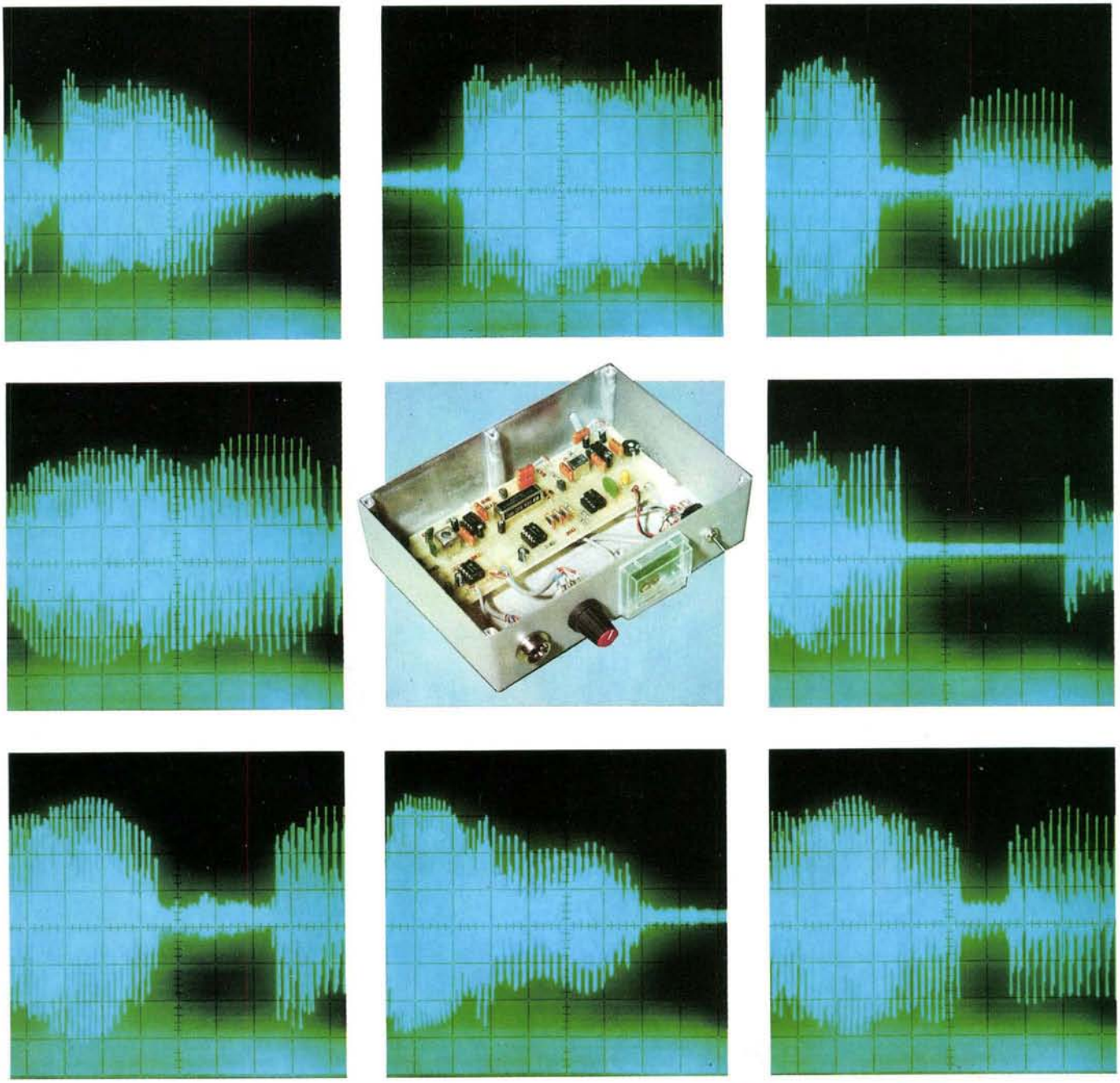
MARCH 1986 £1·10
Australia $2
New Zealand $2.25
Malaysia $5.25
ISSN 1041-0857

Practical Wireless

Audio Processing Special

The Radio Magazine

BUILD PW's RF SPEECH PROCESSOR



ALSO ~ SIMPLE AUDIO OSCILLATOR & LOTS LOTS MORE

REG. WARD & CO. LTD.

1 WESTERN PARADE, WEST STREET, AXMINSTER, DEVON, EX13 5NY.

THE SOUTH-WEST'S LARGEST AMATEUR RADIO STOCKIST

Trio

TS940S	9 Band TX General Cov RX	1695.00	
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)
TS530SP	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)
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	265.00	(—)
TM401A	7cms FM 12W	316.00	(—)
TH21E	2M Mini-Handhelds	170.00	(—)
TH41E	70cm Mini-Handhelds	199.00	(—)
TM211E	2M FM Mobiles	365.00	(—)
TM411E	70cm FM Mobiles	399.00	(—)
TS711E	2M Base Stations	695.00	(—)
TS811E	70cm Base Stations	795.00	(—)
TR3600	70cm Handheld	292.00	(—)
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)

Linear Amps

TOKYO HI POWER

HL 160V	2m, 10W in, 160W out	244.52	(2.00)
HL 82V	2m, 10W in, 85W out	144.50	(2.00)
HL 110V	2m, 10W in, 110W out	204.99	(2.00)
HL 32V	2m, 3W in, 30W out	89.95	(2.00)
HL 20U	70cms, 3W in, 20W out	89.90	(2.00)

MICROWAVE MODULES

MML144/30-LS	inc preamp (1/3 w i/p)	94.30	(2.00)
MML144/50-S	inc preamp, switchable	106.95	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	159.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML144/200S	inc preamp (3/10/25 i/p)	334.65	(2.50)
MML432/30L	inc preamp (1/3w i/p)	169.05	(2.00)
MML432/50	inc preamp (10w i/p)	149.50	(2.00)
MML432/100	linear (10w i/p)	334.65	(2.50)

B.N.O.S.

LPM 144-1-100	2m, 1W in, 100W out, preamp	197.50	(2.50)
LPM 144-3-100	2m, 3W in, 100W out, preamp	197.50	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	175.00	(2.50)
LPM 144-25-160	2m, 25W in, 160W out, preamp	255.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	295.00	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	295.00	(2.50)
LP 144-3-50	2MN 50W out, preamp	125.00	(2.50)
LP 144-10-50	2M 10W in, preamp	125.00	(2.50)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	235.00	(2.50)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	235.00	(2.50)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00	(2.50)
LPM 432-10-100	70cm, 10W in, 100W out, preamp	335.00	(2.50)

SWR/PWR Meters

HANSEN

FS50VP	50-150MHz 20/200 Interval PEP/SWR	106.70	(1.50)
FS300V	50-150MHz 20/200 PWR/SWR	53.50	(1.50)
FS300H	1.8-60MHz 20/200/10W	53.50	(1.50)
FS210	1.8-150MHz 20/200 Auto SWR	63.50	(1.50)
W720	140-430MHz 20/200W	41.50	(1.50)

WELZ

SP10X	1.8-150MHz PWR/SWR	34.00	(1.50)
SP200	1.8-160MHz PWR/SWR	89.00	(1.50)
SP220	1.8-200MHz PWR/SWR/PEP	59.00	(1.50)
SP225	1.8-200MHz PWR/SWR/PEP	99.00	(1.50)
SP350	1.8-500MHz PWR/SWR	79.00	(1.50)
SP400	130-500MHz PWR/SWR	89.00	(1.50)
SP420	140-525MHz PWR/SWR/PEP	69.00	(1.50)
SP425	140-525MHz PWR/SWR/PEP	99.00	(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)
AOR2002	VHF/UHF Continuous Coverage	375.00	(2.50)

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)
IC50S	50MHz multi-mode portable	349.00	(—)
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)
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)
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)
FC700	Tuner	105.00	(2.00)
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	(—)
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	(—)
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)
FRG8800	HF Receiver	475.00	(—)
FRV8800	Convertor 118-175 for above	80.00	(1.50)
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)

Power Supplies

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

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)

TOKYO HI-POWER

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

CAP CO.
AERIAL TUNERS

SPC300	1kW PEP	164.00	(3.00)
SPC3000	3kW PEP	214.00	(4.00)

VIBROPLEX KEYS NOW IN STOCK

AERIALS BY:- JAYBEAM – HYGAIN – G. WHIP – TET – TONNA – MINIBEAM – MET

COMPLETE RANGE OF WOOD & DOUGLAS KITS

ICOM (Tel: 0297-34918) FDK

CLOSED MONDAY/OPEN TUES-SAT 9:00-5:30
(closed for lunch 1:00-2:00)
STOCK ITEMS NORMALLY DESPATCHED WITHIN 48 HOURS

REG G2BSW **RODNEY G6LUJ**

Instant credit also available

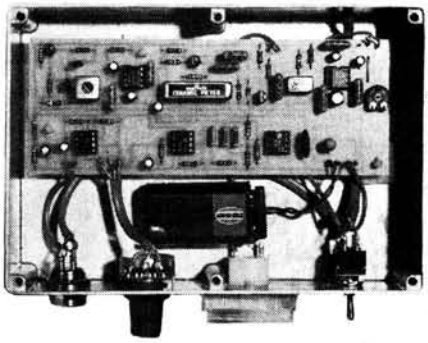
Mail/Telephone order by Cheque or Credit Card. Cheques cleared before goods despatched.

Delivery prices shown in brackets

Practical Wireless
The Radio Magazine

MARCH 1986 VOL 62 NO. 3 ISSUE 948

THIS MONTH



THIS MONTH'S COVER

With audio processing matters featuring in this issue, this month's cover design features the r.f. speech processor and examples of its treatment of spoken numbers in the range zero to nine, captured by a Telequipment DM63 analogue storage 'scope. Our grateful thanks for technical assistance and advice go to Chris Down G8MXW, the Test Equipment Manager of PKS-Digiplan Ltd.

Regular Features

Editorial and Advertisement Offices:
Practical Wireless
Westover House
West Quay Road
Poole, Dorset BH15 1JG
☎ Poole (0202) 671191
Prestel 202671191

Editor Geoff Arnold T.Eng(CEI) FSERT G3GSR
Assistant Editor Dick Ganderton C.Eng., MIERE, G8VFH
Art Editor Steve Hunt
Technical Editor John Fell G0API
Technical Sub-Editor Elaine Howard G4LFM
Technical Artist Rob Mackie
Secretary Kathy Moore
Advertisement Manager Roger Hall G4TNT

hf transceivers

TS940S HF transceiver with general coverage receiver
Top of the range, the TS 940S has every operating feature that the discerning HF operator needs. Amateur bands, 160 through to 10 metres plus a general coverage receiver tuning from 150KHz to 30MHz. Modes of operation are USB, LSB, CW, AM, FSK and FM, included as standard. Forty memory channels, each effectively a separate VFO and simple keyboard frequency entry make operation and ownership of a TRIO TS940S a pleasure.

TS940S . . . £1695.00 inc VAT, carriage £7.00

TS930S HF transceiver with general coverage receiver
Much has been said and written about the TS930S and it now has a place high in the affection of those amateurs fortunate enough to own one. Providing full coverage of the amateur bands from 160 to 10 metres and including a general coverage receiver tuning from 150KHz to 30MHz, the TRIO TS930S is ideal for today's crowded frequencies.

TS930S . . . £1295.00 inc VAT, carriage £7.00.

TS430S HF transceiver with general coverage receiver
A compact transceiver suitable for mobile or portable operation, yet having all the facilities necessary for effective radio communication. The TS430S has, in addition to the amateur bands from 160 to 10 metres, a general coverage receiver. Modes of operation are USB, LSB, CW, AM with FM optional. Owned by many radio amateurs worldwide, the TRIO TS430S is an ideal way to combine amateur radio with short wave listening.

TS430S . . . £720.00 inc VAT, carriage £7.00.

TS830S HF amateur bands transceiver
Needing no description, the TS830S, which uses a pair of 6146B valves in the PA is well known on the amateur bands for its superb signal quality. Having variable bandwidth tuning, IF notch, IF shift and provision for various filters, its receive performance is excellent too.

TS830S . . . £832.75 inc VAT, carriage £7.00

TS530SP HF amateur bands transceiver
A standard HF valve transceiver without frills but providing today's amateur with all necessary facilities for reliable worldwide communication. Modes of operation USB, LSB and CW. The most popular HF transceiver on the market.

TS530SP . . . £698.00 inc VAT, carriage £7.00

handheld transceivers

TR2600E and TR3600E 2 metre and 70 centimetre FM handhelds
The latest handhelds from TRIO are a natural progression from the much liked TR2500/TR3500. By adding DCS, the ability to skip particular memory channels, to hold for either timed or carrier when scanning, for the memory to hold whether the channel is simplex or repeater shift and an illuminated "S" meter, TRIO have produced a first class pair of handhelds.
TR2600E . . . £275.00 inc VAT, carriage £7.00
TR3600E . . . £292.00 inc VAT, carriage £7.00.

TH21E and TH41E 2 metre and 70 centimetre FM compact transceivers
The TH21E and TH41E are two simple handhelds, each extremely small yet having full repeater facilities including reverse repeater. Power output is one Watt or 150 mulliWatts in the low position and frequency selection is by means of thumbwheel switches. Very small but still convenient to operate, the two transceivers are just right for the amateur who wants to stay in touch.
TH21E . . . £170.00 inc VAT, carriage £7.00.
TH41E . . . £199.00 inc VAT, carriage £7.00.

vhf/uhf all-mode transceivers

TS780 VHF/UHF dual band transceiver
The TS780 is the ultimate base station for the enthusiastic operator who wants both 70 centimetres and the 2 metre band in one transceiver. Modes of operation are USB, LSB, CW and FM. Full repeater facilities, plus two VFOs, IF shift, two priority channels, memory and band scan combine to make the TRIO TS780 the perfect rig.

TS780 . . . £948.00 inc VAT, carriage £7.00.

TR9130 two metre all-mode transceiver
The TR9130 is now a classic rig—so popular that to have one on the second hand shelf is rare. 25 Watts on SSB, FM and CW, green frequency display, six memories, two VFOs and memory scan make the TRIO TR9130 ideal for either mobile or base station operation.

TR9130 . . . £499.00 inc VAT, carriage £7.00.
TR9300 (6 metres) . . . **£569.97** inc VAT, carriage £7.00.

TS711E and TS811E 2 metre and 70 centimetre base stations
Following on in the tradition of the TS700 series, the TRIO TS711E and TS811E are perfect base station transceivers. Each produces 25 Watts output and has a full range of operating features. Forty memory channels are available, each of which can be used as a separate VFO. Digital code squelch is also a feature of the TS711E and TS811E.

TS711E . . . £695.00 inc VAT, carriage £7.00. (New low price).
TS811E £795.00 inc VAT, carriage £7.00. (New low price).

vhf/uhf fm transceivers

TW4000A FM VHF/UHF dual band transceiver

To have both 70 centimetres and 2 metres available in one mobile transceiver has been a desire of the VHF/UHF enthusiast for many years. TRIO with the TW4000A have satisfied that need. The transceiver is well known for having an excellent receiver and as those who already own and operate one know, is a delight to use. Compact and producing 25 Watts on both bands, the TW4000A is the enthusiast's natural choice.

TW4000A . . . £522.00 inc VAT, carriage £7.00.

TR7930 2 metre FM mobile/base station transceiver

A mobile FM transceiver that also doubles as a piece of shack equipment. Producing 25 Watts and having 21 memories, priority alert, full repeater facilities including reverse repeater, programmable band scan, memory scan and keyboard frequency entry, the TR7930 is ideal for mobile operation using the programmed memories, yet is suitable for shack use with the front panel keyboard.

TR7930 . . . £329.00 inc VAT, carriage £7.00.

TM201A and TM401A 2 metre and 70 centimetre mobile FM transceivers

Accepting the fact that there is little space in a modern car for anything other than a radio/cassette unit, TRIO have with the TM201A and TM401A produced the definitive compact transceiver. By removing the speaker and making this separate, TRIO have given you excellent receive audio quality. The TM201A and its 70 centimetre version, the TM401A are ideal for the amateur who wants a high performance rig with ease of operation.

TM201A . . . £265.00 inc VAT, carriage £7.00. (New low price).
TM401A . . . £316.00 inc VAT, carriage £7.00.

TM211E and TM411E FM VHF and UHF mobile transceivers

By taking the popular TM201A and TM401A and adding DCS and a tiltable front panel, TRIO have produced higher specification transceivers. Even easier to fit in tight locations, the TM211E and TM411E are transceivers designed to cope with today's crowded bands.

TM211E . . . £365.00 inc VAT, carriage £7.00.
TM411E . . . £399.00 inc VAT, carriage £7.00.

general coverage receivers

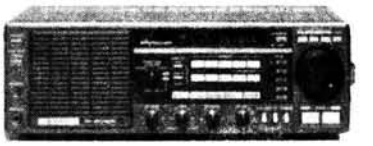
R600 general coverage receiver

The R600 is a general coverage receiver covering 150KHz to 30MHz. Modes of operation are AM, USB, LSB and CW. Operating is on either mains or 12V DC. Easy to use and with a green digital frequency display for easy tuning and internal speaker, the TRIO R600 is equally at home in the lounge, caravan, boat or shack.

R600 . . . £299.52 inc VAT, carriage £7.00.

R2000 general coverage receiver

The R2000 general coverage receiver from TRIO covers the frequencies from 150KHz to 30MHz. Modes of operation are AM, USB, LSB, CW and FM. For convenience the R2000 has ten memories, each of which holding frequency and mode information. Memory scan and programmable scan between user designated limits are also included. Provision has been made for an optional internal VHF converter covering from 118 to 174MHz. Operating from either mains or 12V DC the TRIO R2000 is an ideal way to listen to the world.



R2000 . . . £479.47 inc VAT, carriage £7.00.
VC10 VHF converter 118 to 174MHz . . . **£128.36** inc VAT, carriage £2.50.

station accessories

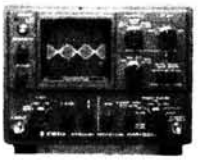
TL922 HF amateur band linear amplifier

The TL922 is a class AB2 grounded grid linear amplifier using two high performance EIMAC 3-500Z tubes. It covers 160 to 10 metres for SSB, CW and RTTY modes of operation. Engineering perfection, those who have seen a TL922 will know what I mean. It is one of the few items of amateur radio equipment which is truly hand built by a specialist engineer.

TL922 inc tubes . . . **£1150.00** inc VAT, carriage £7.00.

SM220 station monitor

Based on a wide frequency range oscilloscope, the SM220 station monitor features in combination with a built-in two-tone generator, a wide variety of waveform observing capabilities. The SM220 aids efficient station operation as it monitors transmitted waveforms and it also serves as a sensitive wide frequency range oscilloscope for various adjustments and experiments. When fitted with the optional BS8 panoramic display and connected to one of the following transceivers (TS940, TS830, TS180, TS820 series) signal conditions in the vicinity of the receive frequency can be seen over a 40 or 200KHz range.



SM220 . . . £243.00 inc VAT, carriage £7.00.
BS8 . . . £60.89 inc VAT, carriage £7.00.

send for the **TRIO** general catalogue

All advertised prices subject to exchange rate variation

SMC — South Midlands

HQ & MAIL ORDER S.M. HOUSE, RUMBRIDGE ST, TOTTON, SOUTHAMPTON

SPECIAL OFFER

FT290R

DURING JANUARY AND FEBRUARY YOU CAN PURCHASE YAESU'S NO. 1 BEST SELLER FOR ONLY

£299 inc. VAT

CHASE

FT726R(2) £775 inc

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, push 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.

WITH YAESU'S TWO

OSCAR 2/10M

The SMC Oscar was designed to satisfy the stringent specifications of MPT1320. It is a solid state, compact, transceiver built to withstand the shock and vibrations experienced in the mobile environment for years to come. It also makes an ideal base station when used in conjunction with an external 12V P.S.U. and optional amplifier such as our type PA10L/25. A high level of frequency stability over a wide temperature range is achieved by the use of low tolerance quartz crystal and the latest in CMOS integrated circuits. The receiver provides good sensitivity allowing excellent reception of even the weakest stations, good selectivity and signal handling allows perfect reception of local signals with minimum interference from adjacent channels. The power output is 5W giving a good range. This coupled with highly controlled modulation and high spurious rejection gives maximum readability with minimum interference to other users.

ONLY £65 inc.

FRG-8800 £475 inc

Continuous coverage from 150kHz to 30MHz. Two speed spin tuned VFO plus keyboard plus computer interface control.

The FRG-8800 demodulates SSB (USB & LSB) CW, AM (Wide and Narrow) and FM narrow as standard, useful for 10M, CB and for VHF.

The FRG-8800 comes with twelve memories, programmed and scanned at the touch of a single button. Any of the memory channels will accept a frequency including the VHF range (optional VHF unit). The mode is also stored in the memory.

Four filters are fitted as standard (SSB/CW, AM, AM-NAR and FM-NAR) chosen for optimum performance, with switchable AGC and variable tone control.

The back-lit green LCD display incorporates easy to read "any angle" 10mm digits.

A twelve function display indicates the status at a glance. It includes memory channel number mode, and frequency to a resolution of 100Hz. Also included is a two dimensional LCD, graphical SIMPO and "S" meter. A 12 button keyboard allows quick accurate changes of frequency and band.

Dual accurate 12 hour clocks, with AM/PM indicators uses the main digital display and features full back-up facilities (mains failure) and can activate the receiver or tape recorder via relay contacts. The FRV-8800, extends coverage to include 118-174MHz all within the main frame, allowing monitoring of, PMR, marine and air bands, as well as 2M. 240-220VAC to 110-120V, 50/60Hz mains standard, 12VDC operation is optional.

LEEDS
SMC (Leeds)
257 Otley Road,
Leeds 16, Yorkshire
Leeds (0532) 782326
9-5.30 Mon-Sat

CHESTERFIELD
SMC (Jack Tweedy) Ltd
102 High Street
New Whittington,
Chesterfield
Chest. (0246) 453340
9.30-5.30 Tues-Sat

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5 Tues, Weds, Fri
10-4 Sat

STOKE
SMC (Stoke)
76 High Street
Talke Pits, Stoke
Kidsgrove (07816) 72644
9-5.30 Tues-Sat

GRIMSBY
(SMC) Grimsby
247A Freeman Street
Grimsby, Lincs
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

JERSEY
SMC (Jersey)
1 Belmont Gardens
St. Helier, Jersey
Jersey (0534) 77067
9-5 pm Mon-Sat
Closed Wed

N. IRELAND
SMC N. Ireland
10 Ward Avenue
Bangor
County Down
0247 464875.

Southampton Showroom open 9-5.30 pm Monday to Friday, 9-1 pm Saturday.

AGENTS

NORMAN DILLEY, DARTCOMMS, DARTMOUTH (08043) 3534

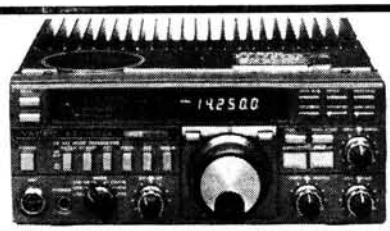
PAT GILLAN, IPSWICH COMMS, IPSWICH (0473) 402173

Communications ltd.

AUTHORISED YAESU

N, SO4 4DP, ENGLAND. Tel: (0703) 867333. Telex: 477351 SMCOMM G.

THE DX



FT757GX £739 inc

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.

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.

TOP PERFORMERS

HANDHELDS

FT203R(5)	Tx/Rx THUMBWHEEL	2M	1.5W	**£175 inc VAT**
FT203R(3)	Tx/Rx THUMBWHEEL	2M	2.5W	**£195 inc VAT**
FT203R(4)	Tx/Rx THUMBWHEEL	2M	3.5W	**£199 inc VAT**
FT703R(5)	Tx/Rx THUMBWHEEL	70CM	1.5W	**£215 inc VAT**
FT703R(3)	Tx/Rx THUMBWHEEL	70CM	2.5W	**£235 inc VAT**
FT703R(4)	Tx/Rx THUMBWHEEL	70CM	3.5W	**£239 inc VAT**
FT209R(5)	Tx/Rx KEYBOARD	2M	1.8W	**£219 inc VAT**
FT209R(3)	Tx/Rx KEYBOARD	2M	2.7W	**£239 inc VAT**
FT209R(4)	Tx/Rx KEYBOARD	2M	3.7W	**£245 inc VAT**
FT709R(5)	Tx/Rx KEYBOARD	70CM	1.8W	**£239 inc VAT**
FT709R(3)	Tx/Rx KEYBOARD	70CM	3.0W	**£259 inc VAT**
FT709R(4)	Tx/Rx KEYBOARD	70CM	4.0W	**£265 inc VAT**
FT209RH(5)	Tx/Rx KEYBOARD	.2M	2.3W	**£225 inc VAT**
FT209RH(3)	Tx/Rx KEYBOARD	.2M	3.7W	**£245 inc VAT**
FT209RH(4)	Tx/Rx KEYBOARD	.2M	5W	**£249 inc VAT**

FROM £175 inc

FRG-9600 £449 inc

An all mode scanning receiver covering 60 through 905MHz continuously, with 100 key-pad-programmable memory channels.

In addition to FM wide (for FM and TV broadcasts), FM narrow and AM (wide and narrow) the FRG-9600 also provides SSB (single sideband) reception up to 460MHz. A front panel tuning knob simplifies tuning of SSB and narrowband AM. Seven tuning/scanning rates between 100Hz and 100kHz assure fast and efficient scanning while permitting easy tuning of narrowband signals.

The scanning system allows full or limited band scanning and memory channel scanning, with auto-resume. In addition to carrier sensing scan stop, audio scan stop sensing is also selectable to avoid stopping on inactive "carrier-only" channels. Scanning steps are selectable, with the wide steps indicated on the front panel display. Signal strength indicated by a two-colour graphic S-meter. A 24-hour clock/timer, recorder output, cpu band selection outputs, multiplexed (FM wide) output, AF and RF mute and other control signals for maximum expansion potential with future options or for own add-on hardware for special applications.

The direct control link to the cpu in the FRG-9600, allowing virtually unlimited customised control functions; such as multiple, organised memory banks; automatic tuning; and customised scanning systems; using most personal computers and a Yaesu FIF CAT Interface Unit.

The FRG-9600 requires 12VDC.

KDK FM240

A brand new 25W FM transceiver from KDK, featuring all the latest in microchip technology and incorporating the revolutionary new **MAN MACHINE INTERFACE** (M.M.I.). The alpha-numeric LCD display combined with rotary controls and push button switches allied to a new C.P.U. displays prompt messages and command data allowing for maximum flexibility of operation with minimum button pushing! Most of the major functions are simple one button operations including: Simplex, Tx+ Offset, TX Offset; Receive Scanning Modes – Skip, Busy, Pause and Delay; 16 Memory Channels; Programmable Scan Limits and Priority Scan. Receive sensitivity of 0.2µV for 12dB SINAD. All this in a small box measuring only 140W × 40H × 170D (mm).

£T.B.A.

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

SMC SERVICE
Free Securicor delivery on major equipment.
Access and Barclaycard over the phone.
Biggest branch agent and dealer network.
Securicor 'B' Service contract at £5.00
Biggest stockist of amateur equipment.
Same day despatch possible.

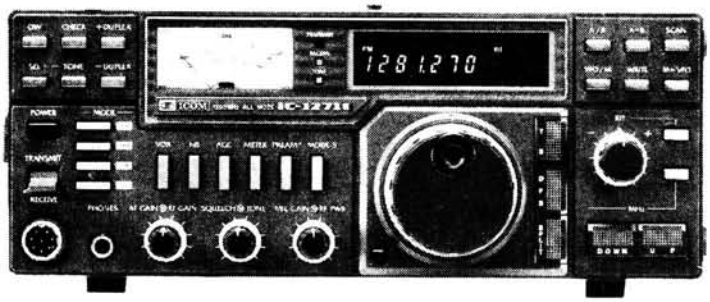
GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-five years of professional experience.
● **2 Year warranty on regular priced Yaesu products.**

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

HIGHER AND HIGHER WITH

2 New models to raise ICOM Amateur frequencies to 1·2GHz.

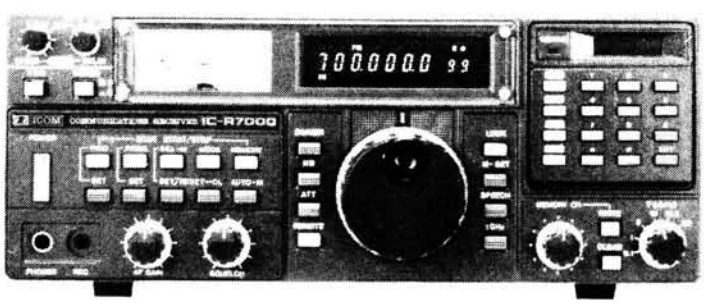
IC-1271E Fantastic new multimode 1.2GHz Transceiver



ICOM, a pioneer in 1.2GHz technology are proud to introduce the first full feature 1240 – 1300 MHz base station transceiver. Features include: multimode operation, 32 memories, scanning and 10 watts RF output. The IC-1271E allows you to explore the world of 1.2GHz thanks to a newly developed PLL circuit that covers the entire band, a total of 60MHz, SSB, CW and FM modes may be used anywhere in the band making the IC-1271E ideal for mobile, DX, repeater, satellite or moonbounce operation. The IC-1271E has outstanding receiver sensitivity, the RF amplifiers use a low noise figure and high-gain disc type GaAs FET's for microwave applications. The rugged power amplifier provides 10 Watts which can be adjusted from 1 to 10 Watts. A sophisticated scanning system includes memory scan, programme scan, mode-selective scan and auto-stop feature. Scanning of frequencies and memories is possible from either the transceiver or the HM12 scanning microphone. 32 programmable memories are provided to store the mode and frequency in 32 different channels. All functions including memory channel are shown clearly on a seven digit luminescent dual colour display. The IC-1271E has a dial-lock, noise blanker, RIT, AGC fast or slow and VOX functions. With a powerful 2 Watt audio output the IC-1271E is easily audible even in a noisy environment. The transceiver operates with either a 240V AC (optional) or 12 volt DC power supply.
A variety of options include IC-PS25 internal AC power supply, IC-EX310 voice synthesizer, the TV-1200 TV transceiver adaptor and the IC-EX309 computer interface. The IC-1271E is the most compact and lightest all-mode 1200 MHz transceiver currently available.

IC-R7000 VHF/UHF scanning receiver

Causing quite a stir at the moment is the ICOM IC-R7000. This new receiver is able to give high frequency coverage up to 1.3MHz without sacrificing SSB stability which is maintained throughout the IC-R7000's entire frequency range. For simplified operation and quick tuning, the IC-R7000 feature direct keyboard entry. Precise frequencies can be selected by pushing the digit keys in sequence of the frequency or by turning the main tuning knob. FM/AM/SSB modes, frequency coverage 25-1000 MHz and 1025 – 2000MHz (25 – 1000MHz and 1260 – 1300MHz guaranteed specification). The IC-R7000 has 99 memories available to store your favourite frequencies including the operation mode. Memory channels may be called up by simply pressing the memory switch, then rotating the memory channel knob or by direct keyboard entry. A sophisticated scanning system provides instant access to most used frequencies. By depressing the Auto-M switch. The IC-R7000 automatically memorises frequencies in use, while the unit is in the scan mode. This allows you to recall frequencies that were in use. Scanning systems include memory selected frequency ranges or priority channels, scanning speed is adjustable. Narrow/wide filter selection. Five tuning speeds: 10Hz, 100Hz, 1.0KHz, 10KHz and 25KHz. All functions including memory channel readout are clearly shown on dual-colour fluorescent display with dimmer switch. The IC-R7000 has dial-lock, noise blanker, S-meter and attentuator. Options include RC-12 infra-red remote controller and a voice synthesizer.
For a more detailed specification of the competitively priced IC-R7000 contact your authorised ICOM dealer or telephone us direct on 0800 521145, our FREE Linkline service for Amateurs and SWL's.



British TELECOM Approved Dealer for Mobile Phone Division
Cellnet

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Than

ICOM

IC-751 The ICOM Flagship

SM-10 Desk-top Mic

The IC-751 is the Flagship of the ICOM range, it is a competition grade ham transceiver with a 100KHz – 30MHz continuous tuning, general coverage receiver and a full featured all mode solid state transmitter that covers all the WARC bands. Utilising an ICOM developed J-Fet DBM, the IC-751 has a 105dB dynamic range and a switchable choice of pre-amp 0-20dB attentuator. The transmitter features a high reliability 2SC2904 transmittors in a low IMD (−32dB @ 100W) full 100% duty cycle. Other features include 32 tunable memories, mode selective scan, frequency scan and memory scan, full break in on CW and Amptor compatibility, Pass band tuning, notch filter, variable noise blanker, Dual VFO's for DX or 10m repeater operation. The IC-751 is fully compatible with ICOM auto units such as the AT500 and IC-2KL. Options include internal or external power supplies, frequency controller, Speech synthesizer, various optional filters and SM6 or SM10 Desk Microphone.

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

IC735 compact HF Transceiver

As predicted the ICOM IC-735 has rapidly gained the reputation it deserves. When compared with similar 'top names' transceivers the IC-735 towers above them (despite its smaller size). The IC-735 has a larger number of programmable channels, but notably most important is the superb sensitivity in all modes SSB, CW, AM and FM. This superior sensitivity is due to the excellent front end performance. All amateur frequencies from 1.8MHz to 30MHz are available including the three new bands 10, 18 and 24MHz. RF output is approximately 100 Watts. Tuning ranges from 100KHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible.

Dynamic range is 105dB with a 70.451MHz first IF circuit. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB. Computer remote control is possible via the RS-232C jack. Options include: the AT-150 automatic antenna tuner, the PS55 AC power supply and the SM-6, SM-8 and SM10 desk mics. Why not find out more about the IC-735 by ringing us or your local ICOM dealer.

50MHz, A New Dimension for the U.K.

IC-505. 50MHz transceiver

The IC-505 is a 50MHz band SSB, CW, FM (optional) transceiver, and has already gained an excellent reputation worldwide. The dual VFO system has been developed using advanced computer and PLL technology. The IC-505 features 6 channel memories and can be used independent of emission modes, memory scan, program scan which searches only specified frequency band. LCD ensures clear visibility even in sunlight. The R.F. amplifier, a dual gate MOSFET features high gain and low noise characteristics. The IC-505 accepts a standard dry cell pack, rechargeable nicad battery pack (BP10) or 13.8v external power supply, 3 watts R.F. output, 0.5 watts low power, 10 watts at 13.8v. Accessory circuits include split frequency operation, noise blanker, squelch and CW break-in. Options include:- EX248 FM unit, PS45 AC Power Supply and LC10 Carrying Case.
All these features make the IC-505 a great transceiver for operation on the 50MHz band.

IC-551. 50MHz Base station

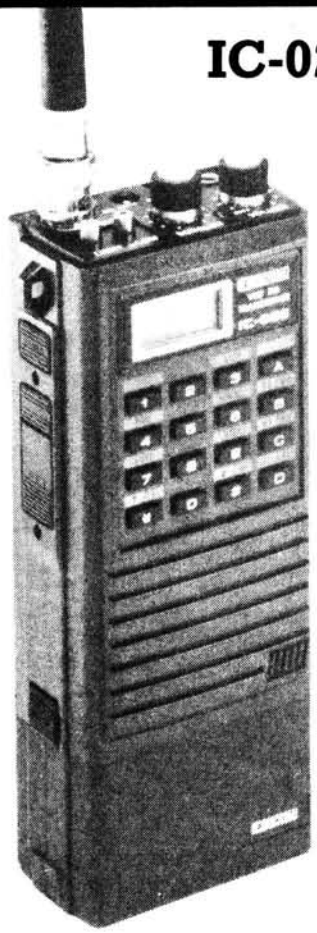
This base station has all mode capability, SSB, CW, AM and FM (when optional FM is installed). It covers 50-54MHz with 80 watts variable R.F. output power (40 watts A.M.), Dual VFO's for split frequency operation. 3 memory channels and memory scan, program scan with adjustable scanning speed and auto stop when a signal is received. A powerful audio output, 2 watts at 8ohms for easy listening even in noisy surroundings.
Other features include a noise blanker, AGC fast or slow RIT, VOX passband tuning and speech processor. Options include:- PS15 20 amp external power supply, IC-EX106 FM unit and IC-HP1 headphones.
These two transceivers allow you to explore this fascinating part of the spectrum. UK stations have worked int VE, VO, W1,2,3,4 and 8. The UK beacon GB3NHQ has been received as far west as Washington State. Please contact Thanet Electronics Limited or your local ICOM dealer for more information on these 6m transceivers.

British TELECOM Approved Dealer for Mobile Phone Division
Cellnet

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Than

ICOM

IC-02E/04E Handportables



These direct entry micro-processor controlled handhelds, one for 2 metres, the other for 70 centimetres. Scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. They have a LCD readout indicating frequency, memory channel, signal strength, transmitter/output and scanning functions. A range of accessories include the HS10 Headset and boom microphone, HS10SB PTT switch box with pre-amp, HS10SA voice operated (VOX) switch box. The IC-2E and IC-4E still continue to be available.

New Retail Shop

We are pleased to announce that we have moved to a new larger retail shop. This will be managed by Andy G6MRI and is situated at Stanley Road/Kings Road, Herne Bay, Kent. Tel: (0227) 369464. Give it a visit for demonstrations and advice on anything to do with your shack. BCNU.

You can get what you want just by picking up the telephone. Our Mail Order department offers you free same day despatch whenever possible, instant credit, interest free H.P. Telephone Barclaycard and Access facility, 24 hr answerphone service.

WANT TO LEARN MORE?

Telephone us free-of-charge on:

HELPLINE 0800-521145.

—— Mon-Fri 09.00-13.00 and 1400-17.30 ——

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

ICOM authorised dealers in the U.K.

Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
A.R.E. Comms, Earlestown, Merseyside, 09252-29881.
Arrow Electronics Ltd., Chelmsford, Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holdings (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
D.P. Hobbs, Norwich, 0603-615786.
Dressler (UK) Ltd., London (Leyton), 01-558 0854.
D.W. Electronics, Widnes, Cheshire, 051-420 2559.
Hobbytronics, Knutsford, Cheshire, 0565-4040. Until 10pm daily.
Poole Logic, Poole, Dorset, 0202 683093.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
Radio Shack Ltd., London NW6, 01-624 7174.
R.A.S. Nottingham, 0602-280267.
Ray Withers Comms, Warley, West Midlands, 021-421 8201.
Scotcomms, Edinburgh, 031-657 2430.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-42043.
Reg Ward & Co. Ltd., S.W. England, 0279-34918.
Waters & Stanton Electronics, Hockley, Essex, 0702-206835.

Listed here are just some of the 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.

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

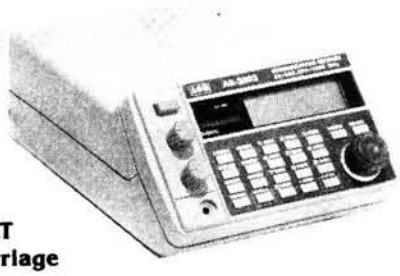
Now you know why we're Europes No. 1

FROM 1ST FEB 1986 — AMCOMM–A.R.E. UNDER ONE ROOF AT UXBRIDGE ROAD

Take part in our 'success story' now! Come and get it at Europe's No. 1 Emporium — or phone for fastest delivery. Remember you'll get a good deal more for a good deal less at AMCOMM–A.R.E.

AR 2002

Receiver
25-550 MHz
800 MHz-
1.3 GHz



£359 inc VAT
add £3.50 carriage

NEW YAESU FRG 9600

ALL MODE
VHF/UHF SCANNER

£429.00

60-905MHz. Wide and Narrow AM/FM with 5, 10, 12½, 25 and 100 steps on FM + 1KH/100Hz AM and 1KHz/100Hz SSB and much, much more including optional interface unit for computers and video IF unit for TV reception.

YAESU

FT1 HF Transceiver	P.O.A.
FT980 HF Transceiver	P.O.A.
SP980 Speaker	75.00
FP700 PSU	170.00
FC700 Tuner	111.00
FT757GX HF Transceiver	769.00
FC757 Auto A.T.U.	279.00
FP757HD Heavy Duty PSU	189.00
FP757GX Switched Mode PSU	179.00
FT290 2m M/Mode Port/Transceiver	STAR BUY 299.00
FT290 With Mutek front modified	STAR BUY 329.00
MMB11 Mobile Bracket	31.45
NC11 Charger	11.50
CSC1 Carrying Case	5.00
YHA15 2m Helical	7.65
YHA44D 70cm ½wave	9.95
YM49 Speaker Mike	20.30
MMB15 Mobile Bracket	14.55
FT203R NEW 2m H/Held/C/W FNB3	175.00
FT209R NEW 2m Held/C/W FNB3	219.00
FT208 2m H/Held	189.00
MMB10 Mobile Bracket	8.80
NC9C Charger	9.60
NC8 Base/station Charger	64.00
PA3 Car Adaptor/Charger	18.00
FNB2 Spare Battery Pack	24.90
YM24A Speaker Mike	23.75
FT726R 2m Base Station	775.00
430/726 70cm Module for above	270.00
MH1B8 Hand 600 8pin mic	17.65
MD1B8 Desk 600 8pin mic	74.75
MF1A3B Boom mobile mic	19.95
YH77 Lightweight phones	14.95
YH55 Padded phones	14.95
YH1 L/weight Mobile H/set-Boom mic	15.70
SB1 PTT Switch Box 208/708	17.25
SB2 PTT Switch Box 290/790	17.25
QTR24D World Time Clock	34.50
FF501DX Low Pass Filter	31.45
YP150 Wattmeter/Dummy Load 150W	97.75
FRG8800	459.00
FRV8800	79.00
FT703	215.00
FT709	239.00
FT270R	299.00
FT2700R	479.00
FRG9600	429.00

Prices may be subject to change due to currency fluctuations

ICOM

IC751 HF Transceiver	1239.00
IC745 HF Transceiver	898.00
ICOM IC 735 HF Transceiver	799.00
PS15 P.S. Unit	135.00
PS30 Systems p.s.u. 25A	259.00
SM6 Base microphone for 751/745	36.50
IC290D 2m 25w M/Mode	469.00
IC290E 10w M/Mode Mobile	399.00
IC271E 2m 25w M/Mode Base Stn	699.00
IC271H 100W version of above	889.00
IC25H 2m 45w FM	359.00
IC27E 25W FM mobile	359.00
IC45E 70c 10w FM	345.00
IC47E 25w 70cm FM mobile	449.00
ICBU1 B/U Supply for 25/45/290	24.50
ICR70 General Coverage Receiver	599.00
ICR71 General Coverage Receiver	699.00
IC02E 2m H/Held	259.00
IC2E 2m H/Held	199.00
ML1 2m 10w Linear	69.00
IC4E 70cm H/Held	259.00
IC04E 70cm handheld	269.00
BC30 Base Charger	56.35
HM9 Speaker mic	18.55
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

Aerial Rotators

9502B 3 core Light Duty	69.50
AR40 5 core Medium Duty	115.00
KR400 Med/H Duty	109.95
KR500 6 core Elevation	139.95
KR400RC 6 core Medium Duty	132.50
CD45 8 core Heavy Duty	189.95
KR600RC 8 core Heavy Duty	189.50
HAM1V 8 core Heavier Duty	299.00
T2X 8 core Very Heavy Duty	365.00
Hirschman 250 ★ STAR BUY ★	49.50

EMOTO — all models POA

HEIL ACCESSORIES

HEIL HC3 Microphone Element	22.85
HEIL HC5 Microphone Element (Icom SM5/6)	25.40
HEIL HM 5 Desk Microphone (300Hz-3KHz) cardoid fwd	59.00
HEIL MM5 Hand Held Mic with HC3 Capsule	37.00
HEIL SS2 SPEAKER see page 10	65.00
HEIL EQ300 Mic Equaliser	65.00
HEIL BM10 8OZ HEADSET/BOOM MIC	65.00

Carriage and VAT included.

VHF LINEAR AMPLIFIERS

THP HL30V 0.5-3w in 30w out	45.00
THP HL82V 10w in 85w out	144.50
THP HL110V 10w in 110w out	204.00
THP HL160V 10w in 160w out	244.52
THP HL160V 25w in 160w out	209.73
MML 144/30LS	
MML 144/50S	
MML 144/100S	
MML 144/100HS	
MML 144/100LS	
MML 144/200S	

UHF LINEAR AMPLIFIERS

MML 432/30L	145.00
MML 432/50	145.00
MML 432/100	299.00
THP HL20U 1-3w in 20w out	82.00
THP HL45U 10w in 45w out	152.77
THP HL90U 10w in 90w out	268.59
ALINCO ELH250C	114.95

B.N.O.S. complete range also in stock
VAT included. Add £2 per item carriage

TELEGRAPH ACCESSORIES

Hi Mound Keys

HK 708 Hand Key with base	14.95
HK 707 Hand Key with base and dust cover	15.48
HK 706 Hand Key with base and dust cover	16.60
HK 702 Key with marble base and dust cover	29.65
MK 704 Dual lever paddle, no base	14.00
MK 705 Dual lever paddle marble base	25.65
COK-2 Practice oscillator	8.99
KENPRO Iambic Electronic Keyer KP100	79.00
KENPRO Iambic Memory Keyer	169.00

Bencher

BY1 Squeeze Key Black base	53.95
BY2 Squeeze Key Chrome base	69.95

Auto CW/RTTY

Tono 9100E	799.00
Tono 9000E Reader/Sender	P.O.A.
Tono 550 Reader	299.00
Tono 5000E	899.00

VAT included. Add £1 carriage per item.

SWR/POWER METERS

WELZ SP200 1Kw	89.00
WELZ SP300 1Kw	129.00
WELZ SP400 150w	89.00
WELZ SP15M 200w	49.00
WELZ SP250 2Kw	65.00
TOYO TM1X 3.5 150MHz 120w	18.80
TOYO T430 145/430MHz thru line watt meter 120w	44.65
TOYO T435 145/435MHz thru line 200w	49.35

VAT included. Add £2 per item carriage.

HOURS: 10:00 — 5:30
SAT. 10:00 — 5:00

AMCOMM ARE

HAM RADIO WISDOM ... FROM HAM RADIO EXPERIENCE ...

PLUS JAYBEAM, M.E.T. ANTENNAS MICROWAVE MODULES, DATONG AND LOTS, LOTS MORE!

373 Uxbridge Road, Acton, London W3 9RN Tel: 01-992 5765/6 Telex: 24263

ICS presents the brilliant ALINCO

2 Metre Transceivers

ALR–206E — 25 watts — 2 metre mobile transceiver

- 144–146 MHz FM
- 25 watts output
- 10 memory channels, band scan
- All programming from key pad on microphone
- Back lit LCD frequency display with LCD 'S' meter
- Frequency selection from front panel or microphone
- Mobile mount included

The ALM–206E and ALR–706E are exciting new mobile transceivers from Alinco.
Micro processor controlled versatility and programming from the microphone in a small package.

ALR–206E Price: **£295 inc.VAT (p & p £2.50)**

ALM–203E — 3/5 watts — 2 metre handheld transceiver

- 144–146 MHz FM
- 3 watts with NiCad, 5 watts with DC/DC converter
- 10 memory channels
- Programable band scan
- Switchable 150–160 MHz Rx (marine band)
- 'S' meter
- Toneburst
- NiCad, charger as standard

Options:

Spare NiCad	**£33.75**
Dry cell case	**£7.50**
DC/DC converter	**£13.50**
Case	**£14.50**
Cigar plug cable	**£4.50**
Mobile charger mount	**£26.50**
Speaker/microphone	**£18.50**

(prices do not include post & packing)

£239 inc.VAT (p & p £2.50)

ELM–230DII
2m 30 watts linear

Built in Ga As FET Pre-amp

Price £69. inc.VAT (p & p £2.50)

Look out for the new ALR–706E!

10 watts, 70cm. mobile transceiver.

Available in the spring.

ICS Electronics Ltd.,
PO Box 2
Arundel
West Sussex BN18 0NX

Telephone: 024 365 590

12 months parts + labour waranty
Dealers throughout U.K.
Prices may vary with exchange rate.
Callers by appointment

VISA
Access

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

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.

STAR £10 LETTER

Burndept

Sir: I was very interested to read John D. Heys' article on the Burndept Ethodyne receiver in *PW* January 1986 issue. When I was in my 'teens I had a bound copy of *Chums* for 1925 (alas, borrowed and never returned to me) in which there was an article entitled "The Rolls-Royce of Radio". The illustration was very similar to those of the Ethodyne shown in Mr. Heys' article, and I have little doubt that this was the set referred to in *Chums*. Perhaps one of your readers may have a copy of this annual and be able to confirm the supposition? I recall the mentioning of the frame antenna as being essential to reduce the radiation of the local oscillator. There was also a reference to a formidable array of filament rheostats which were used to keep the valves at just the right brightness. It was said one could read comfortably by the light of a row of "bright emitters". As Mr. Heys points out, a price tag with all accessories of £100 was truly colossal—not much below the price of a family car. Try relating that to today's values!

Incidentally, Burndept continued to make radio sets right on into the 1940s, but latterly were allied to Vidor. Over a nine year period from 1934, Messrs Burndept produced no fewer than 25 models bearing its name.

Chas. E. Miller
Woodseaves, Staffs

Help

Sir: I am the owner of a Marconi CR150 valved communications receiver and I am unable to locate a circuit diagram or service manual for this set. I wonder if any reader could help me to obtain a copy of this elusive document.

Richard Castle
167 Privett Road
Gosport
Hants PO12 3SS

Boredom?

Sir: If I had a better memory I could direct the writer of the star letter in the December 1985 *PW* to a missive that appeared in *RadCom* a few years ago. Rather than being frustrated with 'phone operators being given to excessively long overs, the *RadCom* correspondent took the opposite line, complaining that especially with those new to the hobby and in the first flush of youth, transmissions were painfully short and gave the operator at the other end very little to chew on. Seems we can't win!

While operation under trial or marginal conditions clearly militates against long transmissions, it is the case with enthusiasts who "go back a long way" that they will take some time to discuss various aspects of interest to them. An old friend at the other end would not, I think, sit there hand on p.t.t. waiting only for the incoming carrier to drop out. Personally, unless I have a vested interest, I avoid these nets like the plague. I think that there is room for all tastes and aspirations (legal that is!) in the hobby, but one lesson we all have to learn is infinite patience, be it with the hardware, the operating conditions or the operators themselves.

Dr Michael Buck GW4NHH

PW COMMENT

50MHz At Last

"AN ANNOUNCEMENT BEFORE CHRISTMAS" they promised—"Which Christmas?" we wondered. Then, true to their word, on December 16 came the announcement from the DTI of the initial conditions of use for the 50MHz amateur band in the UK, to come into effect from 1 February 1986. These are:

- The allocation shall be primary within the United Kingdom.
- Initially only Class A licensees will be permitted access to the band.
- The maximum power at all times shall be:
  carrier—14dBW e.r.p.
  p.e.p.—20dBW e.r.p.
- Maximum transmitting antenna height to be 20 metres above ground level.
- Antennas shall be horizontally polarised.
- No mobile, portable or "temporary premises" operation will be allowed.
- There will be no restriction on modes or times of operation.
- No repeaters will be allowed in the band.
- Existing permits will be withdrawn.

Undoubtedly Class B licence-holders will be very disappointed not to be allowed to use the band, though for some this will come as no big surprise. The hard facts are that this allocation of 50·0 to 50·5MHz was won in the face of very substantial opposition from the administrations of near continental neighbours, who still use the band for TV broadcasting. Excluding Class B licensees is one simple way of limiting the number of amateurs on the band while still maintaining a representative geographical spread of stations during what is announced as an initial trial period. If it proves that amateur operation on this band in the UK can be carried on 24 hours a day without flattening TV and other services in Europe, there is a fair chance that the band will be given to all UK amateurs, possibly with a wider frequency allocation, too. A review of the situation will be carried out at the end of the first 12 months' operation. In the meantime, Class A licensees on this band must be particularly careful to behave in a responsible manner, observing the licence conditions. Although the band is a primary allocation to the amateur service in the UK, the *Radio Regulations* still lay down that harmful interference shall not be caused to other authorised radio services. If such interference **is** caused, the band may have to be withdrawn from UK amateurs. It is stressed that the power restrictions relate to **effective radiated power**. In other words, the gain of the antenna must be taken into account.

Geoff Arnold

50MHz BAND-PLAN

Freq. (MHz)	Service
50·00	c.w. only 50·02–50·08 beacons
50·10	narrow-band modes 50·11 worldwide DX calling 50·20 s.s.b. activity centre 50·30 +/– c.w. m.s. 50·35 +/– s.s.b. m.s.
50·40	• all modes
50·50	

NEWS EXTRA

Return of the Radiogram

Depending on your age, Radiogram may well conjure up visions of a piece of substantial floor-standing domestic audio/radio equipment, or even the original meaning, a telegram sent by wire.

However, in this instance *The Radiogram* is a brand new fact sheet and newsletter for those whose interests extend to the repair and preservation of valve radio receivers. Edited by *PW* contributor Chas Miller, the aim is to appeal to the practical valve radio enthusiast—the person who wants to restore and repair a receiver, to learn or enquire about the more exotic and arcane features to be found in some sets, to build valve-type equipment and receivers, and last, but not least, to simply enjoy the nostalgia evoked by reading about radio sets of the past.

The intention is to produce a minimum of six issues per year. For further details send an s.a.e. to: ***Larkhill, Newport Road, Woodseaves, Stafford ST20 0NP.***

Beacon News

The recently formed North West Kent Beacon Group have advised that they are now responsible for the GB3NWK beacon system. After nearly three and a half years continuous service the original 1·3GHz band beacon was joined by a companion 2·3GHz unit on 12 October.

The 2·3GHz GB3NWK beacon replaces the defunct GB3LDN and is the result of many months of hard work on the part of G4GLN, G8CIU and beacon keeper G8BJG. For the record GB3NWK on 1296·81MHz has an e.r.p. of 100W, using a 15/15 slot-fed Yagi at 162m a.s.l. which beams WNW from its site at Chelsfield (NGR TQ 498644) JO01BI.

The new beacon on 2320·85MHz has an e.r.p. of 5W, using an omni-directional Alford Slot antenna at approximately 158m a.s.l. Both beacons employ F1A (f.s.k.) c.w. ident and send GB3NWK JO01BI. Reports will be welcomed by G4GLN—QSL Cards via the bureau please.

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. **Kits** for some of our more recent projects are available from **CPL Electronics**, 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE. Tel: 0642 591157. The **printed circuit boards** are available from **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.

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 £1.25 each, including post and packing to addresses at home and overseas (by surface mail).

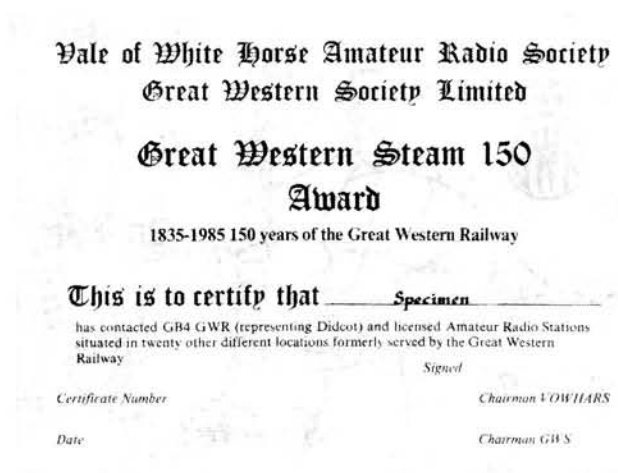
Binders are available (Price £5.50 to UK addresses, £5.75 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to Practical Wireless.

Awards Roundup

The Vale of White Horse Amateur Radio Society have run the Special Event Stations GB4GWR at various Great Western Railway venues since 1982. The Great Western Steam 150 Award, run in conjunction with the Great Western Society, commemorates the 150th Anniversary of "Gods Wonderful Railway" and can be obtained by contacting (or hearing) 20 amateur radio stations operating from 20 different locations formerly served by GWR plus GB4GWR (operational during Easter) at Didcot. The award certificate, which costs £2, or 10 IRC's for non-UK applicants (including a donation to Didcot Railway Centre) features a map of the rail network in GWR colours and can be endorsed SWL or by mode or band. Copies of log entries, with the claimed locations underlined, should be countersigned by two licensed amateurs. Applications to: ***John O'Hagan G4PFY, Brubell, 27 Colne Close, Grove, Wantage, Oxon OX12 0NN.***



Vale of White Horse Amateur Radio Society
Great Western Society Limited

Great Western Steam 150 Award

1835-1985 150 years of the Great Western Railway

This is to certify that Specimen

has contacted GB4 GWR (representing Didcot) and licensed Amateur Radio Stations situated in twenty other different locations formerly served by the Great Western Railway

Signed

Certificate Number — Chairman VOWHARS

Date — Chairman GWS

To celebrate the National Day of Wales the Saint David's Day Special Event Station GB2SDD, run by the Amateur Radio Section of the B.S.C. Port Talbot Sports and Social Club, will be operational from midnight on Friday 28 February to midnight on Saturday 1 March on all h.f. and v.h.f. bands. A special event QSL card will confirm contacts and s.w.l. reports are welcomed.

In conjunction with the event station the Saint David's Day Award can be obtained by contacting an additional ten other GW stations during February and March (five only for non-UK). To claim the attractive award certificate forward copies of logged contacts plus a £2 cheque/postal order (7 IRCs non-UK) made out to SDD Station, to the Event Co-ordinator ***Mr. R. R. Jones GW4HOQ, Bryn-Ynys, 13 Strawberry Place, Morriston, Swansea, West Glamorgan SA6 7AG.***

The County of Cornwall contains a relatively small, but increasing number of radio amateurs and in order to promote further contacts the Cornish Radio Amateur Club has introduced the Cornish Award.

The Club will issue award certificates for three specific areas of operation: 1·8–146MHz, 432MHz and higher or RTTY (any band), with each having a choice of three classes of attainment. On the basis of one point per QSO, a Class 1 certificate for the h.f./144MHz section requires 30 points, Class 2, 20 points and Class 3, 10 points. Correspondingly 432MHz and up, 9, 6 and 3 points and RTTY 20, 15 and 10 points. Non-European claimants are required to obtain 15, 10 or 5 points for the h.f. section with the requirements for the other options as for Europe.

Valid contacts cover resident or visiting stations, operating in all permissible situations (A, P or M etc). Search back through your logbooks because contacts made since, 1 January 1946 are valid! Further details available from: ***Mr. J. E. Bowden, 22 Whites Close, Polbreen, St Agnes, Cornwall TR5 0TU or Tel: (087255) 2278.*** Supply an s.a.e. (IRCs Non UK).

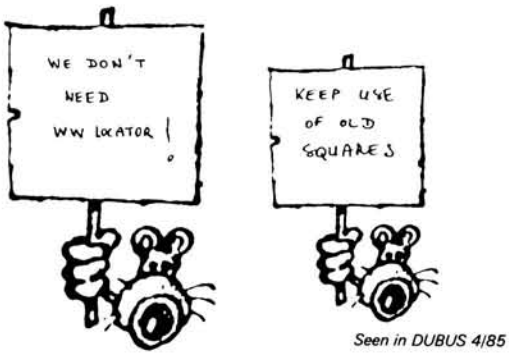
E or WW Locator?

Having just passed the first anniversary of the adoption of the Universal or World Wide (Ex-Maidenhead) locator system it seems that only weather related topics come close in terms of QSO fodder. The WW system with its additional character does undoubtedly provide a unique location reference capability, unlike its European originated predecessor. However, it seems that this singular advantage does not find much favour within Europe where DX orientated operators find the lack of familiarity and added scope for incomplete information exchange too high a price to pay. The logic seems to be, why abandon a workable established system that provides greater positional accuracy for a scheme that, at best, removes the ambiguity between North Africa and the Shetland Islands—should you have had the misfortune to miss the callsign/accent/beam-heading, etc?

My own opinion is that both systems are viable and the choice should depend on the specific area of operation. For e.m.e., OSCAR-10 or h.f. DX (yes, I have been given WW details on bands below 144MHz) the WW system is fine and to most non-European stations will be the only known locator system. Within the greater European area the E locator is still perfectly satisfactory.

If conditions permit the luxury of strong signals in the absence of abundant DX in a pile-up, it should be up to the individual to provide the requested information. During many v.h.f. and u.h.f. contests throughout 1985 the incidence of stations failing to produce the required WW locator details was very low—did those not in favour abstain from operation?

As a final does anyone else find the exchange of E, WW, WAB, NGR and QTH details a trifle excessive?



Seen in DUBUS 4/85

Address Change

If you are having difficulty in obtaining a response from B.N.O.S. Electronics Ltd. it could well be due to their recent move. As of January 2, the address to use is: ***Mill Lane, Stebbing, Dunmow, Essex CM6 3SL*** with the new telephone number ***(037186) 681.***

Repeater News

In order to provide improved communications between repeater groups/users and the RSGB Repeater Management Group, a network of 20 corresponding regional reps will soon be elected. Their responsibilities will include the gathering and dissemination of RMG information, providing a much improved service for all—sounds to be a similar function to that of the repeaters themselves! Each geographical region will contain on average 14 repeater groups who will

nominate a rep in time for the first national briefing at the NEC.

Syledis navigational pulses are creating problems for u.h.f. repeater GB3LI at Liverpool—representations have been made but the amateur service is not a primary user of this section of the spectrum. It is understood that the Mold emergency communications system is well into its second phase with indications that the bandwidth will expand to encompass data as well as conventional speech modulation. No operational problems with amateur repeaters are known to exist yet.

The RMG will submit proposals to the DTI this Spring seeking permission to establish five experimental 29MHz f.m. repeaters. It is hoped to present a paper on the practicalities of the system at the next IARU Conference in Holland, during 1987.

A proposal to establish a 144MHz repeater (GB3DG) to cover areas of Dumfries and Galloway has been acccepted by RMG, but will be held until a suitable free channel can be allocated. The possibility of identification confusion with the IOM Repeater GB3GD was considered as the proposed site is some 60km from the island and 300m a.s.l. Also on the books for GM is GB3KM, a u.h.f. repeater proposal to be sited on the IBA mast at Knock More (co-sited with v.h.f. repeater GB3SS).

GB2RS news broadcasts are being transmitted via 3 v.h.f. and 3 u.h.f. repeaters: GB3NI(R5), SL(R2) and CF(R0) on 144MHz and GB3PY(RB14), SK(RB6) and HO(RB14) on 430MHz. During these broadcasts the DTI have permitted three control options, all of which involve disabling the repeater input receiver for the duration of the transmission. The news can be read directly at the repeater site, using direct manual override; from pre-recorded tape in the same manner (possibly in conjunction with a time switch bypass), or under direct control via a BT private wire. This later option would be expensive to implement and the RMG stress that conventional phone line control is **not** permissible. Private wire circuits can also be used for the purposes of an emergency close down on instruction from the DTI.

The u.h.f. repeater GB3OV (RB5) Huntingdon became operational on 19 November; reports please to G4NVS. On 1·3GHz GB3MC the repeater/beacon unit on Winter Hill near Manchester, commenced beacon mode operation on 20 November—contact G3LEQ for further details/reports.

The RMG proposals for the multiple channel swap to solve the GB3GD related co-channel problems are currently being considered by the DTI and could become effective within 6 weeks of the decision to go ahead.

Rally Date

A brief note from the rally Secretary of the Tiverton S.W. Radio Club informs me that the first Mid Devon Rally takes place on 23 March. The venue selected is the Pannier Market Hall in central Tiverton with doors open from 1000 to 1700. Further details from: ***Mr. B. Morrell G6ZMC on (0884) 254889*** (evenings).

Morse Tests

On 2 December the DTI announced their decision for the future structure of amateur Morse testing in the UK. From 1 April 1986 the RSGB will take over test administration from British Telecom International. Under the new scheme the test fee will be reduced to £7 (and held for 2 years). At least 70 testing centres will be established, one in each county, region (in GM) or designated island, with tests being held every two months at each location. RSGB staff member Brett Rider G4FLQ has said that the February issue of *Radio Communication* will contain an appeal for area examiners. Applicants will receive from the RSGB a booklet detailing the required procedure together with a vetting form. Selected examiners will locate the test centre venues and a detailed list will be held at RSGB HQ. Morse test applicants will then be able to obtain full details of the available centres, together with date/time options, ultimately resulting in a reduction in waiting time and travelling expense.

50MHz at Last

By the time you read this the long awaited release of 50MHz to UK amateurs should have occurred. The news was contained in a DTI press release issued on 16 December and confirmed the following: Band allocation 50–50·5MHz; status—primary; Licence Category—Class A; Maximum power, carrier 14dBW e.r.p.—p.e.p. 20dBW e.r.p.; Maximum height of transmitting antenna a.g.l. 20 m; Antennas to be horizontally polarised; No mobile, portable or temporary premises operation; No restriction on modes or times of operation; No repeaters; Withdrawal of existing permits.

An accompanying explanatory text from the DTI stresses that the band is still used by European broadcasting networks and that the allocation is made on a strict "non-interference" basis, hence the specific restrictions. The DTI have agreed to review the situation after the first year of operation with the object of revising the current conditions, including a possible expansion of bandwidth and access to the band for Class B Licence holders. The DTI acknowledge that the RSGB have consistently pressed for the general release of 50MHz but cite the views expressed by neighbouring administrations in their decision to limit the potential band occupancy during the first 12 months.

What comes over most clearly from the DTI information is that the future availability of this band depends entirely on its responsible use. **Any** breach of Radio Regulation 342, which stipulates that harmful interference shall not be caused to authorised radio services, will result in the *immediate* removal of this valuable amateur resource.

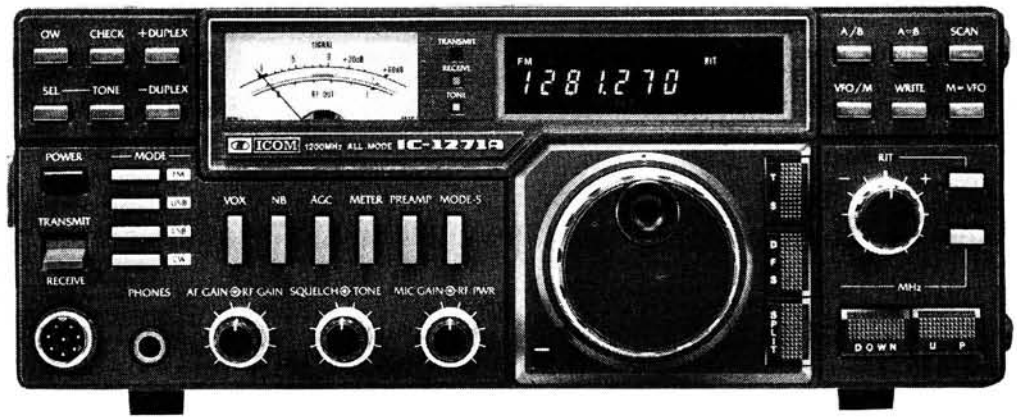
BT Cover Up

If you have ever wondered how much paint it would take to cover each one of BTs Goonhilly Satellite Earth station antennas, the happy looking crew shown in the photograph could tell you. In all 1000 gallons of battleship grey and yacht white marine paint are applied at each repaint, which takes two full seasons to complete. Wonder how many of those handbrushes they are holding have been worn out during the last quarter century of operations?

1·2GHz Transceiver

If you are interested in exploring the bottom end of the microwave bands then Icom have just announced a new 1·2GHz base station rig.

The IC–1271E covers 1·240 to 1·300GHz and produces 10W of r.f. output power into 50Ω. Operating modes provided are s.s.b., c.w. and f.m. and frequency control is by microprocessor based p.l.l. synthesiser giving 100Hz resolution in s.s.b. and c.w. modes and 25kHz steps in f.m. mode. The seven-digit fluorescent display also reads to 100Hz resolution. The rig is provided with 32 memory channels and full scanning facilities.



On the receiver side a double conversion superheterodyne system is used for s.s.b. and c.w. while triple conversion techniques are used for f.m. The RX front end uses a GaAs f.e.t. and sensitivities are quoted as 0·16μV for 10dB S+N/N on s.s.b. and c.w. and 0·22μV for 12dB SINAD on f.m.

Power supply requirements are 13·8V d.c. at around 7·5A on transmit and 1·5A on receive at full rated audio output of 2W into 8Ω.

Size of the IC–1271E is 127 x 303 x 276mm and it weighs around 7·1kg.

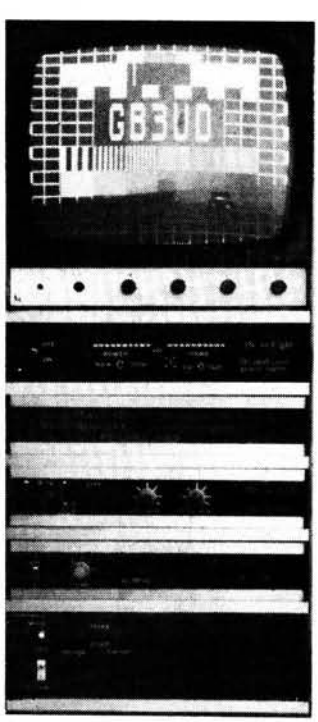
For further details contact ***Thanet Electronics Ltd., Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 363859.***

DC to Light

I have just been informed that DC to Light have now started production of their DC 1G3 FM ATV transmitter. This means that the radio amateur now has the option of buying a built and tested cased unit.

The company claim that with this state-of-the-art unit superb, stable and very clean signals can be generated and that the output levels can be selected at either 2W for driving a linear or 10W for normal use. Four switchable channels are provided as standard but this can be expanded cheaply to as many as desired.

Priced at £210·95 for the 2W version and £255·75 for the 10W unit further details are available from ***DC to Light, 15 Bursley Way, Bradwell, Stoke on Trent ST5 8JQ. Tel: (0782) 639406.***



Spot

One of the most popular uses for the home computer is the calculation and location of contacts. The smallest home computer can be used to calculate the distance and bearing of your contacts using any of the systems in use by radio amateurs and this can save many frustrating hours of calculation after a contest.

The ZX Spectrum is probably the most popular home computer amongst radio enthusiasts and now G4HLX has produced a suite of programs for this computer designed to provide a comprehensive location aid. Called SPOT the program is available for £4·50 as a cassette and is complete with simple instructions and a six-page booklet of background information. The price also includes postage.

SPOT will run on all 48K versions of the Spectrum and the Spectrum + and has fast, simple conversions between Lat/Long, National Grid Reference, European QTH and Universal (Maidenhead) Locator systems, calculations of distance, bearing and contest score, a high resolution map of Europe which can be separated out and included in your own programs, contest log scoring in a format that is compatible with the RSGB log sheets. The contest QSO map also shows locations of all locators worked and shades-in and counts squares worked. The program is fully Microdrive compatible with an auto back-up copying option.

SPOT is available from ***N. P. Taylor, 87 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8ND.***

AMPROM

CTP Software have just released their amateur radio communications ROM, "AMPROM", for the BBC-B microcomputer.

Utilising the cassette port of the BBC to generate and monitor audio tones to and from a transceiver AMPROM turns the BBC into a radio data communications terminal without the need for any special interfaces.

Using AMPROM data can be sent or received in a TTY mode for chatting to other similarly equipped stations. Files can be copied across a radio link with full error protection and correction. This allows computer programs to be easily transferred from one radio amateur to another. (Of course the programs must not be copyright!)

Particular attention has been paid to ensuring consistent use of particular keys, with a minimum of keystrokes for any given operation. AMPROM is thus very easy to learn to use.

The advanced programmer can use the operating system extensions provided in AMPROM in other programs. As an example the *RX command could be used to write a BASIC program that constantly monitors the radio and alerts the operator if a particular callsign is heard.

AMPROM is available in cassette form for use in Sideways RAM or in EPROM. Prices are cassette form £8 and EPROM £18 inclusive. As each copy is individually tailored to its purchaser your callsign is needed with your order. Orders or further details from ***CTP Software, 107A Shacklewell Lane, Shacklewell, London E8 2EB.***

Loop Amp

The serious DXer will be interested in the new DLA 1 medium wave differential loop antenna from D. J. Stanton (Radio). The amplifier has a high-Z f.e.t. balanced input stage to give a high *Q* for sharper nulls. The output stage is balun coupled for less loading of the receiver input. With a two-transistor output stage having variable gain over the range 2 to –20dB the output impedance is a nominal 50 to 75Ω to match most receivers.

Powered by a 9V battery the amplifier is housed in a compact case with screw terminals for connection to the loop and 2 metres of low-loss 50Ω coaxial cable with PL259 plug fitted.

The DLA 1 is claimed to work with all sizes of loop, including ferrite rods and is said to be good for improving the smaller sizes of loop. The amplifier is connected directly across the loop, usually at the terminals of the loop tuning capacitor and the usual coupling turn is not required.

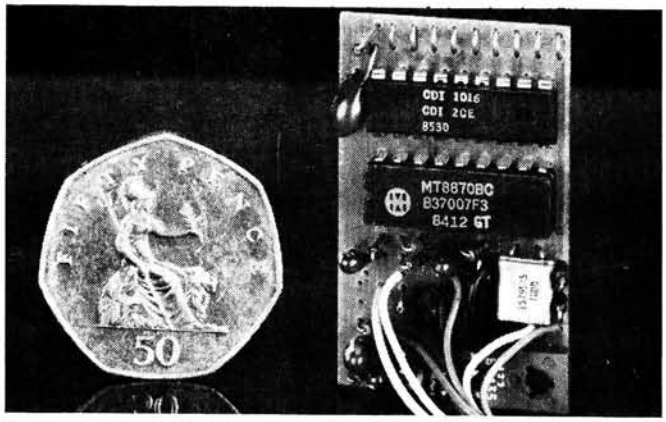
Priced at £25 including VAT and postage the DLA 1 is available direct from ***D. J. Stanton (Radio), 16 Addison Road, Worcester WR3 8EA.*** The company has also recently taken over Amtest and will undertake any servicing and enquiries regarding their old range of equipment.

Mini Selcall

With IQD's Mini Selcall a hand-held radio remains mute until it is either called or used. Developed from IQD's mobile radio selective calling system—Selcall—the new unit is small enough to be fitted into hand-held rigs.

Calls can be made to individual sets, or to selected groups, using a two or four-digit tone code and up to 10,000 sets can be contacted this way. On receiving a signal carrying its tone code the Mini-Selcall unit automatically enables the audio section of the receiver and illuminates an l.e.d. to indicate to the user that a call is waiting.

Further details on this and other dual tone multi-frequency products developed by IQD are available from ***IQD Ltd., North Street, Crewkerne, Somerset TA18 7AR. Tel: (0460) 74433.*** Other d.t.m.f. products include Phonecontrol, an electronic remote control unit and Phonethru, a telephone switchboard by-pass unit.



Low-cost Irons

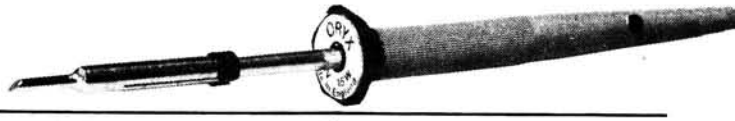
The comprehensive Oryx soldering iron range has been extended with the introduction of a 15 watt mains model.

The Oryx 15 is a low-cost soldering iron based on a successful unit which Oryx has manufactured for a national public service organisation for many years.

The new iron appears in "civvy street" sporting an orange handle and black bush and is to be aimed at all parts of the market from the hobby user to industrial companies.

The bit temperature is set at a nominal 350°C by a wire element in a tubular ceramic insulator rated at 15 watts at 240 volts a.c. The bit is iron plated for a long life.

Look out for the new iron in the usual outlets or get in touch with ***Greenwood Electronics, Portman Road, Reading RG3 1NE. Tel: (0734) 595843.***



Spectrum Add-ons

If you want to use your computer to actually do useful things then it will more than likely be necessary to get it to respond to external analogue signals. Feedback from a potentiometer coupled to the shaft of an antenna rotator comes immediately to mind. This would allow the computer to actually set the beam heading of the antenna in response to a satellite tracking program.

Electronic and Computer Workshop have produced a kit for an analogue-to-digital convertor for the Spectrum. Part of the Velleman range, the K2610 kit will respond to external analogue signals in the range 0 to 5·1V and other ranges can be catered for by the addition of suitable input units also available in the Velleman range.

The completed kit plugs into a Velleman motherboard and can be simply tested and adjusted using a simple routine. The address of the A–D board is selected by on-board jumpers and used in the program as the variable ADDR.

An adjustable voltage in the range 0 to 5·1V is connected to the analogue input along with an accurate voltmeter. The input is adjusted to 5·0V and the input gain set to give an on-screen reading of 5000mV. This is repeated for 10mV so that the display jumps between 0 and 20mV.

The kit costs £29.41 including VAT and postage from ***Electronic and Computer Workshop Ltd., 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.***

430MHz Transceiver

SMC have just let me have details of the 430MHz version of the FT–270RH 144MHz f.m. rig. Called the FT–770RH the new rig is the same size and shape as the 270 but covers the 430–440MHz amateur band in 12·5/25kHz steps. Power output is 25W into 50Ω switchable down to 3W.

The new rig has dual v.f.o. capability, ten scannable memories, repeater shift, toneburst, programmable band scan limits and scanning steps, all selectable from the front panel.

Obviously the power requirements are a nominal 13·8V d.c. and the drain on your car battery is 6·5A on transmit at 25W output and 600mA on standby receive.

A double conversion superhet technique is used for the receiver side of the rig and sensitivity is quoted as 0·2μV for 12dB SINAD. Audio output is 2W into 8Ω for 10 per cent t.h.d.

Full details are available from ***South Midlands Communications Ltd., SM House, Rumbridge Street, Totton, Southampton SO4 4DP. Tel: (0703) 867333.***

Broadside and Endfire Antenna Systems–4

by F. C. Judd G2BCX

Those who are familiar with the 144MHz ZL Special in either of its configurations may be surprised to know that the double-element driving system is in fact an endfire array, as is the original version which was designed for h.f. band use many years ago [1,2]. Because maximum radiation is in the plane of the two elements and as there is a phase difference of 135 degrees between the currents flowing in each element, the radiation pattern in vertical mode is cardioid, which makes the basic two-element ZL Special a uni-directional antenna. By adding parasitic directors, considerable forward gain over a dipole can be obtained (approximately 13dB in the case of the 12-element 144MHz ZL Special beam) [3].

Using the same double-element driving system, which consists of two folded dipoles spaced λ/8 apart and with the 135 degree current phasing, the addition of three directors provides a forward gain of approximately 9dBd. This makes the antenna a 5-element beam. However, when scaled up for use on the 28MHz band it is not excessively large. With a gain of 9dB the *power gain* is nearly 8, so with 100W from the transmitter an e.r.p. of almost 800W can be obtained.

For a single-band beam this is a worthwhile proposition and indeed the first CQ call with the prototype, shown in Fig. 4.1, produced simultaneous replies at S9 from three South American countries—Uruguay, Paraguay and Brazil. When conditions have been reasonable, considerable DX has been worked with the antenna at only λ/2 above ground and using 100W from the transmitter. In order to differentiate this antenna from its 144MHz counterpart it has been decided to refer to it as the ZL5-10.

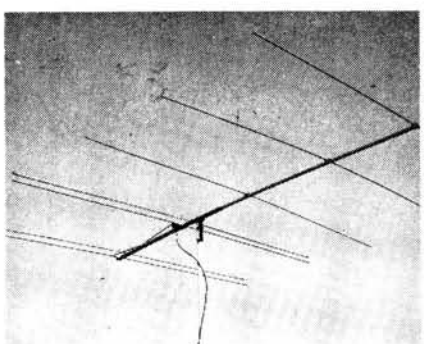
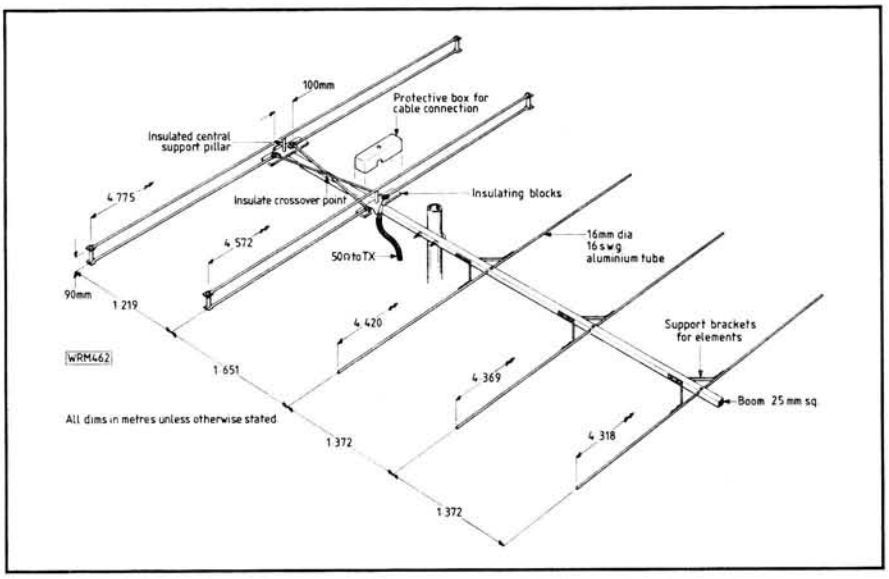


Fig. 4.1: The prototype ZL5–10 five-element 28MHz band ZL Special

Fig. 4.2: Construction details of the ZL5–10



ZL5-10 Construction

General constructional details and dimensions concerned with the driven elements, directors and spacing etc., are given in Fig. 4.2. The coaxial cable connection must be waterproof and this was accomplished with a small plastics box with a screw-on lid. It is important that the crossover phasing lines do not touch and will therefore require a flat piece of insulating material between them secured to one of the lines. The v.s.w.r. may be adjusted by connecting a small variable capacitor across the feed points—about 100pF maximum will suffice and a miniature close-spaced vane type will be adequate as there is no high r.f. voltage at this point. Alternatively, alteration to the length of the 50Ω feed cable will bring the v.s.w.r. down. If this method is used allow about 2 metres of extra cable for cutting as required. The antenna need not be mounted higher than approximately λ/2 above ground—greater height will produce more than one main vertical angle lobe.

The maximum vertical angle radiation when 5 metres above ground will be in a single lobe at about 20 to 25 degrees, depending on ground conductivity. Do not expect immediate DX working at the present time as we are very close to the bottom of the 11-year sunspot cycle and the 28MHz band may only be open very occasionally, except for near continental stations. The horizontal radiation pattern for the ZL5-10 is shown in Fig. 4.3.

The 14MHz Bobtail Antenna

Sometimes referred to as the Bobtail Curtain, the origin of this design is not known for sure but is thought to have been devised by a Canadian amateur.

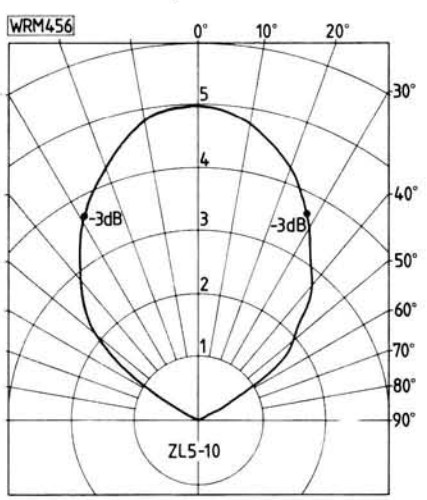


Fig. 4.3: Horizontal radiation pattern of the ZL5–10

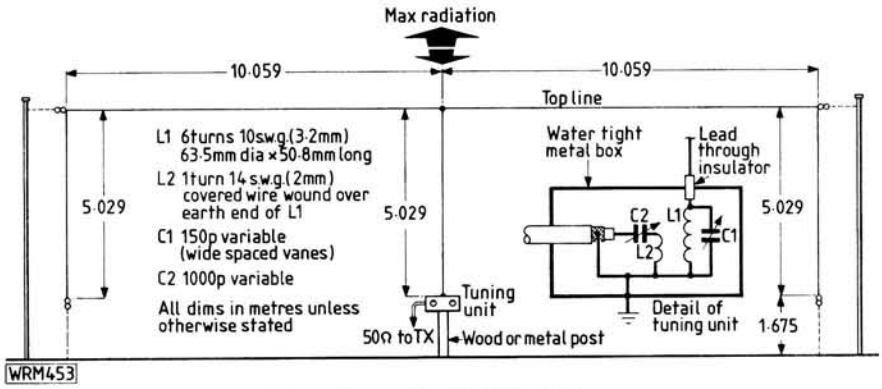


Fig. 4.4: Details of the 14MHz Bobtail antenna

Details of the Bobtail have appeared in various publications, mostly with variations on the construction.

For the dimensions and construction of a prototype for the 14MHz band as shown in the diagrams, credit must go to G3ZTK of Wareham in Dorset. He has found it to be a very effective single-band antenna with very low-angle radiation. The Bobtail is vertically polarised and being a broadside array is bi-directional with a gain in each main lobe in the region 8 to 9dBd.

The antenna consists of three separate λ/4 vertical radiators spaced λ/2 apart. Power is supplied to the system via a tuned circuit at the base of the central radiator as shown in Fig. 4.4. This radiator is voltage-fed so that current at the top is at maximum and flows along the top full wavelength line to current feed the two vertical end radiators. The top line functions more or less as a single-wire transmission line and radiation from it is negligible. Tests carried out by the author using scale models of the Bobtail operating at 900MHz and also with the 144MHz version to be described later, proved this to be the case and also verified other performance factors concerned with this antenna.

The Bobtail can also be constructed for other bands. The length *of each half of the top line* in metres can be obtained from

$$\frac{144{\cdot}17}{f(MHz)}$$

where f is the frequency of operation. The length of the λ/4 radiators is obtained from

$$\frac{68{\cdot}58}{f(MHz)}$$

The tuned circuit connected to the centre λ/4 radiator will of course need to be modified for use on other bands.

For the lower frequency bands the overall length would be considerable. At 7MHz, for example, the total length of the top line would be

$$2 \times \frac{144{\cdot}17}{f(MHz)}$$

or 40·9 metres long. Each λ/4 radiator would be 9·728 metres in length. The lower ends of the radiators need to be at least 1·83 metres above ground so for 7MHz operation a total height of around 12 metres would be needed.

Suggested construction for the 14MHz version is illustrated in Fig. 4.4. The tuning components can be housed in a waterproof metallic box attached to a wooden or metallic post and the centre λ/4 element is taken straight up to the top line. This line will need to be pulled up very tight to prevent sagging so it is suggested that the λ/4 elements are made from 16 s.w.g. copper wire to keep weight to a minimum. A slightly heavier gauge of wire is used for the top line.

Tuning is simply a matter of setting capacitors C1 and C2 to obtain minimum v.s.w.r., a check which is best carried out at first with the v.s.w.r. meter at the antenna end of the 50Ω coaxial feed cable and then at the transmitting end. The bi-directional radiation pattern of the Bobtail is shown in Fig. 4.5. The pattern is almost identical for the 144MHz version to be described next. Remember that radiation from these antennas is *vertically polarised.*

144MHz Bobtail

The configuration for this antenna is virtually identical to that of the version for the 14MHz band except that instead of a tuned circuit at the base of the central radiator, the system is fed via a λ/4 closed-end stub. This is a much more efficient method of matching a 50Ω coaxial line (at v.h.f.) to the high impedance at the base of the central λ/4 radiator. The antenna otherwise has the same characteristics and performance, i.e., bi-directional radiation broadside to the array and the same gain in each main lobe. The antenna is of course vertically polarised. The radiation pattern obtained is similar to that shown in Fig. 4.5. Low angle radiation, more or less parallel to the ground is obtained when operated at a height of 5 metres or more above ground.

In practice the centre vertical element of the antenna may be continuous to provide both one leg of the matching stub and the centre radiator. The v.s.w.r. is adjusted by finding a suitable tapping point (XX) for the feed cable in conjunction with an up/down adjustment of the shorting bar at the bottom of the stub.

A suggested method of construction is illustrated in Fig. 4.6. As already

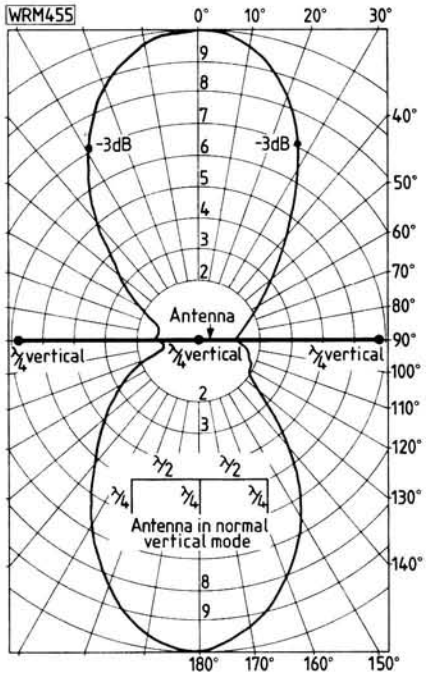


Fig. 4.5: Radiation pattern of the Bobtail broadside antenna

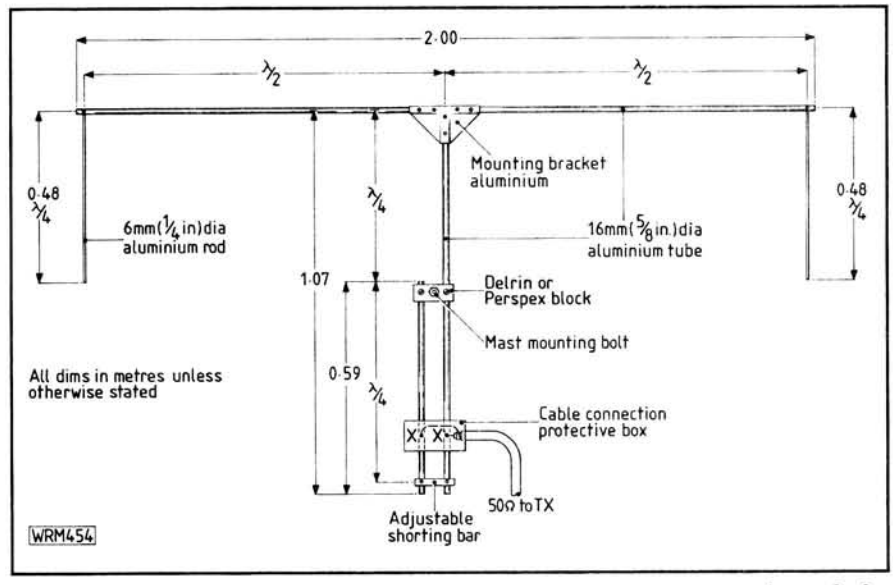


Fig. 4.6: Details of the 144MHz band Bobtail. Bolt to support mast through the stub/feed point insulators ▶

The Birth of Broadcasting Part 1

Almost 65 years on Tim Wander BSc MBCS recalls the beginning of a revolution in communications

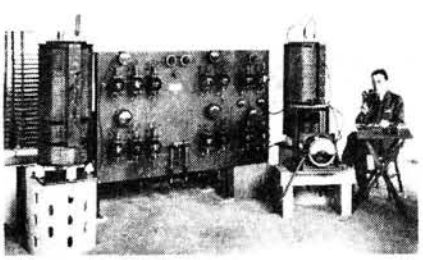
As Britain struggled to return to normality after the horrors of the First World War, radio amateurs, many of them fresh from the trenches of Europe began experimenting with transmitted speech instead of Morse code. They quickly became local celebrities in their own right—their spirit of adventure meant that the amateur audience could listen to anything from gramophone records to humorous articles and local news items. To call them the 1920s equivalent of todays "Disc Jockeys" is wrong, for they were far more. They were experimenters, inventors and innovators, but most of all they were pioneers. For a while, however, the future of broadcasting in this country lay elsewhere, with the company that bore the name of the father of wireless . . . Marconi.

In late January 1920 the Marconi Company installed and began testing a 6kW-input telephony transmitter (feeding a "T" antenna suspended between two 140m masts) under an experimental Post Office licence and callsign MZX. Normally this would not have raised much comment as the company was always testing new transmitters at its Chelmsford New Street works.

A standard testing format had been evolved whereby all Marconi land stations throughout the country were told to listen on 2750 metres during specified periods. The times allocated for the early 1920 tests were between 1100 and 1130 or 2000 and 2030 GMT for two weeks from February 23 except on Saturday nights and Sundays. The broadcasts were otherwise unannounced, so the Marconi engineers in charge, W. T. Ditcham and Captain H. J. Round, bored with the standard speech tests for telephony transmissions of continually repeating railway station names, did something totally different. On the 15 January 1920 they started the first ever telephony broadcasts in Britain by transmitting a programme of speech and gramophone music.

This historic "accident" could well have gone unnoticed, but 214 appreciative reports came in from amateurs and ship's operators alike, from Norway to Portugal (the greatest distance being 2333km) and the young engineers realised that they had struck gold.

The 6kW transmitter was quickly replaced with one rated at 15kW input and for a brief period until 3 March 1920 the tests became a series of 30 minute programmes, aired twice daily as a wireless telephony news service. The Marconi Company still believed that the future of wireless telephony lay with commercial speech transmission. However, additional entertainment was arranged, W. T. Ditcham became "head cook and bottle washer", organising programmes, announcing news and music items supported by A. R. Burrows and W. Petterigill. The final programmes consisted of readings from newspapers, gramophone records and, for the first time ever, live musical performance.



Mr. W. T. Ditcham, a Marconi engineer and the world's first broadcaster at the 6kW transmitter used in his original experiments

The instrumentalists who provided these first live radio broadcasts were drawn from the Marconi engineering staff and included Mr G. W. White on piano, Mr A. V. W. Beeton on oboe and Mr W. Higby on cornet. Vocal numbers were rendered by Mr Edward Cooper, a tenor with Freddie Munnions concert band the Funnions, otherwise employed in the Marconi mounting shop.

Despite the experimental nature of these telephony tests the unofficial musical interludes soon gained a large following. The spirit of adventure was maintained when the first ever paid artiste, Miss Winifred Sayer (later Mrs Collins) was invited to sing. Miss Sayer worked for the Hoffman Manufacturing Company in Chelmsford, but as an amateur soprano with the Funnions she was paid the handsome fee of ten shillings a night (50p), for three half-hour concerts from the new studio—a disused packing shed.

She was later informed by the then managing director of Marconi, Godfrey Isaacs, that she had helped to make history, but at the time she remembers being unimpressed by the new entertainment medium. There was no music (Miss Sayer had to take her key from a tuning fork), which meant that all the songs had to be short and simple using an upturned telephone mouthpiece as a crude microphone.

Despite these shortcomings the Chelmsford programmes soon cap-

tured a wide amateur audience, all used to listening on a slightly shorter wavelength of 2600m for the time signals and weather reports from the Eiffel tower. The popularity of the Chelmsford, Paris and Dutch experimental wireless station PLGG (which began transmission on 29 April 1920 using Marconi equipment) soon modified the attitude of the Marconi Company. The new concept of speech and music crackling over the airwaves into the front rooms of ordinary people was set to revolutionise entertainment and was enthusiastically greeted by the radio amateurs and newspapers throughout Europe. Remembering for a moment the experimental nature of these tests it is interesting to record that on March 6 a telegram (that still survives in the Marconi archives) arrived at Chelmsford. Mr B. T. Fisk managing director of the Australian Company reported that weak but steady signals were heard in Melbourne on two of the Chelmsford broadcast schedules. Even though speech could not be clearly discerned, it appeared to all that the future of broadcasting looked very bright.

Dame Nellie Melba Sings

A turning point in the history of broadcasting and radio was the first broadcast by a recognised professional artiste. The famous Australian prima donna Dame Nellie Melba gave her renowned 30 minute concert from the Chelmsford works on 15 June 1920, commissioned by Lord Northcliffe the then proprietor of the *Daily Mail* newspaper.

When first approached, the singer remained adamant that her voice was not a matter for experimentation by young wireless amateurs and their magic playboxes. It is reputed to have taken all the persuasive talents that Lord Northcliffe could muster to change her mind. Pacified when the planned concert and its possible rewards and publicity were explained in detail, Dame Nellie decided to sing, but there was nowhere for her to do it.

In the preceding weeks to the concert everything humanly possible had been done to improve the acoustics, "studio" appearance and general quality of the microphone and transmitter circuits. It had been originally intended to put in a long hand-line so that the singer could perform in more pleasant surroundings, but at the last moment this burnt out due to the high currents induced by initial test transmissions that destroyed the modulating valves.

When the great day arrived the floor and the walls of the ex-packing shed were bare of any decoration other than that offered by innumerable wires and pieces of equipment, although a thick pile carpet had been placed on the floor. Dame Nellie Melba was shown the transmitting equipment and the antenna masts by the head of the publicity department Arthur Burrows, who remarked that from the wires at the top her voice would be carried far and wide. Her comment has become a piece of radio folklore. "Young man," she exclaimed "If you think I am going to climb up there you are greatly mistaken." Dame Nellie insisted that before she began she must have her favourite dinner of chicken, champagne and special unleavened white bread (this was written into her contract), but was unworried by her spartan surroundings. She even demanded that the carpet be rolled up and tidied away to improve acoustics.

The "studio" scene at an early 2MT Writtle broadcast with the singer Nora Scott at the microphone

On a perfect summer's evening it seemed that the whole of the amateur radio community held its breath as Dame Nellie Melba stood in front of the microphone. Even this was something of a compromise, consisting of a telephone mouthpiece with a horn of cigar-box wood fastened to it, suspended from the ceiling by a length of elastic, but it has survived intact to this day.

A hushed silence fell over the first-ever broadcast studio and at 7.10pm precisely listeners heard their first fleeting notes as Dame Nellie ran up and down the scale. This preliminary sound check brought a flurry of adjustments to the distances between microphones, singer, accompanists and piano, and frantic tickling of cats whisker crystal sets, that most of the audience were listening to; Dame Nellie took a deep breath, and began to sing.

"Punctually at a quarter past seven", said a newspaper the next morning, "the words of *Home Sweet Home* swam into the receivers; those who heard might have been members of the audience at the Albert Hall". This was followed by Bemberg's *Nymphes et Sylvains* (in French), Puccini's *Addio* from *La Boheme* (in Italian), Bemberg's *Chant Venitien* and as an encore a repeat of *Nymphes et Sylvains* and the first stanza of *God save the King.*

The concert was a great success. Within days the Marconi company had received several thousand enthusiastic letters from the four corners of the world and its oceans, as amateurs and ship's operators sang along. Dame Melba described the event as being the "most wonderful experience of my career" and always seemed intensely interested, taking a great personal pride at being the first singer to broadcast all over the world. The concert had been heard with surprising clarity on every kind of wireless set imaginable. It was even reported that at the Eiffel Tower reception was so strong that gramophone records were cut of the concert, although in 1970 RTF could find no record of this historic event.

Dame Melba's secretary was bold enough to prophesy "There must be a great future for wireless concerts", although Dame Nellie Melba's £1000 fee for the performance (paid by the *Daily Mail*) may have added a little to his enthusiasm. H. M. Dowsett wrote in *Wireless Telephony and Broadcasting* (1922–1923) "The renown of the singer, the world-wide attention that was given to her performance and the great distance at which reception was made, all combined redundant to give the Melba concert the atmosphere of a great initiation ceremony. The era of public amusement may be said to have completed its preliminary trials and to have definitely launched its meteoric career from this date."

Dame Nellie Melba came to Chelmsford for one historic June evening, but the experiments continued. During the July and August of 1920 news items were regularly broadcast from the Chelmsford station to offices in Sheffield, Preston, Newcastle and Belfast and also to Norwegian, Danish and Swedish journals. In all cases reception was accomplished by the use of 6-valve receivers, used in conjunction with frame antennas. In late July Scandinavian telephone subscribers were able to enjoy a unique experience when Lauritz Melchior, the famous Danish tenor, broadcast from Chelmsford. The concert was received on the other side of the North sea and by special arrangement telephone exchanges in the Scandinavian capitals were connected to the receiving stations, thus enabling all

subscribers to listen to the "overseas" broadcast.

Dame Nellie Melba's concert was undoubtedly the high point of the short, spasmodic, yet quite spectacular career of Chelmsford experimental station MZX. It was not to last—through all the publicity, acclaim and enthusiasm that the concert generated, at least one person distinctly disapproved of the whole event. The Postmaster General, The Rt Hon Albert Illingworth was definitely not amused and actually sent a strongly worded protest deploring the fact that a national service such as wireless telegraphy should be put to such frivolous uses.

Station KDKA Stateside

The Post Office's seemingly reticent attitude to the start of radio broadcasting in this country may in part have been an attempt to avoid the chaos that had occurred in America. Broadcast transmitters had started operation in almost epidemic proportions; during May of 1920 just under 100 transmitting stations were established and within three years more than 500 stations were on the air in the United States. Although it's a big country serious problems arose when most were on the same or nearby wavelengths. The Federal Radio Commission (now the Federal Communications Commission) was set up to control the situation and on 27 October 1920 station KDKA was granted an official broadcast licence.

This station began a regular service from Pittsburg and was the world's first broadcast radio station not aimed at an experimenting amateur audience. This station had been developed from the amateur station 8XK of Dr Frank Conrad (a radio engineer with Westinghouse) which had been established to carry out range tests with telephony transmissions. During his tests he often left the transmitter to adjust other equipment or monitor his own signals using gramophone records to supply the signal. To his surprise he received a large number of letters asking for more music, especially from ex-service personnel who, having met radio during the war, had home-built crystal sets to receive commercial transmissions. In sheer self-defence Conrad found himself putting on two recitals a week and like Chelmsford, entertainment broadcasting had come to America by accident.

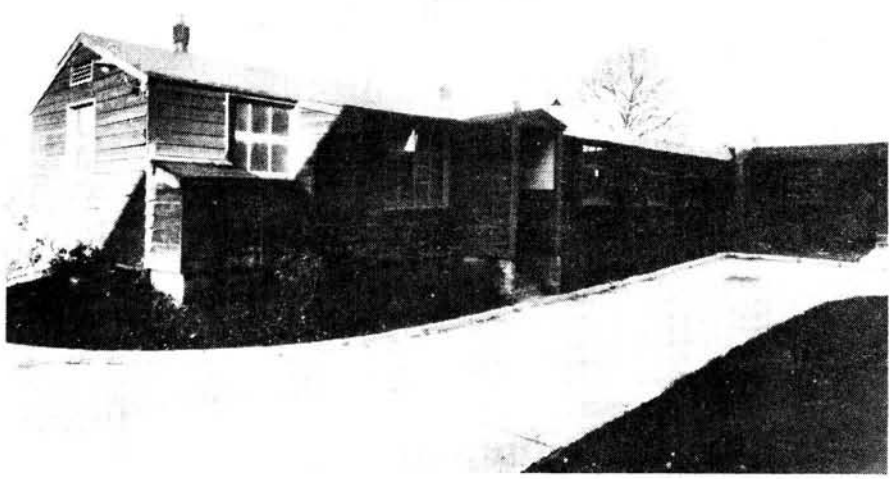
The 1922 staff of 2MT Writtle. Back row from the left B. N. MacLarty, H. L. Kirke, R. T. B. Wynn, H. J. Russell. Front Row, F. Bubb, N. Ashbridge, P. P. Eckersley, E. H. Trump and Miss E. M. Beeson

On 29 September 1920 Joseph Hornes department store ran an advert for their new range of $10 basement radios entitled "concert picked up by radio here". Speculating on a totally unknown market the vice president of the Westinghouse Company, H. P. Davies then authorised Conrad to build a larger transmitter. On 2 November 1920 Station KDKA came on air to broadcast the election results to an audience that still numbered only several hundred people. The object of KDKA was solely to provide a programme service, entertaining and informative enough to persuade listeners to buy Westinghouse domestic radio sets and components. Westinghouse, Conrad and radio in general immediately gained a great deal of publicity from the new project, a speculation that succeeded beyond anyone's wildest dreams.

Chelmsford Closes Down

Despite the American experience that entertainment broadcasting was rapidly gaining favour with the general public, on 23 November 1920 the Postmaster General informed the House of Commons that the experimental broadcasts from Chelmsford were to be suspended on the grounds of "interference with legitimate services" and for the time being no more trials would be permitted. One of the legitimate services badly affected was the new Croydon air traffic control system; typical was an article in *The Financier* newspaper of 25 August 1920. It reported to its readers that a few days previously the pilot of a Vickers Vimy aeroplane was crossing the channel in thick fog and was trying to obtain weather and landing reports from Lympne, but all he could hear was a Chelmsford musical evening.

As the Chelmsford station lapsed into silence and the airwaves returned to their normal monotonous clatter of Morse code, the seeds of the future of broadcasting had been sown. The



The hut at Writtle that housed station 2MT in 1922

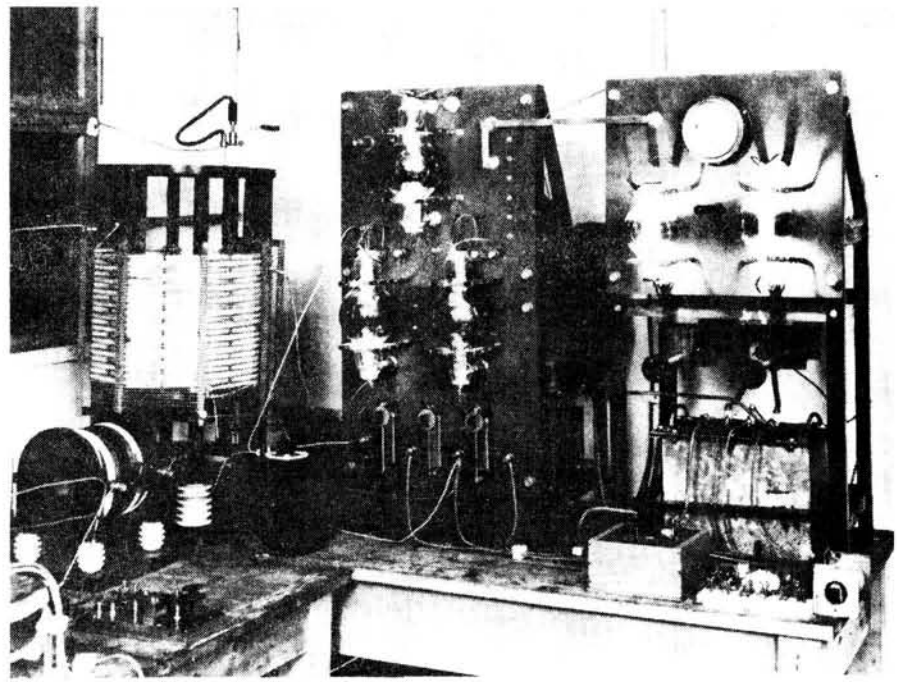
Chelmsford engineers had focussed the attention of both press and the public on the possibilities of using wireless telephony as a means of bringing entertainment into the home. It must be admitted that the Marconi licence was solely experimental, with no mention of broadcast entertainment programmes but its cancellation denied British industry the chance to make strong bids for world markets in receivers and broadcast transmitters, a chance the Americans were not slow to seize.

More Licences Issued

The scheme of events then turned full circle and the story of broadcasting was returned to the small but growing band of amateur radio enthusiasts who had first appreciated the fascination of the spoken word. More and more telephony began to appear on 1000m and 180m despite severe restrictions being placed upon their operation, including a maximum output power of only 10W. By March 1921 there were 150 transmitting licences and 4000 receiving licences issued in this country, but some 1700 requests or enquiries for experimental licences remained unprocessed.

It also appeared that the British public preferred the singing of Dame Nellie Melba to the silence imposed by the Post Office. In December 1920 the Marconi Company asked the Postmaster General to licence a half-hour telephony broadcast each week, but were refused on the grounds that to grant one request would make it impossible to reject requests from all other manufacturers. It was hinted however that a request from the amateur community would be looked upon with favour.

To this end the Wireless Society of London held a conference in March 1921 with the 63 provincial and suburban Amateur Wireless Societies (some 3000 members later to become amalgamated as the RSGB). Although nothing was immediately forthcoming the radio amateurs, led by Leslie McMichael G2FG and Gerald Marcuse G2NM among others, decided to exert continuous pressure upon the Post Office to re-establish telephony transmissions.



A photograph taken in 1922 of the 2MT Writtle transmitter

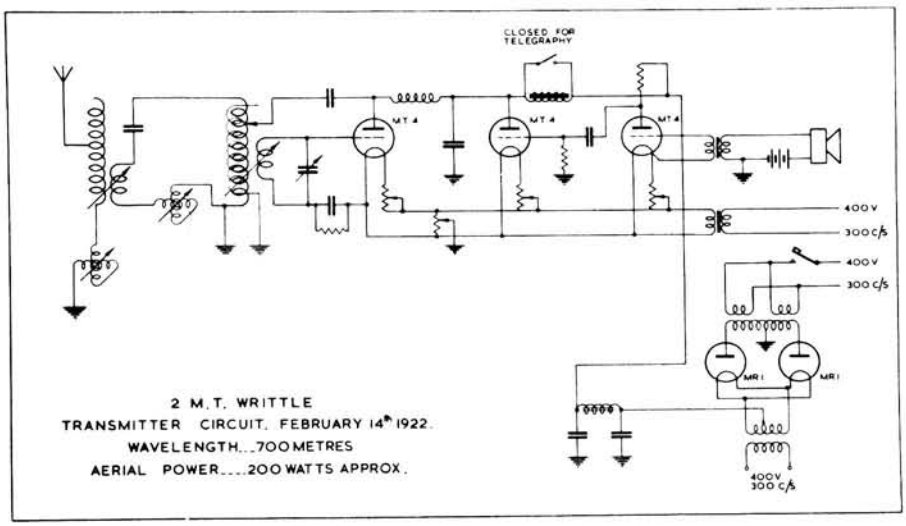
The Battle is Won

By August 1921 letters in the press and regular concerts from the Hague achieved a small success when it was announced that the Postmaster General had authorised transmission by the Marconi company of calibration signals consisting of the name of the frequency continuously repeated. In the December of 1921 the radio societies presented a petition to the Post Office for reinstatement of telephony transmissions. The battle had been won. In a letter dated 13 January 1922 the Right Hon F. G. Kellaway MP (Postmaster General) authorised the transmission of a 15 minute programme of speech and music, to be included in the weekly half-hour calibration transmission.

First Approved Broadcast Service

At the request of the London Wireless Society, Marconi's Company undertook to provide the first ever officially approved broadcast service in this country. To house the new station the company chose one of its experimental sites, formed after the First World War in Writtle, a small village some 3km from Chelmsford. The Writtle site had been established in anticipation of a new market in airborne telephony when civil aviation got underway after the First World War. It had already achieved some measure of success having provided the Croydon air traffic control system (that the Chelmsford station disagreed with) and it was at Writtle that the Marconi AD5, AD6 and AD7 series of radios were designed and tested.

So it was that in an ex-army wooden hut, parked unceremoniously on the edge of a large field, the next chapter in the history of radio was to be written. The Writtle station became the true birthplace of broadcasting in Britain. Its callsign . . . 2MT.



2 M.T. WRITTLE
TRANSMITTER CIRCUIT. FEBRUARY 14th 1922.
WAVELENGTH...700 METRES
AERIAL POWER....200 WATTS APPROX.

Further Reading

World at Their Fingertips, John Clarricoats, RSGB.

A History of the Marconi Company, W. J. Baker, Methuen and Co.

The Cats Whisker (50 years of Wireless Design), Jonathan Hill, Dresko Books.

Broadcasting in Britain 1922-1972, Keith Geddes, HMSO.

TO BE CONTINUED

The author is indebted to the Marconi Company for the illustrations used in this article

Simple Audio Oscillator

This little project started life some time ago when John Keeley G6RAV needed to improvise an audio test signal. The original "ugly circuit" developed into a simple but surprisingly effective battery-operated sine wave oscillator that has proved to be a great asset at G6RAV.

The oscillator covers a frequency range of 100Hz to 15kHz and delivers 0·775 r.m.s. into a 600Ω load with a mid-band total harmonic distortion figure of better than 0·1 per cent. The rather strange output level is the standard reference "0dB" point on audio level meters and corresponds to a power of 1mW dissipated in 600Ω. Historically, the "magic" value of 600Ω comes from the early days of line communication and represents the characteristic impedance of a then commonly used twin open wire transmission line. Subsequently, 600Ω became the standard impedance for audio line equipment. Although the "600Ω junction" is no longer generally used in audio systems, 600Ω is still quoted as a reference load value.

The Circuit

A Wien Bridge circuit is used and a novel feature is that the basic frequency is selected in the range 1–15 by operating four switches in binary sequence. A multiplier switch then sets the final frequency to be 100Hz to 1500Hz in 100Hz steps or 1kHz to 15kHz in 1kHz steps. This approach has the great advantage from a project point of view, in that provided good quality components are used for the Wien Bridge arms the oscillator is effectively self-calibrating—the prototype was constructed with "spare box" components and the frequencies were measured to be within +3·2 −5·5 per cent of setting.

The full circuit is shown in Fig. 1. At first sight this appears somewhat daunting because of the apparently

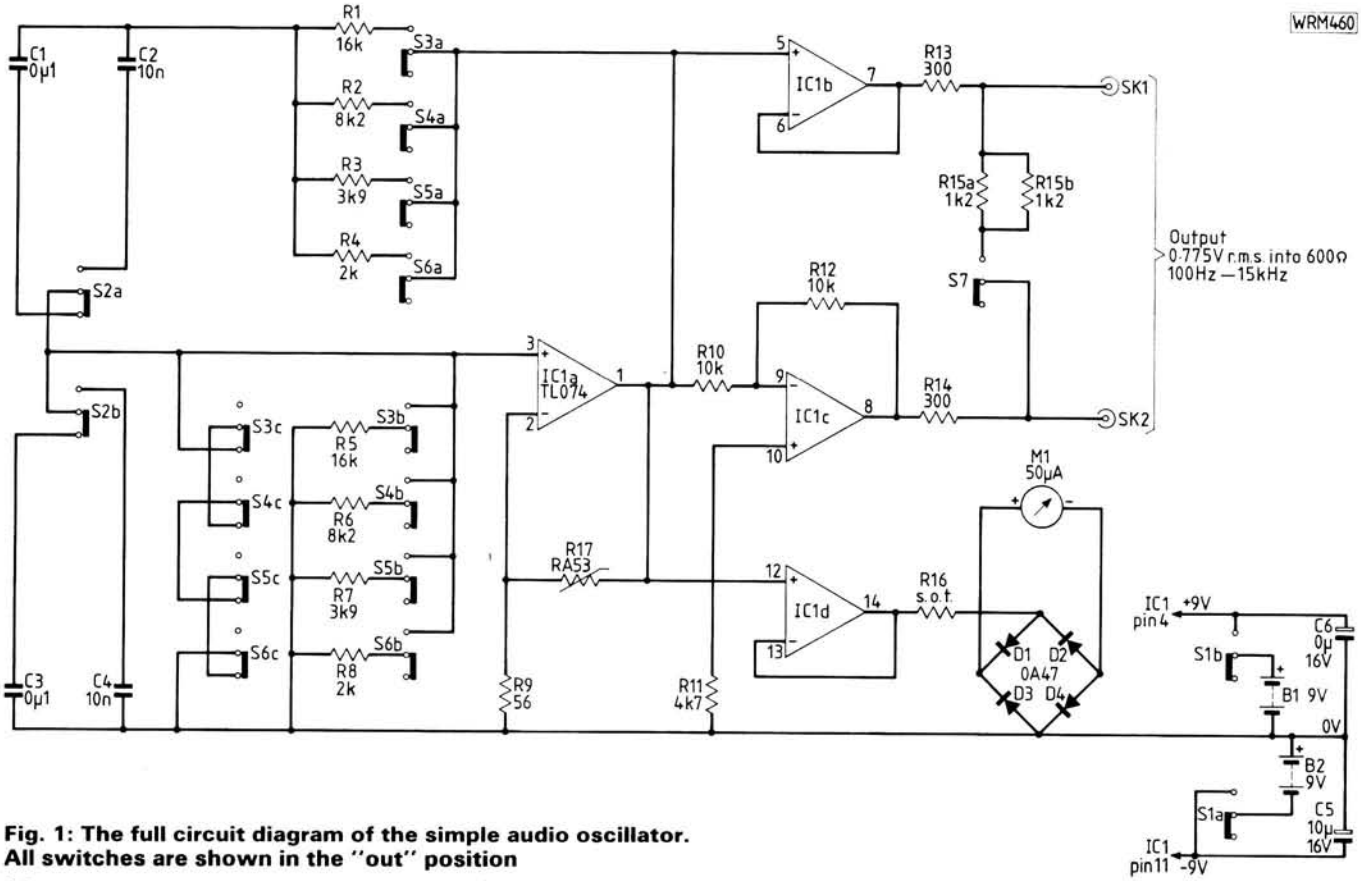
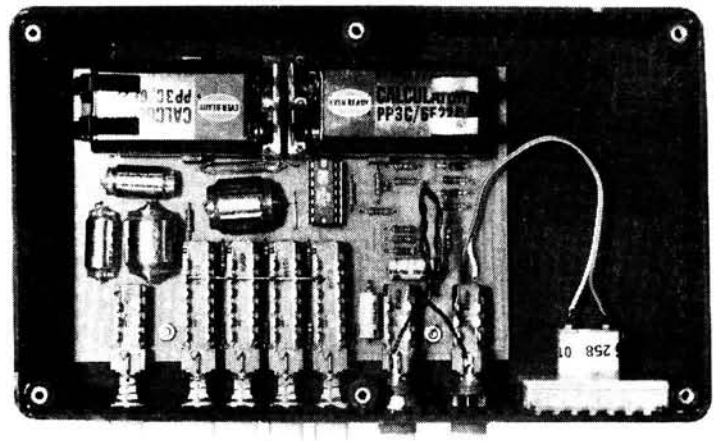


Fig. 1: The full circuit diagram of the simple audio oscillator. All switches are shown in the "out" position



This photograph shows the p.c.b. fitted into a metallised plastics box. Any suitable size of box or case can be used, ideally though it should be metallic or metallised

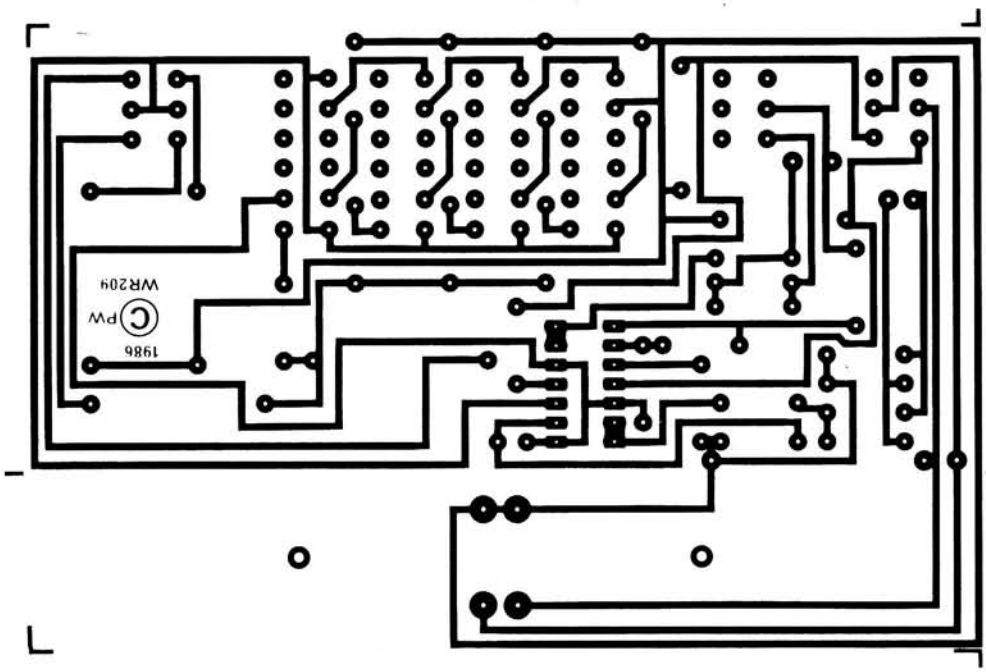
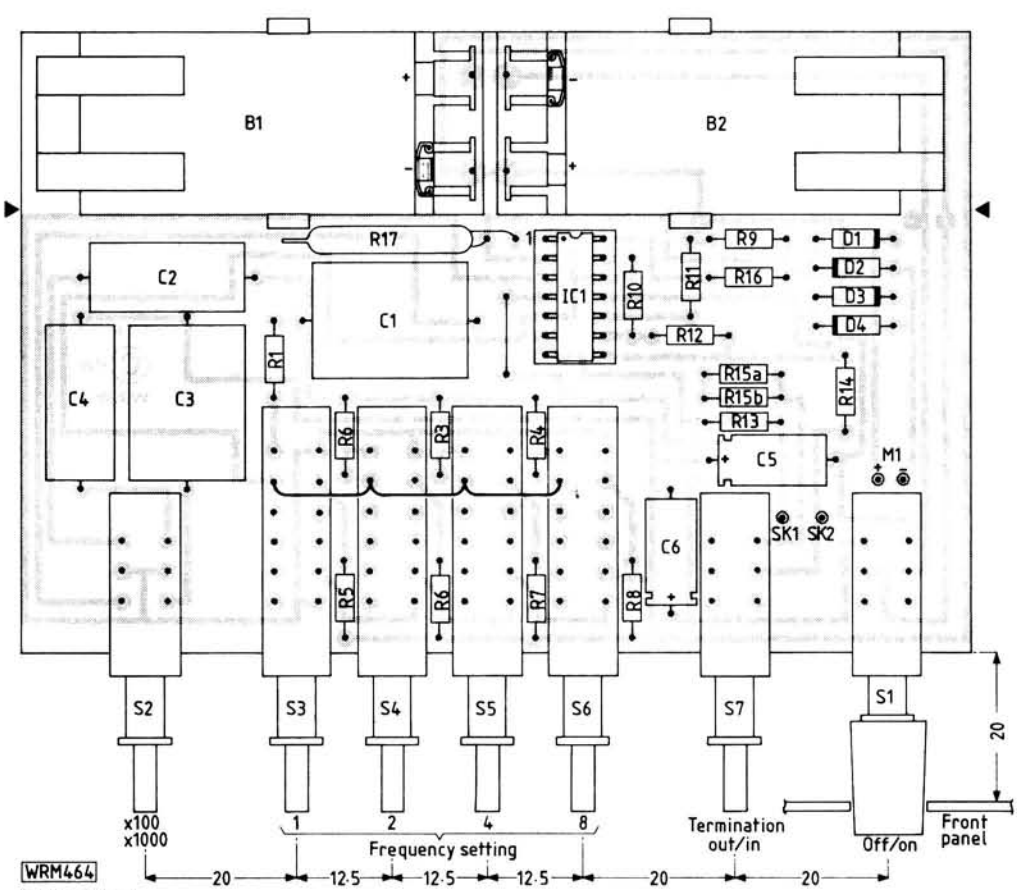


Fig. 2: Full size copper track pattern and component placement drawing for the simple audio oscillator. Although a p.c.b. has been shown here the project could be built using Veroboard or even "ugly" construction. The push-button switches could be replaced by any other type of switch having the required number of poles. The alternative switches would have to be connected using flying leads to the appropriate pads on the p.c.b. The two battery holders are optional—the cheaper flying leads with press stud connectors could be used and in this case the p.c.b. could be cut at the points marked



complicated switching arrangements. Actually, things are not as bad as they seem, and the switching is straightforward, but more about that later. It can be seen that matters revolve around a quad op. amp.—the TLO74. Integrated circuit IC1a is the maintaining amplifier for the oscillator and the signal output is taken this is fed to the inputs of IC1b, c and d. Amplifiers b and c are connected as non-inverting and inverting unity gain buffers respectively—these form a differential (push-pull) output stage for the oscillator. Amplifier d is also used as a buffer to drive the output indicator, M1.

Frequency Selection

Looking at the circuit in more detail, R1–8 and C1–4 form the Wien network that determines the oscillator frequency. The relationship being $f = 1/(2\ CR)$. A feature of this network is that frequency is inversely proportional to resistance. Thus if a combination of 100nF and 16kΩ sets the oscillator frequency to 100Hz, halving the resistance to 8·2kΩ will double the frequency and if the 16kΩ and 8·2Ω are paralleled the frequency will increase to 300Hz. In this way, if four resistors having binary weighted values in the sequence 8:4:2:1 are used in each arm of the Wien network, the parallel combination resulting from them being switched by S3–6 in binary sequence will tune the oscillator through the range 1–15 in unit steps. Switch S2 selects the associated capacitor to be 10nF or 100nF giving a multiplier of ×1000 or ×100 on the basic frequency set up on the binary switches.

A disadvantage of a binary selection method is that the code "0000" is obviously invalid as it would leave the "+" input of IC1a disconnected and floating. To overcome this anomaly, the third poles of S3–6 are interconnected such that if "0000" is selected IC1a "+" input is connected to 0V, so maintaining d.c. conditions.

The oscillator circuit is completed by the thermistor, TH1 and R9. The thermistor stabilises the output amplitude and in conjunction with R9 establishes the output level at 0·775V r.m.s.

The output stage is designed to deliver the reference level into a 600Ω load from a 600Ω source impedance. This may seem a long-winded way of doing things but represents common practice in audio test oscillators. The purpose is to standardise conditions when making measurements on terminated circuits. This situation commonly occurs when a 600Ω calibrated attenuator is being used for gain measurements. Provided the attenuator is correctly terminated it will present a 600Ω load to the oscillator. This will develop the reference level across the reflected load and so the terminated level at the attenuator output can be directly read from the settings.

Amplifiers IC1b and IC1c are non-inverting and inverting unity gain buffers respectively. These are both fed from IC1a and form what is effectively a differential or push-pull output stage. Resistors R13 and R14 artificially increase the output impedance to 600Ω. As that output is differential there is a gain of 2 in the stage so the open-circuit voltage from the test oscillator is 1·55V r.m.s. When correctly terminated this is reduced by a factor of 2 restoring the output to the reference level of 0·775V r.m.s. For convenience, an internal 600Ω termination, formed by the parallel combination of R15a and R15b and switched by S7, is provided.

Integrated circuit IC1d is a further non-inverting unity gain buffer used to drive the level indicator. The prototype used a cheap "VU" style meter and R16 was adjusted on test to give a convenient reading. Note that this does not indicate the output terminal voltage—which depends on the termination—but the oscillator drive voltage, in effect the test oscillator e.m.f. Again, this may seem to be a strange way of doing things but it is normal test oscillator practice. When making audio measurements the convention is that the test oscillator e.m.f. is kept constant. In this way, measurements are more representative of performance under practical conditions, results taking account of any changes in load impedances, etc., that may occur with frequency.

A split battery is used for the power supply as this simplifies design. The consumption is approximately 9mA per rail and the circuit will operate satisfactorily down to ±7V, which is judged to be the end-point for the batteries. The prototype used 6-F22 (PP3) style batteries, but as the oscillator represents what is almost the maximum load for this size of battery it is important that a good quality, or a rechargeable type, be used for best results.

SHOPPING LIST

Resistors
¼W 1% Metal Film

56Ω	1	R9
1·2kΩ	2	R15a,b
300Ω	2	R13,14
2kΩ	2	R4,8
3·9kΩ	2	R3,7
5·1kΩ	1	R11
8·2kΩ	2	R2,6
10kΩ	2	R10,12
16kΩ	2	R1,5
s.o.t.	1	R16

Capacitors

Polystyrene 5%		
10nF	2	C2,4
100nF	2	C1,3
Electrolytic 25V		
10µF	2	C5,6

Semiconductors

Diodes		
OA47	4	D1–4
Integrated Circuits		
TLO74	1	IC1

Miscellaneous
Thermistor RA53 (TH1); Level indicator meter (See text); Push-button switches Toko 'F' Series, 2p Cirkit 53-77002 (3), 4p Cirkit 53-77004 (4), round buttons 53-21002 (7); Battery 9V 6-F22 (PP3) and holders (2); Printed circuit board; Terminals (2); Case (See text).

How Much? & How Difficult?
£16
Intermediate

Construction

Construction is straightforward and no special precautions need be taken other than keeping wiring to the frequency select and multiplier switches short if the push-button p.c.b. mounted type are not used. Circuit layout is not critical—the author used Veroboard for the prototype and a suitable p.c.b. layout is shown in Fig. 2. It is a good idea to mount R9 on terminal pins as this may require adjustment during test to set the output level. The choice of case is left to the constructor, as this will depend to some extent on the switches and meter used for the project.

Testing

Coming to the testing stage, the first thing is to thoroughly check the switch wiring as this is a little complicated. Check the placement of components on the circuit board.

At best an audio level meter will be needed for the testing, but failing that a multimeter with an "output" range will suffice (just!). A calibrated oscilloscope can also be used—it's advisable anyway to visually check the waveform for distortion.

Set the frequency select switches to the "OFF" position—this will disable the oscillator and allow a d.c. check of the circuit. Connect the batteries and switch on. Measure the d.c. voltage across the output terminals—anything more than about 250mV of either polarity indicates a problem!

Assuming the d.c. conditions are correct, the oscillator function can now be checked. Select the internal termi- ▶47

DEWSBURY ELECTRONICS

ICOM

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	Low 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
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

MUTEK

SLNA 50	50MHz Switched preamp	44.90
SLNA 144s	144MHz Low noise switched preamp	39.95
SLNA 145sb	Preamp intended for 290	29.90
GLNA 432e	70cm Mast head preamp	149.90
RPCB 144ub	Front end FT221/225	79.90
RPCB 251ub	Front end IC251/211	84.90
BBA 500u	20-5000MHz Preamp	34.90
GFBA 144e	2m Mast head preamp	149.90
SBLA 144e	2m Mast head preamp	89.90
RPCB 271ub	Front end for IC271	89.90
TVHF 230c	2M-FM Transverter	334.90
LBPF 144v	Bandpass Filter	22.40
LBPF 432u	Bandpass Filter	22.40
TVVF 50c	6M Converter	199.90
GLNA 433e	70cm Pre-amp	79.90
TVVF 144a	2M Transverter	239.90

MET ANTENNAS

70cms		
432-5B	5 Ele	16.95
432-19T/ATV	19 Ele	35.60
432-17X	17 Ele Crossed	49.17
432-17T	17 Ele Long	39.20
2M		
144-5	5 Ele	19.55
144-7T	7 Ele	24.15
144-8T	8 Ele Long	31.26
144-14T	14 Ele	46.71
144-19T	19 Ele	55.88
144-6X	6 Ele Crossed	39.75
144-GP	Ground Plane	14.41
4M		
70/3	3 Ele	30.12
70/5	5 Ele	45.74

SWR/POWER METERS

WELZ		
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

DAIWA

CN410M	3.5-150 Mhz mobile cross needle	48.00
CN460M	140-150 Mhz mobile cross needle	52.00
CN520	1.8-60 Mhz mini cross needle	39.00
CN500	1.8-60 Mhz cross needle	19.50
CN620A	1.8-150 Mhz cross pointer. Up to 1KW	2.10
CN630	140-450 Mhz cross pointer. Up to 200W	66.21
CN650	1.2-2.5 Ghz cross pointer. Up to 20W	98.11
CNW419	1.8-30 Mhz 200W tuning unit	129.50
CNW919	2M Power meter and antenna tuning-unit	159.64
CNW518	3-30 Mhz 8 band hi power tuner	233.09
CL680	1.8-30 Mhz 200W general coverage ATU	104.99

ICS

We now have in stock the full range of ICS RTTY/ASCII/AMTOR/CW products and the remarkable ALM-203E. This keypad operated handheld 2M transceiver has a host of features yet costs much the same as limited facility thumbwheel units – just **£209.00.**

TRIO

TS940	HF General Cov	1695.00
TS940S	9 Band TX General Cov RX	1695.00
TS930S	General Cov RX	1295.00
TS830S	160-10m Transceiver 9 Bands	832.75
AT230	All Band ATU/Power Meter	157.99
SP230	External Speaker Unit	47.73
TS530S	160m-10m Transceiver	698.00
TS430S	160m-10m Transceiver	720.00
PS430	Matching Power Supply	138.00
SP430	Matching Speaker	39.50
MB430	Mobile Mounting Bracket	13.17
FM430	FM Board for TS430	45.00
TS130S	8 Band 200W Pep Transceiver	633.06
SP120	Base Station External Speaker	30.74
AT130	100W Antenna Tuner	108.62
MC50	Dual Impedance Desk Microphone	36.19
MC35S	Fist Microphone 50K ohm IMP	17.01
LF30A	HF Low Pass Filter 1kW	24.68
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
SC4	Soft Case	15.92
SMC25	Speaker Mike	18.66
PB25	Spare Battery Pack	29.10
MS1	Mobile Stand	37.31
R600	Gen. Cov. Receiver	299.52
R2000	Synthesiser 200KHz-30MHz Receiver	479.47
HC10	Digital Station World Time Clock	78.99
HS5	Deluxe Headphones	26.88
SP40	Mobile External Speaker	16.46
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

BNOS

POWER SUPPLIES			
6 amp	**58.00**	25 amp	148.00
12 amp	**99.00**	40 amp	296.00

LINEARS		
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	157.00
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	2MN 50W out, preamp	108.00
LP 144-10-50	2M 10W in, preamp	108.00
LPM 432-1-50	70cm, 1W in, 50W out, preamp	235.00
LPM 432-3-50	70cm, 3W in, 50W out, preamp	235.00
LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00
LPM 432-10-100	70cm, 10W in, 100W out, preamp	335.00

CW/RTTY/TOR

Tono 9000E	Reader/Sender	P.O.A.
Tono 550	Reader	329.00
HI-MOUND MORSE KEYS		
HK702	Straight keyer marble base	30.95
HK703	Straight keyer	29.35
HK704	Straight keyer	19.95
HK705	Straight keyer	15.49
HK706	Straight keyer	16.96
HK708	Straight keyer	14.95
HK802	Straight solid brass	86.30
HK808	Straight keyer	39.95
MK704	Twin paddle keyer	13.50
MK705	Twin paddle keyer marble base	25.65
VIBROPLEX		
Vibroplex Iambic Standard		63.98
Brass Racer		54.59
Vibrokeyer Standard		63.98
Original Vibroplex Standard		70.54
The Presentation		129.62
MISC		
AFR8000	TOR/RTTY/CW Decoder	684.57
AFR2010	TOR/RTTY/CW Decoder	496.80
AFR2000	TOR/RTTY/ASCII Decoder	427.00
AFR1000	Low cost version of above	P.O.A.
Video module for above		85.00
CW module for AFR2000		124.00
Telereader	CWR610E CW/RTTY/ASCII	195.00
STAR		
MASTERKEY	Electronic Iambic keyer	49.95
Junkers	Straight key	45.00
GW Morse Keys		34.99

YAESU

FT690	6m Multimode	269.00
FT980	HF Transceiver	1450.00
SP980	Speaker	78.95
FT77	Mobile HF Transceiver	479.00
FP700	PSU	150.00
FC700	Tuner	105.00
FT77s	10w. version	449.00
FMU77	FM Board for FT77	28.35
FL2050	Linear Amplifier	115.00
FT290	2m M/Mode Port/Transceiver	315.00
FT290	With Mutek front end fitted	345.00
FL2010	Linear Amplifier	69.00
MMB11	Mobile Bracket	30.00
NC11	Charger	11.50
CSC1	Carrying Case	5.00
YHA15	2m Helical	7.65
YHA44D	70cm ½wave	9.95
YM49	Speaker Mike	20.20
MMB15	Mobile Bracket	14.55
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
NC9C	Charger	9.60
NC8	Base/station Charger	64.80
PA3	Car Adaptor/Charger	18.00
FNB2	Spare Battery Pack	27.02
YM24A	Speaker Mike	23.75
FT726R	2m Base Station	775.00
430/726	70cm Module for above	255.00
FRT7700RX	A.T.U.	49.85
MH1B8	Hand 600 8pin mic	15.70
MD1B8	Desk 600 8pin mic	64.80
MF1A3B	Boom mobile mic	18.00
YH77	Lightweight phones	14.95
YH55	Padded phones	15.35
YH1	L/weight Mobile H/set-Boom mic	14.95
SB1	PTT Switch Box 208/708	15.70
SB2	PTT Switch Box 290/790	13.80
SB10	PTT Switch Box 270/2700	14.95
QTR24D	World Time Clock	33.35
FF501DX	Low Pass Filter	29.90
NEW MODELS		
FRG8800	HF Receiver	475.00
FRV8800	Convertor 118-175 for above	80.00
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
FRG9600	60-905MHz Scanning RX	449.00

ROTATORS

MR750E	Multitorque, round controller	193.00
MR750PE	Round and preset controller	217.64
MR300E	High speed VHF rotator	193.00
MR750U	Additional motor unit	64.64
MR300U	Additional motor unit	64.64
DR7600X	Heavy duty. Preset control	189.37
KS065	Deluxe bearing	27.30
KR500	Elevation rotator (not Daiwa)	144.90

Scanners

AR2002	25-550MHz and 800-1,300GHz	375
FRG9600	60-905MHz Continuous Coverage	449
ICOM R7000	25MHz-2.0GHz The Best Yet!	P.O.A.
Fairmate	8 Band Scanner (55-469MHz)	169

Miscellaneous

DRAE	Wavemeter	27.50
L30	30W Dummy load	8.05
L100	100W Dummy load	35.20
L200	200W Dummy load	42.55
CT300	300W Dummy load	69.00
DRAE	2m Pre-set A.T.U.	14.50
TOKYO HI-POWER		
HC200	10-80 HF Tuner	82.50
HC400	10-160 HF Tuner	176.00
SWITCHES		
Sigma	2 way 'n' Skts	19.95
Welz	2 way SO239	22.95
Welz	2 way 'n' Skts	41.90
Drae	3 way SO239	15.40
Drae	3 way 'n' Skts	19.90

SPECIAL ANNOUNCEMENT

Available soon – the STAR MEMORY KEYER with 8 memories, also UPGRADE UNITS to fit all STAR MASTERKEYS.
S.A.E. for details

VISA

DEWSBURY ELECTRONICS
176 Lower High Street, Stourbridge
West Midlands
Tel: Stourbridge (0384) 390063/371228

G4CLX

Allow Ten Days for Delivery
Open Monday thru Saturday.
Instant H.P. subject to status.
Access, Barclaycard and real money.

Access

▶mentioned, the top line does not radiate and is in effect a single-wire transmission line connecting the three vertical radiators. This line may be continuous and 2 metres in length. The centre element is joined to the line by a small triangular plate made of aluminium attached with self-tapping screws. The antenna can be bolted to the top of a lightweight mast.

It would be useful to arrange some form of hand rotation of the antenna for coverage in other directions. Mounted at a height of 5 metres for tests the antenna gave a good performance and with a 10W transmitter produced an S9 signal at a repeater station some 70km distant—this under normal tropospheric conditions.

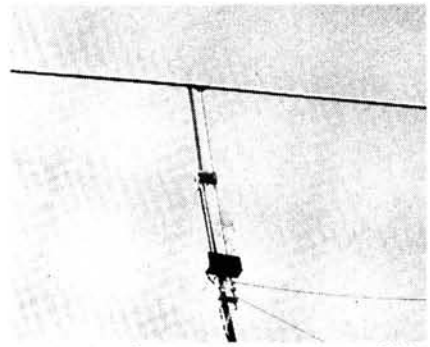


Fig. 4.7: The author's prototype 144MHz Bobtail antenna showing correct mast mounting method

Details of numerous other broadside and endfire antenna arrays, some quite sophisticated, for h.f. as well as v.h.f. bands, may be found in the various references given in this series of articles.

References

1. *The ZL Special*—(h.f. bands). F. C. Judd G2BCX. *Short Wave Magazine* July 1950.
2. *Beam Antenna Handbook*. W. I. Orr W6SAI. Radio Publications Inc., USA (available RSGB books dept.).
3. *Two Metre Antenna Handbook*. F. C. Judd G2BCX. Newnes Butterworth Technical Books.

Speech Processing

Ian Poole G3YWX explains how to use speech processing to make maximum use of your transmitter power.

In amateur radio the ability to make a contact under any given conditions is limited by noise: that generated by co-channel interference, static and also receiver or other forms of wide band noise. In order to make contacts under marginal conditions, or generally to improve the intelligibility of a signal one has to ensure that the highest level of audio is transmitted without overloading the transmitter. Unfortunately the wide dynamic range of a speech waveform makes this very difficult without incorporating various forms of processing the speech waveform.

When any form of speech processing is carried out it should be adjusted so that the correct amount of processing is performed in order that any improvement which may have been made is not lost by distorting the signal to an extent where intelligibility is lost. One only has to listen around on the phone sections of the amateur bands to hear a great variety of signals. Some stations have very badly distorted audio which is difficult to copy whilst others are very pleasant to listen to whilst retaining a high level of processing.

Essentially speech processing involves reducing both the bandwidth and also the dynamic range of the speech so that maximum use is made of both the available transmitter power and bandwidth. However, if methods of processing are applied incorrectly, or to an excessive extent, vital information may be lost leading to a reduction in the overall intelligibility. There are several ways in which a speech signal may be processed, but in order to understand more fully the ways in which they may be applied it is useful to give a brief outline about the nature of speech waveforms and the way in which they are actually generated.

The Composition and Nature of Speech

Human speech is made up from many different sorts of sounds. The lungs, windpipe, vocal cords, throat, nose and mouth cavities all react together in a highly co-ordinated fashion to produce the sounds that we know as speech. Fundamentally we speak by modulating the flow of air which passes out from the lungs.

There are four main types of modulation which are used to generate speech: vocal cord; frictional; cavity; and start-stop. The vocal cord and frictional types of modulation convert the flow of air into audible sound waves, cavity modulation alters the quality of the sound and start-stop modulation actually starts and stops the flow of air.

Vocal cord modulation is produced by the vibrations of the vocal cords which periodically interrupt the flow of air. This results in sound waves, rich in harmonics, which are then modified by the cavities of the nose and mouth to give the characteristic voicing to the speech. This form of modulation has fundamental frequencies between about 80Hz and 500Hz dependent upon factors such as age, sex and so forth.

Frictional modulation is used to generate sounds like *s, f* and *sh* which are known as the fricative sounds. They are formed by creating a small opening through which air must pass quickly. The resultant turbulent air flow contains many randomly generated frequencies, i.e. various forms of noise.

Cavity modulation is used to modify the nature of the sounds which are produced by the vocal cords and also by frictional modulation. The cavities filter some of the harmonics produced by the vocal cords, giving an apparent reinforcement of others. The affect of cavity modulation is often less on fricative sounds because they are often produced near the front of the mouth, but nevertheless apparent changes are made by removing some bands of frequencies.

When these types of modulation are combined many more different sounds can be made. The vowel sounds are formed by using cavity modulation to alter the sounds made by the vocal cords. Plosive sounds like *p, b* etc., are made by combining start-stop frictional and cavity modulation. Therefore by using all these forms of modulation together or separately very many different sounds can be made. In fact there are thirty-nine different sounds which can be distinguished by an English speaking person.

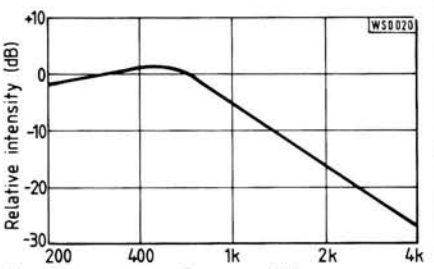


Fig. 1

Not only are there a great number of different sounds produced, but also their amplitude has been found to vary greatly. There are variations between different speakers, variations dependent upon the emphasis placed on different words, and variations between the different sounds which are due to the very nature of the sound. Therefore the intensity of the speech can change by quite a large magnitude within one word. Taking all these factors into consideration the sound level can vary as much as 35dB in extreme cases for a particular speaker.

In addition to intensity variations it has also been found that there are variations between negative and positive peaks. In some cases this assymetry can be around 7 to 8dB. Although these figures do represent extreme cases which would not normally be encountered in amateur applications they do serve to emphasise the large dynamic range of the various sounds which are found in speech.

As well as possessing a wide dynamic range, speech also occupies a fairly wide band of frequencies. A typical frequency distribution is shown in Fig. 1. From this it can be seen that there is a peak around 500Hz falling off slowly below this frequency and more rapidly (typically 9dB/octave) above it. It is found that much of the lower frequency content is generated by the vocal cords whilst many of the higher frequencies are from the fricative sounds.

These wide variations in speech waveforms make it difficult to utilise a transmitter's power efficiently without some form of processing. In order to improve this efficiency maximum use must be made of the available power by only transmitting those components of speech which are required in order to contribute to the intelligibility of the signal.

This is accomplished by increasing the average power and reducing bandwidth by the use of techniques such as compression, clipping and varying degrees of frequency response tailoring.

Speech Compression

Speech compressors can take various forms and the term compressor can often imply different things to different people. However, whatever the approach, a compressor consists of an amplifier which adjusts its gain according to the level of the incoming

signal, progressively reducing it as the input signal level increases.

Usually the gain will remain constant until a certain threshold is reached after which the gain will be reduced. A compressor can take one of two forms. The first is one in which the gain will be adjusted instantaneously and will vary over the audio waveform after the threshold has been reached. In the other form the gain will follow the envelope of the waveform.

Time constants are introduced into the gain adjusting loop so that the compressor follows the undulations of the speech and thereby ensures the peak level of the waveform remains almost constant.

It is this second type of compressor which is used in amateur communication, and it is also sometimes known as VOGAD (Voice Operated Gain Adjusting Device). If either type of compressor is used then the original audio can later be regenerated because the waveform has only been altered and no information lost. In order to do this an expander which matches the compressor is required at the receiving station.

When designing compressors the attack and decay times of the gain controlling loop are important. The attack time should be short so that the gain of the amplifier can be reduced very quickly if there is a sudden increase in signal. If the attack time is not fast enough then transient peaks will pass through the compressor and result in the transmitter being over modulated.

The decay time also has a bearing on the operation of the compressor and this too has to be adjusted for the optimum. If the decay time is chosen so that the gain follows the individual syllables then the compressor is known as a syllabic compressor.

However, if a larger decay time is chosen then the compressor will only be capable of following the undulations in the speech, giving a type of compression known as volume limiting. It is this type of compressor which is most often found in amateur communications equipment where typical time constants for the gain controlling loop will be around 10ms for attack time and 300ms for the decay time.

Although compressors do give a certain amount of gain they are normally used to maintain a constant level either to a further stage of processing or to the transmitter itself. When more gain is required some form of clipping the waveform is usually employed.

Clipping

If a signal is fully modulated with audio, i.e. the peaks reach the maximum allowable level, then further gain can only be achieved by actually increasing the average level of the audio. This is normally accomplished by removing the peaks and transients from the signal and thereby increasing the average to peak ratio of the audio. At first sight one might imagine that by

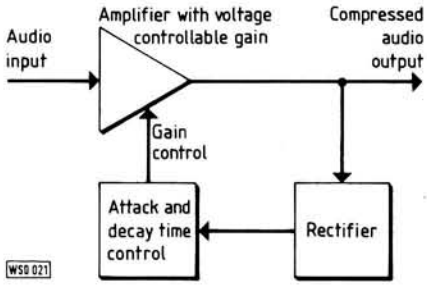


Fig. 2

clipping the signal and effectively removing information which cannot be replaced it would suffer a loss of intelligibility.

This is surprisingly not true. In fact it can be shown that a speech waveform can be clipped to a very high degree and still retain most of its intelligibility. The reason for this is that the sounds contained in speech are distinguished mainly by their frequency content rather than their amplitude content. If speech is clipped using a high grade clipping system which does not introduce harmonics into the audio spectrum then it can be infinitely clipped, i.e. have only frequency information and yet still retain its intelligibility.

When referring to a degree of clipping it is usually expressed in decibels. This refers to the reduction in the peak level of the signal by the clipper. Therefore, if a signal has a peak to peak level of 1V and is clipped so that it becomes 0·5V, then the level of clipping is said to be 6dB.

Unfortunately the process of clipping is non-linear and by its very nature will introduce distortion products into the signal. Most of these are harmonic distortion products, and would cause an audio signal which was limited to 3kHz before clipping to extend above 9kHz. These products have to be removed otherwise they would cause the transmitted signal to occupy a wider bandwidth than is permissible. Therefore, a filter with a steep roll off above 3kHz is required as shown in Fig. 3. In addition to the post clipping filter another filter is shown before the clipper. This is to remove any out-of-band signals before the clipper which may give in-band distortion products.

This form of clipping is known as audio frequency clipping and suffers from many of the distortion products remaining within the audio bandwidth. These cannot be removed and therefore reduce the intelligibility of the signal, thereby limiting the amount of clipping which can be usefully employed.

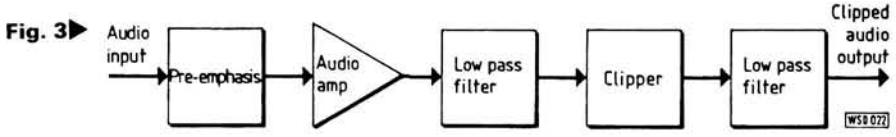
In order to overcome this a system of clipping the signal at radio frequencies was devised. This has the advantage that any harmonics produced will occur at multiples of the radio frequency and can be removed quite easily. In addition to this any intermodulation distortion will also occur on frequencies which can easily be filtered. Using this method an audio signal can be clipped without producing any undue distortion into the signal which would reduce its intelligibility.

An r.f. clipper requires more stages of circuitry than its a.f. counterpart, as shown by the block diagrams in Fig. 4. From this it can be seen that the audio signal is first amplified and any frequency tailoring or pre-emphasis which may be required is applied as well. The audio is then mixed with an r.f. carrier and filtered to produce an s.s.b. suppressed carrier signal.

It is important at this stage to produce a signal which has good unwanted sideband and carrier suppression in order to reduce intermodulation distortion as this would impair the overall performance. This single sideband signal is then clipped and the harmonics which are generated lie at multiples of the radio frequency so they can then be filtered easily and the audio regenerated. In some cases an r.f. clipper is included in the transmitter sideband generator itself so that there is no requirement to regenerate the audio as the clipped, filtered output is then fed into the next stage of the transmitter.

Unfortunately, as an r.f. clipper requires the generation of a single sideband signal, it is considerably more complicated than its a.f. counterpart and therefore more costly. However, it is capable of providing significantly more gain as it is possible to remove more of the distortion. If it is required to assess the gain of a system, one way is to measure the reduction in peak signal level required to give the same

Fig. 3▶



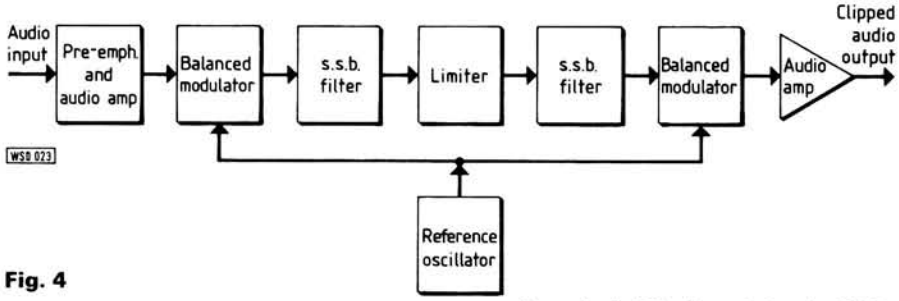


Fig. 4

percentage copy in the presence of noise. The gain of the processor is then equal to this reduction. Under these conditions it was found that 4dB of gain was given using 15dB of a.f. clipping but using r.f. techniques only 10dB of clipping was required. By increasing the amount of clipping in both systems further gain was obtained, but using a.f. techniques the maximum gain which could be obtained was about 5dB whereas with an r.f. system in excess of 8dB was available.

Frequency Response

So far only methods of limiting the amplitude range of the audio signal have been considered. In addition to this the frequency response of the audio can be tailored so that only those components which are required in the signal are transmitted. Again this maximises the use of the transmitter power, and it also limits the actual bandwidth of the transmitter signal.

Despite the fact that the human ear can detect limitations in bandwidth, a reduction in the intelligibility only results if the frequency response is substantially limited.

For example, it has been shown experimentally that reducing the bandwidth to the "standard" communications figure of 300Hz to 3·3kHz will only reduce the intelligibility by one percent under good conditions. If the top frequency limit is then further reduced by 1kHz then the intelligibility only falls by five percent. In fact the limits of 300Hz to 3·3kHz were chosen not only to retain intelligibility but also to retain naturalness and it is this last quality which particularly suffers if the bandwidth is reduced. However, where naturalness is not a prime requirement the upper frequency limit can be reduced below 3·3kHz and this is the case for most amateur transmitters where a figure of 2·7kHz at −6dB is common.

In addition to actual bandwidth limitation there are some circumstances where improvements can be made by emphasising some frequencies more than others. As the frequency components above about 600Hz have less power content it can sometimes be thought to be useful to emphasise the higher frequencies so that they do not become lost below the noise.

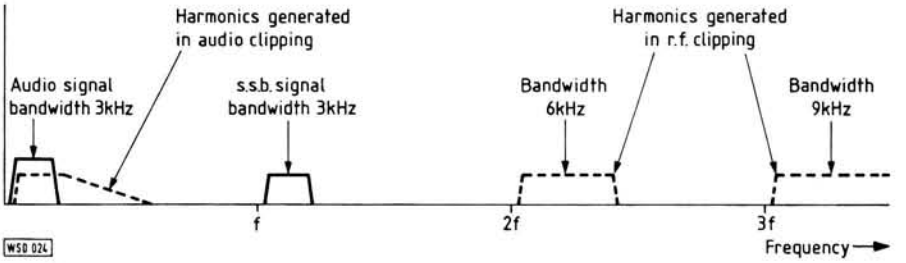


Fig. 5

However, pre-emphasis, as it is termed, is best used in conjunction with a speech clipper. This is because there are a high proportion of transients in the upper frequencies and if these are pre-emphasised the actual average power will have to be reduced if the transmitter is to handle the peaks.

If a small amount of pre-emphasis is applied before the clipping then this is found to be advantageous because the process of clipping tends to suppress some of the weaker high frequency components. The inclusion of some pre-emphasis will ensure that these components are not unduly attenuated and thereby retain their contribution to the intelligibility of the signal.

Speech processing has much to offer both in terms of gain and value for money. An a.f. processor should be able to give 4dB gain and kits for these can be bought for as little as £15 or so. At the other end of the scale an r.f. processor with input level control can provide in excess of 8dB gain but would cost around £80. Both of these units offer ideal value for money especially when compared with a linear amplifier or improved antennna system to give an equivalent gain. Of course, one could employ all these improvements.

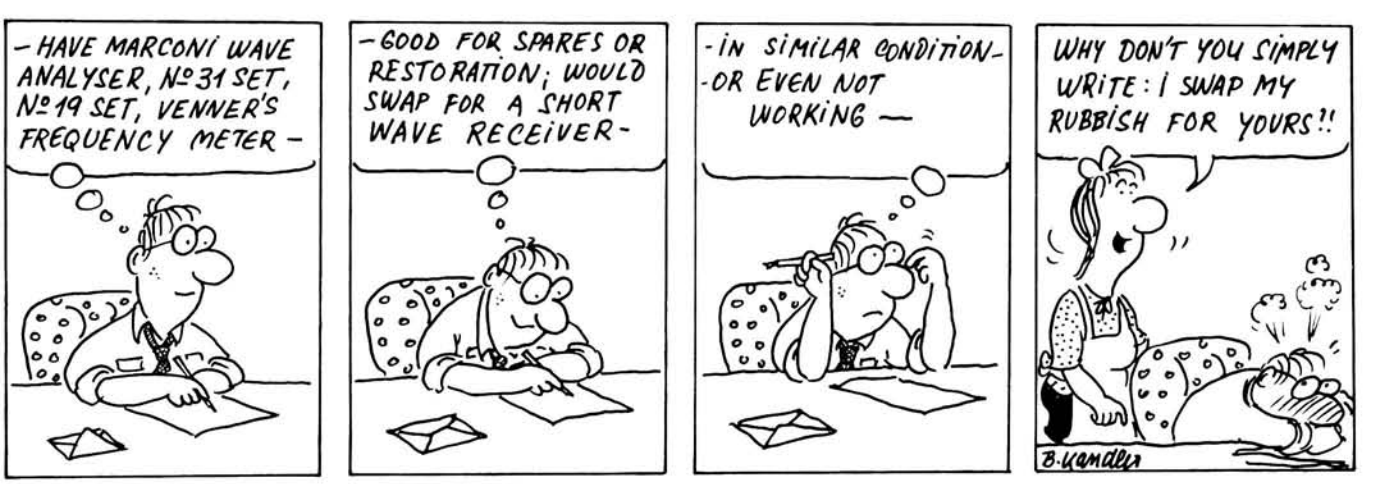
However, when using processors there are a few points to watch. For example, as the whole concept of processing involves packing as much information as possible into the transmitted signal the average transmitted power is increased. This can have disastrous consequences on the transmitter final amplifier if it is not designed to handle high average powers.

Unfortunately many of the designs using line output valves such as the 6LQ6, etc., are not capable of operating in this way and should be treated with care. However, most of the modern valved designs and also most transistorised ones have sufficient reserve capacity to be able to cope with the use of a processor quite easily.

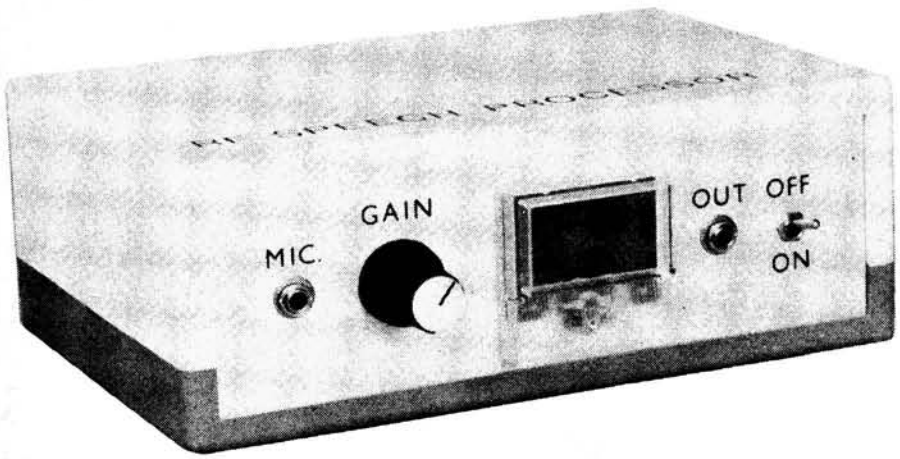
One further point to be aware of is that when using a processor the audio gain is effectively increased. This makes the system far more susceptible to r.f. feedback which can either cause oscillation or badly distort the audio. Therefore adequate filtering should be included on all leads passing into and out of the processor.

Despite these points which can normally be overcome, speech processing provides a way of making the most efficient use of the power available. Whether propagation is poor and signals are weak, or whether there is interference, the conditions of the bands often warrant the use of the maximum gain possible to establish contact. Speech processing is part of the solution. **PW**

BENNY



Build the PW RF Speech Processor



Most users of radio equipment concentrate mainly on the output stage when trying to get every last drop of performance out of the equipment, but a very worthwhile improvement in performance can be obtained at the other end of the system in the form of a speech processor as R. A. Penfold shows.

In general, speech processors seem to have a rather poor reputation and are treated with a good deal of scepticism. One reason for this could simply be that any improvement provided by the processor is usually less easy for the operator to judge than a boost in output power or a change of antenna. It also has to be admitted that not all speech processor designs are very effective—with some the apparent boost in signal level is largely counteracted by a large increase in distortion.

Although there seems to be a general belief that "clipping" type speech processors have to generate high levels of distortion, this is not actually true. Circuits which provide the processing at audio frequencies, known as "baseband" processors, do in fact generate quite high levels of both harmonic and intermodulation distortion and due to the way in which they function *must* do so. On the other hand, so called "r.f." processors, where the signal is boosted to a radio frequency, clipped, and then brought back down to the original frequency range, need generate only very low distortion levels. In practice a good r.f. speech processor can provide less than 1 per cent distortion with 12dB of limiting. This is a totally insignificant level of distortion which is likely to be less than that produced by other parts of the overall system, such as the audio and detector stages of the receiver. It is certainly not enough to impair intelligibility.

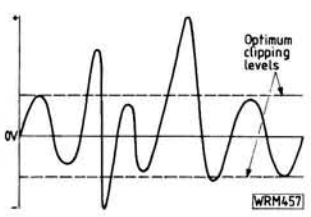
Having heard many radio operators demonstrating various types of speech processor on the air, the r.f. types seem to provide a practical level of performance which matches their theoretical superiority. Unfortunately, they do not only stand "head and shoulders" above baseband processors in terms of performance, but in cost as well. A conventional r.f. processor uses two high quality s.s.b. filters, each of which is likely to cost two or three times as much as a complete baseband processor. The r.f. speech processor design featured in this article is the result of an attempt to produce a circuit based on lower cost filters, to give a good compromise between cost and performance. The aim was to produce a design that would generate no more than a few percent distortion, even with heavy limiting, but which would cost only about half that of a conventional r.f. processor. The final design achieves this, and has a very "clean" sounding output with vastly lower distortion than a baseband processor. Distortion is well below the level that impedes intelligibility and a subjective boost of 10 to 12dB can be achieved without any obvious distortion arising. The filters selected are readily available ceramic types. The completed unit only requires one adjustment to set it up ready for use and no test gear is required for this. The unit simply connects between the microphone and the transmitter and it will work in any phone mode. In fact a speech processor of this type can be used in applications outside the field of radio, such as in a public address system for a noisy building.

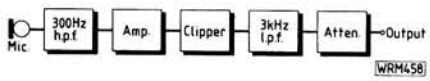
Processing Fundamentals

All speech processors rely on the fact that a speech waveform is of the general type shown in Fig. 1, where the peak level is quite high in relation to the average signal level. Microphone gain must be kept below the level at which signal peaks overload the transmitter, but this gives only a low average modulation level, and a low volume level at the receiving station. A compressor circuit could be used to automatically reduce the gain on signal peaks in order to reduce their amplitude and give a better "peak-to-average" signal ratio. Compressors are less than ideal for this application though, since the attack and decay times would need to be very short if the circuit was to have any chance of responding quickly enough to changes in signal amplitude. This would result in severe distortion with the audio signal effectively modulating itself.

Straightforward clipping gives better results, and the broken lines in Fig. 1 represent about the ideal clipping level. Most signal peaks are left largely or totally untouched and it is only the large peaks that are clipped. This still results in quite high levels of distortion being generated and steps must be taken to combat this.

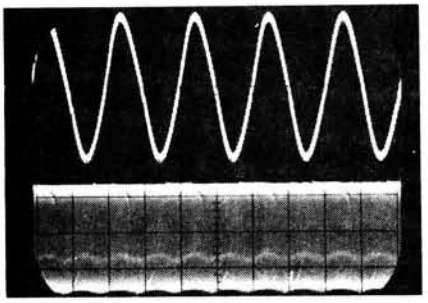
The block diagram of a typical baseband processor is shown in Fig. 2. A 300Hz highpass filter is used to process the signal prior to amplification and



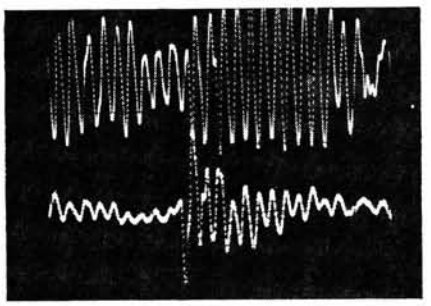


▲Fig. 2: Baseband speech processor block diagram

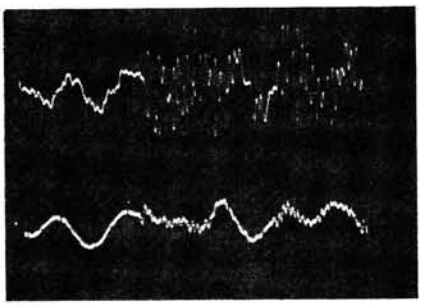
◀Fig. 1: A speech waveform has a high peak-to-average amplitude ratio



Despite heavy limiting of the r.f. signal (lower trace) the 800Hz sinewave output shows no obvious signs of distortion



The boost in the average signal level of the processed signal (upper trace) is clearly shown in this 20ms snatch of speech



Here the limiting provides a boost to the processed signal (upper trace) but the effect of the bass roll-off is also apparent

limiting. The limiting process generates both harmonic and intermodulation distortion. Highpass filtering helps to minimise both types, but is mainly aimed at counteracting harmonic distortion. Harmonic distortion generates multiples of the fundamental frequency—an input at 100Hz, for example, would have harmonics at 200Hz, 300Hz, 400Hz, and so on. In other words it would produce harmonics right across the audio band. The highpass filtering removes low input frequencies, and ensures that most of the harmonics generated are at high frequencies. These are removed by the lowpass filter at the output of the unit. However, inputs at around 300Hz to 1kHz will still generate harmonics within the passband of the output filter and, as speech requires a passband of more than one octave, a baseband processor cannot be totally free from harmonic distortion.

Intermodulation distortion occurs when two or more frequencies are present, as is normally the case with a speech signal. It is rather like the mixing effect used in a superhet radio, with sum and difference frequencies being generated. For instance, frequencies of 200Hz and 500Hz would generate distortion products at 700Hz (200Hz + 500Hz) and 300Hz (500Hz −200Hz). Intermodulation distortion is generally more noticeable and objectionable than the harmonic variety and it cannot be effectively combated in a baseband processor. The input and output filters could be replaced by bandpass types (and are in some designs), so that the lowest acceptable number of input frequencies are allowed to reach the limiter and as many distortion products as possible are removed from the output signal. A substantial amount of distortion would still remain though. The attenuator at the output is merely needed to take the output signal down to a level comparable to that from a microphone.

RF Processing

In principle r.f. processing is very simple indeed. If as an example, an audio signal at 500Hz is raised in frequency by 500kHz using a heterodyne system, this gives an output at 500·5kHz. Clipping the signal would then generate harmonics at frequencies of 1·001MHz, 1·5015MHz, 2·002MHz, etc. The important point here is that the harmonics have been moved well away from the signal frequency, so that there is no difficulty in removing them by filtering. An input signal at 2kHz would give a signal frequency at 502kHz, with harmonics at 1·004MHz, 1·506MHz, 2·008MHz, and so on. There is no longer a problem with harmonics falling within the same frequency range as the components of the wanted signal and harmonic distortion can be eliminated.

Things are not quite as simple as this in practice, as can be seen from Fig. 3 which shows the block diagram of an r.f. speech processor. The microphone signal is amplified and then fed to the input of the balanced modulator. The other input of the modulator is fed from the carrier oscillator. The first problem is that using a balanced modulator to heterodyne the audio frequency input up into the required r.f. range does not simply generate the sum frequency, but the difference frequency as well. Returning to our example of a 500Hz signal being boosted to 500·5kHz, this is the sum frequency—the difference frequency is 499·5kHz (500kHz − 500Hz or 0·5kHz). The circuit is in fact just generating standard upper and lower sideband signals.

An s.s.b. filter is used to remove one or other of the sidebands and it does not matter which one is removed. Unless this is done, the two sidebands interact to produce distortion products within the normal signal frequency range. This is not caused by straightforward intermodulation, which only generates frequencies well above or below the normal signal frequency range, but by intermodulation involving harmonics. Taking the previous example of sidebands at 499·5kHz and 500·5kHz, the second harmonic of 500·5kHz is 1·001MHz, which reacts with 499·5kHZ to give a difference frequency of 501·5kHz. Similarly, the second harmonic of 499·5kHz at 999kHz reacts with 500·5kHz to give a difference frequency of 498·5kHz. The harmonics combine with each other and the fundamentals to produce a wide range of frequencies, and this gives distortion which, after conversion back to the audio range, is comparable to clipping the audio signal.

If up to 12dB of limiting is used (which is about the optimum level), then about 12dB of sideband suppression seems to be adequate to avoid severe distortion. The degree of distortion obtained then appears to be comparable to the sideband suppression achieved, and if supression of 40dB or more can be obtained then a really low harmonic distortion figure will result.

The s.s.b. filter is followed by an amplifier and a limiter stage. A second s.s.b. filter is then used to process the signal. This filter has two purposes, the first of these being to eliminate the signals at frequencies well away from the main signal band. It is mainly signals at frequencies close to harmonics of the carrier insertion oscillator (c.i.o.) that must be eliminated, since these would otherwise combine with the c.i.o. harmonics to produce distortion products on the output signal. It must also attenuate signals at frequencies lying just outside the wanted frequency range. These are produced by the combined harmonic and intermodulation process described previously and are the equivalent of sideband "splatter" in an s.s.b. transmitter. In fact some sets of audio input frequencies will generate signals within the passband of the final s.s.b. filter—r.f. speech processing is not totally distortionless, but in practice the distortion level is very low.

A product detector is used to mix the c.i.o. signal and the output of the filter to reconstitute the audio frequency signal. An attenuator reduces the signal level to one that is comparable to that provided by a microphone.

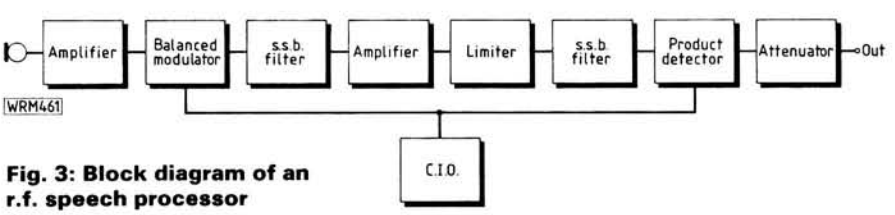


Fig. 3: Block diagram of an r.f. speech processor

Practical Circuit

The circuit diagram of the complete r.f. speech processor appears in Fig. 4. Taking the audio section first, IC1 acts as the pre-amplifier and is an operational amplifier operating in the inverting mode with a voltage gain of 20dB. This works well with medium impedance dynamic microphones and types having similar characteristics, but for operation with a low impedance microphone it is merely necessary to make R3 somewhat lower in value (about 4·7kΩ will suffice), in order to give increased gain and reduced input impedance. The output from IC1 is directly coupled to the input of IC2 via microphone gain control, R5. IC2 is a simple non-inverting amplifier having a gain of about 40dB.

The final stage is a highpass filter having an attenuation rate of 18dB per octave and a cutoff frequency of about 300Hz. There is only limited sideband suppression at low frequencies and it is beneficial to attenuate strong low frequency signals which could cause severe distortion (and which do not aid intelligibility).

In the r.f. section Tr1 is used as a simple 455kHz oscillator which provides the carrier signal. A simple *LC* oscillator gives adequate stability at the relatively low frequency involved here, provided large variations in the supply voltage are avoided. The output is taken from a tapping on the emitter load resistor in order to avoid an excessive drive level.

The balanced modulator, IC4, is an SL1640 integrated circuit. This is not the cheapest of devices, but it gives excellent performance and does not require any carrier balance adjustment. Experiments with simple modulator and demodulator circuits did not provide good low distortion performance—the use of high quality circuits in these positions seems to be at least as important as good filter performance. The 9V supply is dropped and decoupled by R16/C12 to provide the nominal 6V required by IC4.

The first of the filters is CF1, a Murata CFS455J. This has a minimum −6dB bandwidth of 3kHz and a maximum −80dB bandwidth of 9kHz—typical bandwidths are more like 3·5kHz and 8kHz respectively. With the carrier placed at one of the −6dB points this gives an audio passband of approximately 300Hz to just over 3kHz and only represents about 18dB of sideband supression with a 300Hz audio input. However, this is adequate for the present application and the sideband supression increases rapidly as the audio input frequency is increased (almost 40dB at 1kHz and approaching 70dB at 2kHz), giving quite good overall performance.

The source impedance provided by IC4 is somewhat lower than the 2kΩ recommended for the CFS455J, but providing more accurate impedance matching here does not seem to significantly affect performance and has not

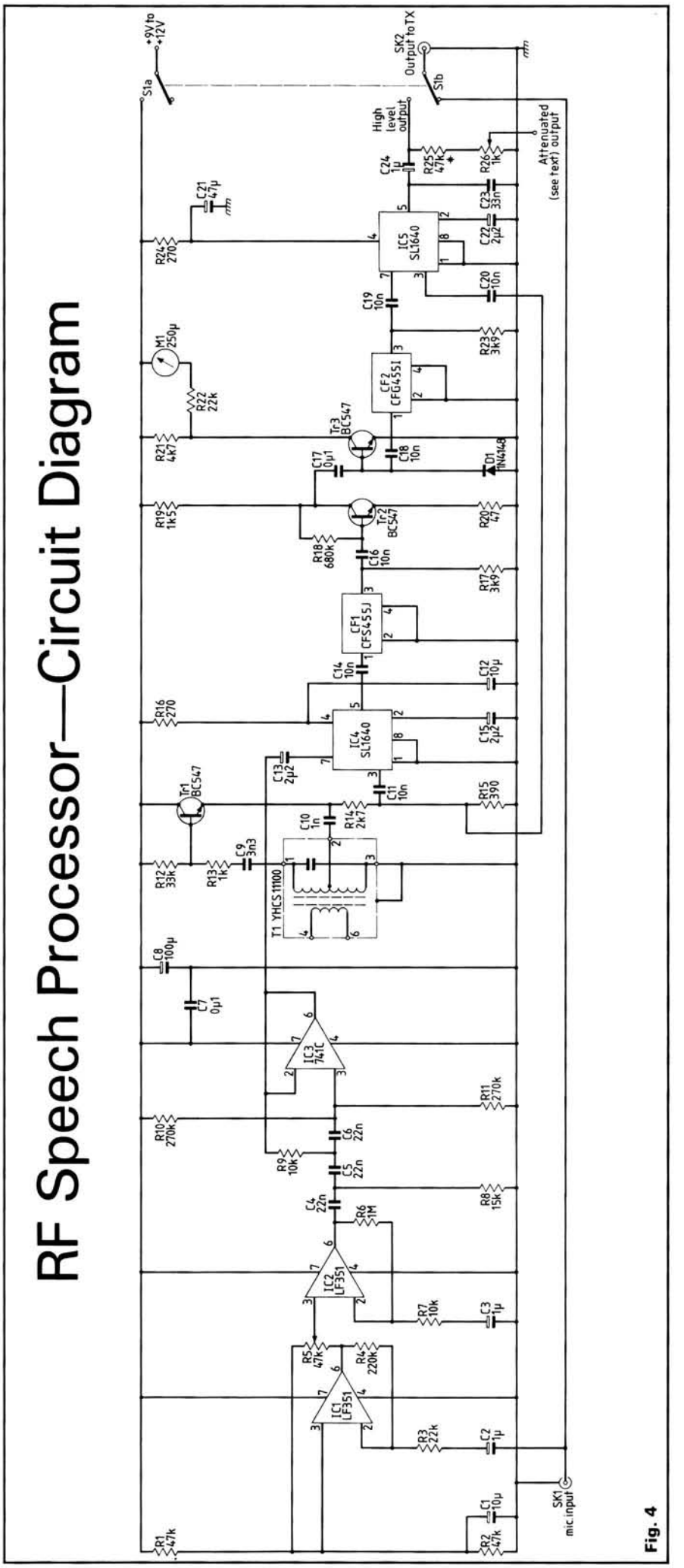


Fig. 4

SHOPPING LIST

Resistors

¼W 5% Carbon film

47Ω	1	R20
270Ω	2	R16,24
390Ω	1	R15
1kΩ	1	R13
1·5kΩ	1	R19
2·7kΩ	1	R14
3·9kΩ	2	R17,23
4·7kΩ	1	R21
10kΩ	2	R7,9
15kΩ	1	R8
22kΩ	2	R3,22
33kΩ	1	R12
47kΩ	3	R1,2,25
220kΩ	1	R4
270kΩ	2	R10,11
680kΩ	1	R18
1MΩ	1	R6

Horizontal skeleton preset

1kΩ	1	R26

Logarithmic carbon potentiometer

47kΩ	1	R5

Capacitors

Polycarbonate/min. polyester

22nF	3	C4–6

Polyester (C280 style)

10nF	6	C11,14,16, 18–20
33nF	1	C23
0·1µF	1	C17

Mylar

1nF	1	C10
3·3nF	1	C9

Radial electrolytic

1µF 63V	3	C2,3,24
2·2µF 63V	3	C13,15,22
10µF 25V	2	C1,12
47µF 25V	1	C21
100µF 16V	1	C8

Disc Ceramic

0·1µF	1	C7

Semiconductors

Transistors

BC547	3	Tr1–3

Diodes

1N4148	1	D1

Integrated Circuits

LF351	2	IC1,2
SL1640	2	IC4,5
741C	1	IC3

Miscellaneous

CFS455J ceramic filter, CF1 (Cirkit stock no. 16-45550); CFG455I ceramic filter, CF2 (Cirkit 16-45542); M1 250µA level meter, M1 (Maplin LB80B); Sub-min d.p.d.t. toggle switch, S1; Jack sockets (SK1/2 see text); Toko YHCS11100 455kHz, T1 (Cirkit 35-11000); 8-pin d.i.l. i.c. holders (5); Printed circuit board; 180 × 120 × 50mm diecast aluminium box or similar; Control knob; Veropins.

been included in the final design. The output load impedance is reduced to the correct figure by R17. Incidentally, ceramic filters of the type used here do not suffer from harmonic and other spurious responses and there is no need to include any ordinary i.f. transformers in the signal path.

The amplifier stage formed by Tr2 boosts the signal to a suitable level for clipping, with the clipping then provided by D1 and the base-emitter junction of Tr3. The clipping is unlikely to be perfectly symmetrical, but this does not seem to adversely affect performance. During positive half cycles when clipping occurs Tr3 is switched on and it is used to drive clipping level indicator, M1. The clipped signal is fed to CF2, the second ceramic filter which is a CFG455I with a minimum –6dB bandwidth of 4kHz and a maximum –80dB bandwidth of 10kHz. Performance of the second filter seems to be far less crucial than that of the first filter and even quite cheap ceramic filters give a reasonable level of performance in this application. The CFG455I gives excellent results, is reasonably inexpensive and represents a good compromise.

Another SL1640, IC5, acts as the product detector and this is much the same as the modulator circuit apart from the inclusion of r.f. filter capacitor C23 at the output. The output socket, SK2, is fed via S1(b) which allows the unit to be bypassed. A choice of fixed high level or variable attenuated output is available by wiring S1(b) to C24/R25 or the wiper of R26. Pinouts are provided on the p.c.b. for this purpose.

Construction

The exact form construction takes must be varied to suit the way in which the processor is to be used. It could be built into an existing piece of equipment, used as part of a newly constructed item of gear or, like the prototype, constructed as a stand-alone unit. Whichever option is selected, the printed circuit design of Fig. 5 can be used as the constructional basis for the project.

None of the devices are m.o.s. types but it is recommended that holders should be used for the i.c.s. There is nothing out of the ordinary about construction of the board and provided the specified types of component are used there should be no difficulty in fitting and connecting each component. Fit Veropins at the points where connections to off-board components will eventually be taken.

If built as a stand-alone unit a metallic case measuring approximately 180 × 120 × 40mm will comfortably accommodate all the parts. The two controls, M1, and the sockets are mounted on the front panel. The sockets must be types which suit the equipment with which the unit is being used and if the microphone is fitted with p.t.t. switching this must be directly coupled through from the input socket to the output of the unit.

Mounting inexpensive panel meters can be rather awkward as there is often no provision for screw fixing and the main mounting hole might not be a circular type. Probably the best way of tackling the mounting hole is to first make a round hole that is just small enough to fit within the required cutout and to then file it out to the correct size and shape, using a small flat file. The meter can either be made a tight push fit into the cutout, or some adhesive can be used to glue it firmly in place.

To complete the unit the p.c.b. is mounted on the base panel using M3/6BA fixings and the hard-wiring is added. The circuit can be powered from any reasonably stable and well smoothed 9V d.c. power supply, or from a 12V supply if R16 and R24 are raised to a value of 560Ω.

If an external supply is used it should be well de-coupled at the point of entry into the case to avoid any problems of r.f. feedback into the audio stages of the transmitter.

For a battery powered unit probably the best option is to use NiCad rechargeable cells (six AA cells in a plastic holder will suffice). An ordinary 9V battery is usable and there is no significant c.i.o. drift as the battery voltage falls due to ageing. However, with a current consumption of over 30mA it could prove to be a very expensive means of powering the unit unless a large type such as a PP9 is used.

Adjustment and Use

The core of T1 must be adjusted to bring the c.i.o. frequency to one side of the unit's passband and as ceramic filters have almost perfectly symmetrical responses, in terms of performance, it does not matter which side it is tuned to. Probably the easiest way of setting the core correctly is to feed an audio signal into SK1 and to monitor the high level output of the unit using medium/high impedance headphones, a crystal earphone, or a suitable amplifier and loudspeaker. The earphone socket of a radio can provide the audio input signal, but the signal must be

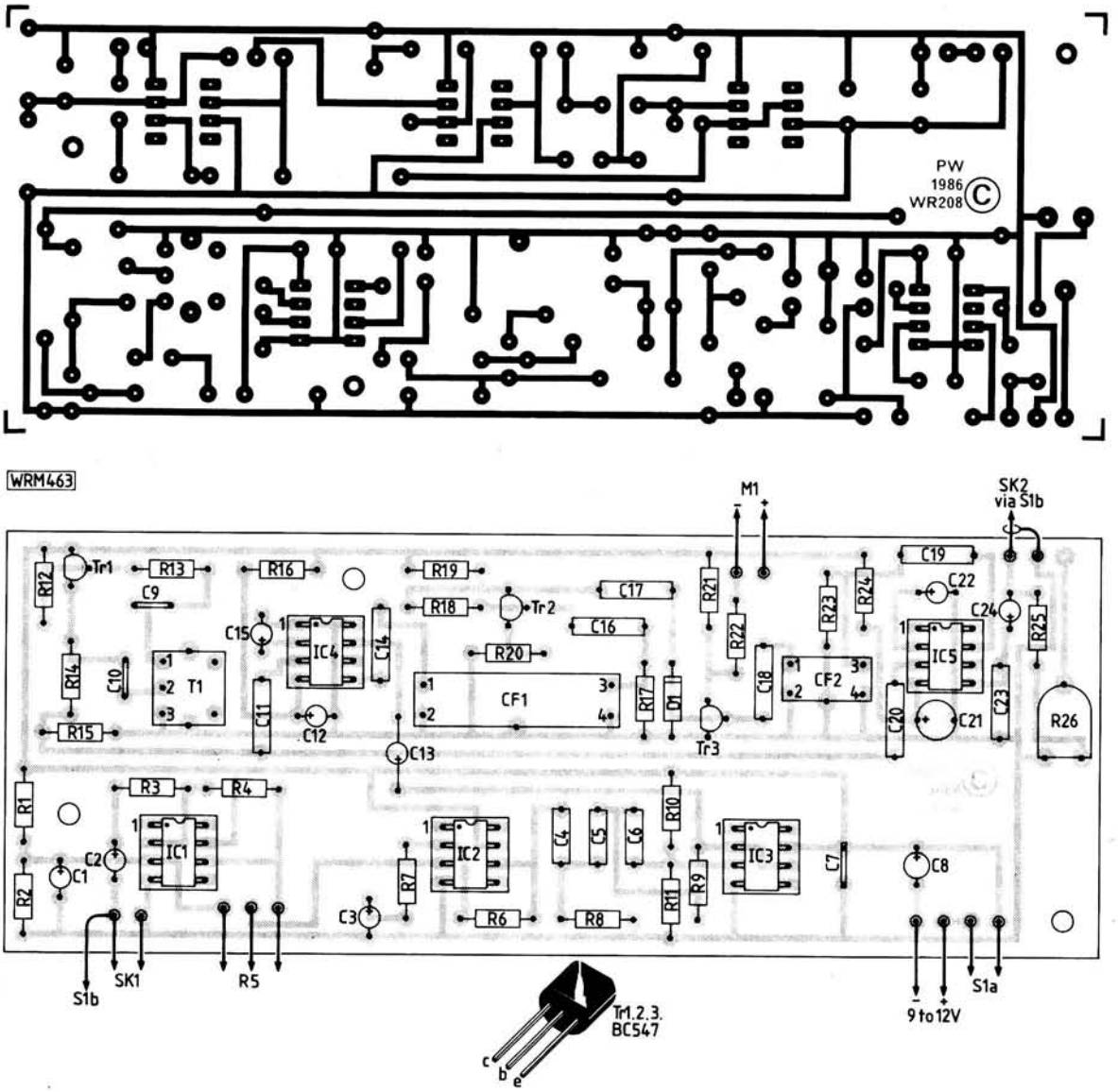


Fig. 5: Full-size printed circuit board track pattern and component location diagram of the r.f. speech processor. Veropin connections are provided allowing the choice of fixed high level or variable attenuated output via S1b. If the variable output level falls below the required drive level, the value of R25 may be reduced until R26 provides adequate control range

How Much? & How Difficult? £47 Intermediate

attenuated using the network shown in Fig. 6. With T1 adjusted so that the c.i.o. frequency is near the middle of the passband the audio output will be rather "dull" sounding and decidedly distorted if the clipping threshold is exceeded. Tuning the c.i.o. to one side of the response should give much better results and the c.i.o. should be taken as far out into one skirt of the passband as possible without incurring any obvious loss of low frequency response on the audio output signal. It is advisable to use a proper trimming tool when adjusting the core of T1 as a screwdriver could damage the core and it could also have a detuning effect that would make accurate adjustment difficult.

Potentiometer R26 can be adjusted to give a particular output level from the low level output if desired, but in most cases it will be satisfactory to merely set this at a roughly mid-way setting. If this variable output level is found to be insufficient R25 may be reduced in value or replaced by a wire link.

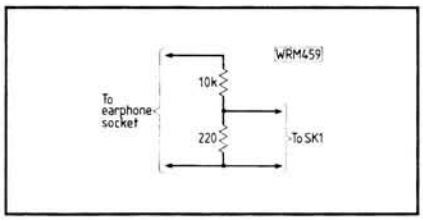


Fig. 6: Signal source attenuator network

Results will probably be best with M1 peaking at about 60 to 70 percent of full scale deflection. Using a radio to provide a speech input signal, and monitoring the output, a little experimentation should soon show the optimum clipping level (and meter reading). Turning up the gain through the clipping level will initially give a substantial increase in volume at the output, but beyond a certain point there is little rise in volume and an increase in distortion. The optimum clipping level is at or just below this point. As an interesting experiment you might care to play some music through the unit. With a baseband processor the intermodulation distortion generates strong non-harmonic frequencies that give a very discordant sound which is painful to anyone even slightly musical. With an r.f. processor the intermodulation distortion is low enough to give quite tolerable results. ***PW***

Delivery In About 2000 Days!

The second half of the 80's is now well under way. But will it provide as many surprises as the last five years? Few predicted the effect that home computing would have on both the radio receiving and transmitting hobby. The list of financial casualties after the European collapse of Citizen's Band interest is another example of how difficult it is to judge the impact of new products and trends. Peter Laughton recently visited Japan to look at the consumer electronics industry for *PW*.

It is not difficult to get lost in Tokyo. Even on the metro, most signs use the Chinese characters. Few people speak English well enough to give directions. But if you have even the slightest interest in communications and electronics, at least find the way to Akihabara station. Step outside, and then get lost in a world that is difficult for the Western visitor to comprehend. Akihabara is packed with electronics shops. Amateur radio gear spills out onto the pavement. Even on Sunday afternoon the area is thriving with Japanese and foreigners alike, looking for a bargain. Larger stores boast familiar TV sets and video-recorders.

But in the centre of Tokyo's electronics district is a two-storey covered market which must be the constructor's dream. Individual stands specialise to the point where you wonder how the owner can make a living. A shop selling plugs, another with only audio transformers. A Japanese colleague was looking for a small 1000μF capacitor. It had to have 150 volt d.c. working voltage. The smiling face behind the counter bowed in traditional style, then disappeared. A few seconds later the owner stretched over to hand us a plastic bowl. In it are a few dozen small capacitors. "What colour did you have in mind?" came the polite request. The choice is unbelievable. So are the low prices, compared to Europe or North America.

Radio communications equipment is only a small section of the giant Japanese electronics industry. Though it doesn't compete with sales of video-recorders and compact-disc players, companies specialising in this field display tremendous pride in their share of the market. Competition is fierce on both a company and personal level. In general, Japanese society does not encourage individual initiative or actions. Being different is disliked not desired.

Yet the "one-family" manufacturer is vital to the whole structure. In the Tokyo suburbs are hundreds of, literally, little houses making specific items for the larger companies. Ferric chloride tanks outside a Japanese house indicate the owner is making printed circuit boards. We found places making nothing but tuning knobs, grub screws, or panels—in fact anything where large scale production is not economic.

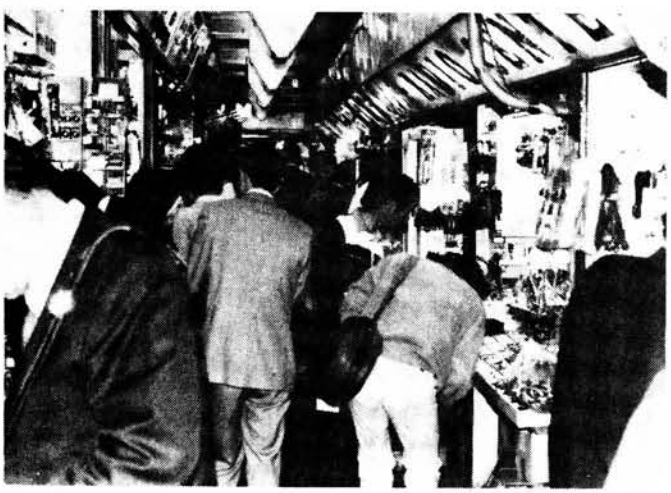
The "Cottage" Industry

Often companies contract out almost everything, including the final assembly. Their offices are purely administration and design. But there are exceptions. For instance, an hour's trip (by bullet train) north of Tokyo, Yaesu-Musen operate their Sukagawa factory. Final assembly of their range takes place there. An engineering section stamps out the panels and metal cases. Computerised machinery fills and solders the printed circuit boards. But components, panel lettering, and knobs all come from outside sources. Quality control in this higher priced field is simple. Incoming components are checked for flaws. If any are found, companies like Yaesu find another supplier. The Japanese "face" is extremely important.

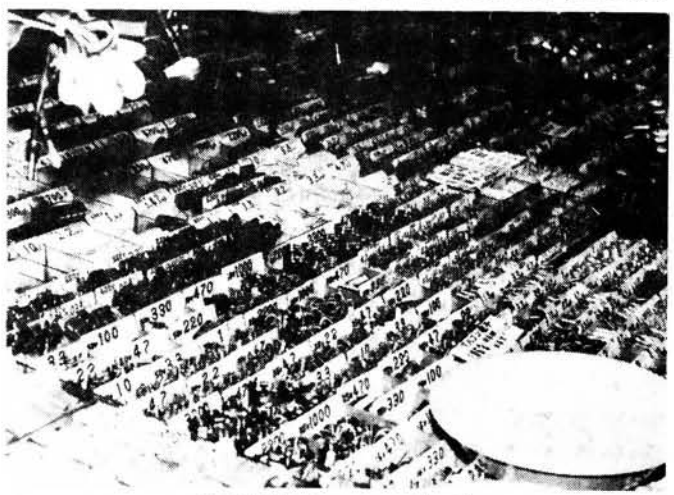
"Limited Feedback"

Many Japanese openly acknowledge their communication problem with other countries. Being an island race, not many display foreign linguistic ability. This has also affected the design of equipment. Transceivers and receivers are still commonly designed primarily for the Japanese domestic market. This trend is changing with the growth in the export market, especially in trade with the Peoples' Republic of China. The confusing, literally translated instruction books with Japanese communications equipment have significantly improved in the last decade. But many instruction booklets with receivers in particular, give the short wave listener very little accurate information as to what to listen to.

Getting feedback to design engineers in Tokyo, from important markets like Western Europe and North America, seems to be a common problem.



Tokyo's electronic component market



Psst! Want a capacitor?

Curious twists in export/import regulations make it cheaper to offer an optional d.c. conversion kit on many transceiver/receivers, than supplying the set with a 12 volt d.c. power input jack installed on the back panel.

Ten years ago there was an enormous boom in the number of Japanese short wave listeners. This was mainly due to the Sony Corporation, who brought out a receiver called the Skyrider, the ICF5800. They teamed up with one of the commercial medium wave stations in Tokyo for a promotional campaign. The Japanese public seem to go through crazes for certain hobbies, golf for instance. In the case of short wave, things really did explode. One non-profit federation quickly recruited some 15 000 members. The peak has passed, mainly because that age group has grown up. It either has less spare time, or has switched to the new MSX home computer craze. But a healthy interest in communication remains. Many younger Japanese feel insecure, and are becoming aware of their limited foreign language skills. Japanese broadcasts from foreign stations usually include language lessons. The national short wave commercial network, Radio Tampa, devotes airtime to a sort of media programme, rebroadcasting tapes from foreign stations, mostly in English.

Japanese Trends

So what can we expect in the next 2000 days? More integration. The drop in the price of memory chips means that software control of a receiver and/or transmitter is becoming much more economically attractive. Manufacturers design new products based on the existing market place. Numbers of units sold remains a closely guarded secret. Price is an often over-riding factor. A simple £5 variable audio notch filter which might considerably improve the enjoyment of a communications receiver is out of the question. It doesn't fit into the price versus specifications battle. The same applies to the narrower, more selective filters, or receiver incremental tuning facilities that European reviewers seem to miss.

Until, that is, the competition comes out with it. People inside the industry light-heartedly explain that in Japan it's interesting to start a rumour that you've heard company Y is planning to launch a synchronous detection full coverage receiver with sharp filters, etc, etc. Within a year company X may launch it.

The days of servicing your own equipment are clearly passed. There is some curious built-in obsolescence, such as software held in RAM powered by lithium batteries. The latter have a lifetime of around 7 years, after which they need to be changed, and the receiver (e.g. Icom IC-R71) re-programmed by the manufacturer or an authorised agent. The trend is to ask the hobbyist to develop the software side, instead of hardware.

A computer survey is currently under way by the European DX Council. Preliminary half-time results show a strong interest amongst the short wave/amateur radio community in using a home computer to control a trans/receiver **providing** the current problem of mutual interference is solved. Two manufacturers, Yaesu and Icom offer facilities on some of their equipment for external control via an RS232 communications port. The latter company has yet to launch successful software, though the listening community has already beaten them to it. In future, some form of standardisation is expected, maybe along the lines built up by Yaesu so far.

More intelligent receivers are certainly on the way. As concepts such as packet radio become more common, the ability to handle orbital and propagational information needs to be built in. Critics might argue that this will increase the number of "black-box" operators. But challenges still exist for the hobbyist, especially in modes such as FAX and SSTV, albeit in a different form from now.

And Europe?

Europe tends to concentrate on supplying the professional end of the communications market. Few hobbyists can afford a new Racal, Rhode and Schwarz, or Siemens monitoring equipment. Production costs here are higher, as one entrepreneur found out only a few months ago. Eska Elektronik, a Danish company, announced a deluxe, high performance communications radio for the serious short wave listener as long ago as January 1984. They were declared bankrupt in April 85. However, it looks as though an established Dutch electronics company, Alreso Elektronica in Zaandam, a few km north-west of Amsterdam intends to save the main product that the Danish Eska had been working on, namely the RX99PL receiver. The Dutch company specialises in software for industrial computer control. The RX99PL is a communications receiver, controlled by a built-in computer. The front panel has some 56 touch-sensitive switches, so you can not only key in the frequency you want to listen to, but how wide the filter bandwidth should be, how the receiver should scan the band, whether the signal is a.m. s.s.b., or narrowband f.m., in fact the list goes on.

A sample run of 25 receivers appeared with selected dealers towards the end of 1985, with availability from the Dutch factory expected in early 1986. But the cost of more than £1750 for the basic portable model, puts the receiver well beyond the average hobbyist, despite the impressive specifications.

There is also a trend for much wider coverage receivers. Research shows a growth in broadcast listening amongst amateur radio operators as a result of general coverage receiving sections in transceivers. The launch of Yaesu's FRG-9600 and Icom's IC-R7000 with coverage to above 900MHz opens new horizons for communication experiments.

Digital Car Radio

Finally, we can expect more use of digital techniques in radio as well as TV. As you drive around Europe, one of the most important pieces of information you need is news of road conditions. In most countries this is simply given verbally by a presenter. In West Germany and Austria, all traffic news is preceded and followed by a

The home of Yaesu radio

A Yaesu transceiver on final test

tone system. Developed by Blaupunkt, the ARI system is designed to activate specially adapted car radios. They're really two receivers in one. A section of the car radio monitors the channel carrying the traffic information. When the tones are broadcast, the receiver interupts the cassette player if you were listening to music, or indeed switches itself on if you were driving in silence. You get the traffic news, and then the radio returns to what it was doing previously. In Britain a medium wave system called CARFAX said to be better than the German system never got past the laboratory stage.

But recently the European Broadcasting Union set down standards for yet another car information system, this time digital. Directly related to this, the Dutch Philips concern recently announced details of a car navigation system they're working on, incorporating a speech synthesiser.

The demonstration proves that the voice beats any backseat driver. It is certainly safer than trying to read a map of a strange city balanced on your knees as you peer outside for street name signs. Research is concentrated just outside Eindhoven, where a van has been fitted out with a prototype of the so called Car Information or "CARIN" system. Next to the steering wheel, a monitor and a keyboard have been installed, plus a car compact disc player. Directions are read from road maps loaded onto a compact disc, not paper. The average disk has a 600 megabyte capacity, equivalent to a pile of road maps more than 15m tall. The computer knows the main roads, so you don't find yourself trying to drive through a housing estate, and one-way systems. Maps in the digital form needed for future map compact discs are already available for many parts of Western Europe. Having input your starting position, and destination, the car navigation system gives instructions (turn left, fork right, etc.) before each junction. The system is being designed to cope with digital traffic information encoded into f.m. radio signals. The initial cost will be high, around £2000 for the complete system. But mass production will no doubt reduce the cost, depending on when it is introduced within the next five years. ***PW***

The prototype Philips "CARIN" system

SWAP SPOT

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issues of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale—and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

The appropriate licence must be held by anyone installing or operating a radio transmitter.

Have Avometer model 40, also Pye Reflectometer/s.w.r./power meter (as new) also many valves, etc. Would part exchange for cheap 144MHz mobile or handheld rig. Tel: 0935 25225. *A804*

Have Pye AC10 12V 10A p.s.u., ASP 430MHz base station colinear antenna, Micronta mains digital clock. Would exchange for anything radio/computer/music. M. Hahn G4JRB, 21 Stanley Road South, Rainham, Essex. *A815*

Have an extensive modern 00 scale model railway collection. All items in v.g.c., mostly unused, some items still boxed. Locos, carriages, track and accessories. Would exchange for anything h.f. in working order. John. Tel: Swindon 854293. *A822*

ERRORS & UPDATES

On the air—Amateur Bands January 1986

Our very sincere apologies go to Dr J. A. V. Pritchard GW1HGO of Cardiff, whose callsign was inadvertently attributed to Mr. M. F. Newell G1HGD of Kenilworth, Warks. We are sorry for any confusion caused.

Avon

City of Bristol RSGB Group: C. R. Hollister G3SQQ (Bristol 508451). Meets 4th Mondays, 7.30pm in the Small Lecture Theatre, University Walk, University of Bristol, Clifton. Feb 24—G5HD of RSGB EMC Committee.

North Bristol ARC: Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol 7. Meets Fridays, 7pm at the Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol. Feb 21—Air Traffic Control by G3HKA; March 7—Railways by Ron Gardiner.

South Bristol ARC: Len Baker G4RZY (Whitchurch 834282). Meets Wednesdays, 7.30pm at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. Feb 12—144MHz s.s.b. Activity; 19th—Surplus Equipment Sale.

Bedfordshire

Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm in the Church Hall, Ampthill Road, Shefford.

Berkshire

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

Cambridgeshire

Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848). Meets 4th Thursdays, 7.30pm at Southfields Junior School, Stanground, Peterborough. Feb 27—VHF DXpedition by G4DHF.

Central

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

Cheshire

Chester & District RS: Dave Hicks G6IFA (Chester 336639). Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm at Chester RUFC, Vicars Cross, Chester. Feb 11—HF Antennas by G3EWZ; 18th—G3VYB from Microwave Modules visits.

Clywd

Conwy Valley RC: N. Vicars-Harris GW4VVW (Conwy 636376). Meets 2nd and 4th Thursdays, 8pm at the Green Lawns Hotel, Bay View Road, Colwyn Bay. Feb 13—Test Equipment by GW3JGA.

Cornwall

Plymouth ARC: John Veale G4SCA (Plymouth 337980). Meets 1st and 3rd Mondays, 7.30pm in the Plymouth RFC, Beacon Park, Peverell. Feb 17—St John Ambulance talk; March 3—Antennas and Pye Equipment Mods.

Plymouth Polytechnic ARS: Darren Dalter G1ERM, 92 Alma Road, Pennycomequick, Plymouth. Radio Shack on the Science Block top floor is open Wednesday afternoons.

Cumbria

Carlisle & District ARS: Tony Leach G4WOQ (Scotsby 500). Meets Mondays, 7pm in the Scout Hut, Trinity School, Carlisle. Bank Holidays at the Grosvenor Hotel.

CLUB NEWS

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

Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith. Meets 3rd Thursdays, 7.30pm in the Kings Arms, Temple Sowerby (on the A66). Feb 20—RTTY by G4AFU; March 20—AGM.

South Lakeland ARS: Dave Warburton G6LKB (Barrow-in-Furness 54982). Meets 1st and 3rd Thursdays, 8pm in the NORWEB S & SC, Ormsgill Hotel, Barrow-in-Furness.

Westmorland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal. Meets 2nd Tuesdays, 8pm in the Strickland Arms, Sizergh, nr Kendal.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Fridays, 7.30pm in the Cavalier, West Street, Axminster. Feb 7—G6CJs *Aerial Circus* Video; March 7—Simple Receiver Construction by G3MYM.

Tiverton (SW) RC: G. W. Draper G4ZNV (Crediton 235). Meets Tuesdays, 7.30pm in the Half Moon Inn, Fore Street, Tiverton, Devon.

Torbay ARS: Brian Wall G1EUA (Teignmouth 78554). Meets Fridays and last Saturdays, 7.30pm in the ECC Social Club, Ringslade Road, Highweek, Newton Abbot.

Dorset

Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Fridays, 7.30pm in the Commander's House, Constitution Hill Road, Poole. Feb 28—50MHz band.

Dumfries & Galloway

Maxwelltown ARC: C. D. S. Rogers GM4NNC, 5 Elder Avenue, Lincluden. Meets 1st and 3rd Wednesdays, 8pm in the Tam O'Shanter Inn, Queensberry Street, Dumfries. Feb 19—VU7 DXpedition film.

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

Dyfed

Aberporth RAC: Frank Thomas GW6RDR (Cardigan 87274). Meets Thursdays, 7pm in Building 17, Royal Aircraft Est., Aberporth.

Essex

Braintree & District ARS: Dave Willicombe G0DEC (Braintree 45058.) Meets 1st and 3rd Mondays, 7.30pm in Braintree CAC, Victoria Street, Braintree. Feb 7—Club Dinner at the Old Court Hotel; 17th—BNOS Equipment by G8UYN and G6FQE.

Colchester Radio Amateurs: F. R. Howe (Colchester 851189). Meets 1st and 3rd Thursdays, 7.30pm in the Colchester Institute, Sheepden Road, Colchester. Feb 20—Canadian Rockies by G4PAY; March 6—G4FRX and G4HMF of the RSGB; 20th—Crime Prevention Officer.

Havering & District ARC: D. St J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm at the Fairkytes Arts Centre, Billet Lane, Hornchurch. Feb 19—Contest Operating by G4ZTR, G4VIX and G4ZST.

Southend & District RS: Brian Wood G4RDS (South Benfleet 50494). Meets Fridays, 7.30pm in the Rocheway Centre, Rocheway, Rochford. June 1—Mobile Rally.

Fife

Glenrothes & District ARC: Anne Edmondson GM4TCW (Glenrothes 744449). Meets Wednesdays and 3rd Sundays, 7.30pm at Provosts Land, Leslie. Theory on Mondays and c.w. on Tuesdays, 7pm at Balwearie High School, Kircaldy.

Glamorgan

Rhondda ARS: John Howells GW4BUZ (Tonypandy 432542). Meets Thursdays, 7.30pm in the NUM Club, Tonypandy, Rhondda. Feb 20—Measuring s.s.b. Power Outputs by GW3NWS; March 6—Slide Show on the WAB Award.

Greater Manchester

South Manchester RC: Dave Holland (061-973 1837). Meets Fridays, 8pm in Sale Moor CC, Norris Road, Sale.

Gwent

Abergavenny & Nevill Hall ARC: J. B. Davies GW4XQH (Abergavenny 4655). Meets Thursdays, 7.30pm in the Pen-Y-Fal Hospital, above Male Ward 2. Code Classes start the evenings as well as RAE.

Pontypool ARS: Ivor Wilkinson GW4RJA (Cwmbran 72110). Meets Tuesdays (in term time), 7pm in the Settlement, Rockhill Road, Pontypool.

Gwynedd

Merion ARS: Ken Judge GW4KEV, Tyddyn Mawr, Arthog. Meets 1st Thursdays, 7.30pm in the Dolserau Hall Hotel, Dolgellau. March 6—Homebrew Competition.

Hampshire

Basingstoke ARC: Dave Burleigh G4WIZ (Tadley 5185). Meets 1st Mondays, 7.30pm in the Forest Rings CC, Sycamore Way, Winklebury. March 3—RSGB Technical Film; 8th—Special Event Station at Basingstoke Library Exhibition.

Binstead ARS: A. F. Knight G4RTT (IOW 295951). Meets Wednesdays, 7.30pm in the 1st Ryde/1st Binstead Scout HQ, Binstead, IOW.

Fareham & District ARC: Brian Davey G4ITG (Fareham 234904). Meets Wednesdays, 7.30pm in the Porchester CC, Westlands Grove, Porchester, Room 12. Feb 26—Radio Components by G4ITF.

Farnborough & District RS: Peter Taylor G4MBZ, 12 Dunbar Road, Paddock Hill, Frimley, Camberley. Meets 2nd and 4th Wednesdays, 7.30pm in the Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough. Feb 12—Members Discuss Their Favourite Piece of Equipment; 26th Open evening for RAE and c.w. Students.

Horndean & District ARC: Dan Barnard G4RLE, 36 Guildford Road, Fratton, Portsmouth. Meets 1st Thursdays, 7.30pm in the Merchiston Hall, London Road, Horndean.

Hereford and Worcester

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

Hereford ARS: F. E. G. Cox G3WRQ, 35 Thompson Place, Hereford. Meets 1st and 3rd Fridays, 7.30pm in the County Control CD HQ, Gaol Street, Hereford. March 6—Talk by G8OHH.

Kidderminster & District ARS: Tony Hartland G8WOX (Kidderminster 751584). Meets 1st and 3rd Tuesdays, 8pm in the Vice Presidents Club, Harriers Football Ground, Hoo Road, Kidderminster. Feb 18—Surplus Gear Sale.

Hertfordshire

Borehamwood & Elstree ARS: Tony G0DDJ (01-207 3809). Meets 3rd Mondays, 7.30pm in the Wellington, Theobold Street, Boreham Wood. Feb 17—AGM.

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

Stevenage & District ARS: Frank Wilson G4ISQ (Baldock 893736). Meets 1st and 3rd Tuesdays, with c.w. at 7.30pm at Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage. Feb 18—Junk Sale; March 4—Receiver Alignment.

Welwyn Hatfield ARC: Dave Fairbank G0AII (Welwyn Garden 326138). Meets 1st and 3rd Mondays, 8pm in the Knightsfield Scout HQ, Welwyn Garden City.

Humberside

Hornsea ARC: Richard Guttridge G4YTV (Skirlaugh 62498). Meets Wednesdays, 7.30pm in the Mill, Atwick Road, Hornsea.

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesdays, 8.30pm in the Downe Village Hall as from Feb 18.

Bredhurst R & TS: A. S. White G4EGH (Medway 388760). Meets Thursdays, 8.15pm in Parkwood CC, Parkwood, Rainham. Feb 20—Radio in the Old Days by G1CNS.

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

East Kent RS: A. G. Stone G4UPJ, 86a Joy Lane, Whitstable. Meets 1st and 3rd Thursdays, 7.30pm at Herne Bay Youth Centre, The Cabin, Kings Road, Herne Bay. Feb 18—Power Supplies by an ILP Electronics rep.

West Kent ARS: Nigel Peacock G4KIU (Tunbridge Wells 33586). Meets Fridays, 8pm in the AEC Annex, Quarry Road, Tunbridge Wells. Feb 7—Junk Sale; 21st—Contesting by G4BUQ.

Lancashire

Bury RS: Miss C. J. Ashworth G1PKO (061-764 5018). Meets Tuesdays, 8pm in the Mosses Youth and CC, Cecil Street, Bury. Feb 9—Hamfeast at 11am; 11th—HF Station Installation by G4JAG.

Morecambe Bay ARS: W. E. Delamere (Heysham 52659). Meets Mondays, 7.30pm in the canteen, Luneside Eng Co, Mill Lane, Halton. Feb 17—Film Show; 24th—Code Class.

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

Skelmersdale & District ARC: Gordon Crowhurst G4ZPY (Ormskirk 894299). Meets Thursdays, 8pm in the Beacon Park Centre, Dalton Lane, Skelmersdale.

Thornton Cleveleys ARS: Mrs Milne G4WIC (Blackpool 821827). Meets Mondays, 7.45pm in the 1st Norbeck Scout HQ, Carr Road, Bispham, Blackpool.

London

Ealing & District ARS: Anton Berg G4SCR (01-997 1416). Meets Tuesdays, 7.30pm in Northfields CC, 71a Northcroft Road, London W13.

Grafton RS: John Kaine G4RPK, 74 Camden Mews, London NW1. Meets 2nd and 4th Fridays, 8pm in the Five Bells, East End Road, East Finchley.

Wimbledon & District ARS: George Cripps G3DWW (01-540 2180). Meets 2nd and last Fridays, 7.30pm in the St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Feb 14—Past Field Days by G3PVA; 28th—Top Band Matters; March 7—Surplus Equipment Sale.

Middlesex

Echelford ARS: Peter Coleson G4VAZ (Sunbury 783823). Meets 2nd Mondays and last Thursdays, 7.30pm in The Hall, St Martins Court, Kingston Crescent, Ashford. Feb 16—Receiver Alignment by G3GLB; 27th—Surplus Equipment Sale.

Edgware & District RS: John Cobley G4RMD (Hatfield 64342). Meets 2nd and 4th Thursdays, 8pm at 145 Orange Hill Road, Burnt Oak, Edgware. Feb 27—Technical Topics by G3PSP.

Nottinghamshire

Mansfield ARS: Angela Fisher G1DZH (Mansfield 652812). Meets 1st Fridays and 3rd Tuesdays in the Victoria SC, Mansfield. April 4—Constructors Competition.

ARC of Nottingham: Ian Millar G4JAE (Nottingham 232604). Meets Thursdays, 7.30pm in Sherwood CA, Woodthorpe House, Mansfield Road, Nottingham. Feb 13—Spring Junk Sale; 20th—Operating Overseas; 27th—Forum; March 6—SMC Talk and Demo.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets Tuesdays, 7.30pm at the Sun-Aqua Club, The Maltkins, Gateford Road, Worksop. Feb 11—QRP by G6DCT; 25th—Lecture by G3ZVG.

Oxfordshire

Vale of White Horse ARS: Janet Baker G4SYL (Didcot 816845). Meets 1st and 3rd Tuesdays, 7.30pm in the Waterwitch, Cockroft Road, Didcot.

Somerset

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm in the Recreation Centre, Chilton Grove, Yeovil. Feb 13—Plotting JFET Characteristics by G3MYM; March 6—On Diodes; Feb 20—Relays in Amateur Equipment.

Staffordshire

Cannock Chase ARS: B. Robinson G1FEC (Cannock 74521). Meets Thursdays, 8pm in the Bridgtown Memorial Club, Bridgtown, Cannock.

Strathclyde

Ayr Amateur Radio Group: R. D. Harkness GM3THI (Ayr 42313). Meets alternate Fridays, 7.30pm in the Wellington Leisure Centre, Wellington Square, Ayr. Feb 7—50MHz by GM4NFC; 21st—Radio in ZS by ZS6CBF; March 7—Repeater Mystique by GM4COX.

Helensburgh ARC: Dave Reid GM0BZF, 28 Bainfield Road, Cardross, Glasgow. Meets Mondays and Thursdays, 7.30pm in the Cairndhu Nursing Home (Cellars), The Old Cairndhu Hotel, Rhu Road, Helensburgh. Amateur Radio and computing catered for.

West of Scotland ARS: Ian McGarvie GM4JDU (Brediland 2708). Meets Fridays, 7.30pm in the clubrooms at 154 Ingram Street, Glasgow. Feb 21—Reports from "Down Under" by GM4PHG (ex VK5ASC); March 7—QRP by GM30XX.

Suffolk

Ipswich RC: Jack Toothill G4IFF (Ipswich 44047). Meets 2nd and last Wednesdays, 8pm in the Rose and Crown Club Room, 77 Norwich Road, Ipswich.

Surrey

Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays and last Thursdays, 8pm in St Swithuns Church Hall, Grovelands Road, Purley.

Dorking & District RS: J. Greenwell G3AEZ (Newdigate 236). Meets 2nd and 4th Tuesdays, 8pm in the Star and Garter Hotel, Dorking, for informal meetings, others at Ashcombe School.

Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam. Meets 3rd Fridays, 7.30pm at the Downs LT Club, Holland Avenue, Cheam. Feb 15—Annual Dinner at the Stoneleigh Inn; 21st—Junk Sale.

Sussex

Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesdays and 3rd Thursdays, 7.30pm in the Fernleigh Centre, 40 North Street, Chichester.

Hastings Electronics & RC: Dave Shirley G4NVQ (Hastings 420608). Meets 3rd Wednesdays, 7.45pm in the West Hill CC, Croft Road, West Hill, Hastings. Meets Tuesdays and Fridays in the Club House, Downey Close, St Leonards-on-Sea. March 8—Grand Dinner & Dance with Southdown ARS and RAYNET at the Horshoe Inn, Windmill Hill, Herstmonceux at 7.30pm.

Tyneside

South Tyneside ARS: P. W. Grainger (South Shields 543955). Meets Mondays, 7.30pm in the Martec Club, S. Tyneside College, Grosvenor Road, Tyneside.

Warwickshire

Atherstone ARC: Roy Fuller G6YQU (Chapel End 393518). Meets 2nd and 4th Mondays, 7.30pm during school times in the Physics lab, Atherstone Upper School, Long Street, Atherstone.

Rugby ATS: Kevin Marriott G8TWH, 41 Foxon's Barn Road, Brownsover, Rugby. Meets Tuesdays, 7.30pm in the Cricket Pavillion, BTI Radio Station, Building "B", Hillmorton, Rugby. Feb 18—Talk by Radio Interference Service.

Stratford upon Avon & District ARC: David Boocock G8OVC (S-u-A 294387). Meets 2nd and 4th Mondays, 7.30pm in the Baptist Church, Payton Street, S-u-A. Feb 10—Film Night; 24th—VHF Antennas by G4ABS.

West Midlands

South Birmingham RS: Tim Scrimshaw G8RGQ (021-459 8312). Meets 1st Wednesday, 7.45pm in West Heath CC, Hamstead House, Fairfax Road, West Heath, Birmingham.

Midland ARS: Norman Gutteridge G8BHE, 68 Max Road, Quinton, Birmingham. Meets every evening at Unit 5, Henstead House, Henstead Street, off Bromsgrove Street, Birmingham 5.

Mirfield RC: C. Marks G4ZPJ, 63 Alvis Walk, Chelmsley Wood, Birmingham. Meets Mondays to Thursdays, 7.30pm at the Mirfield CC, Yockleton Road, Lea Village, Birmingham. Club 'phone number is 021-783 5898.

Willenhall & District ARS: John Phillips G4UPF (Wombourne 782076). Meets Wednesdays, 8.30pm in the Cross Keys, Prouds Lanes, Willenhall.

Wolverhampton ARS: Keith Jenkinson G1OIA (Wolverhampton 24870). Meets Tuesdays, 8pm in Wolverhampton Electricity S & SC, St Marks Road, Chapel Ash, Wolverhampton. Feb 18 and 25—Discussion Nights.

Wiltshire

Blackmore Vale ARS: M. R. Bailey, 11 Brines Orchard, Templecombe. Meets 2nd and 4th Tuesdays in the Bell and Crown Inn, Zeals. Feb 11—Telecoms by a BT Rep.

Devizes & District ARC: Peter Greed G3MQD, 18 Nursteed Park, Devizes. Meets Fridays, 8pm at Devizes Football SC, Devizes.

Salisbury Radio & Electronics Society: Neil Underwood G4LDR (Amesbury 22809). Meets Tuesdays, 7.30pm in the Grosvenor House Centre, Churchfields Road, Salisbury.

Trowbridge & District ARS: Gerry Callaghan G4SPE (Trowbridge 4532). Meets 4th Tuesdays, 8pm in Southwick Village Hall, near Trowbridge.

Cover Date	Deadline	For events from early
May	Feb 15	April
June	Mar 15	May
July	Apr 15	June

Yorkshire

Halifax & District ARS: David Moss G0DLM (Halifax 202306). Meets 3rd Tuesdays, 7.30pm in the Running Man, Pellon Lane, Halifax. Feb 18—Converting CB Rigs by G4YDI; March 18—Junk Sale.

Pontefract & District ARS: Colin Mills G0AAO (Pontefract 43101). Meets Thursdays, 8pm on the top floor, Carlton CC, Pontefract. Feb 13—Club Project Evening.

Spen Valley ARS: Tim Clough G4PHR (Mirfield 499397). Meets Thursdays, 8pm in the Old Bank WMC, Mirfield. Feb 20—Chassis Bashing; March 6—Film Show.

Todmorden & District ARS: J. Gamble G6MDB (Todmorden 2494). Meets 1st and 3rd Mondays, 8pm in the Queens Hotel, Todmorden.

Wakefield & District ARS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. Feb 18—Next Meeting.

North Wakefield RC: S. Thompson G4RCH (Morley 536633). Meets Thursdays, 8pm in the White Horse, East Ardsley. Feb 20—Coach Visit to Jorvik Museum in York; March 6—Social Evening.

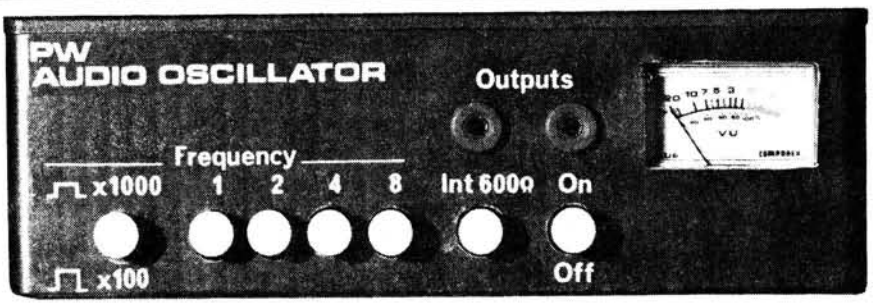
White Rose ARS: Steve Clack G4YEK (Harrogate 884481). Meets Wednesdays, 8pm in Moortown RUFC, Moss Valley, King Lane, Leeds. March 5—Judging the Constructors Contest and Prizes.

30▶

nation, set frequency select switch "1" to "ON", leaving the other switches in the "OFF" position and set the multiplier to "×1000". A 1kHz tone should now be present at the output—listen with an earpiece to confirm the oscillator is working and the frequency is more or less correct. Using a multimeter set to a low a.c. voltage range measure the level at the output terminals. This should be approximately 0·775. Deselect the internal termination and check that the meter reading rises to 1·55V. The basic testing is now complete and has covered d.c. conditions, oscillator function, output stage and output impedance. All that remains is to check each frequency setting and set the output indicator to read a convenient value.

It is best to check each frequency setting with an oscilloscope as this will allow approximate measurement of period—and hence frequency—as well as output voltage—remember the oscilloscope will indicate peak to peak not r.m.s. The peak to peak equivalent of 0·775 r.m.s. is 2·2V. Finally, choose a value for R16 that gives a convenient reading on the output indicator.

Spreads in the thermistor characteristics may make it necessary to adjust the value of R9 to set the output to the reference level. Decrease R9 to decrease the output and *vice versa*. To aid stability a preset potentiometer was deliberately not used for R9. The best way to adjust the output level is to find a preferred value for R9 that gives an output level slightly above reference. Experimentally shunt R9 with resistors at least 10 times its value until the correct output level is achieved. The resistor combination is then soldered in place.



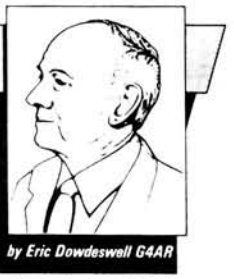
Front panel view of the completed oscillator. Round push-buttons have been used to simplify the cutting of the clearance holes in the panel

Settling Time

A final practical point remains—this little test oscillator has a simple thermistor amplitude stabilisation circuit. This has a certain time constant which in practical terms means the output will take a little time to settle after switch-on or changing frequency. During the settling time, a fraction of a second at the higher frequencies—a little longer at l.f., the output can rise well above the reference level, particularly at switch-on. For this reason and in order to avoid possible damage to equipment being tested, it is a wise precaution to switch the oscillator on before connecting to the test circuit, similarly it may also be wise to disconnect the oscillator before changing frequency. ***PW***

ON THE AIR

AMATEUR BANDS



by Eric Dowdeswell G4AR

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

As readers will know I always take the opportunity to recommend the use of an antenna tuning unit (a.t.u.) between the antenna and the receiver in order to boost the signal before reaching the receiver, generally known as resonating the antenna. One correspondent took me to task, albeit gently, on this point because, he said, resonating the a.t.u. never made any difference to the audio level of the signal.

I'm glad to hear it! If that is true then it shows that the automatic gain control (a.g.c.) system is doing it's job well, maintaining a constant level, more or less, of audio over a wide range of input signal levels.

The usual method of adjusting the a.t.u. controls is to tune for maximum deflection on the receiver's S-meter, which is driven from the a.g.c. line. The a.g.c. circuits only operate above a certain signal input level, called the delay level, and for signals below that level you must tune the a.t.u. "by ear" for maximum audio output from the receiver.

If a weak wanted signal is very close in frequency to a strong unwanted one, the a.g.c. will respond to the strong signal, reducing the receiver's gain so that the weak signal disappears. In this situation it is best to switch the a.g.c. off, turn the audio gain control up to near maximum, and control the audio level with the r.f. gain control.

Ideally, the receiver should have an a.g.c. switch which will give FAST and SLOW time-constants as well as an OFF position. For strong signals, the FAST position is best for c.w. and the SLOW position suits s.s.b. and a.m. modes.

General

The Havering & District ARC tells me that Len Ensor G4YHD died suddenly at the age of 81. A South African, Len was originally ZT6AB in 1933 which became ZS6BJ and his sons are Norman ZS6OO and John ZS6AEW. He married and settled in the UK in 1968 and became G5AQQ and subsequently G4YHD when that type of G5 call was withdrawn. Being an overland telegraphist in his early days Len was able to help many members of the club to their "A" licences.

Two Hungarian amateurs are engaged in a trip round some exotic spots in their 9·6m-long yacht *St Jupat* using the callsign HG4SEA/MM. In addition to navigation equipment the yacht has a Yaesu FT-7B, a Hustler rig and Yaesu mobile antennas. The two crew, Jozsi and Nandi, had a trial trip around the Mediterranean during the summer and are now off to visit ZB2, EA9, EA8, ZD8, ZD7 and ZD9, then round the Cape of Good Hope to FB8W, FB8Z and to VK where they will stay a few months. After that it's on to ZL and Polynesia, Cape Horn, LU, PY and some islands in the Caribbean Sea and finally across the Atlantic and home. A computer program run by HA5AM handles schedules for the yacht and activity planned for Mondays, Wednesdays and Fridays starting around 1200Z on either 14·262 or 21·255MHz. Net control stations are HG1S, HG1W, HA4KYN, HG5A, HG6V, HG7B and HG9R and other possible frequencies are 3·675, 7·075, 14·265, 21·255 and 28·505MHz, with QSLs to HA5NP, either for QSOs for s.w.l.s. Any other info to Charlie HA4XH, POB 13, Szekesfehervar 8007, Hungary. Thanks to Bob Senft G0AMP for this information.

For readers learning Morse code the c.w. transmissions from the VERON HQ station PA0AA can be very useful, transmitted on 3·602, 14·103, 144·8 and 433·45MHz from 1830Z to 2100Z every Friday, with news in Dutch at 1830 and 2030, news in English at 1845 and 2045, Morse for beginners at 1900 and advanced code at 1930 changing to RTTY at 2000Z. Code proficiency tests are given on the last Friday of the month at the Morse times, starting with 15 w.p.m. and in 5 w.p.m. steps to 40 w.p.m. More details are available from VERON, POB 220, AE Nuenen, Netherlands.

DX Bands

Despite the fact that the sunspot number continues to hover around zero readers are managing to log or work some good DX on the h.f. bands, although 3·5 and 1·8MHz are steadily coming into their own with some excellent DX recorded. Even 28MHz has come up with some exotic stuff from time to time and should never be ignored. It is still fair to say that 28MHz is often proclaimed to be "dead" when in fact conditions will support some measure of DX — the trouble being that everyone is listening and nobody calling! So try that odd CQ DX and be surprised at what turns up.

First this month must come a letter and log from **Peter Davies** of Rhyl (Clwyd, N. Wales) who is a climbing instructor in Snowdonia. He has made an 18km round trip to the summit of Snowdon at 1085m a.s.l. taking a Yaesu FRG-8800 and Daiwa CNA1001 a.t.u. and a 12V tractor battery for power. He ran out two antennas each 40m long and running E/W and S/W. He was so amazed at what he could hear on 3·5MHz that he stayed on that band all the time! He climbed by day and listened at night. Temperatures were around −9°C. He reports that he did not hear one G station working on 3·5MHz, probably due to skip effect at night.

Peter is hoping to take the May RAE so we must wish him well and hope he'll be taking some transmitting gear next time! So, on to his log for the DX end of the band around 3·8MHz, with VE2NUP, W8FLP, KW2WP, VE3KFE, FY7DYF, K9CLO, AD4E, JA2BAV, KP4AAQ, 4X6IF, HZ1AB, EP2TY, J3AH, VK6AJW, J73CB, C6AEY, A71AD, CP1PRS, YS9RVE, TI2KD, HC1JQ, VP2MF, HH5CB, 6T1YP, FM7WS, HP3FL, ZK1CG and VS5TA. The list also included many European and other North American stations. Operating times were between about 0100 and 0800Z, over three nights. A fine effort Peter and keep it up!

Phil Dykes G4XYX (Poole, Dorset) continues with his QRP activities using a converted CB rig running 10W p.e.p. to a dipole, and worked EA8TE, T77C, UA6LQ, UZ6LWZ and 4U1ITU, plus IV3LES on c.w. On the 7MHz band on c.w. with an 8m vertical antenna he managed K3IWZ who answered Phil's CQ (!), N8CSX who tail-ended when he was finishing with the K3, OH6DZ, RA9SUV and UQ2GMI. Plans are afoot to construct a 28 plus 50MHz quad to put up at around 7m with a rotator, which should make a big difference over the dipoles in use at present. A later letter from Phil says this project is almost finished. As if that were not enough Phil is starting to build a 28/50MHz transceiver for split-band working when we get the new allocation. More QRP operation on 7MHz brought contacts with EA8BCJ, I4JSC also QRP with 2W, ON4PAX/P the Ypres Club anniversary station 1945/85 with cards to POB32, 8900 Ypres, Belgium, and UZ-3DYW and WB2EZM.

Bruce Milburn of Alfreton, Derbys, has a Realistic DX200 and a 40m-long wire antenna but not much time to look for the DX but he logged JA6YCO, KP2AH, VK6AP, YB0TK, ZD9BV (QSL W3HNP), 5H3BH and 6W2DV, all s.s.b. around 3·8MHz.

From Harrogate, N. Yorks, **Marcus Walden** was also pushed for time to DX but he did sit for the RAE in December so we wish you all luck OM, and glad to know you are getting on with the code, now at 7 w.p.m. On 7MHz Marcus found JA4CYG at 2230Z, with T77F with QSLs to

This very impressive station of Dave Chambers G4SYT (Epsom, Surrey) includes, left to right, Tono 9000E RTTY/c.w. terminal and v.d.u. coupled to a Brother M1009 printer, Trio TS-430S and AT-230 a.t.u. both being used mainly for mobile and portable operation, Trio TS-940S h.f. transceiver with internal a.t.u., Yaesu FRG-7700 back-up receiver, Yaesu FT-726R with modules for 50, 144 and 430MHz plus 30W linears for 144 and 430MHz, and a home-brew 13·8V power and distribution unit

I2WWW. Only item of interest on 14MHz was OE5JTL/YK with cards to OE5BA. Two beacons DL0IGI and IY4M were the only sign of life on the 28MHz band. Marcus runs a Realistic DX302 and two long wires. Incidentally, a new beacon cropped up on 28·215MHz with the call GB3RAL and giving the Maidenhead locator IO91RL.

George Hitchens sends in a good log to the column for the first time albeit all on 14MHz like OD5BP, SM7DLZ/O, YA6LDX, YB4IWF, ZL4BO, ZS5FG, 5R8AL and 9H4B, all with a Panasonic RF-3100LBE receiver and 20m-long dipole.

The Belgian society UBA is running an s.w.l. contest during 1986 which could interest some listeners. More details and log forms for three IRCs from Marc Domen ONL6945, Gebr. Blommestraat 14, Borgerhout B-2200, Antwerp, Belgium.

Melvyn Dunn BRS86500 lives in Grimsby where he has a Yaesu FRG-7700, with signals from a 40m-long antenna. His catches on the high end of the 3·5MHz band on s.s.b. included 9Y4VT, VE2RP, YS1RRD, HP3FL and 9L1SL, all between 2330Z and 0130Z. On the 7MHz band, mostly around 7·09MHz, Melvyn logged VU2CVP, TI2KD, J37AH, N9AG/V2A, 6Y5JC, CO6DC and YN1RD, between about 0100Z and 0200Z.

Just down the road from me resides **Dave Chambers G4SYT** and he has been busy on the h.f. bands with his new, shiny Trio 940S transceiver feeding either an HF5 antenna or an inverted-V antenna on 3·5MHz. The separate photograph shows his elegant station in more detail. Although hardly DX two new ones for Dave were HB0/DL1ECU and LX9BV bringing him nearer the magic 100 countries, both on 7MHz. On 14MHz additions were TF3CW, T77C, J88BK and ZL2AQA. On the patchy 21MHz band "goodies" were VP9AD, P43A (Dutch Antilles) and 4U1ITU.

Other DX reported from various sources included 8P9AG, HZ1HZ (makes a change from HZ1AB!), PZ1AC, 3X0HAB and DJ0ON/S9 all on 3·8MHz or thereabouts. The 21MHz band was good on occasions with XE1X, ZB2EO, LU9CV, W6REC/VP2M and FM5WD. Strangely enough there are still virtually no reports from the new WARC bands so details of anything worthy of note would be appreciated.

Lastly, usual log from **Andy Durrant** (Aldershot, Hants) although he has not had so much time to DX due to some illness and pressure of work. Get better soon OM! Andy sports an FRG-8800 and FRT-7700 a.t.u. driven from a 40m long inverted-V antenna. On 3·5MHz sole catch was VE1ZZ, and up to 7MHz and ON5OS/VS6 on holiday in Hong Kong, and EA9RM. The 14MHz band produced VP8LP who seemingly runs the Post Office on South Georgia, and 5R8AL with cards to WA6VDU. More on 21MHz but on c.w. for a pleasant change with A4XYQ, PY5EG, TA3B, TU2JT, YC3NCR, ZF6DFC, ZS6ABN, Z21GN, 3D6BW (QSL AK1E) and 5B4LT (QSL POB1267, Limassol. Only s.s.b. station logged was JS5VK.

Don't forget, logs and letters to reach me by the 13th of the month, with sample log sheets available from me direct for an s.a.e. Good listening and don't forget the new WARC bands!

VHF Forum

Now that the DTI has announced the new 50MHz allocation to amateurs, 50 to 50·5MHz, there will no doubt be a scramble to be ready for the start-up on 1 February. I look forward to your reports! The restrictions initially imposed are designed to prevent QRM to other 50MHz services on the Continent although as far as I know nothing was said when our Band I TV service was operational and that must have been slinging megawatts e.r.p. in all directions.

Regions 2 and 3 have had 50MHz allocations for years and it is about time we were allowed to join in the fun. There is still a large measure of uncertainty on the mode of propagation on certain DX paths which have been covered recently, thought to be some form of multi-hop sporadic-E rather than the F2 mode we can expect to support DX contacts in a couple of years time.

It is very important that the RSGB's band plan for 50MHz (see "Comment" in this issue) is observed by all 50MHz operators. It is likely that cross-band operation will be popular initially and spot transmitting frequencies on the 28MHz band would be very useful for those who can only listen on 50MHz. It would, incidentally, bring some much desired activity to 28MHz which has now been abandoned by all except a small number of devotees, plus those operating around 29·6MHz.

Those amateurs who intend making their own 50MHz transmitters or transverters should be aware of the use now of frequencies around 100MHz in our v.h.f. f.m. BC band and be most careful about suppressing any second harmonics in the transmitted signal.

RTTY

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

by Ron Ham BRS15744

The BARTG Spring RTTY Contest will be between 0200GMT on March 22 and 0200GMT on the 24th. Although the total period is 48 hours, only 30 hours of operation is permitted and "off" periods may not be less than 3 hours at a time and must be noted on the log sheet. The event will take place on the 3·5, 7, 14, 21 and 28MHz bands. The ARRL DX countries list will be used and each W/K, VE/VO and VK call area will be counted as a separate country. Readers interested can get more detailed information, and log sheets, by sending a large (A4) s.a.e. to Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT. (Overseas readers, 4 IRCs.) Peter is the contest manager for BARTG and wishes to thank our readers for their past support in these annual events which are organised to promote interest in the RTTY mode and he looks forward to receiving your logs and comments again, this time by May 31.

Country (Prefix)	Band (MHz) 3·5	7	14	21
Austria (OE)		X	X	
Balearic Is (EA6)		X	X	
Belgium (ON)	X	X	X	
Brazil (PP7, PP8, PY)			X	X
Bulgaria (LZ)			X	
Canada (VE)			X	
Canary Is (EA8)			X	
Ceuta & Melilla (EA9)			X	
Chile (CE)				X
Cyprus (ZL4, 5B4)			X	
Denmark (OZ)	X		X	
England (G)	X		X	X
Finland (OH)			X	
France (F)	X	X	X	
French Guiana (FY7)			X	
W. Germany (DF, DH, DJ, DL)	X	X	X	
E. Germany (DM, Y2–Y9)		X	X	
Gozo & Comino (9H4)			X	X
Haiti (HH2)			X	
Hungary (HA, HG)			X	

Fig. 1: The monthly chart of RTTY prefixes copied in the UK

Country (Prefix)	Band (MHz) 3·5	7	14	21
Italy (I)		X	X	
Japan (JA, JR, KA)			X	
Lebanon (OD)			X	
Leichtenstein (HB0)		X		
Netherlands (PA)	X		X	
New Zealand (ZL)			X	
Nigeria (5N)			X	
Norway (LA)		X	X	X
Oman (A4)			X	
Poland (SP)			X	
Portugal (CT1)		X	X	
Rumania (YO)			X	
San Marino (T77)			X	
Sardinia (ISO)			X	
Scotland (GM)	X		X	
Sicily (IT9)			X	
Spain (EA)		X	X	
Sweden (SM)	X	X	X	
Switzerland (HB9)	X	X	X	
USA (K, N, W)			X	X
USSR (RB, UB, UI, UK, UT, UZ)		X	X	
Wales (GW)	X			
Yugoslavia (YU)			X	

Fig. 2

Country (Prefix)	Band (MHz) 3·5	7	14	21
Canary Is (EA8)			X	
England (G)	X		X	
France (F)			X	
Germany (DF, DH, DJ, DL)	X	X	X	X
Italy (I, IK, IT)		X	X	
Kuwait (9K2)			X	
Netherlands (PA)	X			
Norway (LA)			X	
Portugal (CT1/4)			X	
Scotland (GM)	X			
Spain (EA1, 3, 5)		X	X	
Sweden (SM)			X	
Switzerland (HB9)		X		
USA (W1–9)			X	

Among the interesting RTTY signals I copied during the month prior to December 14 was CY0SAB, the Sable Island DXpedition station, at 1705 on November 22. There was also an abundance of Russians, UA3FUI, UA3TT, UB0MA, UK3KP, UR1RXO, UW3HO, UZ3AYR and RW3DR during the morning of the 17th; as well as a very strong "CQ" and subsequent QSOs from IQ8RAI, the special event station to commemorate the 60th anniversary of Radio Televisione Italiana. They were operating on 14·092MHz, and the station was manned by IK8HBZ at 0853 on December 10. Earlier on the 10th I copied my best DX, QSOs between ZL0AIX and YU2CRS in 45 Baud and ZL0AIX and PY2BW in 110 Baud ASCII. The New Zealand station was reasonably strong with me but the YU and PY signals were subject to QSB and some interference from a stronger but intermittent tone.

Another rewarding look around 14MHz came between 0830 and 0848 on the 13th when I copied RTTY signals from A4XJQ in Oman, OD5NG Lebanon and G4TYI in the UK participating in a three-way QSO, followed by strong signals from JA1GWA and JA2EJA working into Spain and Germany respectively. There was a VK about but the consistency of his RTTY signal was ruined by deep and slow QSB.

"Data communications traffic has also suffered from the widespread deterioration in h.f. band conditions," **writes Len Fennelow G4ODH**, Wisbech. He logged 33 prefixes during the month prior to December 10. However, his perseverence was rewarded with three new RTTY countries on 14MHz, French Guiana FY7, Haiti HH2 and San Marino T77, the latter pair being received on December 1. Our monthly chart of RTTY prefixes, copied in the UK (Fig. 1), was compiled from my log and the log sheets of Len Fennelow.

Len also copied four countries using AMTOR on 3·5 and 7MHz, 11 on 14 and 1 on 21MHz, as listed in Fig. 2. He writes, "one advantage of AMTOR is that the copy can often be read through the noisy band conditions which could wipe out RTTY reception."

Reports by the 15th please

SPACE & SATELLITES

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

by Pat Gowen G3IOR

Reading the Telemetry

Whilst the earlier amateur-radio satellites only had the simple to read Morse code telemetry (and indeed the current RS Radio satellites still have) much of the telemetry (TLM) of OSCAR-9, 10 and 11, other than the CW, RTTY and Digitalker modes, cannot be read by ear as it is data in p.s.k. (Phase Shift Keying). Thus it normally requires dedicated circuitry such as an interface between the receiver and the home computer to display.

Now comes a breakthrough for our many Spectrum users, as G4IDE and G4INP of SARUG have evolved some excellent computer program tapes called "UO1-EAR" and "UO2-EAR" that are now generally available.

They will decode the weekly updated satellite news bulletin, the status points and the telemetry of both UoSATs without the need of an interface or any additional circuitry. That means you simply feed the ear-socket of the 48K Spectrum direct from the receiver audio or the tape recording made from the satellite f.m. p.s.k., and the selected data appears on the screen "before your very eyes". Samples of part of the bulletin, the telemetry, and a user summary are shown in Figs. 1, 2 and 3, from which the updated Keplerian sets, latest news and satellite values can be read.

The full information and cost can be supplied from G4INP (QTH on page 55, December issue) or from G4IDE at 79 South Parade, Boston, Lincs PE21 7PN, if a self-addressed stamped envelope is sent with your request. The cost, from the latter, is just £6.00 for one or £10.00 for both tapes.

OSCAR-10 puts out 8 w.p.m. c.w. bulletins at the hour and half-hour, with RTTY at the quarter and three quarter hour periods. If you wish to follow the full content of the 400 bits/second p.s.k., and to read all the telemetry values, navigation sensors, powers, voltages, currents, a.g.c. values, status points and the 2K bytes of plain language information bulletins, then a demodulator is needed. Part of one of the messages and its useful timely information is shown in Fig. 4. Note that this refers to 15 September 1985, the updated schedule follows later.

The demodulator was described by the author and designer Jim Miller G3RUH, in the October/November '84 issue of *Wire-*

Fig. 1: ◀ New bulletin copied off UoSAT-1 (OSCAR-9)

```
                UoSAT Spacecraft Control
  Centre
University of Surrey, Guildford,
  Surrey, England
**********************************
**********************

Frame counter : 027D

****  UoSAT-OSCAR-9       Bulletin
-154    29 November 1985 ****

UoSAT Spacecraft Control Centre,
  University of Surrey, England

** GENERAL NEWS **

1.  Concepts for the design and
implementation of the next
generation of OSCARs is the obje
ctive of several study
committees now being formed.  Ov
er the next several months
these groups, mandated by AMSAT
Board of Directors resolution,
will look at possible successors
  to the Phase 3 generation of
long-lived, multi-transponder, M
olniya orbit spacecraft
```

Fig. 3: ▼ Keplerian elements direct from UoSAT-2 (OSCAR-11)

```
Satellite: oscar-9
Catalog number:  12888
Epoch time:       85297.44049619

    Thu Oct 24 10:34:18.870 1985
UTC
Element set:          807
Inclination:        97.6427 deg
RA of node:       288.1957 deg
Eccentricity:     0.0003154
Arg of perigee:   148.0242 deg
Mean anomaly:     212.1253 deg
Mean motion:   15.27690470 rev/
day
Decay rate:     1.695e-05 rev/
day^2
Epoch rev:            22496
Semi major axis:  6857.821 km
Anom period:     94.259932 min
Apogee:           487.730 km
Perigee:          483.404 km
Ref perigee:     2853.45738403

    Thu Oct 24 11:13:01.980 1985
UTC
Beacon:           145.8250 MHz

Satellite: oscar-10
Catalog number:  14129
Epoch time:       85300.14032412
```

```
UOSAT-2 TELEMETRY    FRAME 7
1985 Fri 15 Nov 20:52:02 UTC
Beacon Summary
35 145MHz b'con power = 0mW
36 145MHz b'con I = 51.47mA
37 145MHz b'con temp. = 15.39°C
45 435MHz b'con power o/p = 737.
50mW
46 435MHz beacon I = 207.23mA
47 435MHz beacon temp. = 10.39°C
55 2.4GHz b'con power = 5.20mW
56 2.4GHz b'con I = 0mA
```

Fig. 2

```
ZL1AOX 1698-80: 15 Sep 1985 to all. The present attitude of AO-10
is LON 200, LAT -32 degrees.  The next attitude change will occur
on Sep. 23rd, when a move to LON 180, LAT -25 will be made.
A new schedule will be implemented then as follows:
MA  40 to 119 Mode B, MA 120 to 136 Mode L, MA 137 to 220 Mode B,
MA 221 to 039 OFF.  Omni 2m antenna will be on from MA 45 to 60.
The next attitude change will be on 21st Oct. with a move
to LON 180, LAT 0.  Omni antenna OFF also.  Vy 73  Ian.
```

Fig. 4: One of the OSCAR-10 p.s.k. messages

dressler

191 FRANCIS ROAD
LEYTON · E10

OPEN: MON – SAT 9AM – 5.30PM
INTEREST FREE
HP FACILITIES AVAILABLE
ON MANY ITEMS
PROMPT MAIL ORDER

TELEX 8953609 LEXTON G

TEL. 01-558 0854 / 01-556 1415

Access VISA

LATEST NEWS

ICOM R7000
SCANNING RECEIVER
25MHz-2GHz
Full SSB, AM, FM
& Memories

£849 inc ARA500
Active Antenna Worth £99

DATONG P.C.I.

Fit the PCI with the R7000 or FRG9600 & have 100Kc to 30 MHz general coverage H.F. USB/LSB/AM/FM for

Only £139.00

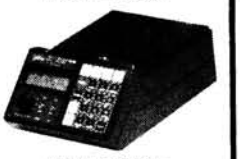
or with the FRG9600 and all power supplies

£575.00

YAESU FRG-9600 £425

60-905MHz
AM · FM · SSB

AOR 2002



25-550 MHz
+ 800MHz-1.3GHz

YAESU FT-757GX

+ FP757 HD PSU
+ FC757 ATU

TRIO-KENWOOD TS-940

INCLUDING
AUTO-ATU **£1,725**

ICOM R71

100KC-30MHz
AM FM SSB CW
GEN. COV.

YAESU £450 FRG - 8800

+ OPTIONAL
FRV8800 CONVERTOR
GEN. COV.

HX 2000E
An excellent hand-held scanner
60- 80MHz
118-136MHz
136-174MHz
390-490MHz
490-525MHz
AM/FM
5-10-12½Kc steps

£260

DRESSLER ARA 500 ACTIVE ANTENNA

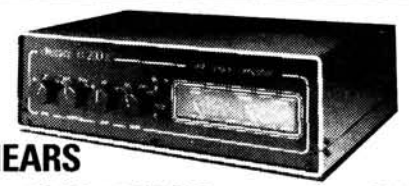
50MHz to 1300MHz
Gain 17dB Typical

TECHNICAL SPECIFICATIONS FOR ARA 500

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

£99.00

Operation is possible up to 1300MHz with gain of 10dB
Noise 4-6dB
Intercept Point 3rd Order: +18dbm at Input



LINEARS

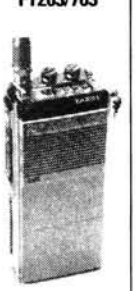
D200	2 MTR 500W SSB	£699
D200S	2 MTR 750W SSB	£799
D70	70 CMS 550W SSB	£799

dressler – ara 30 – active antenna

200 kHz . . . 40 MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glass fibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £90 + £4 p&p. See Review in August Issue p.15

MUTEK SPECIALISTS

TRIO KENWOOD TH-21/TH-41	YAESU FT209/709	YAESU FT203/703	ICOM IC2E/IC02E	ICOM IC4E/IC04E
				

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

less World. It was reprinted in the October (No. 55) *Oscar News* and appeared in the April 1985 issue of *Ham Radio* magazine (USA). It takes its audio direct from a 144MHz s.s.b./c.w. RX or from tape, and has three selectable digital outputs as serial 1200 baud RS232, 8-bit parallel, or raw 400 bits serial data stream.

A p.c.b., as well as test tapes, TLM specification and display software is available direct from G3RUH at 3 Benny's Way, Coton, Cambridge CB3 7PS, or from AMSAT-UK, London, E12 5EQ. For further information send an A5 s.a.s.e. or 4 IRCs, mentioning *PW*. Jim is currently working on a Spectrum program, as well as one for the IBM PC to complement the already available BBC version.

Forthcoming Satellites

Both **RS-9** and **RS-10** are now complete, tested and ready for space. If all goes according to plan, soon after you receive this issue, we should be able to hear the two brand new "Radio" satellites operating in orbit.

Further to the frequencies published on page 65 of the June edition of *Practical Wireless* we now have those of the two passband encompassing beacons for the RS-10 "T" mode of 21MHz up and 145MHz down, which are 145·957 and 145·997MHz respectively.

The licence for the intended 435·395MHz beacon was still awaited at mid-November by UA3CR, the builder, and thus there may not be permission to put it on until full authorisation is acquired.

There is now a distinct possibility that RS-9 and RS-10 may fly on quite separate launches, partially due to the earlier delay with RS-9, and that a slight delay in launch times(s) may keep the pair grounded until early February.

Class B licensees, who have long standing stated authorisation to use the 145–29MHz "A" Mode now have full written permission, but it needs to be pointed out that it would be outside the conditions of that licence to use "K" (21–28MHz) or "T" (21–145MHz) as those with B licenses are not allowed to transmit lower than 144MHz. Even so, there appears to be no reason as to why they should not QSO A licencees who are uplinking on the 21·260–21·300MHz band if the K and A modes are mixed, on the proviso that they uplink only via Mode A between 145·960–146·000MHz.

The **ISKRA-4** satellite still has no final decision as to the incorporation of a transponder. It is now felt that if time permits this inclusion, then a Mode "A" (145 to 29MHz) device is by far the most likely, as such units are already built and available.

Some further delay with ISKRA–4 is now probable, as one of the Salyut-7 Cosmonauts was taken ill in early December, causing a premature return of the three-man crew. At the time of writing this column in mid-November, he is rapidly recovering in hospital, and may be one of the three man replacement manning crew ready for the Soyuz lift-off on the first opportunity window, e.g. January 16, or the following on February 3/4 or 19. It is possible that soon one or more of the crew may be a radio amateur, as discussions on a Soviet Amateur Radio operation from the Salyut-7 space-station have been taking place recently.

The French AMSAT group are progressing with their satellite destined for a future 200Kg **Ariane** launch. The mechanical structure is complete, and full spin and vibration tests have taken place since our last report. The prototype electronics are ready and performing to specification, with a 40 per cent power amplifier efficiency reported. All power supplies are complete and ready to go. Still underway are the antennas, the solar panel deployment mechanism, the command and decoding telemetry system and the testing of the new Apogee kick motor in the modified structure. Flight models are now being built, and ground stations are being developed, with completion of the entire project confidently expected by the end of 1986.

FC2STA and FD1STA are regularly active on the h.f. bands, and giving regular progress reports on the activities.

JAS-1

Since our September report things have been moving fast towards the completion of the new satellite by JAMSAT and JARL, with calibration and thermal tests complete, the store-and-forward system tested out, and the *JAS-1 User's Guide* currently being translated into English. Some details of the satellite's packet-radio requirements are already to hand from N6MBM and NK6K that provide the basic needs for the potential user.

1200 bauds will be used for both the uplink and the downlink, and data will be exchanged using Manchester encoding that requires a frequency modulated r.f. signal from the ground for the uplink. Phase shift keying will be employed for the downlink that will require a single sideband type receiver at the ground users station within 200–300Hz of true frequency.

The JAS-1 digital transponder will transmit with 1 watt output, whilst the user will require some 50 to 100W e.i.r.p. (e.g. 10 watts to a 10dB gain 145MHz antenna) as this satellite unit is "JD" Mode, 145MHz up, and 435MHz down. The uplink has four channels spaced between 145·900 and 146·000MHz, to give a single 435·910MHz channel downlink. One megabyte of packet user memory is available for loading.

The design of a simple modem is now complete, and development of an improved second-generation model by JA-1TUR is underway, with only eight easy-to-obtain chips used in the circuit.

On c.w. and s.s.b., the linear transponder will have an uplink passband running from 145·900 to 146·000MHz, to give a downlink between 435·900 and 435·800MHz inverted, i.e. l.s.b. up for u.s.b. down. 28 channels of satellite housekeeping memory will be sent by the Telemetry system. Power uplink requirements for the user are similar to that of the digital transponder.

The satellite is destined for a 50° inclination 1600km orbit of around a 2 hour period.

Phase IIIc

AMSAT-DL are making excellent progress according to schedule with their satellite, and few problems have been experienced in the complexities involved. With five new satellites this year amateur radio space enthusiasts are due for a very busy and interesting time!

Weathersats, etc

On October 24 Meteor-III was placed into a 110·3 minute period 1240km orbit, higher than most weather-satellites. It transmits 2 lines per second on 143·400MHz, a frequency already occupied by another of the Meteor series. The Keplerian elements are:

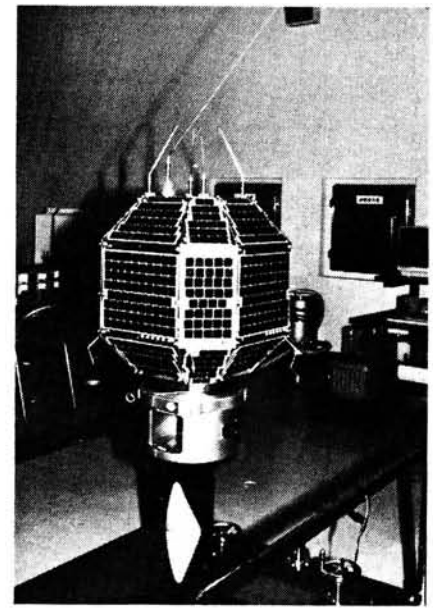


Fig. 5: JAS-1 under test

Epoch Year:	85
Epoch Day:	294·31962192
Epoch Rev:	3
Inclination:	82·5558
RAAN:	96·6912
Eccentricity:	0·0015761
Arg. of Perigee:	233·4361
Mean Anomaly:	126·5109
Mean Motion:	13·05913232

Graham Smith G1JVZ and **Bob Christie** of Lincoln report some additions to ZS1BIs list of satellites around 137MHz, with Meteor 3-1 (Object 1985–100A) transmitting on 137·41MHz, and with other weathersats heard on 137·060, ·080, ·100, ·130, ·150 and ·170MHz. Graham points out that Meteor 30 (1980–51A) changes frequency, and is responsible for all or most of these signals.

Graham found a strong carrier on 137·68MHz which he believes to be P76/5, a navigation satellite adapted now for propagation studies. He has listened for the associated u.h.f. frequency, but cannot hear this. (Ariel-5 used this frequency, but re-entered several years ago.)

On 137·200MHz he hears a strong wideband digital signal that could well be GEOS-2 (1978–71A). Ariel 6 (1979–47A) sends strong f.m. a.p.t. on 137·560MHz, and can be clearly seen by the naked eye, aided by the predictions published in *The Guardian*. Graham further points out that h.f. signals emanate from the Salyut-7/Progress/Cosmos 1686/Soyuz complex, the size of which coupling makes it one of the brightest objects in the sky. (Again,

predicted in *The Guardian*). In use by Salyut-7 was 15·009MHz c.w. telemetry, but it was spoiled by a 3W8 radio station, so this has ceased. Soyuz uses 20·008MHz c.w. when docking, and the change in the keying length indicates when docked. Cosmos 1686, currently docked at the opposite end of Salyut-7, transmits f.s.k. on 19·955MHz continuously.

Concluding, Graham wonders if any DX TV enthusiasts have tried listening to 922·75MHz which Soyuz uses for down-linking television pictures to earth.

UHF Satellites

Following on to the listing of satellites between 136 and 138MHz by ZS1BI in our December issue, here is a list of those to be found on the higher frequencies from **John Branegan GM4IHJ**. He points out now that Icom have introduced the R-7000, scanning from 25–2300MHz, a whole new spectrum of space experiments are available.

Freq (MHz)	Name	Orbit	Signal Format
800 to 1000	Molyna	Elip	Soviet Cosmonauts
922·75	Salyut	Circ	Astronauts
928·4	Venera	Deep Space	Planetary probes
1227·4	Navstar	Elip	Navigation
1575·4	.....	.....	.....
1675·281	Meteosat 2	Geosat	Weather
1675·929	.....	.....	.....
1681·6	GEOS 3 to 5	.....	.....
1684	.....	.....	.....
1686·833	Meteosat	.....	.....
1687·1	GEOS 3 to 5	.....	.....
1688·2	.....	.....	.....
1690·2	.....	.....	.....
1691	Meteosat/GEOS	.....	.....
1694	GEOS	.....	.....
1694·3	GEOS	.....	.....
1694·5	Meteosat 2	.....	.....
1698	NOAA/OPS9845	Circ	.....
1702·5	.....	.....	.....
1707	NOAA	.....	.....
1945	COMM 2A Japan	Geosat	Communications
2205	Shuttle	Circ	.....
2209·068	GEOS	Geosat	Weather
2214	.....	.....	.....
2217·5	Shuttle	Circ	Communications
2227·5	Navstar	Elip	Navigation
2250	Shuttle	Circ	Communications
2252	Fleetsatcom	Geosat	Communications
2253	IRAS	Circ	Research infra-red
2262·2	Fleetsatcom	Geosat	Communications
2265·5	Landsat	Circ	Earth Rescources
2280	Cosmos E/Warn.	Elip	Nuclear Alert
2280·5	Astro Japan	Circ	Research
2286·5	COMM 2A Japan	Geosat	Comms. Research
2286·5	GEOS	.....	Weather
2287·5	SME	Circ	Solar Mes. research
2287·5	Landsat	.....	Earth Rescources
2287·5	Shuttle	Circ	Communications
2292	Cosmos E.W.	Elip	Nuclear Alert

DIY Propagation Forecasting

Radio amateurs and s.w.l.s are in a unique position to perform many research experiments into propagational behaviour and forecasting, as they form a world-wide observation network coupled with the means for inter-communicating the results. It would appear that individually much interest abounds, but few communicate their mutual findings, and even fewer ever publish their results.

GM4IHJ proposes a simple experiment that could be attempted by those with the new wide coverage v.h.f./u.h.f. receivers mentioned in the November issue, that can capture signals from satellites twice as far away as DX such as Australia at 17 000km on h.f.

Due to some of the problems of path variables in getting signals through the ionosphere, no new GEOSATS will employ v.h.f. downlinks, but those remaining offer a good research basis to investigate the cause of these very effects that give rise to the difficulties.

In order of strength, here are three Geosynchronous satellites that can be used for your experiment, viz:

1. METEOSAT, on 137·080MHz f.m. or c.w. due south from the UK at 30° elevation.
2. MARINE COMSAT on 137·169MHz c.w. at azimuth 200° (20° west of south) and 15° elevation from the UK.
3. GENERAL COMSAT on 137·049MHz f.m. due south of the UK at 30° elevation.

Look for variations of signal strength through time, any slight changes of frequency that may be due to Doppler shift variables caused by sudden path changes, any detectable changes of azimuth and elevation brought about by re-angulated paths, and for changes of polarisation. The latter, called Faraday rotation, will normally cause the polarisation to change from horizontal to vertical and back again twice on quiet days, but up to five or six full rotations on disturbed days, and can be observed by looking at the signal with linearly polarised antennas.

Correlate your results with the m.u.f., the solar flux and sunspot number (given by WWV), any auroral activity (often quite strong on the satellite signals themselves coming from the north), and sporadic-E (Es) activity. When Es is present, the signal will fade with a characteristic deep two minute peak to peak QSB.

You will soon discover that you have found a remarkably good ionospheric state indicator, as once the layers were thought to be virtually transparent at v.h.f., but can now be shown to be otherwise by the effect of signals passing through them rather than scattered off them. If you are now able to collect and compare results with others so interested, you have the basis for a good scientific paper.

OSCAR 10 Mode L

A number of disappointed listeners point out that they cannot hear Mode L on its 436MHz band downlink. The beacon at 436·040MHz on this mode is very weak when transmitting the p.s.k. telemetry, but the RTTY comes up much stronger. Also some of the amateurs downlinks are surprisingly strong if you can find them, normally operating with signals between 435·5 and 435·55MHz—the most sensitive part of the equivalent uplink band on 1269MHz. Even here, due to problems in the satellite transponder caused by non-linearity due to a faulty bias regulator transistor in the power amplifier, signals often carry cross modulation from the beacon, and vary in signal strength with the change of beacon keying mode.

For these reasons, Mode L is little used compared with Mode B on 145MHz downlink, as well as the fact that it takes quite a lot of radiated power to "get up there". The result is a very modestly used satellite, but even this has its advantages, as the space is available for some experimentation by way of high power uplink bulletin transmissions using a.c.s.s.b. and even f.m.

Commencing imminently, WA2LQQ will be broadcasting the news to us using a 2C39 amplifier and a 5·4m dish, giving a meaty 350kW e.i.r.p. and upwards if needed which should be heard well. Reports will be appreciated and QSLed.

Stations listening should hear this, using equipment such as an Icom 451 or a good Microwave Modules converter fed from a 21-element Yagi that does not fall off at 436MHz, or a 48-element Multibeam. To hear it really well, a masthead pre-amplifier mounted at the antenna is desirable. The MuTek bipolar pre-amplifier works well, but to really enjoy Mode L a GaAsf.e.t. is by far the best.

One of the users is Stan GW3XYW, who sends copies of QSLs for contacts with KA0OOQ, I6PNN, ZS6CNG, IN3HER, OE9FKI, ZS6AXT, OE1VKW, VE2LI and K0RZ. Stan has now rebuilt his 6m e.m.e. dish, and finds that just 5 watts is sufficient to get him a RS55/9 report, depending upon the other stations receive capability. He appreciates our regular Keplerian elements, as his pointing accuracy has to be within ±1·5°.

The Hydrogen Band

Both your author and GM4IHJ have always been fascinated by the story of how during the darkest days of the Second World War, Professor Oort in Nazi occupied Holland set his student H. Van de Hulst in pursuit of an idea. That was, as all atoms radiate weak electromagnetic radio signals, each at a fequency peculiar to that atoms composition and physical state, it should be possible one day to listen to these atomic signals from across the breadth of our Milky Way home galaxy.

Van de Hulst produced a now classic paper suggesting that the most likely source of signals would be Hydrogen gas in the spiral arms of the Milky Way, but it took quite a few years before a practical

proof of this was demonstrated by Harold Ewen in USA long after the war.

All this is now past history, and since then research using the Hydrogen signal on 1428MHz has not only revealed to us the shape of our own galaxy, but has allowed us to reach much further out to remote galaxies far beyond our own. Quite a few radio amateur astronomers will be tuning to the Hydrogen line now that receivers are commercially available, and to add spice to their experiments it has been suggested that because the Hydrogen line is such a Universal Beacon, its general vicinity is the obvious place to listen for the signals from other galactic civilisations. GM4IHJ is looking forward to long QSOs with fellow hams on planets orbiting around Alpha Centauri, but he has not yet worked out what to devote his research activities to during the four year time lag that it would take for each QSO over!

Shuttle and Spacelab

Early reports resulting from the analysis of some forty hours of tape recorded QSOs of the STS-61-A /D-1 "Ham-in-Space" (or "SAREX" for Shuttle Amateur Radio Experiment as it is called by NASA) has resulted in over one thousand callsigns being logged. This includes many rare DX calls previously not expected to have 437MHz f.m. capability. The QRM was heavy over Europe, whilst outlaying stations who did not get the message of calling thrice only per pass blocked the 437·275 only uplink frequency in use. Some stations called on c.w., and could not be copied, but caused considerable QRM.

A list of stations logged will appear in the January *CQ-DL* Magazine, and stations who feel they may be on the tape, or SWLs desiring a QSL card should send their QSL and report to: D-1 Ham-in-Space, DARC, Postfach 1155, Lindenalle 6, D-3507 Baunatal-1, West Germany with a s.a.e. plus 2 IRCs.

The D2 mission is now being planned for September 1988, on which at least one amateur will be in the crew. The same basic system is planned, but this time automatic uplink channel selection will be installed, as well as a change in the recording system to permit the outgoing responses to be taped as well as the upcoming. A lower power equipment consumption is called for—so packet radio is planned—with a link to the Phase IIIc "RUDAK" which will be operational by then, and Amateur (Fast-scan) Television, with a camera to send down internal scenes and space pictures is on the list. Phase-coherent beacons on 145, 435 and 1296MHz are also planned to be in use on this flight.

News did not come in early enough for the publishing deadline to permit informing readers about the 435·033MHz "GAS-CAN" (Get Away Special Canister) by the Marshall Amateur Radio Club, to be flown with the STS-61-C mission due for a 18 December lift-off. This is basically a repeat of the earlier experiment that did not get switched on (story on page 64, April 1985 *PW*). The planned inclination was only 28·67°, so most unlikely to be heard even in GJ/GU or Cornwall (see last month's column on Shuttle Missions). It might have been heard via OSCAR-10 on the Special Service H-1 channel downlink frequency of 145·972MHz if the alligators were quiet, as it had 5 watts to a half wave dipole for its f.m. synthesised telemetry monitoring the growth of a crystal and a radish seed. Reports by this means, or from stations closer to the Equator in range, would be welcomed by WA4NZD QTHR.

Gateway to Space

The first experiments with a "Gateway" system for OSCAR-10 (see *PW* February 1985 page 64) are now taking place in the UK on 145·950MHz downlink by G4CUO and G4ZHG. The results look very promising, and a licence is to be sought if all works out according to plan.

Library

AMSAT has announced the immediate availability of a new publication aimed at both the beginner and the experienced OSCAR-10 user entitled *The AMSAT Phase III Satellite Operations Manual*. It comprehensively explains in simple terms many of the intricacies, with the aid of graphical presentation of orbits and terminology definitions by over a dozen authors all that the user should need to know. Write to AMSAT, PO Box 27, Washington D.C. 20044, USA for details.

OSCAR-10 Operations

Many stations to the North can rarely "see" OSCAR-10 now at Apogee, so the AMSAT command is maintaining a period around Perigee for transponder operations. The current schedule is:

Mean Anomaly	Mode
055 to 119	B
120 to 136	L
137 to 203	B
204 to 239	OFF
240 to 019	B
020 to 054	OFF

As the system seems stable, this schedule may be maintained for some time, but users should observe the bulletins on 145·810MHz for advance warning of any change. **Ian ZL1AOX** requests again that users should keep their powers down to produce a downlink not greater than 1 S-point over the General Beacon level. To put some teeth into effecting this, G4CUO is replying to QSLs sent from "Alligators" who called him during his GD4CUO DX-pedition with a note explaining that when they use the satellite(s) correctly, they will get a QSL.

Apologies for those awaiting the next episode of our beginners' column, but in respect of the length of our columns, Space is definitely NOT infinite!

VHF BANDS

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

by Ron Ham BRS15744

"Signals strong and clear", "Exceptional strength", "Not heard before" and "Like locals", or "Very weak", "Band noisy", "Rapid QSB", "Absolutely dead", "Echoing" and "Watery signals" are just some of the remarks in your past letters about the prevailing conditions, showing the plus and minus side of radio communications on the h.f. and v.h.f. bands. It is comments like these that make consistent observational work on the amateur and broadcast bands both exciting and, more often than not, very rewarding.

Solar

Although the sun is still very quiet, there are signs of increasing activity. For instance **Patrick Moore,** Selsey, observed a small group of sunspots at 1010 on November 16, Fig. 1. The observatory at Boulder, Colorado, reported a minor magnetic storm on the 19th, possibly caused by a disappearing filament, and **Ron Livesey's** magnetometer in Glasgow recorded activity on the 17th and 19th. "I have reports of visible auroral activity on the nights of November 13/14, 14/15 and 29/30 from observers in Edinburgh, Fraserburgh, Helsinki, RAF Lossiemouth and from the Wick Met office," writes Ron. He is the auroral co-ordinator for the British Astronomical Association. During the 29/30 Ron's observers Dr. David Gavine, Neil Bone and Sandy Hood saw the aurora as arcs, glows, rays, rayed arcs and bundles. Ron also received a radio report from marine wireless officer Andy Steven and general confirmation from Dr. Roger Stapleton at St. Andrews University observatory. Karl Lewes, Saltash, told Ron that his fluxgate magnetometer was very unsettled on the 16th and 17th, recorded a storm on the 18th and 27th and severe storm conditions on the 29th and 30th. I recorded several tiny bursts of radio noise from the sun at 143MHz during my midday observations on days 26, 27, 28 and 29 and found the 14MHz band almost completely dead for most of the 30th.

At 2355 on the 29th **Andy Stafford G4VPM,** Paignton, found a couple of Norwegian and Russian stations working on 14MHz and noted that the skip on the band was north to east and short and the tone of the LA's c.w. was rough. Andy promptly checked 144MHz and having identified auroral conditions, he proceeded to complete tone-A QSOs with GM3ZMK, GM4OBD giving Andy his 112th new square, GM4YXI and G3UTS in Durham. He also reported that some northern England stations were working into UQ2. Andy's impressive shack and operating position can be seen in Fig. 2 and his rotatable h.f., v.h.f. and u.h.f. antenna system is predominant above his rooftop in Fig. 3.

Unfortunately, due to overcast skies during the month prior to December 13, **Cmdr. Henry Hatfield,** Sevenoaks, was unable to see the sun's disc with his spectrohelioscope. However, he was very quick to confirm the massive burst of solar radio noise, Fig. 4, which I recorded at 1253 on the 14th. This four minute duration burst came suddenly and sent both our recording pens against the upper stops. Henry's radio telescope works at 136MHz and his 5-element Yagi tracks the sun in conjunction with the mirrors of his spectrohelioscope for most of the day.

Meteor Trail Reflection

"For the second year running, the *VHF/UHF Newsletter* is promoting activity periods on the random m.s. calling frequencies. It is hoped that this will encour-

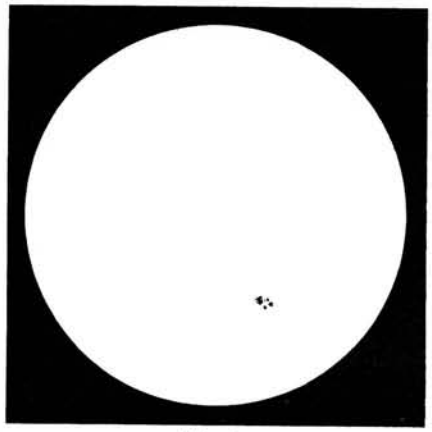


Fig. 1

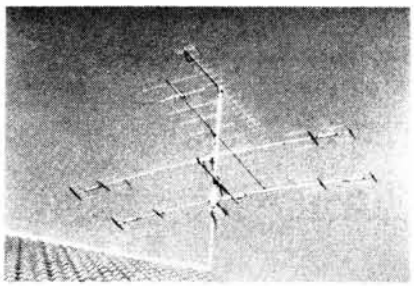
Fig. 2

age stations to be more active on random meteor scatter throughout the year," writes **David Butler** G4ASR, Editor of the *Newsletter* and member of the RSGB's VHF Committee. Each month has two activity periods, Saturday 2200–2400GMT and Sunday 0600–0800GMT, and participating stations should call on 144·1MHz c.w. for 5 minutes or 144·4MHz s.s.b. for 1 minute and send their results to the *Newsletter* at PO Box 73, Hereford HR2 9EW. The activity dates arranged for 1986 are: February 8 and 23, March 8 and 23, April 12 and 27, May 10 and 25, June 7 and 22, July 12 and 27, August 9 and 24, September 6 and 21, October 11 and 26, November 8 and 23 and December 6 and 21. The purpose of the *VHF/UHF Newsletter* is to assemble theoretical and practical material for the v.h.f./u.h.f. enthusiast. It is available from RSGB, (VHF/UHF Newsletter), Lambda House, Cranborne Rd, Potters Bar, Herts EN6 3JW. This is published monthly and the annual subscription rate is £5·16.

Every day from November 15 to December 12 **Norman Hyde G2AIH,** Epsom Downs, logged signals via meteor scatter from the 50MHz beacons GB3SIX and GB3RMK, using the 2-element beam at the top of his new AT32 mast, Fig. 5. Readers not familiar with this observational technique should try listening for a while on the exact frequency of an inaudible station for a brief burst, like a "ping", of signal. Although short-lived, this bit of station intelligence has reached your antenna via the trail of ionised gas left by a meteor particle burning up after colliding with the earth's atmosphere. **Gordon Pheasant G4BPY,** Walsall, received signals from the German beacons DF0AAB and DL0IGI via meteor scatter on November 25 and December 2, 3, 5 and 11, and November 25 and December 2, 4, 6 and 10, respectively.

The 28MHz Band

Although at present the 28MHz band is very quiet, some say completely dead, the experienced DXer knows that this is only



◀ Fig. 3

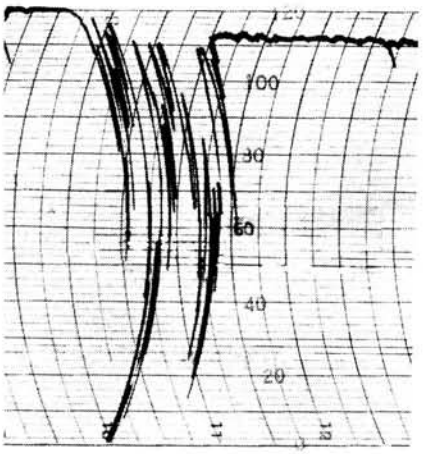


Fig. 4

temporary, and I would like to reassure recent newcomers to amateur radio that this really is a fantastic band, with worldwide QSO possibilities, when conditions are right. Be patient lads and lasses and, if possible, keep up a daily check from 28 to 30MHz. Take a look for the International Beacon Project stations between 28·2 and 28·3MHz and listen for c.w. signals below 28·1MHz. This is because at the least sign of the band opening amateurs will certainly have a go. **Fred Pallant G3RNM,** Storrington, did just that when he worked G3NNY in Luton at 1520 on December 12. Fred also heard some c.w. and s.s.b. activity around 1740 on the 14th and thinks it may have been a contest.

Propagation Beacons

"I have not heard a single 28MHz beacon this month," wrote **Len Fennelow G4ODH,** Wisbech, on December 10 and a similar report came from Henry Hatfield. "Very little to offer this month, some happenings, as shown in the list, but otherwise the band was completely shut down," said **Bill Kelly,** Belfast, on the 2nd, adding that on some days he heard European signals on the 27MHz Citizens' Band but nothing on 28MHz. "The highlight of this period was the appearance of the Medway Towns beacon, GB3RAL, 28·215MHz on November 27," writes Norman Hyde, who then logged it daily until December 13. I heard it for the first time on the 14th. Both Norman and Gordon Pheasant G4BPY received signals from the "Marconi" repeater beacon IY4M, 28·195MHz, on December 1. Despite a daily check, I heard the German beacon DL0IGI only twice during the period; however, a near neighbour of mine, Fred Pallant G3RNM, made a better contribution to our monthly 28MHz beacon chart, Fig. 7, and Gordon Pheasant logged the Australian and Hong Kong beacons VK2RSY, VK6RTW and VK6RWA and VS6TEN and like Fred, had a good haul of South Africans.

"The 14MHz beacon family is a superb indicator of h.f. band conditions generally,

Fig. 5

and since this band is such a world-wide vehicle for amateur traffic, the reception of these beacon signals is an extremely good guide to the DX potential," writes Len Fennelow. During the 25-day period from November 16 to December 10 he received signals from CT3B on 9 days, LU4AA on 3 days, OH2B on 6 days, ZS6DN/B on 15 days and 4U1UN/B and 4X6TU/B on 12 days. "Signals from OH2B were very strong on November 24 and December 7 as were ZS6DN and CT3B on December 6 and 7 respectively," reports Len. Both Len and I copied the RSGB beacons in Hertfordshire GB3NHQ on 50·050MHz and Wrotham GB3VHF on 144·925MHz each day throughout the period. "I now have a Sinclair QL computer which I have spent much time programming to scan the FRG-8800 around the various beacon frequencies when I am out," writes Gordon Pheasant. He adds, "I am now able to arrange for the receiver to come on every half hour and listen for a short period to each beacon in turn." By using this method in conjunction with a tape recorder, Gordon has found that DL0IGI is very often audible but weak, and often he hears it via meteor scatter when he replays the tape. "Occasionally DF0AAB shows up in the same way and the reception of the Norwegian beacon LA5TEN was picked up by the computer on December 3 and 11," said Gordon, who is working to develop this system even further. At 0812 on November 26 Gordon logged VK6RTW for the first time in 1985 and at 1200 DL0IGI was at 589 due to a bit of Sporadic-E. My thanks are due to Bill Kelly, Norman Hyde, Fred Pallant, Gordon Pheasant, **Chris van den Berg, David Maxwell,** Hamilton, and Ted Waring, whose logs I used to compile the chart in Fig. 6.

Chris van den Berg, The Hague, logged signals from the Norfolk repeater GB3NB on R1 and GB3VHF on 144·925MHz on most days from November 15 to December 8. He also heard the Belgian beacon ON4VHF on 144·985MHz on November 17, 29 and December 1.

During a tropo opening it is worth turning your beam toward the continent and listening for the v.h.f. beacons in Austria, Belgium, France, Germany, Holland, Italy, Spain and Yugoslavia between 144·8 and 145MHz. It is also worth trying for Scandinavia, too.

Tropospheric

The atmospheric pressure was consistently high from the start of this period, November 15, to midday on the 26th, when it fell to below 30·0in (1015mb) where it remained until December 1. The

PHOTO ACOUSTICS LTD. MAIL ORDER

TEL: 0908 610625

58 HIGH STREET, NEWPORT PAGNELL, BUCKS, MK16 8AQ

HF TRANSCEIVERS	£	(p&p)
Trio TS940S	1695.00	(—)
Trio TS930S	1295.00	(—)
Trio TS430S	720.00	(—)
Trio TS830S	832.75	(—)
Trio TS530SP	698.00	(—)
Yaesu FT980	1450.00	(—)
Yaesu FT757GX	739.00	(—)
Icom 751	1299.00	(—)
Icom 745	899.00	(—)
Icom 735	849.00	(—)
ANTENNA TUNER UNITS		
Trio AT230	158.00	(2.00)
Icom AT500 auto	459.00	(—)
Icom AT100 auto	329.00	(—)
Yaesu FC757 auto	255.00	(—)
Yaesu FC700	105.00	(2.00)
Welz AC38M	85.00	(1.50)
SEM Tranzmatch	99.00	(2.00)
Mizuho KX3 SWL	53.75	(1.50)
HF RECEIVERS		
Icom R71E	729.00	(—)
Trio R2000	479.50	(—)
Trio VC10 VHF Converter	128.00	(1.50)
Trio R600 (Last few available)	299.00	(—)
Yaesu FRG8800	475.00	(—)
Yaesu FRV8800 VHF Conv.	80.00	(1.50)
VHF RECEIVERS		
JIL SX400N	625.00	(—)
AOR 2002	398.00	(1.50)
Regency MX7000	399.00	(—)
Yaesu FRG9600	449.00	(—)
Signal R532 Airband	189.00	(1.50)
Signal R537 Airband Handheld	55.00	(1.50)
2M FM TRANSCEIVERS		
Alinco ALM 203E Handheld	209.00	(2.00)
Trio TM20IA 25W	265.00	(—)
Trio TM211E 25W	365.00	(—)
Icom 27E 25W	379.00	(—)
Icom 27H 45W	399.00	(—)
Yaesu FT27OR 25W	315.00	(—)
Yaesu FT 27ORH 45W	365.00	(—)
Trio TR2600 Handheld	275.00	(—)
Trio TH21E Handheld	170.00	(1.50)
Icom ICO2E Handheld	269.00	(—)
Yaesu FT 209R Handheld	239.00	(—)
Yaesu FT203R Handheld	195.00	(—)
2M MULTIMODE TRANSCEIVERS		
Trio TS711E Base 25W	695.00	(—)
Trio TR9130 Mobile 25W	499.00	(—)
Trio TS780 Base 2M/70cms	948.00	(—)
Icom IC271E Base 10W	659.00	(—)
Icom IC290D Mobile 25W	449.00	(—)
Yaesu FT 290R Portable	315.00	(—)
Yaesu FT726R 2M Fitted	775.00	(—)
70CMS TRANSCEIVERS		
Trio TS811E Base	795.00	(—)
Trio TM401A FM Mobile	316.00	(—)
Trio TW4000A Dual Band	522.00	(—)
Trio TM411E FM + DCS	399.00	(—)
Trio TR3600 Handheld	292.00	(—)
Trio TH41E Handheld	199.00	(1.50)
Icom IC471E Base	829.00	(—)
Icom IC490E Mobile	529.00	(—)
Icom IC04E Handheld	279.00	(—)
Icom 3200E Dual Band	495.00	(—)
Yaesu FT2700R Dual Band	499.00	(—)

70CMS TRANSCEIVERS cont.	£	(p&p)
Yaesu FT709R Handheld	259.00	(—)
Yaesu FT703R Handheld	235.00	(—)
MORSE EQUIPMENT		
HK708 Straight Key	15.45	(1.50)
HK707 Straight Key	16.00	(1.50)
HK706 Straight Key	17.46	(1.50)
MK704 Squeeze Paddle	14.50	(1.50)
HK702 Marble Base	32.50	(2.00)
MK705 Squeeze Paddle	26.50	(2.00)
CW3 Practice Oscillator	10.75	(1.00)
Star Master Key Electronic Keyer	49.95	(2.00)
D70 Datong Tutor	56.35	(2.00)
DRAE Morse Tutor	52.00	(2.00)
BY1 Bencher Iambic Paddle with black base	67.45	(3.00)
BY2 Bencher Iambic Paddle with chrome base	77.00	(3.00)
BY3 Bencher Iambic Paddle with GOLD base	141.75	(3.00)
SPEAKERS		
Trio SP230	47.75	(2.00)
Trio SP430	39.50	(1.50)
Trio SP120	30.75	(1.50)
Trio SP40 Mobile	16.50	(1.50)
Trio SP50 Moblie	16.50	(1.50)
Yaesu SP55 Mobile	14.95	(1.50)
Icom SP3	56.00	(2.00)
Icom SP4 Mobile	19.95	(1.50)
MICROPHONES		
Trio MC85	85.00	(2.00)
Trio MC60A	65.30	(2.00)
Trio MC80	42.80	(2.00)
Trio MC50	36.20	(2.00)
Trio MC42S Hand Mic	17.60	(1.50)
Trio MC40S Hand Mic	15.35	(1.50)
Trio MC35S Hand Mic	17.00	(1.50)
Trio MC55 Mobile	43.90	(1.50)
Yaesu MD1B8 Desk	64.80	(2.00)
Yaesu MH1B8 Mobile	15.70	(1.50)
Yaesu YM24A Speaker Mic	£23.75	(1.50)
Yaesu YM49 (FT29OR) Speaker Mic	£20.20	(1.50)
Yaesu MH12A2B (FT209/709/203/703)	£16.50	(1.50)
Yaesu MF1A3B Mobile	£18.00	(1.50)
Yaesu YH1 Headset	14.95	(1.50)
Yaesu YH2 Headset	14.95	(1.50)
Yaesu SB1 Switch Box	15.70	(1.50)
Yaesu SB2 Switch Box	13.80	(1.50)
Yaesu SB10 Switch Box	14.95	(1.50)
Icom HS10 Headset	19.50	(1.50)
Icom HS10SB Switch Box	19.50	(1.50)
Icom HS10SA VOX Unit	22.00	(1.50)
Icom SM6 Base	40.25	(2.00)
Adonis AM503G Desk	53.45	(1.50)
Adonis RM303G Desk	39.95	(1.50)
COAXIAL SWITCHES		
SA450 2 Way SO239	15.45	(1.00)
SA450N 2 Way 'N' Type	19.95	(1.00)
CH20N 2 Way 'N' Type	41.90	(1.00)
CH20A 2 Way SO239	22.95	(1.00)
DRAE 3 Way SO239	15.40	(1.00)
DRAE 3 Way 'N' Type	19.90	(1.00)
AERIALS		
Jaybeam TB3 HF 3 element Tribander Beam	230.00	(10.00)

AERIALS cont.	£	(p&p)
Jaybeam TB2 HF 2 element Tribander Beam	155.25	(10.00)
Jaybeam TB1 HF Tribander rotary dipole	83.37	(10.00)
Jaybeam VR3 HF Vertical Tribander	55.77	(10.00)
(Full range of Jaybeam VHF and UHF aerials available. Please ring for details.)		
Tonna 5 element 50MHz	37.90	(5.00)
Tonna 9 element fixed 'N' skt 144MHz	25.65	(5.00)
Tonna 9 element portable 144MHz	21.05	(5.00)
Tonna 2 × 9 element 'N' skt 144MHz	41.05	(5.00)
Tonna 13 element portable 144MHz	32.67	(5.00)
Tonna 17 element 'N' skt 144MHz	47.85	(5.00)
Tonna 9 element 435MHz	15.45	(5.00)
Tonna 19 element 435MHz	21.85	(5.00)
Tonna 2 × 19 element 435MHz	36.00	(5.00)
Tonna 21 element 432MHz	31.25	(5.00)
Tonna 21 element 438MHz ATV	31.25	(5.00)
Tonna 23 element 1250MHz	27.75	(3.00)
Tonna 23 element 1296/1269MHz	27.75	(3.00)
Tonna 55 element 1296/1269MHz	44.75	(5.00)
G5RV full size	16.25	(2.00)
G5RV ½ size	14.25	(2.00)
HB9CV 2 metres	3.95	(2.50)
HB9CV 70cms	3.95	(2.00)
2 metre Slim Jim	8.95	(2.50)
1-1 & 4-1 Baluns	12.95	(2.00)
3.7 and 7.1MHz Traps (pair)	9.50	(2.00)
Dipole centrepieces	1.80	(0.50)
Copper wire 50 metre rolls hard drawn	7.95	(2.00)
CX14OD masthead coaxial relay (weatherproof)	39.95	(3.00)
MISC		
DRAE 12Amp PSU	86.50	(2.50)
DRAE 24Amp PSU	125.00	(3.00)
BNOS 12Amp PSU	115.00	(2.50)
BNOS 25Amp PSU	169.00	(3.00)
BNOS 40Amp PSU	345.00	(5.00)
MMT144/28 Transverter	129.95	(2.00)
MMT144/28R Transverter	236.90	(2.00)
Mutek TVVF144a Transverter	239.00	(2.00)
Mutek TWF 50a 6M Transverter	239.00	(2.00)
Mutek TVVF 50c 6M Transverter	199.90	(2.00)
Mutek SLNA 145sb Preamp (FT290R)	29.90	(1.00)
Mutek SLNA 144s Preamp	39.95	(1.00)
Mutek SBLA144e Masthead	89.90	(1.00)
Mutek GFBA 144e Masthead	149.90	(1.00)
Daiwa CN410M 3-5-150MHz SWR Meter	48.00	(1.50)
Daiwa CN460M 140-450MHz SWR Meter	52.00	(1.50)
Daiwa CN620A 1-8-150MHz SWR Meter	66.21	(1.50)
Welz SP220 1-8-200MHz SWR Meter	59.00	(1.50)
Welz SP420 140-525MHz SWR Meter	69.00	(1.50)
Welz SP350 1-8-500MHz SWR Meter	79.00	(1.50)

FULL RANGE OF BNOS LINEARS, TONNA AND JAYBEAM AERIALS ETC ETC ETC . . .

GOODS NORMALLY DESPATCHED WITHIN 24 HRS. — PRICES CORRECT AT TIME OF GOING TO PRESS — E&OE

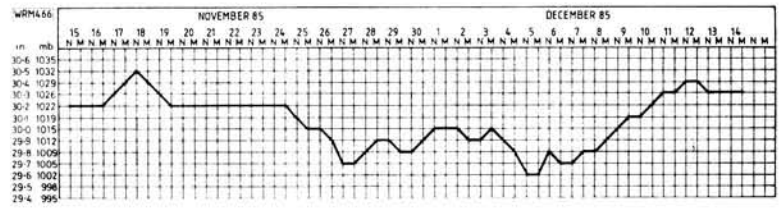
SPEND UP TO £1,200 INSTANTLY WITH A PHOTO ACOUSTICS LTD CREDIT CHARGE CARD — APPLY FOR DETAILS

PART EXCHANGE WELCOME, ASK FOR KERRY G6IZF, ANDY G4YOW, OR ROY G3TLE

Monday Friday 9.30-5.30 — Saturday 9.30-4.30

pressure then hovered around 30·0 up to the 4th, then falling again to fluctuate between 29·6 and 29·8 (1002 and 1009) until midnight on the 8th. At this point it began to rise gradually, reaching 30·4 (1029) at noon on the 12th, followed by a slight fall to 30·3 (1026), where it finished this period on the 14th. The foregoing text described the changes in pressure as recorded on the analogue charts on the Short and Mason barograph installed at my QTH. The slightly rounded readings taken from these charts at noon and midnight each day were used to compile our monthly pressure chart, Fig. 6.

Fig. 6



Band II

"Despite the high barometer readings between November 15 and 26, reception in Band II was poor compared with the summer," writes **Harold Brodribb,** St. Leonards on Sea. He adds, "As the front receded so British locals, such as Radios Kent, London, Solent, Sussex and Invicta Radio were more audible." Harold found the variability of direction an interesting point, and says that on November 16 and 18 he could hear French programmes from Lille and Neufchatel, but nothing from Abbeville and Paris. However, on the 22nd this was reversed and on the 25th he received very good signals from Paris. While the prevailing high pressure was falling, during the evening of December 12, I counted about eight Dutch and French stations and many inter-station warbles between 87 and 103MHz, with only a dipole feeding my ex-military R216 v.h.f. communications receiver. Although **Stuart Brooks,** Carluke, can hear BBC radios Cumbria, Newcastle and Merseyside and ILR Clyde, Downtown, Forth and West Sound most of the time, during the better conditions in November, Stuart added BBC Radios Cleveland, Cymru, Devon, Humberside, Lancashire and Sheffield and ILR Beacon, Capital, LBC, Metro, Red Rose, Signal, Tay and Trent, to his score.

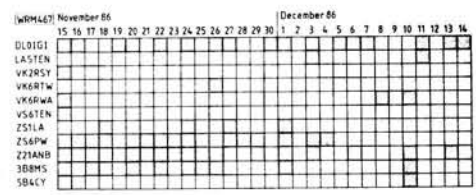


Fig. 7

TELEVISION

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

by Ron Ham BRS15744

Much has already been written about the mechanics and causes of tropospheric openings, so let us take a look at these events from the practical DXers viewpoint and what can be received from our normal DX catchment area. The television ranges influenced by the troposphere are 175 to 230MHz in the v.h.f. part of the radio frequency spectrum, known in the TV world as Band III, and 470 to 607 and 615 to 856MHz, known as Bands IV and V respectively. The channel numbers allocated to these bands and seen on the dials of most combined v.h.f./u.h.f. receivers, are 5 to 12, 21 to 38 and 39 to 69, although in practice the u.h.f. band is normally scribed 21 to 69, because there is little need to separately identify Bands IV and V on the receiver. More precise details can be seen in the *World Radio Television Handbook* including the many main and relay stations in Austria, Belgium, France, Germany, Holland, Ireland, Italy, Luxembourg, Norway, Spain, Sweden, Switzerland and the UK, which transmit 625-line pictures with positive vision modulation on these bands in our catchment area.

However, the French network TF1 uses 819 lines and negative modulation for its monochrome signals in these bands and 625 lines for its u.h.f. colour transmissions. Other countries such as Bulgaria, Czechoslovakia, Finland, Poland, USSR and Yugoslavia also use these bands but their signals (other than by Sporadic-E in Band I) are seldom seen in the UK. Large numbers of the European TV transmitters within our average catchment area, by international agreement, use the same channels. Despite this, as a result of careful planning, they do not interfere with each other until their recognised range is multiplied by complicated changes, of a temporary nature, in the structure of the troposphere. A minor tropospheric disturbance usually extends to Band III, and with a multi-element v.h.f. beam turned between south-east and north-east, pictures from continental and Scandinavian stations should be seen in the UK. This also applies, but with a u.h.f. antenna, during a major opening when Bands IV and V are affected. Don't forget to look toward Ireland for both v.h.f. and u.h.f. signals from Radio Telefis Eireann and u.h.f. signals from the BBC and IBA in Ulster.

On the subject of antennas, **Neil Purling** in Hull asks, "Is there a particular transmitter which appears when there is a slight lift, which with my 12-element antenna I can use as a guide to the strength and quality of conditions in Band III?" In your case, Neil, I would suggest one of the German stations on Chs. 8, 9 or 10. A fixed point station for propagation reference is a good idea and each DXer has a favourite. In my case it is the Dutch stations on Chs. 5 and 6. Ideally, v.h.f./u.h.f. antennas should be mounted as high as possible and rotatable, and the signals they collect should be conveyed to the receiver by a good-quality, low-loss feeder. Also, do remember to make sure that the connections at the antenna are well secured and that the centre pin of the coaxial plug at the receiver end is soldered. The last thing a DXer wants is an intermittent antenna circuit.

In some cases the home QTH is not always the best for DX, because of shielding by hills or high buildings; therefore, readers like **George Garden,** Edinburgh, and **Simon Hamer,** New Radnor, take their portable sets and various antennas, from "bow ties" to Yagis, to a local high spot and find out just what can be received even under normal conditions. I seldom go out in the car without my Plustron TVR5D ready for a tune through the bands if I reach a high clear spot.

While in Germany last August, George Garden did a bit of "on site" DXing and took the opportunity to photograph the test cards from ARD Wedelstein, Fig. 1, and Austria ORF FS2, Fig. 2, on the hotel receiver.

From their homes in the UK, **Keith Chaplin** and **Martin Messias** logged a caption, Fig. 3, and a test card, Fig. 4, respectively, from the Belgian networks BRT-1 and RTBF-1, during previous openings. At his QTH in Edinburgh, George Garden recently installed his rotatable u.h.f. antenna, Fig. 11, on his chimeny with a booster, and although his QTH is partially screened by the Pentland Hills he has received pictures under normal conditions from Border TV at Caldbeck on Ch. 28 and Selkirk on Ch. 59 and IBA CH4 from Darvel on Ch. 29. "When signals are weak, accurate pointing of the antenna for maximum pick-up is most important and worth taking time to get it right," said George. He tested this point by leaving his set tuned to Border TV on Ch. 59 and turned his antenna, in a westerly direction, away from Selkirk, looking for Ulster TV at Limavady, also on Ch. 59, and found a fading b/w signal coming in waves lasting only for a few seconds.

Among **Tony Palfreyman**'s collection of DX pictures is a weather report, Fig. 5, and a programme schedule, Fig. 6, from ARD and ZDF, the latter showing the word "HEUTE" which we frequently see when the signal paths are open to Germany. Another document that I find most useful is *A Pocket Guide to Transmitting Stations* published by the IBA Engineering Information Service, Crawley Court, Winchester, Hants SO21 2QA.

Tropo openings are also of great interest to **Major Rana Roy** in India who often receives pictures from the Lahore station of Pakistan TV and keeps a special watch for captions, Figs. 7 and 8, and people, Figs. 9 and 10, like announcers and programme presenters. I am always pleased to hear about television DX from our overseas readers, because it gives us in the UK a chance to better understand atmospheric disturbances which occur in other parts of the world.

Band I

Although the frequency range of 40 to 68MHz, known as Band I, is often full of DX during the summer months and is currently very quiet, both Simon Hamer and I received bursts of test card from Poland TVP and a discussion programme on Ch. R1 49·75MHz, early on November 15. Simon also logged a test card from Czechoslovakia, RS-KH on Ch. R1 and a

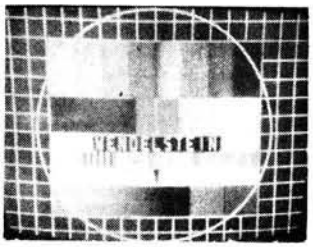


Fig. 1

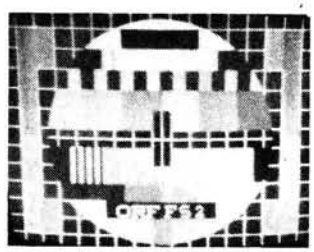


Fig. 2

Fig. 3

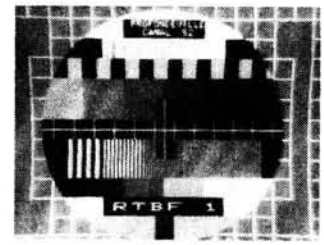


Fig. 4

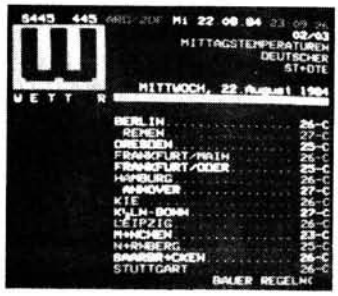


Fig. 5

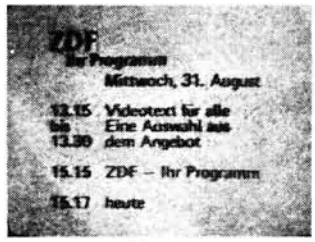


Fig. 6

Fig. 7

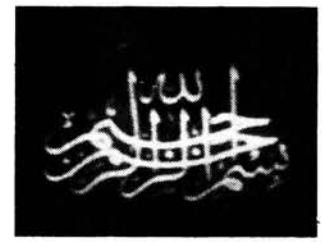


Fig. 8

Fig. 9

Fig. 10

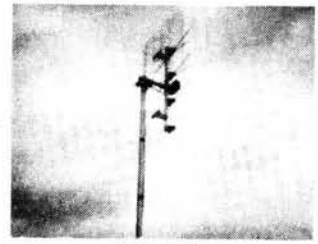


Fig. 11

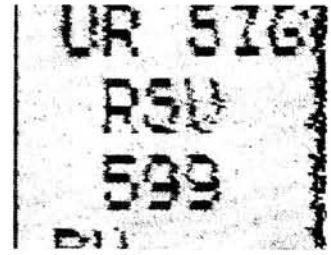


Fig. 12

programme from Italy, RAI on their Ch. Ia 53·75MHz, on December 3, and a test pattern from Spain RTVE on Ch. E2 48·25MHz, on the 6th. Between 0830 and 1030 on the 14th there were many strong, but brief, bursts of pictures on Ch. R1. During one of these which lasted over a minute, I recognised one of the regular Polish newscasters with their insignia "dt" over his right-hand shoulder. It is reports like these that prompt me to remind the new TVDXers that, although the start of the 1986 sporadic-E season, which you are eagerly awaiting, is still three months away, it is always worth making a daily check on Chs. E2 and R1 during the early mornings and afternoons for short life, pre-season openings, which can be very rewarding.

SSTV

Although propagation on the 14MHz band was not marvellous during the month prior to December 14, I did copy SSTV pictures from I1CEL, YU2HX and an SP2 which was lost through QSB around 1100 on November 17. Between 1020 and 1130 on December 1, I received a picture of an analogue clock at 1044 showing 1144 and the captions, "NAME ZILE QTH SMEDER?", "HOW COPY EA2AAU PSE K", "NICE COPY DR OM" and "UR SIG RSV 599", Fig. 12. My SSTV signals are received on a Trio R-2000 communications receiver, fed with a long wire antenna and processed by a Spectrum computer with Scarab software. I have connected a tape recorder at the point where the audio leaves the receiver and enters the input EAR port on the Spectrum. By watching the monitor, I can be sure that the signal I decide to record is of the correct tone and will produce a picture when played back into the system. The edited results are reproduced from the computer by an Alphacom 32 printer. On December 1, G1OTO received SSTV pictures from **Richard Thurlow G3WW**, March, on 144·5MHz at RS58 using a BBC computer with Scarab software, and on the 7th Richard completed a first time 2-way QSO with F6FKN on 14·230MHz. Another new SSTV "CQ", from I4JXF on 14MHz, was answered by Richard, so increasing his first timers score to 2105. The Italian station was using a Robot 400 and a computer for his eight seconds monochrome pictures and, of course, is welcome to the mode. "G3OQD is now transmitting and receiving the new Robot-type colour video on his home-designed and made converter with many operational refinements," writes Richard. He also tells me that G3UEU should soon be on with equipment of his own design. The 14MHz band seemed quite good during the morning of December 14, when, at 1123, I copied a very strong caption, "QRZ SSTV DE I0EMU" and a few minutes later, "SORRY QRM DE I0EMU".

Reports by the 15th please

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

It is interesting to reflect upon conditions in Australia at this time, for they are at their worst just now. **John Ratcliffe** of Southport, Queensland, says, "I cannot report on any m.w. DX reception, for a change in the weather during November has brought with it a lot of electrical storms, which seem to 'brew up' around mid-afternoon and contine until sunrise the next day: this effect extends right across the band and up as far as 6MHz!"

However, conditions for DXing the medium wave band have gradually improved in the UK during November and early December and much DX is being reported. A good loop antenna is the key to success and Dave Mayhew's "Sooper Loop" constructional article (mentioned in the November issue of *PW* "On the Air", page 68), will be published in *PW* soon.

DX Report

Note: All frequencies in kHz: Time UTC (GMT).

Transatlantic DX: Over 50 years ago, during the early '30s, **G. T. Morley** of Redhill, Surrey, was a keen m.w. DXer. He gave it all up, however, until last year, when the "bug" bit again and he is now very active recapturing "the days of old". Of course, his equipment has changed; he now uses a Trio R-2000 plus 20m wire and an a.t.u., but he has noted that a number of the original stations are still listed—old callsigns like WGY, WTIC, WIOD, WWVA and many more! Some of these may not be heard now because they use directional antennas. European stations, too, which operate 24 hours a day create a problem nowadays but then the band was wide open from midnight to North and South America until 0400 when the Russians used to be received.

The most consistent recent signal is CJYQ 930, St. John's, Newfoundland, with WNEW 1130, New York, not far behind. Others heard were, from the USA—New York's WOR 710; WABC 770; WINS 1010 and WHN 1050; Boston's WHDH 850; WBZ 1030 and WMRE 1510; Philadelphia's WCAU 1210 and from Canada—CBM 940 Montreal; CKCW 1220 Moncton N.B., CKLM 1570 Laval, Quebec and VOCM 590 from St. John's —all between 2200 and 0230.

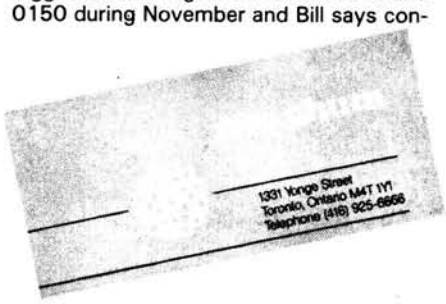
Paul Logan of C. Fermanagh, N. Ireland, took his receiver along to relatives near Lisnaskea. Using the set's internal ferrite rod antenna, Canada's CJYQ; VOCM; CKYQ 610, Grand Bank, Nfld; CKCM 620 Grand Falls, Nfld; CBN 640 St. John's, Nfld and CHYQ 670, Musgravetown, were received and, from the USA, WHN and WMRE were heard, too. Paul then attached an 18m TV coaxial cable and heard CHER 950, Sydney N.S. and Caribbean Beacon 1610—all between 2240 and 0030—it just shows what can be done! Back at home, Paul received, from the USA, WNEW; WNBC 660, New York; WLAM 1470, Lewiston, Maine, and WHDH. He heard Radio Globo el Mundo, 1220 from Rio at 0015 and Radio Kutcha, Venezuela 1470 at 0410.

A programme about Maritime Radio attracted **Dave Mayhew** of Yapton, Sussex, to Canada's CJFX 580, Antigonish N.S. Using his "Sooper Loop" with a Grundig 1400 receiver, Dave heard many other Canadian stations, including CHER; CKNB 950, Campbellton N.B.; CHUM 1050 Toronto; CKCW; CBJ 1580 Chicoutimi, Quebec and Montreal's CFCF 600; CKAC 730; CBM and CKLM. Turning his loop to the USA, New York's WNBC 660; WABC; WCBS 880; WINS and WHN were logged. Others included WHIN 1010 Gallatin, Tenn.; WBAL 1090 Baltimore and WMRE; further south, CMBC 690 Cuba and XEBBC 1470 were noted.

The first ever confirmed reception of signals in South Africa from Canada's CBE 1550, Windsor, Ontario, took place on 19 September 1985 at 0400. The letter of confirmation to **Leo Gieske ZR6AKF** of Randburg from Mr. R. A. Clark, Radio Resources Manager, CBE, says—"Your report was the first received from South Africa in our 35 years of broadcasting. Most DXers responding to CBE are from north of the Equator—usually very far north."

Another remarkable reception in Randburg took place on 25 September 1985 at 0400, when Leo heard WOKJ 1550, Jackson, Miss. The letter of confirmation from Sharon Terry, Station Secretary, WOKJ, says—"The details you have given prove correct . . . thank you for informing us of this miraculous occurence." I am sure all *PW* readers will want to join me in congratulating you, Leo!

Bill Kelly of Belfast has again been DXing through much of the night, judging by his logs! "Old Faithful" CJYQ 930 was logged on five nights between 2340 and 0150 during November and Bill says conditions were generally good. WMRE 1510 was received on four nights with prizes being offered in response to their adverts! Bill listened to a basketball game between Detroit and Boston and baseball, too, via WTOP 1500 Washington D.C. at 0225. From Ohio, Cleveland's WGAR 1220 was a good signal at 0200. Lower in frequency, Canada's CIYQ 680, Grand Falls, Nfld. was transmitting about football on two nights around 0200. CKYQ was also noted twice.



Evangelical programmes from Caribbean Beacon, Anguilla 1610 were heard at 0400 on three nights. Radio Globo 1220, Rio, was consistently a good signal around 0130. Bill received a new one—KJR, Seattle, Washington, at 0015: has anyone else logged this station?

Graham Powell of Pontypridd says, "band conditions were the best for a long time". Many Canadian stations were received between 0330 and 0500 including, VOCM; CKYQ; CIYQ; CKVO 710, Clarenville, Nfld.; CJCH 920, Halifax N.S.; CJYQ; CBM; CHER; CKLM; CKCW; CJRS 1510, Sherbrooke and CHUM (Fig. 1).

Religious programmes were noted from Caribbean Radio Lighthouse 1165 Antigua at 0100, Caribbean Beacon 1610 at 2359 and from St. Kitt's Radio Paradise 825 at 0400. From South America, Radio Vision 950 Caracas, Venezuela, Radio Capital 1040, São Paulo and Radio Liberacion 1470, Carupano, Venezuela, were logged between 0056 and 0428.

Other DX: The long, dark winter evenings are helping to make m.w. DXing a pleasure. Some of the interesting stations featured in Paul Logan's log include Ljubijana 918 at 2300 and Zagreb 1134 at 2200—both from Yugoslavia; also, Radio Sophia, Bulgaria 1224 and Radio Tirana, Albania 1215, both received at 1930. Of particular interest to the many Polish people in the UK may be his mention of Wroclaw, Poland on 1206kHz.

Using a Vega 206 Mk II receiver, **Alan Merritt** of Abingdon has been enjoying the programmes from Monte Carlo, Monaco on 1467, which is a good signal.

Two weak unidentified stations have been received during the night by Bill Kelly. They appear to be speaking in Arabic and the transmissions are heard on 621 and 954kHz—they may be Batra, Egypt and Al Arish Qatar: has anyone else heard these signals around 0300 hours? Bill heard positive identification of Kharkov, Ukraine 837 at 0115.

Margaret Sadler of Leeds, who has a Grundig Satellit 1400 receiver, has been checking the German news headlines from DDR Berlin 1359 at 2215. Then later she listens to the VOA news from West Germany on 1197 at 0131. Margaret has been listening to some interesting programmes from BRT Brussels 1512.

Germany is also featured in the log from **Alan Williams** of Helston, Cornwall. He draws attention to Deutschlandfunk's DX programme on Tuesdays at 1900 on 1269kHz. Another station in his log is Radio Finland, which transmits on 254kHz, 558kHz and 963kHz and has a programme in English at 1930. Alan says he has been hearing a test transmission from Radio Berlin International on 1578 at 2300.

Local Radio DX: Although a regular reader of *PW* "On the Air" for some years, **Stuart Brooks** of Carluke, Strathclyde, has not sent in a report before, so it is nice to welcome him. He says, "It is, of course, more difficult to receive many local radio stations so far north"—and that I can quite understand. However, his impressive list

would delight many listeners! Extracts from this list are, BBC's Radio Devon (Barnstaple 801, Plymouth 855 and Exeter 990); Solent (Fareham 999 and Bournemouth 1359); Lincolnshire 1368; Humberside 1485; Merseyside 1485; Nottingham (Trowell) 1521 and Kent (Rusthall) 1602; also, ILR's DevonAir (Pearce's Hill) 666; 2CR Bournemouth 828; Beacon Radio (Wolverhampton) 990; Downtown (Belfast) 1026; Broadland (Norwich) 1152; Plymouth Sound 1152; Swansea Sound 1170 and Wyvern (Cotheridge) 1530.

Most of the stations detailed were received on a Grundig Satellit 2100 plus a loop antenna but, recently, Stuart changed to their Satellit 600 model and this has, so far, presented a problem since the internal ferrite antenna cannot be disconnected. This is a common problem encountered by *PW* readers and the special "Ferrite Injector" designed by Dave Mayhew and detailed in his forthcoming "Sooper Loop" constructional article may soon help here.

Much to his surprise, James Sneddon of Motherwell, Lanarkshire, found he could receive BBC Local Radio Cumbria 756 on his Network cassette radio—so now he has a new interest, m.w. local radio DXing! Using the set's internal antenna at his 12th floor flat, several other stations became apparent, including ILR Downtown Radio (Belfast) 1026 and no less than four stations on 1458—BBC London, Newcastle, Manchester and Devon (Torbay). The built-in cassette recorder was soon put to good use!

Although not Local Radio Stations, other BBC stations were noted too, BBC Ulster (Lisnagarvey) 1341 and BBC Wales 882 with transmitters at Forden (1kW), Penman (10kW), Twywn (5kW) and Washford (70kW)—without a loop antenna the exact one received is in doubt.

Books

The British DX Club have published the 5th edition of their 20-page booklet *Radio Stations of the United Kingdom* which details all *UK* m.f. and v.h.f. transmitters, locations, operating frequencies and their power output, also the 1986 frequency changes are included. Available to members and non-members at 75p (or 3 IRCs) incl. UK postage or surface mail world-wide from: BDXC, 54 Birkhall Road, Catford, London SE6 1TE.

QSL Address

Radio Finland: PB10, 00241 Helsinki, Finland.

SW BROADCAST BANDS

Reports: as for Medium Wave DX, but please keep separate

by Brian Oddy G3FEX

For the Newcomer SWL

Any "Newcomer s.w.l." who has obtained a short-wave broadcast schedule from a particular country will no doubt have wondered why there are so many transmission frequencies listed on different bands at a given time of day or night, considering that they are all carrying the same programme material. Could it be that they are doing this for political reasons, to make sure that their signal and point of view cannot be missed?

Well, this may certainly be the case with some countries, who have perhaps six or more transmissions on the same band, fairly closely spaced together. However, there are good technical reasons too for using several frequencies, so let us consider them.

One good reason that comes to mind is that, by using directional beam antennas and different frequencies, the same programme can be radiated to several countries or target areas simultaneously. This could also be done, however, by using an accurately set common frequency for transmission and directional beam antennas at different transmitting sites (this is known as "inter-station synchronisation").

The main reason for the use of several frequencies is the nature of the ionosphere. We have briefly looked at the basic principles of s.w. propagation via the ionosphere (see October 1985 *PW*, page 72).

The degree of ionisation of the reflecting layers is dependent upon the sun's activity. Radiation from the sun is far from constant and any changes in the degree of ionisation of the reflecting layers can affect long distance s.w. reception. Blemishes on the sun's surface, such as **sun spots** and invisible areas called **M regions** will cause such changes to occur. As seen from the earth, the sun takes 27 days to rotate on its axis and some of its effects on reception tend to have a 27 day periodicity. Sun spots follow an 11 year cycle from minimum/maximum/minimum in number on the sun's surface and cause an 11 year change in reception conditions—from poor at minimum to excellent at maximum. We are at the minimum just now—see Fig. 1.

For satisfactory s.w. reception, the frequency of the transmission has to be chosen with care: if it is too high the signals will penetrate the ionosphere and be lost into space; if too low, the signal will be partly absorbed by the lower regions of the ionosphere, i.e. attenuated. Best results are obtained by using a frequency which is just below that which penetrates the ionosphere and is called the **maximum usable frequency** (m.u.f.). This m.u.f. will depend on the degree of ionisation present in the ionosphere. In turn, this will depend largely upon the extent to which the sun is illuminating the ionosphere over the chosen path, so the m.u.f. will vary with both time of day and time of year. It is impossible to predict with accuracy how these variations over a long period will affect the m.u.f. but daily observations of signals can help to provide a clue.

Broadcasters change their operating schedules generally four times a year, in March, May, September and November, to allow for seasonal changes but are generally reluctant to change them more often because listeners expect to find their programme on a particular frequency. To offset the variations and make best use of transmission paths, two or three frequencies are used to radiate the programme. A transmission on 17MHz (16m) could be backed up by 15MHz (19m) when the m.u.f. is high, for example, and 11MHz (25m) could be used to back up 15MHz when the m.u.f. is low. In the summer, the m.u.f.'s are lower in the daytime and higher at night than those obtained during the winter months. In the summer, therefore, more stations are crowded into fewer bands and interference results. During minimum sun spot periods (as at present), m.u.f.s are generally lower throughout the year.

Another reason for the choice of frequency is the distance between the transmitter and receiver, for the "skip distance" is also important. Generally speaking, a lower frequency would be used to cover shorter distances. Low-angle, high-frequency signals just "skip" over the nearer countries and cannot be heard there.

The actual bands of frequencies allocated to broadcasters are decided by international agreement. The frequency limits of the present allocations were given in August 1985 *PW*, page 59.

So, in view of the foregoing, what can we expect from these bands? In the tropical regions of the world long distance l.w. and m.w. reception of domestic broadcasts is unsatisfactory because thunderstorms create high levels of static interference. The 2MHz (120m), 3MHz (90m) and 5MHz (60m) bands provide much better coverage and reception in these areas and form the Tropical Bands equivalent of the m.w. domestic service. Other countries use these bands for other purposes — communications transmissions, etc., and much interference exists from the DXers point of view. These tropical transmitters, which use relatively low power, can be received after dark in the UK, usually with interference (QRM) present, consequently good equipment, skill and patience are needed!

The 4MHz (75m) band is an international broadcast band which is also shared with other services. It is normally used during darkness for DXing and can produce some interesting stations.

During the daytime, short and medium distances can be covered by services on the 6MHz (49m), 7MHz (41m) and 9MHz (31m) bands. After dark, the distances increase and world-wide signals become audible. During periods of low sunspot numbers (as at present) many broadcasters move down to these bands when the higher frequencies become difficult. Consequently, they become packed with signals.

The 11MHz (25m) band is one of the most reliable h.f. bands and provides good DX reception during both day and night. Local signals are weak or non-existent.

The 15MHz (19m), 17MHz (16m) and 21MHz (13m) bands are capable of providing truly world-wide DX reception during the daytime. However, these are the bands most affected by solar events. High sunspot numbers and solar activity can ensure that adequate levels of F-layer ionisation exist to permit such reception but low sunspot numbers produce poor conditions.

In winter, at night, signals soon fade out after nightfall but, in summer, weaker signals may be present throughout the night. Solar storms can produce unpredictable reception periods, or even total loss of signals for a few hours or days.

During periods of high sunpot numbers, the 25MHz (11m) band offers unrivalled DX possibilities, for exceedingly strong signals from all continents are possible. However, for much of the remaining time in the 11-year sunspot cycle this band is virtually dead, being unused by broadcasters.

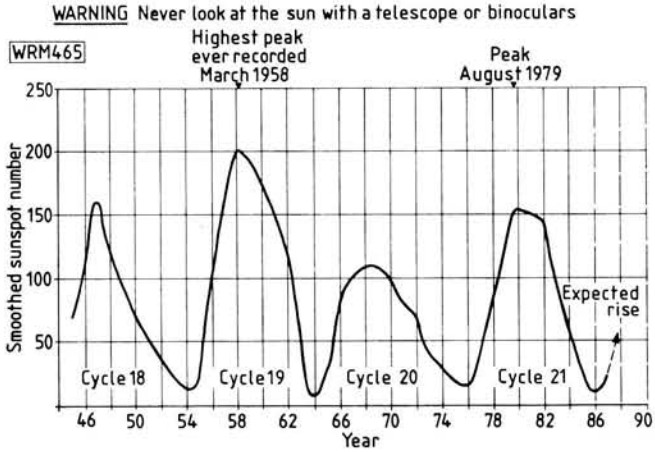


Fig. 1

Conditions on the HF Bands

(Note: Frequencies in MHz: Times in UTC=GMT)

The 25MHz (11m) and 21MHz (13m) Bands

Conditions on the 25MHz band are, as expected, very poor. **Graham Powell** of Pontypridd has regularly checked this band during November and early December and has heard a signal on only one day, at 1300! **Bill Kelly** of Belfast heard it too, but on three days between 1130 and 1200! This signal is from Radio Liberty, which transmits daily in Russian to Asia on 25·690 between 0830 and 1330. It would be interesting to know how well it is

received in the target area! Other listeners report a lack of signals and, from "down under", **John Ratcliffe** of Southport, Queensland, says, "the 11m band is completely silent here".

During daylight hours, conditions on the 21MHz band are favourable from some areas. The UAE transmitter in Dubai, mentioned by **Margaret Sadler** in her log from Leeds, can be heard on 21·700 with a programme in Arabic around 0925. Their programme in English and Arabic commences at 1030 on 21·605 and **Keith Fernie** of Ossett, Yorks, receives their news at 1330. By this time this is one of the few signals not swamped by the considerable illegal "jamming" which takes place around mid-day. Earlier, at 1155, **Philip Rambaut** of Macclesfield has logged Radio Cairo on 21·465, which is beaming to Asia with a programme in Indonesian and Thai languages from 1130.

John Ratcliffe says—"Only a few signals are audible on 13m; Radio Nederlands and Radio Moscow being the most noticeable". The BBC are not mentioned by John, although they transmit to Australia on 21·550 and 21·710 at 0800.

By 1630, the BBC Ascension Island transmitter is one of the few signals remaining on the band before it closes soon after sunset in the UK.

The 17MHz (16m) and 15MHz (19m) Bands

Conditions on the 17MHz band are generally fair—although somewhat unreliable at times—and many interesting signals can usually be found here. **Robert Taylor** of Edinburgh and **Peter Edwards** of Abingdon have both been listening to the lively programmes from The Voice of Israel on 17·630—in Hebrew at 0930 but in English from 1100. Attrative music and news in English form part of the programmes from the Voice of Greece which **Leslie Biss** of Knaresborough, Yorkshire, has been hearing on his DX100L receiver at 1235 on 17·565.

UAE Dubai have a strong signal in the UK on 17·775 from 1030. Some readers may be interested in their programme entitled "The History of Zionism" at 1330 on Wednesdays. From farther afield, Margaret Sadler has been hearing local and world news from Radio Pakistan, 17·660 at 1005.

Radio Nederlands broadcast to Asia and the Middle East from their Madagascar relay station at 0912 on 17·575. Signals are directed to South Africa at 1000 by Radio Portugal on 17·880. Signals from South Africa can be heard on 17·780 with news in English at 1100. On Wednesdays, Radio RSA, Johannesburg, have a popular *Mailbag* programme at 1405, when listeners' letters are answered: this is preceded by a news summary at 1400.

Peter Mills of Sherborne, Dorset, has been enjoying the programmes from HCJB Quito, Ecuador, on 17·790, beaming to Europe from 1900 to 2000.

John Ratcliffe says—"there are plenty of signals on the 16m band but few are in English. There is no sign of the BBC. VOA and Radio Moscow predominate".

On 15MHz signals from many countries in several continents have been audible during the day despite the high levels of illegal "jamming". Radio Japan's transmission to Europe on 15·195 at 0900 has been heard by **Julian Wood** of Buckie, Scotland, and Peter Mills. Peter also logged Radio Pakistan at 1100 on 15·605.

The broadcast beamed to Asia by Radio Australia on 15·405 has been logged by **Tim Shirley** of Bristol and Philip Rambaut, at 1000. KYOI Saipan 15·190 at 0800 and Radio Korea 15·579 at 1100 are noted in Graham Powell's log. Other eastern stations of interest include Radio Beijing, China, 15·165 audible around 1010 and All India Radio which can be received at 1330 on 15·335.

The Voice of Greece 15·630 at 1540 was received well by **Leighton Smart** of Trelewis, Wales, on his RP8260 receiver—he has clipped a long wire antenna onto the whip to improve results. RCI Canada is a regular feature in his log, too, on 15·325 from 1900—of special interest to all s.w.l.'s is their *Short-wave Listeners' Digest* on Saturday at 1935.

"Anyone interested in American Football should tune into AFRTS, 15·430 on Sunday at 1930"—says **Andrew Hill** of Cheslyn Hay, Staffs. Enthusiast **Chris Hughes** of Helston, Cornwall, says—"They usually broadcast two games and then give the NFL results". Andrew mentions that VOA's latest schedules can be obtained from the US Embassy, London, by sending a s.a.e.

Alan Williams, also of Helston, has been hearing Radio Jamahiriyah, Tripoli, on 15·450 at 1930. This station's time schedule varies and **Harry Armstrong** of Co. Armagh, N. Ireland, has obtained their QSL for a transmission on this frequency at 2200 in July which was not scheduled. Alan's log mentions that Radio Portugal can be heard on 15·105 at 1600 transmitting to Asia and the Middle East.

WINB, Red Lion, Pa., USA, has been logged by Peter Mills at 1800 on 15·295 and RAE Argentina 15·345 at 2100 has been noted, too. **Reg Billing** of Rochester, Kent, has also been hearing South America. He used his B210 Selena receiver to pick up RNB Brazil, 15·155 at 1800.

John Ratcliffe says—"The BBC is a good signal most mornings at 10 a.m. local time and VOA, Radio Moscow, Radio Sweden Int., Radio Berlin Int., UAE Dubai are all good signals. During the afternoon, Radio New Zealand is received. Three Japanese stations can be heard on 19m in the evening, here in Queensland".

The 11MHz (25m), 9MHz (31m), 7MHz (41m) and 6MHz (49m) Bands

These bands are very congested and are a hive of activity at night. **Stuart Brooks** of Carluke, Strathclyde, concentrated on 11MHz DX from South America, logging Radio Nacional, Argentina 11·710; Radio Nacional de Amazona, Brazil 11·780; Radio Guaiba, Brazil 11·785; Radio Globo, Brazil 11·805; Radio Aparcida, Brazil 11·855 and Radio Bandeirantes, Brazil 11·925—all received between 2200 and 2300 on a Grundig 600 receiver plus 30m wire antenna.

KYOI Saipan 11·900 at 1000 and Radio Tashkent, Uzbek, USSR 11·785 at 1200 were just two of the interesting signals received by Graham Powell.

Ted Tew of Northallerton, Yorkshire, who works with aircraft, enjoyed the programme *Canadian Airline Safety* broadcast by RCI Montreal, 11·945 at 1900. *Farming in Sweden* also interested him from RSI, Stockholm, 11·940 at 1230.

Harry Armstrong, Peter Edwards and **Simon Hamer** of New Radnor, Wales, have all remarked on the "excellent signal from Radio RSA to Europe on 11·900 at 2100"—it's hard to believe that Johannesburg is over 9000 kilometres away!

On 9MHz, Radio Australia have a test transmission to Europe between 0800 and 1000 on 9·655—Tim Shirley and Ted Tew have been receiving it well. Your report, too, will no doubt be welcomed "down under"!

There are interesting broadcasts to Europe during the evening on 31m from The Voice of Israel, 9·385/9·920 at 1800; Radio Cairo, Egypt, 9·805 at 2115 and from The Voice of Turkey, 9·560 at 2300.

From farther away, Radio Pyongyang, N. Korea, 9·350 at 2000; The Voice of Vietnam, 10·040 at 2030; Radio RSA Johannesburg, 9·585 at 2100 and VOFC Taipei, Taiwan, 9·955 at 2200 all beam to Europe.

Alan Merritt of Abingdon received an attractive QSL from WYFR, California, USA, for reception of their signal on 31m in September.

"Newcomer s.w.l." **Clive Powell** of Southport has added another station to his growing list—Radio Baghdad 9·610 at 2130. He is delighted at the number of QSLs and booklets he has received!

Albert Fisher G4VBH, of Heston, Hounslow, has been checking the 7MHz and 6MHz bands. Extracts from his logs include Radio Australia 7·205/6·035 from 1600 to 2000; Radio Beijing, China 7·590/6·860 at 2100 and Radio Sophia, Bulgaria 7·115/7·100/6·070 at 2130.

John Ratcliffe says—"On 25m there is little daytime reception but, at night, the band is full of mainly Spanish, German and French-speaking stations. The 31m band is open until mid-day and the BBC signal is good. From mid-day to 4 p.m. the band is dead. By evening, the band is very congested with mainly Japanese and South American signals. The 41m band is similar to 31m. Reception on 49m is only possible from late afternoon, when BBC and VOA are good."

The 5MHz (60m), 4MHz (75m), 3MHz (90m) and 2MHz (120m) Bands

Tropical DXing for the first time, Alan Merritt was thrilled to hear FRCN Lagos, Nigeria 4·990 at 2105. **Fred Pallant G3RNM**, of Storrington, Sx. heard it too, also Mali, Bamako 4·835 at 2200; ORTS Dakar, Senegal 4·890 and Garoua, Cameroon 5·010. Over in Co. Fermanagh, **Paul Logan** logged Kaduna, Nigeria 4·770; Doula, Cameroon 4·795; Gabon 4·810; Chad 4·905; GBC Ghana 4·915 and Ecos del Torbes, Venez. 4·980.

John Parry G4AKX, Northwich, Cheshire, received All India Radio 3·905/3·925; Xingjiang, China 4·500; also Radio Nepal 5·005, noted too by Simon Hamer, along with BBC Singapore 3·915; Ulan Bator, Mongolia 4·080 and ORTB Cotonou, Benin 4·870 at 2130. Margaret Sadler's extensive log details most of those listed so far!—also R.SWA Namibia 3·270; Azad Kashmir, Pakistan 4·790; R. Tachira, Venez. 4·830; Gansu, China 4·865; R. Cultura do Para, Brazil 5·045 and R. Togolaise, Togo 5·047. New DX for Tim Shirley was R. Sao Vincente, Cape Verde Is. 3·930; R. Zaracay, Ecuador, 3·395; El Gran Columbia, Ecuador 4·911 and R. Tanzania 5·050.

Paul Fry of Eastleigh, Hants, is seeking details of the best time(s) to receive MBC Mauritius 4·856—please advise him, via me.

Universal Semiconductor Devices Ltd.

17 GRANVILLE COURT, GRANVILLE ROAD, HORNSEY, LONDON N4 4EP, ENGLAND.
TEL. 01-348 9420/9425 * TLX. 25157 usdco g

WE OFFER ONE OF THE LARGEST RANGES OF SEMICONDUCTORS AT HIGHLY ECONOMICAL PRICES. THE FOLLOWING SEMICONDUCTOR TYPES ARE AVAILABLE FROM STOCK. IF WE DON'T STOCK WHAT YOU NEED THEN WE CAN GET IT FAST FROM OUR FACILITIES IN WEST GERMANY AND USA UPON REQUEST.

TRANSISTORS – BIPOLARS – GERMANIUM AND SILICON
SMALL SIGNAL
POWER
DARLINGTONS – ALL SHAPES AND SIZES
VHF/UHF DEVICES – ALL SHAPES AND SIZES

FETS – POWER MOSFETS
UNIJUNCTIONS

DIODES – GERMANIUM AND SILICON
RECTIFIERS AND BRIDGES
OPTO-ELECTRONIC DEVICES
LEDS OF ALL SHAPES AND SIZES

THYRISTORS AND **TRIACS** – ALL
SHAPES
SIZES
RATINGS

INTEGRATED CIRCUITS:
CONSUMER – DIGITAL/ANALOGUE
MICROPROCESSORS AND PERIPHERALS
IC SOCKETS

JAPANESE COMPONENTS – VAST RANGE OF DISCRETES AND CONSUMER IC's.

MAIL ORDER CUSTOMERS: PLEASE SEND FOR OUR COMPREHENSIVE PRICE LIST, ENCLOSING 75 PENCE IN STAMPS, CHEQUE OR POSTAL ORDER. THIS SUM IS REFUNDABLE WITH A FIRST ORDER VALUE OF £5.00 OR MORE.

CATALOGUE SENT FREE OF CHARGE, WHEN REQUESTED ON OFFICIAL LETTERHEAD (WITHOUT REFUND), TO OEM'S, SCHOOLS, COLLEGES, UNIVERSITIES, GOVERNMENT INSTITUTIONS, COMPUTER FIRMS, ELECTRONIC REPAIR FIRMS AND DISTRIBUTORS.

SPECIAL DISCOUNTS AND PAYMENT TERMS ARE AVAILABLE TO ABOVE INSTITUTIONS.

PLEASE ENQUIRE FOR QUANTITY DISCOUNTS.

WE WELCOME TELEPHONE AND TELEX ENQUIRIES!

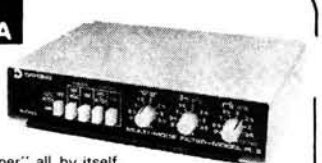
INTRUDER ALARM UNITS light activated comprises light detector with photo diode & scr. Control unit mains operated with int 6v Nic Cad battery & charger, test buzzer, test & reset swts, mains ind. as sks for two I/Ps and one O/P to operate 12v two tone siren supplied. Were intended to be operated/activated by flash cube but will work from torch or sim, new unused with leads, £19.50. **ROTARY INV** aircraft type I/P 18v DC O/P 230v AC at 180 watts 50c/s sine wave approx 18 amps I/P for full load, new, £45. **METERS** 240 Deg 1 Ma, scale 0 to 8×100 3¼" sq, £12.50, also DC 0/10 amps 2½" dia, £4.50, DC 0/25 amps proj mt 3½", £8.50, DC 100 Ua scale 0/100 3×2¼", £5.50, all new. **DIODES** stud type 200 PIV 20 amps, 4 for £4.50. **VARIACS** for 240v, O/P var 0 to 270 at 8 amps or 2Kw max for internal mounting, £35. **HAND GENERATORS** Army type provide O/P for charging 12v batteries est 3 amps with O/P ind tree clamp, handles, carrying bag, cable, new, unused, £45. **ULTRA L.B. Rts.** 70/90 Mc/old type, solid state, dash mt, 4 chan AM, size 12×7×4½, est 3 watts 12v ext, soiled cases, most have mikes, £18. **AUDIO OSC.** Advanced gen purp osc 15c/s to 50Kc sine wave var o/p into 5 or 600 ohm mains tested, £33. **MOTOR** 6/24v DC with int gearbox 60 RPM at 24v size 2½×1½×1½", £4.50. **TAPE RECORDERS** 2 chan 3 speed ¼ track with mon spk in wood carrying case for 240v with headset with boom mike, tape circ & inst, £29, or Rec only £19. **ARMY RECT. 7** 240v AC or 12v DC I/P gives 80-0-80v DC at 30Ma, will also give 240v AC at approx 40 watts from 12v DC I/P, in wood case with lid, £10.50. **ROTARY SWTS** 2p 10 way ceramic, 2 for £2.50. **PYE PF.1 Rx.** nom 450Mc/s FM req 9v batt with circ, £6.50. **C.R.T.** DG-7-32 gen purpose 2¾" dia tube green trace with connec, £14. **TAPE REC.** Fi.Cord miniature battery operated reel to reel, 2 speed ½ track ¼" tape, req two supplies of 7/12v DC supplied with tape, mike, carrying case, inst etc, £65. **PHOTO TEST UNIT** Reflec Densitom, contains two lens units with adjustable light source mains trans etc, £25. **CONDS** block paper 8uf 1500v size 5×4×5", two for £10 also 4uf 1500v at £3.50ea. **BRIDGES** Services type CT492 general purpose CRL bridge meter indication, battery operated, £85. **VOLTAGES REGULATORS** Claude Lyons mains voltage stab nom 220v out at 30 amps, adjustable motor, variac type with transis control unit, tested, £85. **TAPE RECORDERS** Philips type Pro.12 reel to reel 3¾/7½" two chan int mon amp, 7" spools, mains operated, modern professional recorder in good cond tested, £135. **For callers** Army lead acid batteries 12v 75 A/Hr, £18 new or £11.50 S/Hand.

Above prices inc. Carr/Postage & VAT. Goods ex-equipment unless stated new. Allow 14 days for delivery. SAE with enquiry or 2×17p stamps for List 37.

A.H. SUPPLIES

122 Handsworth Road, Sheffield S9 4AE.
Phone: (0742) 444278.

AUDIO FILTERS MODELS FL2, FL3, FL2/A



Model FL3 represents the ultimate in audio filters for SSB and CW. Connected in series with the loudspeaker, it gives variable extra selectivity better than a whole bank of expensive crystal filters. In addition it contains an automatic notch filter which can remove a "tuner-upper" all by itself. Model FL2 is exactly the same but without the auto-notch. Any existing or new FL2 can be up-graded to an FL3 by adding Model FL2/A conversion kit, which is a stand-alone auto-notch unit. Datong filters frequently allow continued copy when otherwise a QSO would have to be abandoned.

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

ACTIVE RECEIVING ANTENNAS

Datong active antennas are ideal for modern broadband communications receivers – especially where space is limited.

- highly sensitive (comparable to full-size dipoles).
- Broadband coverage (below 200 kHz to over 30 MHz).
- needs no tuning, matching or other adjustments.
- two versions AD270 for indoor mounting or AD370 (illustrated) for outdoor use
- very compact, only 3 metres overall length. ● professional performance standards.

Prices. Model AD270 (indoor use only) **£51.75** Both prices include mains power unit.
Model AD370 (for outdoor use) **£69.00**

MORSE TUTOR

The uniquely effective method of improving and maintaining Morse Code proficiency. Effectiveness proven by thousands of users world-wide.

- Practise anywhere, anytime at **your** convenience.
- Generates a random stream of perfect Morse in five character groups.
- D70's unique "DELAY" control allows you to learn each character with its correct high speed sound. Start with a long delay between each character and as you improve reduce the delay. The speed **within** each character always remains as set on the independent "SPEED" control.
- Features: long life battery operation, compact size, built-in loudspeaker plus personal earpiece. Price: **£56.35**

Our full catalogue plus further details of any product are available free on request.

All prices include VAT and postage and packing. Goods normally despatched within 3 days subject to availability.

VISA

Barclaycard, Access Orders – Tel: (0532) 552461

DATONG ELECTRONICS LIMITED

write to dept. P.W.
Spence Mills, Mill Lane
Bramley, Leeds LS13 3HE
England
Tel (0532) 552461

ANTENNES TONNA (F9FT)

50MHz	
5 element	£37.87(a)
144MHz	
4 element	£15.82(a)
4 element crossed (N)	£34.78(a)
9 element fixed (N)	£25.62(a)
9 element portable (N)	£27.92(a)
9 element crossed (N)	£41.03(a)
13 element portable (N)	£39.57(a)
17 element fixed (N)	£47.83(a)
435MHz	
9 element (N)	£22.31(a)
19 element (N)	£28.75(a)
19 element crossed	£36.01(a)
21 element 432MHz (N)	£38.12(a)
21 element ATV (N)	£38.12(a)
144/435MHz	
9 & 19 element Oscar	£36.01(a)

1296MHz OR 1269MHz OSCAR UPLINK

23 element	£27.72(b)
4×23 element – power splitter – stacking frame	£144.74(a)
55 element	£44.75(a)

We are pleased to introduce a new range of antennas shown thus (N). The dipoles have been redesigned and now include a fully sealed 'N' connector – absolutely NO matching or tuning required. Also a new 1296MHz 55 element yagi. Send for full details.

POWER SPLITTERS – STACKING FRAMES
PORTABLE ALUMINIUM TELESCOPIC MASTS

PLEASE ADD CARRIAGE AS SHOWN (a) £4.00. (b) £2.20. ALL PRICES INCLUDE VAT AT 15%

ACCESS – VISA – Just telephone your card number for immediate despatch.

FOR FULL SPECIFICATIONS SEND 40p FOR CATALOGUE

Callers welcome, but by telephone appointment only please. Goods by return.

RANDAM ELECTRONICS (P)
12 Conduit Road, Abingdon, Oxon OX14 1DB. Tel: (0235) 23080 (24 hours)

AMATEUR ELECTRONICS UK

G6XBH
G1RAS
G8UUS

R.A.S. (Nottingham)
Radio Amateur Supplies
Tel: 0602 280267

YAESU

Visit your Local Emporium

Large selection of New/Used Equipment on Show

AGENTS FOR:	ACCESSORIES:
F.D.K.	Welz Range
AZDEN	Microwave Modules
ICOM	Adonis Mics
YAESU	Mutek Pre-Amps
CELLNET	Barenco Mast Supports
VODAFONE	DRAE Products
	BNOS Linears & P.S.U.'s

AERIALS, Tonna, Halbar, New Diamond Range of Mobile Whips
JAYBEAM TIGER ANTENNAS
JUST GIVE US A RING
Monday: CLOSED Tuesday-Saturday: 10.00am to 5.00pm

3 Farndon Green, Wollaton Park, Nottingham
Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)

Receivers and Components

PRACTICAL WIRELESS KITS

RTTY/morse modem	Jan. '86 **£34.65**
Crystal calibrator	Jan. '86 **£19.95**
Two tone oscillator excl. mic plug	Dec. '85 **£22.45**
Capacitance Meter	Oct. '85 **£23.90**
DIP Oscillator	Oct. '85 **£19.90**
Meon 50mHz Transverter	Oct. '85 **£49.50**+£1.50 p&p
U.H.F. Prescaler	Sept. '85 **£24.95**

All kits complete (less batteries) unless specified, including all components, PCB (or Vero), case & hardware. All components are new/full spec.

P.W. PROJECT COMPONENTS

RA53 Thermistor	**£4.95**
LM566	**£1.25**
12V Relay-Meon (RS type)	**£2.95**
22mHz Crystal-Meon	**£7.95**
180uH Choke-Meon	**£0.49**
Coil Formers-Meon per 3	**£2.95**
Cermet Multiturn Pots ¾"	**£0.85**

(All R.S. components available)

Please add 70p postage unless specified. **Do not add VAT.** Cheque or Postal Order to:
C.P.L. ELECTRONICS
8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE.
Tel: 0642-591157.
Kits available for other magazine projects, plus components etc. Write or 'phone for Free Price List.

LISTEN TO TWO METER RADIO AMATEURS on your C.B. Quartz V.H.F. converter covers popular simplex channels and all repeaters. £24.50 inclusive. SAE more details: Mike Rathbone (G3211), Sound Centre, 41 Tulkeith Street, Southport, Merseyside.

SWL & DXING PRODUCTS. SAE details please: D. J. Stanton (Radio), 16 Addison Road, Worcester WR3 8EA.

1000 KG EQUIPMENT, components, test gear, metres, computers, cable, valves. 50% new knockout prices list 50p. 021 472 3688.

VALVES: 78 types, 160 as one lot including PX4's, shields, bases, plugs, £60 ono. Telephone 06845 69715.

RADIO CANADA, Peking, Australia, Voice of America. A Vega 206 (6× SW/MW/LW) pulls these and dozens more. £24.95. "Good buy" Practical Wireless. Year's guarantee. Return despatch. CORRIGAN-RADIOWATCH, Building 109, Prestwick Airport, KA9 2RT.

CRYSTALS Made to order for any purpose and large stocks of standard frequencies for computers, modems, etc. Amateur CW (QRP) freqs.*£4.00* and CB conversion crystals at*£4.50*.
PROGRAMMABLE OSCILLATORS (PXO) for baud rates, MPU, and freq markers*£12.50*.
FILTERS Crystal, monolithic, mechanical and ceramic for all standard IF's. Special 10.695MHz for big improvement to most CB rigs at*£4.50 each*.
S.A.E. FOR LISTS. PRICES INCLUDE VAT AND POST
P. R. GOLLEDGE ELECTRONICS
G3EDW, Merriott, Somerset, TA16 5NS
Tel. 0460 73718

MAXI - Q
COILS AND CHOKES
PREVIOUSLY MADE BY DENCO
S.A.E. PRICE LIST
8 BRUNEL UNITS, BRUNEL ROAD, GORSE LANE IND. ESTATE, CLACTON, ESSEX CO15 4LU.
TEL: (0255) 424152

SMALL ADS

The prepaid rate for classified advertisements is 40 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £13.23 per single column centimetre (minimum 2.5 cms). Please add 15% VAT to total. All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Westover House, West Quay Road, Poole, Dorset. Tel. 0202 671191.

NOTICE TO READERS

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

Receivers and Components Cont.

JAYCEE ELECTRONICS
JOHN GM30PW
20 Woodside Way, Glenrothes, Fife KY7 5DF
Tel: 0592 756962
Open: Tues-Sat 9-5
Quality secondhand equipment in stock. Full range of TRIO goodies. Jaybeam – Microwave Modules – LAR.

ESR ELECTRONIC COMPONENTS
● Full range of Components ● Speakers & Accessories ● Audio Connectors & Switches ● Amplifier Modules & Cases
FREE PRICE LIST AVAILABLE
13A STATION ROAD, CULLERCOATS, NORTH SHIELDS, TYNE & WEAR NE30 4PQ.
TEL: 091 251 4363.

Software

Morse Transceive for 48K Spectrum. Split screen, type ahead, programmable memories, self tracking 8/30 wpm. Send at receive speed or set speed between 8/30 wpm. Requires CW filter as below. *SAE for full details to address below.*

RTTY Transceive for 48K Spectrum. Menu driven, split screen, morse indent, programmable memories, 4 baud rates, etc. **No terminal unit,** uses simple filter unit. Cassette and instructions including filter circuit etc. **£8.50.** Filter built and tested, **£6.00.** RTTY/CW filter fully tested and boxed, **£11.50,** same with tuning LED, **£13.50.** *S.A.E. for full details to address below.*

Morse Reader Programme. Off air onto screen. Programmes for SPECTRUM, ZX81-16K, BBC B, AMSTRAD 464, ATARI 600/800XL, DRAGON, COMMODORE 64 & ANY VIC 20.

Sinclair machines need no interface, others use simple one transistor interface. Self tracking 8/30 wpm. All connections to exisiting sockets. Cassette with instructions including interface circuit, **£6.00.** Ready-built interface, **£2.50.**

J.E.P. ELECTRONICS, New Road Complex, Kidderminster DY10 3XL. Phone: (0562) 753893

Veteran & Vintage

EARLY WIRELESS SETS FOR SALE. Crystal sets, bakerlite radios. S.A.E. for list: 312 Carterhatch Lane, Enfield, Middlesex.

Wanted

WANTED: copy of "Practical Wireless Circuits", 18th Edition. Phone Whitley Bay 091 2520361.

MAINS TRANSFORMER for Solartron CD1400 oscilloscope. RUNDELL, 38 Heathfield Road, Keston, Kent.

Books and Publications

DIAL-SEARCH 4th Edition (1986/87) now available: handy 52 page booklet giving all essentials for listening to European and British broadcasts. Clear listings MW, LW, selection VHF & SW; signature tunes, superb maps. £3.30 including postage; abroad £3.50 or 15 IRCs. WILCOX (PW1), 9 Thurrock Close, Eastbourne BN20 9NF.

Security

D.I.Y. ALARMS
Door Entry Phone
CC TV BS 4737 approved.
Showroom demonstration.
Same day despatch.
Free catalogue.
01-965 1230
SMITHS SECURITY SYSTEMS
43 Park Parade, London NW10

Auctions

AUCTION NOTICE ELECTRONICS
AUCTIONS HELD EVERY OTHER FRIDAY — LOTS INCLUDE:
Electronic and Electrical Equipment, Components, Test Gear, Radiotelephones, Computers, Photographic and Video Equipment, also Manufacturers Plant and General Works Effect.
CATALOGUES AVAILABLE, SUBSCRIPTION £10 PER YEAR, POST PAID.
ANGLIA INDUSTRIAL AUCTIONS
5 Station Road, Littleport, Cambs. CB6 1QE.
Phone: 0353 860185.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for ..... insertions. I enclose Cheque/P.O. for £ .....
CAT. heading .....
(Cheques and Postal Orders should be crossed Lloyds Bank Ltd. and made payable to Practical Wireless)

NAME .....
ADDRESS .....
.....

PRACTICAL WIRELESS
Classified Advertisement Department, Westover House, West Quay Road, Poole, Dorset.
Rate **40p** per word, minimum 12 words.
Box No. **60p** extra.
PLEASE ADD 15% VAT TO TOTAL

Company registered in England. Registered No. 53626. Registered Office: King's Reach Tower, Stamford Street, London SE1 9LS.
3/86

Valves

MAJOR VALVE TYPES STOCKED. Contact I. YOUNG, 14 Cow Lane, Rampton, Cambs. Cottenham 50315.

For Sale

MARCONI TF144H/4S SIGNAL GENERATOR £125. Advance B4B £65. Gygocounter 5GC0012 £75. Dummyload 500 watt 50 ohm. Tubular brass £75. R1155 £75. Linear – 26-30MHz, 140 watt, new, £99. Leson base microphone – DT251, new £49. Teletype 33 discones £28 and £78. 10/11 metre new three elementbeam £55. Large selection receivers/transmitters. Part exchanges. Buying/selling. SSB PRODUCTS (G3EKX), 42 Halvarras Road, Playing Place, Truro. (0872) 862575.

AMATEUR RADIO EQUIPMENT bought, sold, exchanged. Contact DAVE G3RCQ. Tel. Hornchurch (040-24) 55733 evenings 6-9pm Prestel MBX 402455733 or send S.A.E. for current list: G3RCQ, 65 Cecil Avenue, Hornchurch, Essex RM11.

Service Sheets

SERVICE SHEETS for valve radios etc. From 70p. 5 Holcombe Avenue, Bury BL8 2RN.

BELL'S TELEVISION SERVICES for service sheets on Radio, TV, etc. £1.50 plus SAE. Service Manuals on Colour TV and Video Recorders, prices on request. SAE with enquiries to B.T.S., 190 Kings Road, Harrogate, N. Yorkshire. Tel. (0423) 55885.

TECHNICAL INFO SERVICES
76 Church St – Larkhall – Lanarks

FULL SIZE SERVICE SHEETS
Any radio, audio £2.50 + l.s.a.e.
CTVs/MusC £3.50 + l.s.a.e. complete set

Worlds largest collection
service manuals 30's – date
from £4.50-£35 each.

Comprehensive T.V. Repair Course
Complete Radio Service & Repair Course
ONLY £9.50 EACH

Unique comprehensive repair
data & circuits for almost
every TV & video in stock.

S.a.e. brings any quotation
FREE 50p mag. inc. service sheet!
Pricelists unique elect. publications

FOR FAST QUOTES RING
0698 884585 before 5pm
0698 883334 after 4pm

Educational

COURSE FOR CITY & GUILDS, Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses (GCE, Career and professional examinations, etc.) write or phone: THE RAPID RESULTS COLLEGE, Dept. JX16, Tuition House, London, SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting Dept. JX16.

Miscellaneous

G2VF D.I.Y. H.F. long and medium wave loop antennas. SAE for details: F. RYLANDS, 39 Parkside Avenue, Millbrook, Southampton.

BURGLAR ALARM EQUIPMENT. Ring Bradford (0274) 308920 for our catalogue or call at our large showrooms opposite Odsal Stadium.

QSL CARDS. Gloss or tinted cards. SAE for samples to: TWROG PRESS, Dept PW, Penybont, Gellilydan, Blaenau Ffestiniog, Gwynedd.

HEATHKIT U.K. Spares and Serviceable Centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys (new material only) from stock. Special sizes to order. Call: EARTH STATION 01-228 7876. 22 Howie Street, London SW11 4AR.

SUPERB INSTRUMENT CASES by BAZELLI, manufactured from PVC, Faced steel. Vast range. Competitive prices start at a low £1.50. Punching facilities at very competitive prices. Suppliers only to Industry and the Trade. BAZELLI, (Dept No. 25), St. Wilfrid's, Foundary Lane, Halton, Lancaster LA2 6LT.

THE SCIENTIFIC WIRE COMPANY
811 Forest Road, London E17. Telephone 01-531 1568
ENAMELLED COPPER WIRE

SWG	1lb	8 oz	4 oz	2 oz
8 to 34	3.63	2.09	1.10	0.88
35 to 39	3.82	2.31	1.27	0.93
40 to 43	6.00	3.20	2.25	1.61
44 to 47	8.67	5.80	3.49	2.75
48	15.96	9.58	6.38	3.69
SILVER PLATED COPPER WIRE				
14 to 30	9.09	5.20	2.93	1.97
TINNED COPPER WIRE				
14 to 30	3.97	2.41	1.39	0.94
Fluxcore Solder	5.90	3.25	1.82	0.94

Prices include P&P VAT. Orders under £2 add 20p.
SAE for list of copper and resistance wire.
Dealer enquiries welcome.

NEW
UK LISTENERS
CONFIDENTIAL FREQUENCY LIST
2nd EDITION

This brand new publication is a must for all UK short wave listeners. It contains information that no serious listener should be without. If you enjoy exploring the shortwave spectrum you will certainly enjoy reading all the hitherto unpublished information contained in this publication. It opens with some general information and hints on listening. It then goes into more details about a variety of strange unexplained transmissions that can be heard across the bands. A chance here for the enthusiast to do some real detective work! The main body of the publication tells you exactly where to listen for the stations you are looking for. A comprehensive list of non-broadcast stations with frequencies, mode and location guides you right the way through the shortwave spectrum. Whether you're interested in Airband, Marine, Amateur or transmissions we cannot mention here you'll find this fascinating reading. We can almost guarantee that this publication will have you burning the midnight oil and sitting on the edge of your chair with excitement.

£4.95

OVER 2000 COPIES SOLD

"CONFIDENTIAL" VHF/UHF AIRCRAFT LISTINGS

This unique frequency manual contains a complete list of all the VHF civil aircraft frequencies in use throughout the UK plus all the RAF, USAF and MOD airfield frequencies in both the VHF and UHF bands. No other publication offered at anywhere near the price has offered so much information. New 2nd edition now with lots more frequencies!

£3.95 plus 40p p&p

OCEANIC HF AIRBAND SUPPLEMENT

Yet another unique publication! This is a supplement to our successful VHF/UHF Airband Manual and provides comprehensive information on the HF airband traffic from 2-18mHz. It lists both bands and specific frequencies used by air traffic crossing the worlds oceans. It also lists civil and military VOLMET broadcasts, RAF Strike Command frequencies, and civil and military in-flight frequencies etc. etc. Essential reading for the enthusiast.

Goods by return **£1.95**

WATERS & STANTON
18-20 MAIN ROAD, HOCKLEY, ESSEX
Tel: (0702) 206835
BARCLAYCARD – ACCESS

★ BAKER ★
GROUP P.A. DISCO AMPLIFIERS post £2

150 watt Output, 4 input Mixer pre-amp. Illustrated **£99**
150 watt Output, Slave 500 mv. Input 3 Speaker Outputs **£80**
150+150 watt Stereo, 300 watt Mono Slave 500 mv. Inputs **£125**
150 watt P.A. Vocal, 8 inputs. High/Low Mixer Echo Socket **£129**
100 watt Valve Model, 4 inputs, 5 Outputs. No Cabinet **£99**
60 watt Mobile 240v AC and 12v DC. 4-8-16 ohm+100v line **£89**
Reverb Unit for Microphone or Musical Instruments **£35** PP £1.
Electronic Echo Machine for mic/etc **£85** PP £1. Deluxe **£95.**

FAMOUS LOUDSPEAKERS — **FULLY GUARANTEED**

Make	Model	Size	Watts	Ohms	Price	Post
AUDAX	WOOFER	5½in.	25	8	**£10.50**	£1
GOODMANS	HIFAX	7½×4¼in	100	8	**£34**	£2
GOODMANS	HB WOOFER	8in.	60	8	**£14**	£1
GOODMANS	"402"	12in.	60	15	**£30**	£2
BAKER	WOOFER	12in.	80	8	**£25**	£2
GOODMANS	DISCO/GROUP	12in.	120	8/15	**£36**	£2
BAKER	DISCO/GROUP	15in.	100	8/16	**£28**	£4
H+H	DISCO/GROUP	15in.	100	4/8/16	**£49**	£4
GOODMANS	HP/BASS	15in.	250	8	**£74**	£4
GOODMANS	HPD/BASS	18in.	230	8	**£87**	£4

COMPACT FULL RANGE SPEAKER SYSTEMS size 24×17×12in
100 watts **£90**, 200 watts **£100**, 400 watts **£150** each. Carr £12.
MID-N-TOP 300 watts, system complete **£125**. Carr £12.

DISCO CONSOLE Twin Decks, mixer pre amp **£145.** Carr £10.
Ditto Powered 120 watt **£199;** or Complete Disco **£300.** Carr £30.

MAINS TRANSFORMERS — Price Post
250-0-250V 80mA. 6.3V 3.5A. 6.3V 1A. **£7.00** £2
350-0-350V 250mA. 6.3V 6A CT **£12.00** £2
220V 25mA. 6V 1 Amp **£3.00** 220V 45mA. 6V 2 Amp **£4.00** £1
LOW VOLTAGE TAPPED OUTPUTS AVAILABLE
1 amp 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 **£6.00** £2
ditto 2 amp **£10.50** 3 amp **£12.50** 5 amp **£16.00** £2
31-26-0-26-31 volt 6 amp **£14.00** £2
LOW VOLTAGE MAINS TRANSFORMERS £5.50 each post paid
9V, 3A; 12V, 3A; 16V, 2A; 20V, 1A; 30V, 1½A; 30V, 5A+ 17-0-17V, 2A; 35V, 2A; 20-40-60V, 1A; 12-0-12V, 2A; 20-0-20V, 1A.

PANEL METERS 50μA, 100μA, 500μA, 1mA, 5mA, 100mA, 500mA, 1 amp, 2 amp, 5 amp, 25 volt, VU 2¼×2×1¼in. **£5.50** post 50p
MINI MULTI TESTER Volts AC-DC, ohms, milliamps **£8.50**
DELUXE RANGE DOUBLER METER 50K O.P.V. £25.00 PP £1
7 × 5 × 2in Ohms 20meg, volts 0.25, 1000, current 50ua. 10a.

PROJECT CASES. Black Vinyl Covered Steel Top, Ali Base
4 × 2½ × 2¼in. **£2.50;** 6 × 4 × 1½in. **£3.60;** 8 × 5 × 2in. **£4.00;** 11 × 6 × 3in. **£5.50;** 11¾ × 6 × 5in. **£9.00;** 15 × 8 × 4in. **£12.00.**
ALUMINIUM PANELS 18 s.w.g. 12 × 12in. **£1.80;** 14 × 9in. **£1.75;** 6 × 4in. **55p;** 12 × 8in. **£1.30;** 10 × 7in. **96p;** 8 × 6in. **90p;** 14 × 3in. **72p;** 12 × 5in. **90p;** 16 × 10in. **£2.10;** 16 × 6in. **£1.30.**
ALUMINIUM BOXES. MANY OTHER SIZES IN STOCK.
4 × 2½ × 2in. **£1.20;** 3 × 2 × 1in. **£1;** 6 × 4 × 2in. **£1.90;** 8 × 6 × 3 **£3.00;** 12 × 5 × 3in. **£3.60;** 6 × 4 × 3in. **£2.20;** 10 × 7 × **£3.60.**

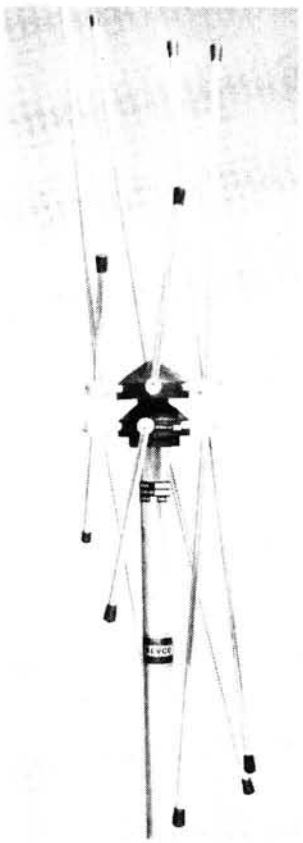
HIGH VOLTAGE ELECTROLYTICS

16/450V	**50p**	220/400V	**£2**	32+32/500V	**£2**
20/500V	**75p**	8+8/450V	**85p**	32+32/350V	**85p**
32/350V	**45p**	16+16/350V	**75p**	16+32+32/500V	**£2**
47/350V	**75p**	20+20/350V	**75p**		

GEARED TWIN GANGS 365 + 365 + 25 + 25pf **£2.00.**
REVERSE VERNIER cord drive **90p.**
VERNIER DIALS, 0:100, 36mm, **£2.50,** 50mm, **£3.00.**

RADIO COMPONENT SPECIALISTS
Dept 4, 337, WHITEHORSE ROAD, CROYDON
ACCESS **SURREY, U.K. Tel: 01-684 1665** VISA
Post 65p Minimum. Callers Welcome.
Full Lists 34p Stamps **Same day despatch** **Closed Wednesday**

REVCO



A BREAKTHROUGH IN WIDE BAND ANTENNA TECHNOLOGY

The new Radac® series from Revco offers a very much improved performance over existing Discone and other type configurations. Produced after concentrated development, wide band performance is available in a very compact form. Primarily designed for omnidirectional monitoring applications, these antennas can also be used over the entire band for transmitting purposes. Quality engineered to meet professional, military and amateur applications. Special and higher frequency versions will be available.

MODEL 2045: 100-480 MHz. AV. with options 25-100 MHZ.

MODEL 2046: Amateur Bands Version 28-50-70-145-430 MHz.

Max. Diam: 7½" (90mm).
Weight – 4 kgs.

PRICE: £59 + carriage + V.A.T.
Total £70.95

REVCO ELECTRONICS LTD.,
Poundwell Street,
Modbury, S. Devon PL21 0RQ.
Tel: 0548 830665
Telex: 8954665 VBSTLX G REL

Also from:
Garex Electronics, Lowe Electronics, A.R.E.

RST

MAIL ORDER CO.
Langrex Supplies Ltd.,
Climax House,
159 Fallsbrook Road,
Streatham, SW16 6ED.

SPECIAL EXPRESS MAIL ORDER SERVICE

	£p								
AZ31	2.75	EM81	2.50	PL509	6.00	6AK5	5.99	6K8	3.00
CL33	4.00	EM87	2.50	PL519	6.00	6AL5	1.50	6KD6	7.00
DY86/7	1.50	EN91	6.50	PL802	6.00	6AM6	6.02	6L6G	3.00
DY802	1.50	EY51	2.75	PY33	2.50	6AN5	4.75	6L6GC	5.75
E88CC	10.33	EY86	1.75	PY81	1.50	6AN8A	3.50	6L7	2.50
E180F	12.05	EY88	1.75	PY82	1.50	6AQ5	3.25	6LQ6	7.50
EB10F	35.48	EY500A	3.00	PY83	1.25	6AR5	25.00	6Q7	3.75
EABC80	1.25	EZ80	1.50	PY88	2.00	6AS6	8.66	6RHH8/6KN8	10.00
EB91	1.50	EZ81	1.50	PY500A	4.00	6AS7G	8.75	6SA7	3.00
EBF80	1.50	GY501	300	PY800	1.50	6AT6	1.25	6SC7	2.75
EBF89	1.50	GZ32	4.00	PY801	1.50	6AU5GT	5.00	6SJ7	3.25
EC91	8.00	GZ33	4.75	QQV02-6	34.00	6AU6	2.50	6SK7	3.50
ECC33	4.50	GZ34	4.00	QQV03-10	25.00	6AW8A	3.75	6SL7GT	3.00
ECC35	4.50	GZ37	4.75	QQV03-20A	48.38	6B7	3.25	6SN7GT	3.00
ECC81	1.75	KT61	5.00	QQV06-40A	46.00	6B8	3.25	6SS7	2.75
ECC82	1.75	KT66	15.00	QV03-12	6.80	6BA6	1.50	6SG7M	2.50
ECC83	1.75	KT77 GOLD	12.00	R18	3.00	6BA7	5.00	6U8A	2.25
ECC85	1.75	KT88 LION	20.00	R19	9.24	6BE6	1.50	6V6GT	4.25
ECC88	3.50	N78	15.00	SP41	6.00	6BH6	2.50	6X4	3.00
ECC91	8.93	OA2	3.25	SP61	4.00	6BJ6	2.25	6X5GT	1.75
ECF80	1.50	OB2	4.35	U19	13.75	6BN6	2.00	12AX7	1.75
ECH35	3.00	OC3	2.50	U25	2.50	6BQ7A	3.50	12BA6	2.50
ECH42	3.50	OD3	2.50	U26	2.50	6BR7	6.00	12BE6	2.50
ECH81	3.00	PC86	2.50	U37	12.00	6BR8A	3.50	12BY7A	3.00
ECL80	1.50	PC88	2.50	UABC80	1.25	6BS7	6.00	12E1	20.00
ECL82	1.50	PC92	1.75	UBF89	1.50	6BW6	6.00	12HG7	4.50
ECL83	3.00	PC97	1.75	UCH42	2.50	6BW7	1.50	30FL1/2	1.38
ECL86	1.75	PC900	1.75	UCH81	2.50	6BZ6	2.75	30P4	2.50
EF37A	5.00	PCF80	2.00	UCL82	1.75	6C4	1.25	30P19	2.50
EF39	2.75	PCF82	1.50	UCL83	2.75	6C6	3.50	30PL13	1.80
EF41	3.50	PCF86	2.50	UF89	2.00	6CB6A	2.50	30PL14	1.80
EF42	4.50	PCF801	2.50	UL41	5.00	6CD6GA	5.00	572B	55.00
EF50	2.50	PCF802	2.50	UL84	1.75	6CL6	3.75	805	45.00
EF54	5.00	PCF805	1.70	UY41	2.25	6CH6	13.00	807	3.75
EF55	3.50	PCF808	1.70	UY85	2.25	6CW4	8.00	811A	18.33
EF80	1.75	PCH200	3.00	VR105/30	2.50	6D6	3.50	812A	35.00
EF86	3.50	PCL82	2.00	VR150/30	2.50	6DQ5	6.00	813	65.00
EF91	2.95	PCL83	3.00	Z759	25.00	6DQ6B	4.75	866A	35.00
EF92	6.37	PCL84	2.00	Z803U	25.00	6EA8	3.00	872A	20.00
EF183	2.00	PCL85	2.50	2D21	3.25	6EH5	1.85	931A	18.50
EF184	2.00	PCL86	2.50	3B28	50.00	6F6	3.00	2050	7.50
EH90	1.75	PCL805	2.50	4CX250B	58.00	6Gk6	2.75	5763	4.50
EL32	2.50	PD500	6.00	5R4GY	5.50	6H6	3.00	5814A	4.00
EL33	4.00	PFL200	2.50	5U4G	3.00	6HS6	3.77	5842	12.00
EL34	4.00	PL36	2.50	5V4G	2.50	6J5	4.50	6080	14.00
EL36	2.50	PL81	1.75	5Y3GT	2.50	6J6	8.93	6146A	12.00
ELL80	19.00	PL82	1.50	5Z3	4.00	6J7	4.75	6146B	12.00
EL81	5.25	PL83	2.50	5Z4GT	2.50	6JB6A	5.00	6550	8.00
EL84	2.25	PL84	2.00	6/30L2	1.75	6JE6C	7.50	6883B	12.50
EL86	2.75	PL504	2.50	6AB7	3.00	6JS6C	6.00	6973	7.50
EL91	7.39	PL508	5.50	6AH6	5.00	6K4N	2.50	7025	3.00
EL95	2.00					6K6GT	2.75	7027A	8.00
EL360	8.50					6K7	3.00	7360	10.00
								7586	15.00
								7587	23.00

Open daily to callers: Mon-Fri 9 a.m.-5p.m.
Valves, Tubes and Transistors – Closed Saturday
Terms C.W.O. only, allow 7 days for delivery. Tel. 01-677 2424/7.
Prices excluding VAT add 15% Quotations for any types not listed S.A.E. **Post and packing 50p per order** **Telex 946708**

Prices correct when going to press

GREAT NEW SOFTWARE

The RX-4 Multimode receive program for SSTV – RTTY – AMTOR – CW

No expensive hardware is needed. This program has everything you want, including text and picture store for instant recall, save and printer dump. Frequency scale and fine-tune adjustment for accurate, easy tuning and a long list of other top features.
For **SPECTRUM** (not 16K), **BBC-B, CBM64, VIC20** (+ at least 8k). Tape **only £25.** Spectrum needs no hardware, the others use the same interface as our RTTY/CW program (see below).

RTTY and CW TRANSCEIVE

You don't need a pricey terminal unit with our program, although if you already have one it will perform superbly with that, too. Split screen, type ahead, 26 saveable memories, auto CR/LF, preset baud rates and shifts, receives any shift automatically, autotrack CW to 250wpm, QSO review to screen or printer and much more.
For **BBC-B, CBM64, VIC20** (+ at least 8k). Tape £20. Interface kit £5, ready-made £20 inc all connections (state rig).
CW-only version for **SPECTRUM** (no hardware needed) £12.

And superb programs for BBC-B, CBM64, VIC20, SPECTRUM, ELECTRON

MORSE TUTOR Britain's best. Absolute beginner to over 40 wpm. Easy, effective, with full learning guide. Tape £6. **For ZX81-16K also.**
LOCATOR QTH or Maidenhead locator or lat/long. Distance, headings, contest points, converts between locator and lat/long. Tape £7.
LOGBOOK Date, band, mode, call and remarks. Instant callsign search. Screen/printer output. VIC20 needs expansion. Tape £8.
RAE MATHS All the practice and testing you need. With comprehensive reference sheet. Tape £9. For **ZX81-16K also.**
Any BBC-B, CBM64, VIC20 program available on **disc at £2 extra.** BBC: state 40/80 tk.

Prices include VAT and p&p by return 1st class inland, airmail overseas. Channel Islands, Eire, BFPO Europe deduct 13%.

technical software (PW)
Fron, Upper Llandwrog,
Caernarfon, Gwynedd LL54 7RF.
Tel. 0286 881886

APOLLO
(G6LNS)

BRITISH MADE AERIALS OF QUALITY

In response to many requests received during our visits to the Mobile Rallies, our aerials are now available direct by Mail Order.
Take advantage of these introductory price offers

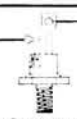
2M	Price		Mainland P&P
5 Element YAGI	**£8.50**	+	£1.95
8 Element YAGI	**£14.50**	+	£2.50
5 × 5 Crossed YAGI	**£16.00**	+	£2.50
8 × 8 Crossed YAGI	**£27.50**	+	£3.50
Slim-Jim	**£5.50**	+	£1.95

The design and construction of these aerials ensure first class performance at a realistic price. The results speak for themselves – ask around – or just listen. S.a.e. for current lists. Callers by telephone appointment please. Allow 14 days delivery.

APOLLO AERIALS (BLACKPOOL)
161 SAINT WALBURGAS ROAD
BLACKPOOL FY3 7EY **Tel. 0253 31040**

J. BIRKETT

RADIO COMPONENT SUPPLIERS



25 The Strait
Lincoln, Tel. 20767
(LN2 1JF)
Partners (J.H.Birkett.
(J.L.Birkett.

VARIABLE POWER SUPPLY KIT 6 to 22 volt 1 Amp. Consisting Of Transformer, Regulator Board With LM317, 5K Pot And Instructions @ **£4.75** P.P. £1.50.
PHILIPS CONCENTRIC TRIMMERS 30p.f. @ **15p, TETFER VHF TRIMMERS** 10p.f. @ **18p.**
ITT CRYSTAL FILTER Type 014DG 10.7MHz BW ±3.75MHz @ **£3.95.**
144MHz WAVEMETER KIT With Instructions @ **£4.60.**
GECALLOY RINGS For L.F. Suppression Int. Dia 15mm. Ext. Dia 28mm @ **38p.**
14 PIN DIL OP-AMPS 710, 741, 747 All **20p each.**
STRIPLINE TRANSISTORS Similar to BFR91 @ **£1.30.**
POLYESTER CAPACITORS 2200p.f. 1000v.w. @ **5p,** 0.015u.f. 1000v.w. @ **6p,** 0.1u.f. 400v.w. @ **10p,** 0.15u.f. 1000v.w. @ **10p,** 0.68u.f. 630v.w. @ **15p.**
GLASS CRYSTALS 28KHz @ **50p,** 28.5KHz @ **50p,** 100KHz @ **£1.50,** 5MHz @ **£1.**
HC6U CRYSTALS 1MHz @ **£1.50,** 7MHz @ **£1.50,** 10MHz @ **£1.48,** 3MHz @ **£1,** 50.1MHz @ **£1.**
BRIDGES 100 Piv 20 Amp @ **£1.30,** 100 Piv 10 Amp @ **95p.**
VHF TRANSMIT-RECEIVE PIN DIODES @ 5 for **60p.**
UHF TRANSMIT-RECEIVE PIN DIODES @ 5 for **75p.**
VMOS POWER TRANSISTORS VN10KM @ **50p,** VMP11 @ **40p,** VN1047 @ **40p.**
SOLDER-IN FEED THRU CAPACITORS 5p.f., 30p.f., 300p.f., 1000p.f., All @ **20p Doz.**
CRYSTALS 10X Type 7010, 7045, 7070, 7090KHz All @ **50p each.**
10XAJ Type 7010, 7012.78, 7040, 7050, 7085, 7090, 7100MHz All @ **60p.**
WIMA POLYESTER CAPACITORS 0.1u.f. 160vw @ 50 for **60p.**
AIR SPACED VARIABLE CAPACITORS 400+300p.f. 3mm Spindle @ **£1.30,** 350+180p.f. @ **£1.50,** 10+10+20p.f. @ **£1.30,** 100+200p.f. @ **£1.50,** 250+250+20+20+20p.f. @ **£1.50,** 500+170p.f. @ **£1.50.**
ALL TIGER AMATEUR BAND AERIALS ON STOCK.
WOOD AND DOUGLAS KITS available by post and for callers.
ACCESS AND BARCLAY CARDS ACCEPTED. POST AND PACKING 60p UNDER £5, OVER FREE, EXCEPT WHERE STATED. GOODS NORMALLY BY RETURN UNLESS OTHERWISE STATED.

This little devil can talk back!

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H × 144mm W × 177mm D. It has all the features that you require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:– 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5 Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one.

Thanet Electronics Limited ICOM

Herne Bay, Kent CT6 8LD. Tel: (0227) 363859. Telex: 965179 Thanet G

INDEX TO ADVERTISERS

YOUR LOCAL DEALERS

LONDON

AMCOMM

Approved dealer for Yaesu and Icom

194 Northolt Road, South Harrow, Middx HA2 0EN
Tel: 01-422 9585

(Mail order a speciality)

LONDON

Dressler (UK) Ltd.

A large selection always in stock – all makes

191 Francis Road, Leyton, LONDON, E10
Tel: 01-558 0854

(Mon-Sat 9am-5.30pm)

LONDON

Henry's

Test instruments, components and accessories. Catalogue – S.A.E. (A4) + 34p (UK)

404 Edgware Road, London W2 1ED
Tel: 01-724 0323

(Open 6 days a week)

ESSEX

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment

203 High Street, Canvey Island, Essex
Tel: 0268 691481

(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

HERNE BAY

Thanet Electronics

The Official Icom importer

95 Mortimer Street, Herne Bay, Kent
Tel: 0323 369464

(Open Mon-Sat 9-5.30, except Thurs 9-1)

SOUTHAMPTON

South Midlands Communications

Official Yaesu Importer

S.M. House, Rumbridge Street, Totton, Southampton SO4 4DP
Tel: 0703 867333

PORTSMOUTH

Telecomms

Importers of the Nevada range of 934MHz equipment

189, London Road, North End, Portsmouth, Hants, PO2 9AE
Tel: 0705 662145

DEVON

Reg. Ward & Co. Ltd.

The South-West's largest amateur radio stockist. Approved dealer for Trio, Yaesu and Icom

1 Western Parade, West Street, Axminster, Devon, EX13 5NY
Tel: 0297 34918

(Closed 1:00-2:00 and all day Monday)

BUCKINGHAMSHIRE

Photo-Acoustics Ltd.

Approved Trio, Yaesu and Icom dealer (part exchange always welcome)

58 High Street, Newport Pagnell, Buckinghamshire MK16 8AQ
Tel: 0908 610625

(Mon-Fri 9:30-5:30, Sat 9:30-4:30)

WEST MIDLANDS

Dewsbury Electronics

Approved Trio, Yaesu and Icom dealer

176 Lower High Street, Stourbridge, West Midlands
Tel: 0384 390063

(Open Mon-Sat 9.30-5.15)

MERSEYSIDE

A.R.E. Communications

For all your amateur radio needs – most models in stock.

38 Bridge St., Earlestown, Newton-Le-Willows, Merseyside
Tel: 09252 29881

(For commercial enquiries ring Bernie or Brenda on 01-992 9142 or 01-993 8367)

DERBYSHIRE

Lowe Electronics

The official importer of the TRIO range of equipment (See main ad. for the full list of all our shops)

Chesterfield Road, Matlock, Derbyshire, DE4 5LE
Tel: 0629 2817/2430/4057

CRICKLEWOOD ELECTRONICS LTD

It's no secret!

. . . that there is a *real difference* at *Cricklewood Electronics*. That's why you should never be without the *FREE* CRICKLEWOOD ELECTRONICS COMPONENTS CATALOGUE, for sheer variety, *competitive prices* and *service* from the U.K.'s number one 100% component shop. No gimmicks, no gadgets or computers, just components, millions of them, all easily available by mail order, calling or credit card telephone orders. Just pick up the phone (or a pen) to get your FREE copy now (no SAE required). You have nothing to lose.

CRICKLEWOOD ELECTRONICS LTD.
40 Cricklewood Broadway NW2 3ET.
01-450 0995 & 01-452 0161
ALL MAJOR CREDIT CARDS ACCEPTED
Telex 914977 Phone or write today

VALVES

*SPECIAL QUALITY

Prices are as at going to press but may fluctuate. Please phone for firm quotation

1A3	1.40	6AH6	1.15	6C6	1.20	6J6W	2.80	9D6	2.90	20D1	0.80
1L4	0.80	6AK5	0.65	6CH6	8.20	6JE6C	5.90	11E2	19.50	20E1	1.30
1R5	0.80	6AK8	0.60	6CL6	2.75	6JS6C	6.40	12A6	1.00	20P1	0.65
1S4	0.65	6AL5	0.60	6CW4	8.50	6K7	1.45	12AT6	0.70	25L6GT	1.60
1S5	0.65	6AL5W	0.85	6CX8B	4.60	6KDB	5.50	12AT7	0.85	25Z4G	0.75
1T4	0.65	6AM5	4.20	6CY5	1.15	6KD6	4.60	12AU7	0.60	35W4	0.80
1U4	0.80	6AM6	1.50	6D6	1.50	6L6M	4.60	12AUB	0.95	85A2	1.40/2.55*
1X2B	1.40	6AN8A	2.50	6F6	1.60	6L6GC	3.70	12AX7	0.75	807	1.60/2.40*
2X2A	2.50	6AQ4	4.40	6F6GB	1.10	6L6GT	1.95	12BA6	0.90	812A	44.80
3A4	0.70	6AQ5	1.30	6F7	2.80	6L18	0.70	12BE6	1.25	813	28.50/68.50*
3A72	3.40	6AQ5W	2.20	6F8G	0.85	6LD20	0.70	12BH7	3.45	829B	24.00
3B28	12.00	6AS6	1.15	6F12	1.50	6LG6	5.90	12E1	18.95	832A	8.90
	19.50*	6AS7G	4.99	6F14	1.15	6Q7G	1.30	12J5GT	0.55	866A	5.05
3D6	0.60	6AT6	0.90	6F15	1.30	6SA7	1.80	12K7GT	0.70	866E	9.80
3E29	19.00	6AU6	1.25	6F17	3.20	6SG7	1.80	12K8GT	0.80	931A	19.80
3S4	0.70	6AV6	1.25	6FZ3	0.75	6SJ7	1.80	12Q7GT	0.60	954	1.20
4B32	18.25	6AX4GT	1.30	6F24	1.75	6SK7	1.40	12SC7	0.65	955	1.20
5R4GY	2.20	6AX5GT	1.30	6F33	10.50	6SL7GT	0.85	12SH7	0.65	956	1.20
5UAG	1.40	6BA6	0.70/1.20?	6FH8	17.80	6SN7GT	1.60	12SJ7	0.70	5763	5.75
5V4G	0.75	6B49	3.45	6GA8	1.55	6SQ7	0.95	12SQ7	1.45	6060	1.95
5Y3GT	0.95	6BE6	0.65/120*	6GH8A	1.95	6SR7	4.60	12S7GT	0.85	6080	7.30
5Z3	2.80	6BG6G	1.60	6H6	1.60	6V6G	1.50	12Y4	0.70	6201	5.20
5Z4G	1.25	6BJ6	1.30	6JU6	5.85	6V6GT	1.30	13D3	2.80	6146	10.35
5Z4GT	1.45	6BQ7A	0.85	6J4	1.35	6X4	1.50	13D5	0.90	6146B	10.35
6.3DL2	0.90	6BR7	2.00	6J4WA	2.00	6X5GT	0.65	19AQ5	0.85	8068	12.50
6AB7	0.70	3BW6	6.20	6J5	2.30	6Y6G	0.90	19G3	11.50	9001	0.95
6AC7	1.15	5BW7	1.80	6J5GT	0.90	6Z4	0.70	9G6	10.35	9002	0.95
6AG5	0.60	6C4	0.70	6J6	0.85	724	1.90	19H5	39.55	9003	0.95

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. Minimum order £1.00. Delivery by return.

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.**

MAKE YOUR INTERESTS PAY!

More than 8 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 90 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert 'personal' tutors. Find out how we can help YOU. Post or phone today for your **FREE INFORMATION PACK** on the course of your choice. (Tick one box only!)

Electronics	☐	Radio, Audio and TV Servicing	☐
Basic Electronic Engineering (City & Guilds)	☐	Radio Amateur Licence Exam (City & Guilds)	☐
Electrical Engineering	☐	Car Mechanics	☐
Electrical Contracting/ Installation	☐	Computer Programming	☐
GCE over 40 'O' and 'A' level subjects			☐

ICS Name _____
Address _____ P. Code _____
International Correspondence Schools Dept EES36, 312/314 High St., Sutton, Surrey SM1 1PR. Tel: 01-643 9568 or 041-221 2926 (24hrs).

SPECTRUM COMMUNICATIONS

MANUFACTURERS OF RADIO EQUIPMENT AND KITS

2 METRE EQUIPMENT		KIT	BUILT
RECEIVE CONVERTERS, 6 metre input, 2 or 10 metre IF option, 26dB gain, 2½dB NF, with OSC output. Special box, SO239 sockets. RC6-10 or RC6-2	PCB BOXED	£17.25 £25.00	£24.50 £32.25
TRANSMIT CONVERTER, 6 metre 500mV output, 25mW to 1W 10 metre drive, takes OSC drive from RC6-10, includes AE and IF switching. TC6-10	PCB BOXED	£16.50 £25.50	£25.75 £38.00
TRANSMIT CONVERTER TC6-10 & RECEIVE CONVERTER RC6-10 in combined box. TRX 6-10	BOXED	£45.75	£66.25
TRANSMIT CONVERTER, 6 metre 2½W output, 25mW to 1W 2 or 10 metre drive, includes harmonic filtering and AE switching. TC6-2H or TC6-10H	PCB BOXED	£39.00 £53.00	£54.00 £83.00
TRANSCEIVE CONVERTER, 6 metre 500mW output, 25mW to 1W 10 metre drive, 26dB receive gain, 2½dB NF. With semi-duplex facility. TRC 6-10			
TRANSMIT AMPLIFIER, 20W min output, 500mW drive, linear multimode, second harmonic –60dB, suits TC 6-10 & TRC6-10 & MEON. TA6-U2	PCB BOXED	£40.50 £45.00	£48.75 £53.00

VAT & P&P INC PRICES
Delivery within 14 days subject to availability. 24 hr answering.

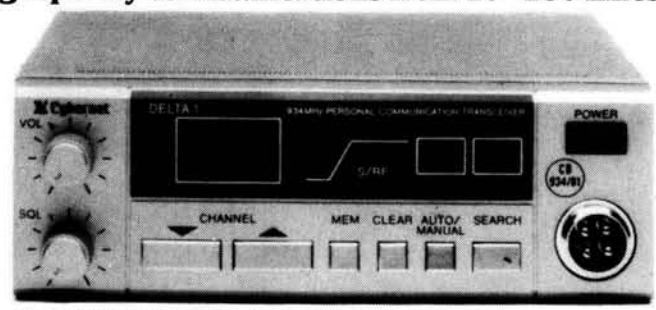
UNIT B6, MARABOUT INDUSTRIAL ESTATE, DORCHESTER, DORSET. TEL: 0305 62250

934 MHz PERSONAL RADIO

The Nevada Range

Join the growing number of people discovering this exciting radio band.

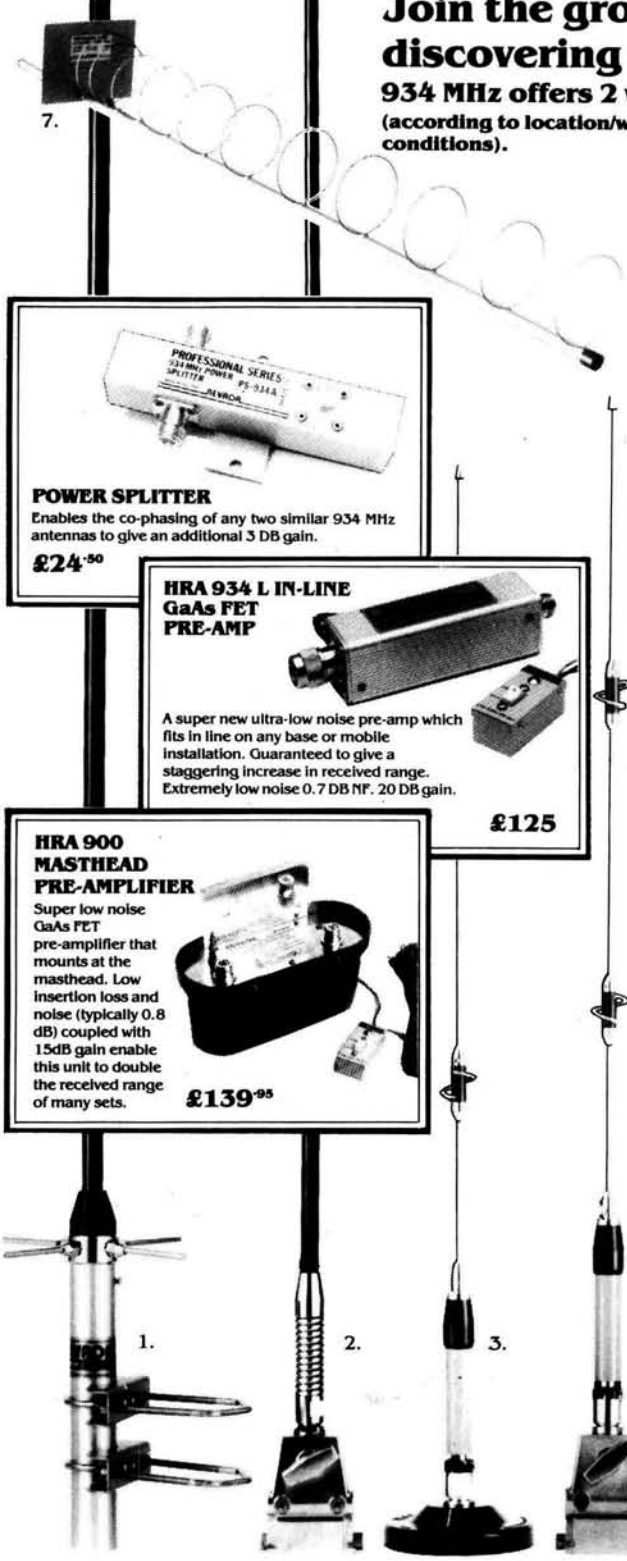
934 MHz offers 2 way high quality communications from 10 - 250 miles (according to location/weather conditions).



THE CYBERNET DELTA 1 934 MHz TRANSCEIVER
Has been engineered specifically for the UK market using latest "state of the art" technology.

- Sensitive RX (0.25 μV for 12 db SINAD).
- 16 memories available.
- Auto/Manual scan and search facility.
- External 'S' meter socket.

£355
+£5 SPECIAL DELIVERY



7.

POWER SPLITTER
Enables the co-phasing of any two similar 934 MHz antennas to give an additional 3 DB gain.
£24.50

HRA 934 L IN-LINE GaAs FET PRE-AMP
A super new ultra-low noise pre-amp which fits in line on any base or mobile installation. Guaranteed to give a staggering increase in received range. Extremely low noise 0.7 DB NF. 20 DB gain.
£125

HRA 900 MASTHEAD PRE-AMPLIFIER
Super low noise GaAs FET pre-amplifier that mounts at the masthead. Low insertion loss and noise (typically 0.8 dB) coupled with 15dB gain enable this unit to double the received range of many sets.
£139.95

SWR/POWER METER
This precise and extremely accurate meter features an illuminated scale, low loss 'N' type connectors and twin meters for both power and SWR measurement. Power 0-50 watts in two ranges.
£89.95

REMOTE ANTENNA SWITCH
High quality weatherproof masthead mounting switch. For switching 2 antennas with one cable feed.
£59.95

HAS-2
Remote DC switch for mast head antenna switch
£6.95

WR 900 SWR/POWER METER
A low cost unit measuring power to 100 watts in three ranges.
£49.50

1. 2. 3. 4. 5. 6.

ANTENNAS
Manufactured to the highest possible specification.

1. **PA7-E BASE COLNEAR** Gain 7.14 dBi stacked ⅝ array. **£66**
2. **P714-RE** High gain gutter mount, mobile antenna. **£44**
3. **P7-ME** High gain mobile magnetic mount antenna. **£44**
4. **P7-E** High gain gutter mount mobile antenna. **£44**
5. **G900A** Low profile, bolt thru mobile antenna. **£25**
6. **G900R** Low profile bolt thru mobile antenna in black. **£25**
7. **Tc 12L MKII 12 ELEMENT BEAM** A new aluminium version of our succesful 12 element loop quad. Gain: 18dBi. **£49**

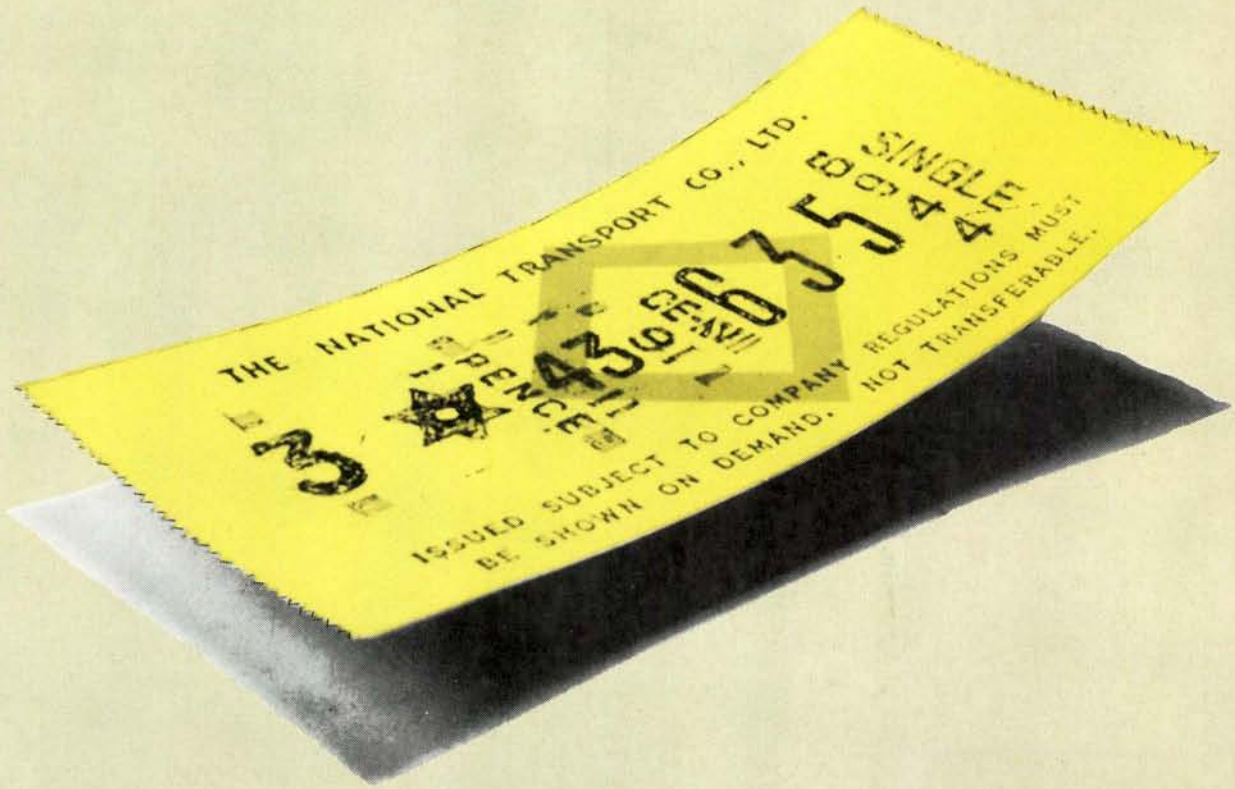
NEVADA 934
Professional Series

ASK YOUR DEALER FOR MORE INFORMATION OR CONTACT US DIRECT.

Telecomms, 189 London Road, Portsmouth PO2 9AE. Tel: 0705 662145 Telex: 869107 TELCOM G

Nevada 934 MHz Catalogue with full details and specifications of the complete range is available from Telecomms £1.00.

Lowest possible prices?
Top quality components?
Fast reliable service?
Large range?



Maplin ..... **Just the ticket.**

Pick up a copy of our new 1986 catalogue from any branch of W.H. Smith for just £1.45.
Or post this coupon now, to receive your copy by post for just £1.45 + 40p p & p. If you live outside the U.K. send £2.50 or 11 International Reply Coupons. I enclose £1.85.

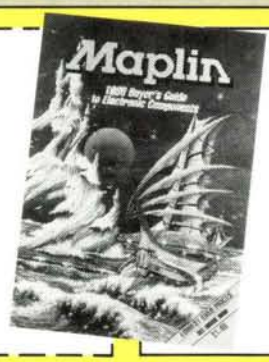
Name .....

Address .....

.....

.....

PW



MAPLIN ELECTRONIC SUPPLIES LTD.
Mail Order: P.O. Box 3, Rayleigh, Essex SS6 8LR.
Telephone: Southend (0702) 552911

SHOPS
- BIRMINGHAM Lynton Square, Perry Barr, Tel: 021-356 7292.
- LONDON 159-161 King Street, Hammersmith, W6. Telephone: 01-748 0926.
- MANCHESTER 8 Oxford Road, Tel: 061-236 0281.
- SOUTHAMPTON 46-48 Bevois Valley Road, Tel: 0703 225831.
- SOUTHEND 282-284 London Rd, Westcliff-on-Sea, Essex. Telephone: 0702-554000

Shops closed all day Monday.