band has been open to several continents during the course of the day. Radio Pakistan 17·660, reported by **André Newall** of Twickenham, may be received at 1100. Signals from South Africa, Radio RSA 21·535 logged by Bill Kelly and others have been good and can be heard between 1100 and 1556.

The Radio Nederland transmitter in Madagascar on 21·485 is well received at 0830—not only in its target area, the Far East, but also in the UK. **Chan Seng Chai,** using a Sony ICF-6800W receiver, finds it is a good signal in Sarawak, Malaysia, where short wave listening is becoming very popular (a new Malaysian Radio Club is flourishing there). The signals are good here in the UK too and heard by **David Wright** of Telford regularly.

From Dubai, the United Arab Emirates' transmitters have continued to provide excellent signals; which have been well received by **John Berridge** of Whitchurch, Cardiff on 21·605 and by **D. Degg** of Stoke-on-Trent on 21·695 during much of the day.

The USA's Family Radio Station WYFR in Oakland, California, can be heard at 2000 on 21·615. **Graham Powell** of Pontypridd has been checking out his new Trio R-2000 receiver on most bands and has also noted WYFR on 21·525 at 2055—this transmission is intended for North and Central America and the Caribbean.

A good signal from South America is HCJB of Quito, Ecuador, on 21·477MHz. **Albert Fisher** G4VBH of Heston, Hounslow, has been hearing this one from 1900.

The BBC are regular users of the band and can be found on 21·470, 21·550, 21·705 and 21·710 at various times during the day. Some of these transmissions are from Cyprus and Ascension Island.

The 17MHz (16m) and 15MHz (19m) Bands: There is much to be heard on these bands, which are regular favourites with many s.w.l.s; however, conditions on the 16m band from Australia have become very poor around 0800. Radio Australia's 17·750 signals are weak and jammed by other stations now at this time. (Whilst these transmissions are not intended for the UK, but Asia, they have been good signals until quite recently.)

Much earlier, Radio Australia can be heard clearly at around 0300 on 17·715, according to **Derek Thomley** of Birmingham

Peter Edwards of Abingdon, who is a newcomer to s.w.l.ing, has also been enjoying listening to Radio Australia on his Selena MB210/2 receiver. Radio Japan has been heard by **Peter Mills** of Sherborne, Dorset, on 17·710 with News in English at 0728. Later, he has received The Voice of Israel 17·630 at 1001, Radio Cairo 17·675 at 1244 and Radio Bangladesh 17·665 at 1250.

Margaret Sadler of Leeds, Graham Powell and Peter Edwards are keen listeners to the programmes from HCJB, Quito,

A book mark from Radio Peking sent in by Derek Thomley

Ecuador, 17·790 at 2130. These programmes are very popular with listeners throughout the world. Newcomer s.w.l.s should certainly have a look for this station.

The Voice of Greece heard by **Peter Lewis** G4VFG of Ivybridge on 17·565 has news in English at 1850.

Conditions on the 19m band have permitted reception of signals from all continents and generally have been good, considering the present position in the sun-spot cycle. Radio Australia was received in the early hours by Bill Kelly on 15·240 from 0230 and Bill received their QSL. Later, at 0720, Peter Mills found the 15·165 transmission to be very good.

Radio New Zealand, however, is still not audible here. Graham Powell has put their frequencies into the memories of his new receiver and regularly scans them—without result! **Paul Rawdon** of Wellington, New Zealand, who kindly sent along the schedule in the September issue for Radio New Zealand, has now sent along the tentative schedule for the period October 27 to March 2, 1986:

To Pacific

1800–2015: 11·780, 15·150
2145–0045, 0245–0630: 17·810

To Australia and Papua New Guinea

2245–0045, 0245–0630: 15·380
0930–1115: 9·520, 11·850

The transmitters may still be the original ones as the proposed new high-power transmitters may have been delayed by a Government Royal Commission investigating Broadcasting in New Zealand.

An interesting log from **Calum Macleod** of Isle of Lewis, Scotland, includes the VOA signals from the Philippines relayed on 15·425 at 1230. He also mentions AFRTS via their Munich relay on 15·265 at 1230. This service for the US Armed Forces can be heard on 15·430 from their Greenville, USA, transmitter from 2000. **Ivo Swinnen** of Belgium has their QSL—it has the seal of the Department of Defence on it!

Log of the month for Graham Powell was hearing The Voice of Malaysia 15·295 at 0822. This is certainly one to look out for!

The 13MHz (22m) Band: Philip Rambaut of Macclesfield, Cheshire is convinced that Radio Moscow is intent on occupying the entire band, having heard them on 13·625, 13·635, 13·645, 13·655, 13·660, 13·665, 13·705, 13·740 and 13·755 so far! Also noted were Radio Bangladesh 13·670, Voice of Israel 13·722, Radio Baghdad, Iraq 13·700.

Radio Moscow has additionally been using 13·720 and 13·745 according to **Philip Hodgson** of Stamford, Lincs.

The 11MHz (25m), 9MHz (31m), 7MHz (41m) and 6MHz (49m) Bands: Conditions on these bands are generally good and most of the 11 to 6MHz stations detailed in *On the Air* for Sept/Oct can still be heard. **Alan Williams** of Helston, Cornwall, noted Radio Australia 11·910 as a good signal at 0630 and heard WYFR 9·455 at 0730.

Bill Stewart of Lossiemouth, Scotland, has logged VOA from several locations in the mornings—5·995 from Greenville, USA, at 0600, 6·040 via Wooferton, Shropshire, at 0600, 9·635 from Tangier, Morocco 0600 and on 9·670 via Greenville, USA.

The launch of the space shuttle *Challenger* was heard by **Alan Merritt** of Abingdon, via VOA on 6·040 at 1850. Alan is a newcomer s.w.l. and was delighted to find Radio Australia a good signal on 6·035 at 1930.

Using a DX150 receiver **Darren Taplin** of Tunbridge Wells heard many interesting stations, including All India Radio 11·620 at 2000.

The 5MHz (60m), 4MHz (75m), 3MHz (90m) and 2MHz (120m) Bands: Conditions on these bands have been good. Margaret Sadler has been very busy with her Grundig Satellit 1400 receiver, logging South Africa RSA 3·230 at 0400, BBC Singapore 3·915 at 2210, Xinjiang, China 4·735 at 2315, Radio Douala Cameroon 4·795 at 2240, R. Diff. TV Burkina Ouagadougou 4·815 at 2350, Radio Reloj Irazu Costa Rica 4·832 at 0454, ORT B Cotonou Benin 4·870 at 2230, Radio National Chad 4·905 at 2042, Radio National Bata, Eq. Guinea 4·925 at 2150, Radio

A QSL card from Radio Canada International sent in by Andrew Hill

Nigeria 4·990 at 2300 and R. Diff. TV Togolaise Togo 5·047 at 2330.

Darren Taplin logged RSA on 4·990 at 0300 and Graham Powell heard ZBS Zambia 3·346 at 2108 and ZBC Zimbabwe 3·396 at 2153. Bill Kelly found Radio Columbia National 4·980 with English at 0305.

Radio Botswana 4·820 and Radio Swaziland 4·980 were received by **John Parry** G4AKX of Northwich, Cheshire, also Africa No. 1 Libreville Gabon 4·810 and Chad 4·905 in French. These stations were also logged by Albert Fisher (a former BBC Monitor at Tatsfield). Albert heard a signal on 5·005 which may have been Nepal—can anyone identify this one?

From "Down Under", **John Ratcliff** of Southport, Australia, says "These bands are like the Medium Waves in the 1930's, with plenty of room!" John heard Standard Frequency WWVH on 2·500 and 5·000 from Hawaii. He says that the Solomon Isles operate just above 5·0MHz at 0600UTC, so there is a challenge!

Station Addresses

Radio Tanzania, P.O. Box 9191, Dar es Salaam, Tanzania.

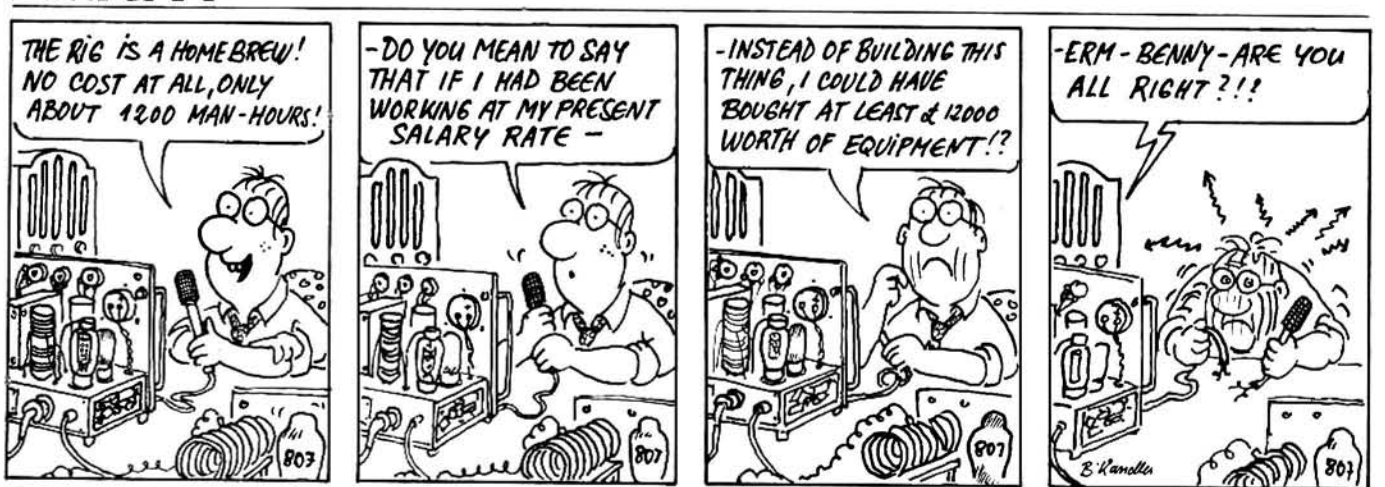
Radio Bangladesh English Dept. Overseas Service, P.O. Box 2204, Taka, Bangladesh.

Please note: many Broadcasters will change their frequencies and times of transmission in November, to account for seasonal changes in ionospheric conditions.

Please send along your reports to reach me by the 15th of the month for inclusion in this series.

All reports by the 15th please

BENNY



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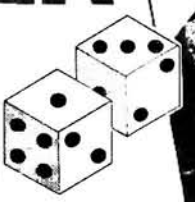

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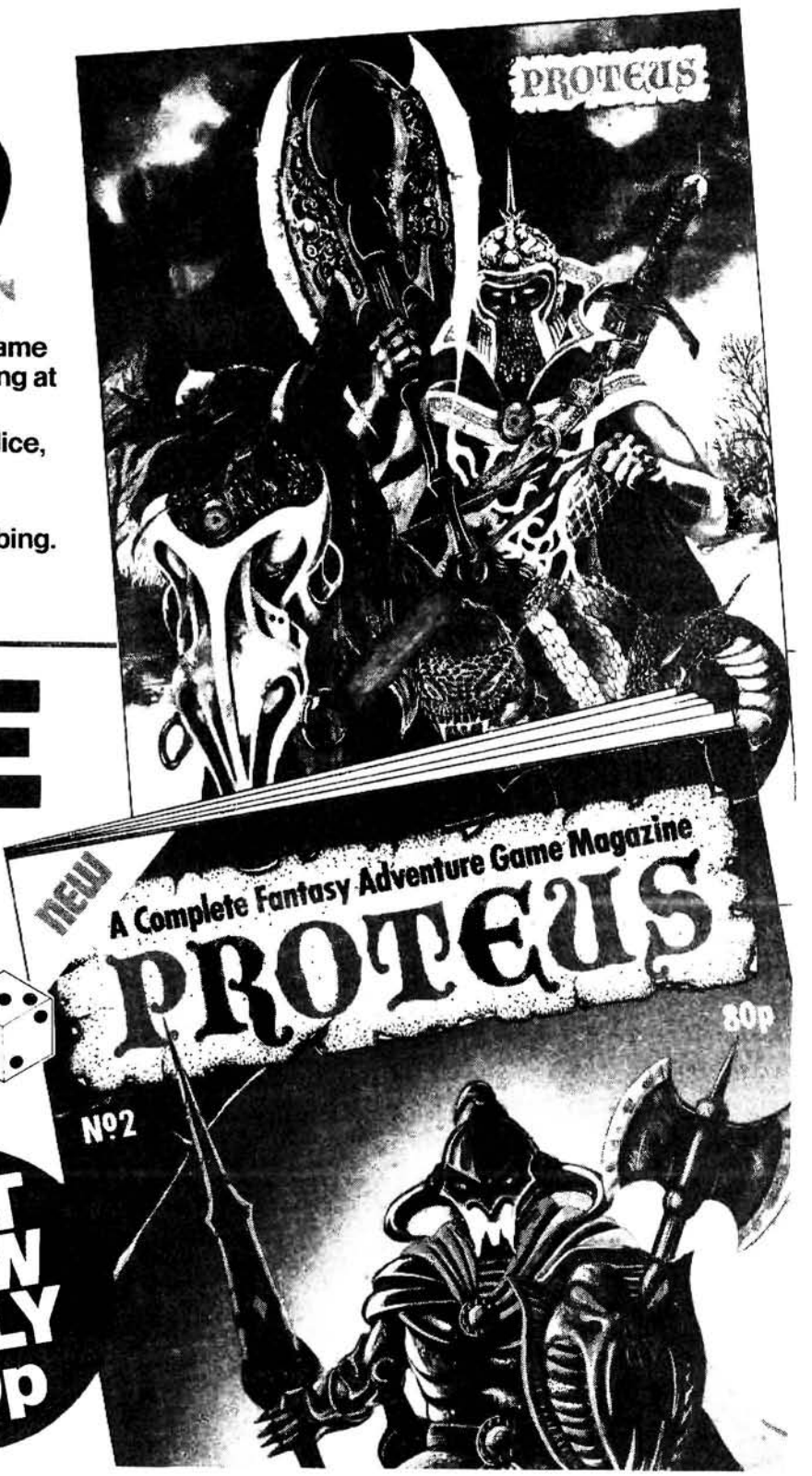

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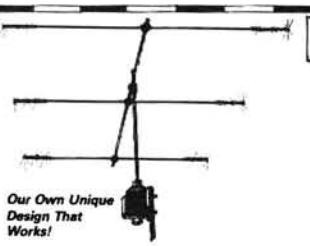

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Side Null Db	25	25	20
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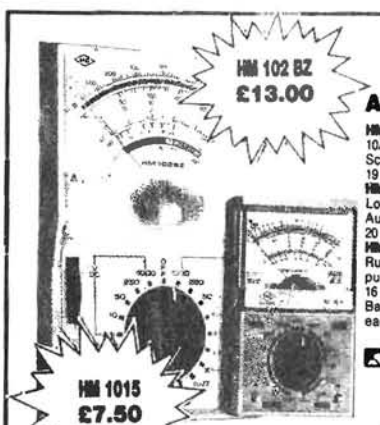

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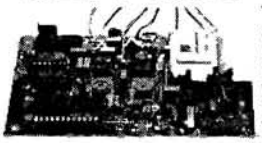

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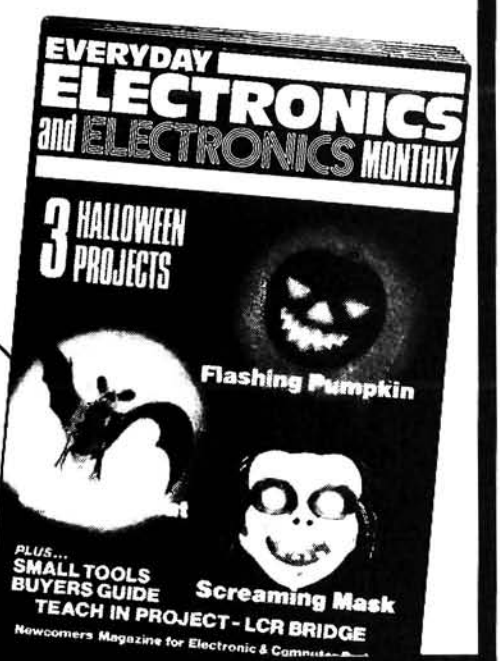

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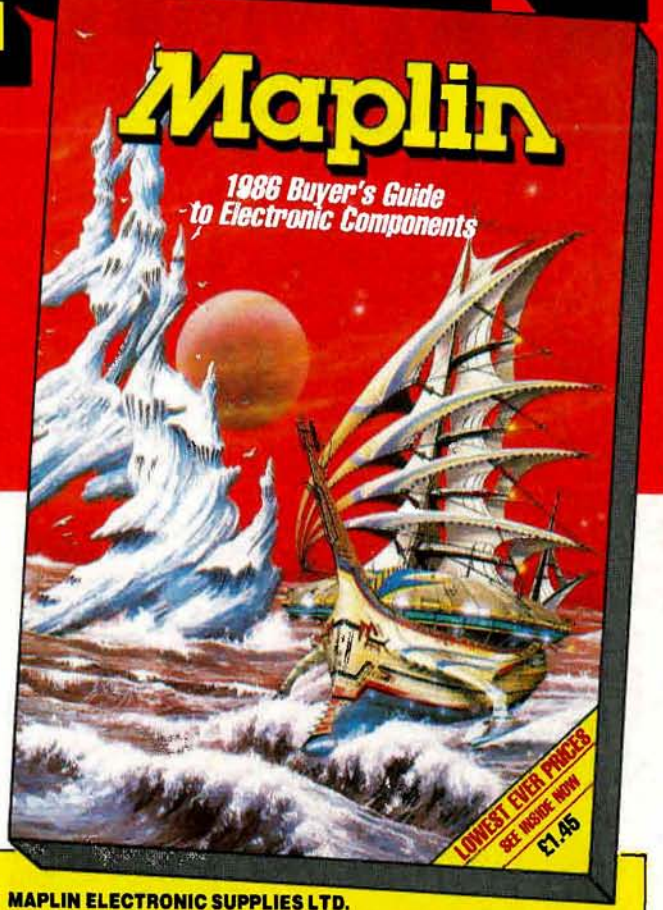

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