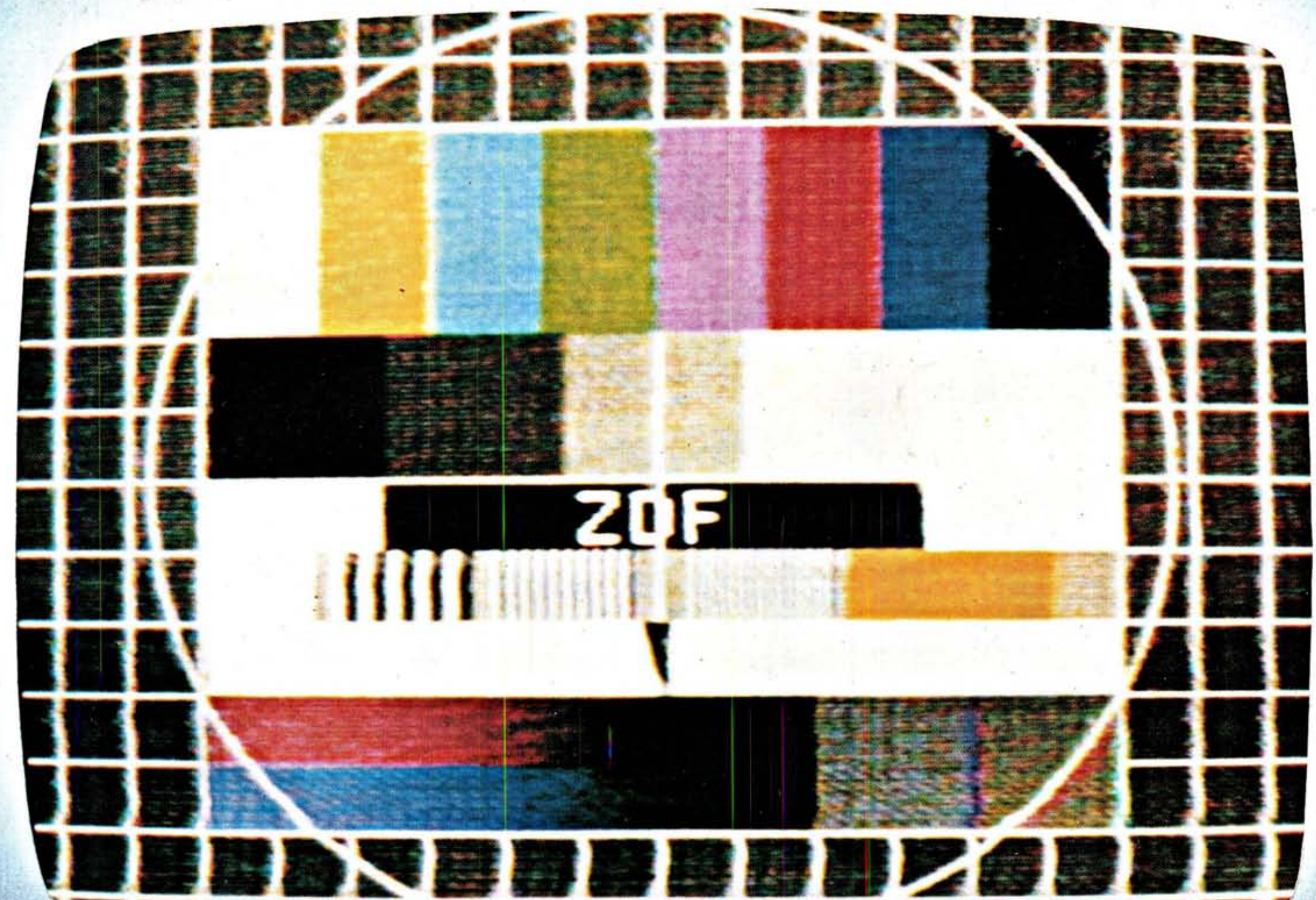
MAY 1986 £1·10

Practical Wireless

The Radio Magazine



Inside This Issue ~ Receiving DXTV

and build the PW ARUN Parametric Filter

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THE SOUTH-WEST'S LARGEST AMATEUR RADIO STOCKIST

Trio

TS940S	9 Band TX General Cov RX	1795.00	
TS930S	9 Band TX General Cov RX	1395.00	(—)
TS830S	160-10m Transceiver 9 Bands	898.00	(—)
AT230	All Band ATU/Power Meter	170.65	(2.00)
SP230	External Speaker Unit	51.43	(1.50)
TS530SP	160m-10m Transceiver	779.79	(—)
TS430S	160m-10m Transceiver	750.00	(—)
PS430	Matching Power Supply	139.01	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	13.56	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
SP120	Base Station External Speaker	33.33	(1.50)
MC50	Dual Impedance Desk Microphone	39.56	(1.50)
MC35S	Fist Microphone 50K ohm IMP	18.65	(1.00)
LF30A	HF Low Pass Filter 1kW	27.70	(1.00)
TR7930	2M FM Mobile	365.60	(—)
TR9130	2M Multimode	544.73	(—)
TW4000A	2M/70cm mobile	580.35	(—)
TM201A	2M 25W mobile	296.09	(—)
TM401A	7cms FM 12W	350.91	(—)
TH21E	2M Mini-Handhelds	189.30	(—)
TH41E	70cm Mini-Handhelds	220.95	(—)
TM211E	2M FM Mobiles	398.00	(—)
TM411E	70cm FM Mobiles	466.18	(—)
TS711E	2M Base Stations	770.74	(—)
TS811E	70cm Base Stations	895.00	(—)
TR3600	70cm Handheld	324.36	(—)
TR2600	New 2M FM Synthesised Handheld	299.00	(—)
ST2	Base Stand	66.11	(1.50)
SC4	Soft Case	16.95	(1.00)
SMC25	Speaker Mike	19.78	(1.00)
PB25	Spare Battery Pack	32.20	(1.00)
MS1	Mobile Stand	38.41	(1.00)
R600	Gen. Cov. Receiver	323.78	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	518.73	(—)
HS5	Deluxe Headphones	29.39	(1.00)
SP40	Mobile External Speaker	18.08	(1.00)
TL922	160/10M 2kW Linear	1265.00	(7.00)
TS780	2M/70cm M/M Transceiver	1061.20	(5.00)
TS670	6, 10, 15, 40M 10W M/M Transceiver	774.13	(5.00)
TR9300	6M M/M Transceiver	590.49	(5.00)

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)
SP122	1.8-60MHz PWR/SWR	75.00	(1.50)
SP220	1.8-200MHz PWR/SWR/PEP	59.00	(1.50)
SP225	1.8-200MHz PWR/SWR/PEP	99.95	(1.50)
SP420	140-525MHz PWR/SWR/PEP	69.00	(1.50)
SP425	140-525MHz PWR/SWR/PEP	99.95	(1.50)
SP825		149.00	(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	435.00	(2.50)

Icom Products

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

Mutek Products

SLNA 50	50MHz Switched preamp	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	67.42	(2.00)
BY2	Squeeze Key, Chrome base	76.97	(2.00)

HI-MOUND MORSE KEYS

HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	27.60	(1.50)
HK710	Up down keyer	39.95	(2.00)
HK802	Up down solid brass	86.30	(2.00)
HK803	Up down solid brass	82.65	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)

KENPRO

KP100	Squeeze CMOS 230/13.8v	82.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1759.00	(—)
SP980	Speaker	86.09	(2.00)
FT757GX	HF Transceiver	879.00	(—)
FC757	Auto A.T.U.	318.00	(2.00)
FP757HD	Heavy Duty PSU	199.00	(2.00)
FP757GX	Switched Mode PSU	199.00	(2.00)
FT290	2m M/Mode Port/Transceiver	369.00	(—)
FT290	With Mutek front end fitted	399.00	(—)
FT690	6M M/M Portable Transceiver	289.00	(—)
FL2010	Linear Amplifier	79.00	(1.00)
MMB11	Mobile Bracket	33.00	(1.00)
NC11	Charger	10.00	(1.00)
CSC1	Carrying Case	6.50	(1.00)
YHA15	2m Helical	7.50	(1.00)
YHA44D	70cm ½wave	10.95	(1.00)
YM49	Speaker Mike	19.00	(1.00)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	225.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	265.00	(—)
FT703R	70cm H/Held	255.00	(—)
FT709R	70cm H/Held	285.00	(—)
FT270R	2m 25W F.M.	359.00	(—)
FT270RH	2m 45W F.M.	399.00	(—)
FT2700R	2m/70cm/25W/25W	499.00	(—)
FRG 9600	60-905MHz Scanning RX	465.00	(—)
MMB10	Mobile Bracket	8.50	(1.00)
NC9C	Charger	9.60	(1.00)
PA3	Car Adaptor/Charger	18.00	(1.00)
FNB2	Spare Battery Pack	25.00	(1.00)
YM24A	Speaker Mike	27.00	(1.00)
FT726R	2m Base Station	899.00	(—)
430/726	70cm Module for above	255.00	(2.50)
FRG8800	HF Receiver	575.00	(—)
FRV8800	Convertor 118-175 for above	90.00	(1.50)
FRT7700RX	A.T.U.	49.85	(1.50)
MH1B8	Hand 600 8pin mic	17.50	(1.00)
MD1B8	Desk 600 8pin mic	75.00	(1.00)
MF1A3B	Boom mobile mic	23.00	(1.00)
YH77	Lightweight phones	17.50	(1.00)
YH55	Padded phones	17.50	(1.00)
YH1	L/weight Mobile H/set-Boom mic	17.00	(1.00)
SB1	PTT Switch Box 208/708	18.50	(1.00)
SB2	PTT Switch Box 290/790	16.00	(1.00)
SB10	PTT Switch Box 270/2700	18.50	(1.00)
QTR24D	World Time Clock	39.00	(1.00)
FF501DX	Low Pass Filter	33.00	(1.00)

Power Supplies

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

SMC

RU120406	4 amp Power Supply	14.95	(2.35)

Aerial Rotators

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

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	23.95	(1.00)
Welz	2 way 'n' Skts	42.95	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)
Kenpro KP21N	2 way Switch	24.15	(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)
CT20A	20W Dummy Load PL259	12.95	(1.00)
CT20N	20W Dummy Load N. Plugs	20.95	(1.00)
CT530	300W Dummy Load	75.00	(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)

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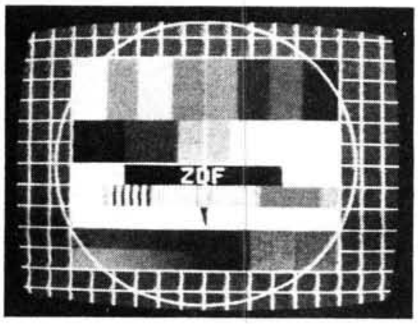
Practical Wireless

The Radio Magazine

MAY 1986 VOL 62 NO. 5 ISSUE 950

THIS MONTH



THIS MONTH'S COVER

The DXTV photograph on this month's front cover was taken by Peter Lincoln of Aldershot. He photographed the West German test card at 2330BST on 13 October 1985. The TV station's main transmitters use System G/PAL and horizontal polarisation.

Regular Features

NEXT MONTH

RECEIVER SPECIAL–

Circuits, Mods, Reviews, etc.

On sale May 1

▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶

PLEASE NOTE OUR NEW ADDRESS

▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶ ▶

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LOWE SHOPS ARE TO BE FOUND IN

In Glasgow,
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In the North East,
the shop manager is Don, G3GEA, the address, 56 North Road, Darlington,
telephone 0325 486121.

In Cambridge,
the shop manager is Tony, G4NBS, the address, 162 High Street, Chesterton, Cambridge,
telephone 0223 464154.

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

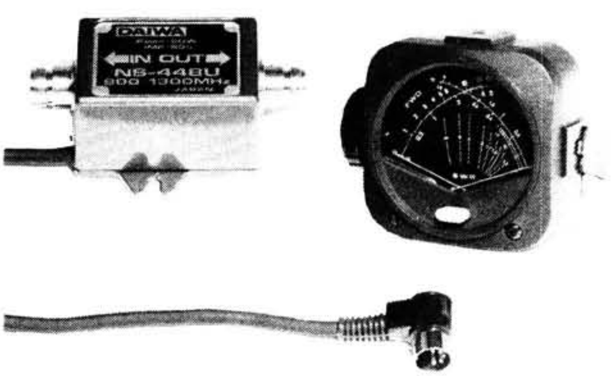
In London,
the shop manager is Andy, G4DHQ, the address, 223/225 Field End Road, Eastcote, Middlesex,
telephone 01-429 3256.

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

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

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

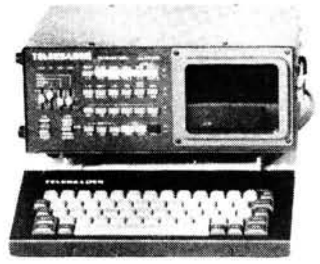
DAIWA NS448
swr/power meter range..... 900 to 1300 MHz.



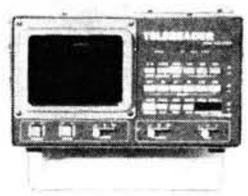
Frequency range 900 to 1300 MHz, impedance 50 ohms, power range forward 5/20W, reflected 1.6/6.6W, connections N type.

NS448 cross needle power/swr meter . . . **£75.00 inc VAT, carriage £2.50.**

TELEREADER
range of equipment.

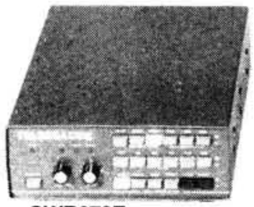


CWR685E

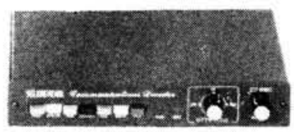


CWR675E

CWR610E



CWR670E



CD660

CWR685E . . . A radio-teletype terminal designed for use in the shack or out portable. Having a built-in monitor and external keyboard, the unit can receive and transmit CW, Baudot or ASCII codes. High and low RTTY tones, selectable baud rates and frequency shift, together with a buffer memory on transmit make the CWR685E ideal. Add nothing more than a DC power supply and transceiver to create a complete CW/RTTY station.
CWR685E . . . . £856.51 inc VAT, carriage £7.00

CWR675E . . . A receive only version of the CWR685E, the CWR675E complete with built-in monitor, provides the short wave enthusiast with an additional dimension to his listening.
CWR675E . . . . £498.57 inc VAT, carriage £7.00

CWR670E . . . For the listener with his own monitor or who prefers to use a television, the CWR670E has similar facilities as the CWR675E.
CWR670E . . . . £436.00 inc VAT, carriage £7.00

CWR610E . . . Not only a CW/RTTY/ASCII terminal but a CW random generator for morse practice. Requires a monitor or UHF television for display.
CWR610E . . . . £216.41 inc VAT, carriage £3.00

CD660 . . . A receive only unit for not only RTTY/CW/ASCII but TOR/AMTOR plus a morse code practice generator.
CD660 . . . . £257.19 inc VAT, carriage £3.00

From TELEREADER, a comprehensive range of equipment!

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

send £1 for complete mail order catalogue.

from TRIO, a **NEW** 45 watt two metre FM mobile.

The TRIO TM2550E is a high power 2 metre FM mobile transceiver.

Power output from the TM2550E is 45 watts. Current drain is approximately 9.5 amps in the high power position (45 watts) and approximately 3 amps in the lower power position (5 watts). Low power can be adjusted up to 40 watts. Power requirement of the transceiver is 13.8 volts DC.

Frequency selection is easy using the back-lit front panel keypad. The selected frequency is displayed on a backlit LCD together with additional operating information e.g. priority channel, reverse repeater, simplex or repeater shift etc.

The TM2550E has 23 memory channels into which frequencies are easily written. The TM2550E automatically selects simplex or repeater mode in accordance with the band plan. This function is easily overridden by using the "OS" key.

Scanning operations are divided into keyboard, memory and priority scan. Frequency hold on an occupied channel can be either "time" or "carrier" operated.

As an option, the TM2550E can be fitted with DCL. Compatible with the DCS system, DCL (Digital Channel Link) enables your rig to automatically QSY to an open channel. The DCL system searches for an open channel (checks the next eleven 25 kHz spaced frequencies above a user designated one), remembers it, returns to the original frequency and transmits control information to the other DCL equipped station that switches BOTH rigs to the clear channel.

TM2550E 2 metre mobile FM transceiver....... **£399.00** inc. VAT, Carr £7.00

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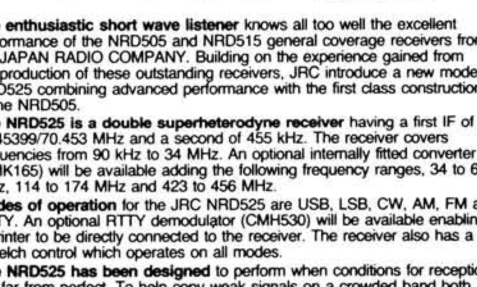
from the Japan Radio Company, a **NEW** general coverage receiver, the **NRD525**.



The enthusiastic short wave listener knows all too well the excellent performance of the NRD505 and NRD515 general coverage receivers from the JAPAN RADIO COMPANY. Building on the experience gained from the production of these outstanding receivers, JRC introduce a new model, the NRD525 combining advanced performance with the first class construction of the NRD505.

The NRD525 is a double superheterodyne receiver having a first IF of 70.45399/70.453 MHz and a second of 455 kHz. The receiver covers frequencies from 90 kHz to 34 MHz. An optional internally fitted converter (CMK165) will be available adding the following frequency ranges, 34 to 60 MHz, 114 to 174 MHz and 423 to 456 MHz.

Modes of operation for the JRC NRD525 are USB, LSB, CW, AM, FM and RTTY. An optional RTTY demodulator (CMH530) will be available enabling a printer to be directly connected to the receiver. The receiver also has a squelch control which operates on all modes.

The NRD525 has been designed to perform when conditions for reception are far from perfect. To help copy weak signals on a crowded band both notch filter and pass band tuning controls are included. The receiver has, as standard, a 3 kHz filter for USB and LSB (INTER), a 6 kHz filter for AM (WIDE) and in the AUX position a bandwidth of 12 kHz. If an optional filter is placed in the AUX position the 12 kHz bandwidth ceases to be available. For CW and RTTY reception the NARR position can be fitted with the optional 500 Hz filter (CFL232). In the FM mode (narrow band FM), BANDWIDTH and AGC switches do not function.

The NRD525 is extremely "user friendly" having an easy to use numeric keypad for frequency entry and memory selection. Whether you are entering a full shortwave frequency, Vatican Radio on 6185 kHz, or the three digits of Radio Czechoslovakia's long wave transmission on 272 kHz, entry is simple, key in the digits as read and press enter. A megahertz only frequency can also be easily entered into the NRD525, simply key in the required number, e.g. 6 and press the button marked MHz. Switch pads select mode and bandwidth whilst a large heavy knob makes fine tuning a pleasure. A quick tune up or down the band is easily achieved using the up/down switch pads conveniently located above the tuning knob.

Memory capacity is 200 channels. As well as frequency, each memory holds mode, bandwidth, AGC setting (slow, fast and off) and whether or not the attenuator (approx 20 dB) is on or off. Frequencies can be easily transferred from memory to VFO.

The NRD525 has both memory scan and frequency sweep. The receiver can be quickly programmed with the START and END memory channel numbers. Pressing the run button initiates memory channel scan. Operation of frequency sweep is similar, START and END frequencies being entered before commencing sweep. Two additional controls are provided for use in conjunction with scan/sweep. A P LEVEL control adjusts the level at which an input signal causes the receiver to pause and a SPEED control sets the rate of scan/sweep.

By pressing numeric key 4 with the MEMO key depressed the input RF filters are bypassed or inserted in circuit. When bypassed the display indicates PASS, an excellent feature when receiving very weak signals.

The NRD525 will operate from either 100/120/220/240 volts AC (selectable on back panel) or 13.8 volts DC so making it suitable for use at home or when out portable.

Add to the above an audio tone control, a tunable BFO for enhanced CW operation, an adjustable level noise blanker, a dimmer switch for the fluorescent display, the ability to connect a high or low impedance aerial and switch between the two, a mute jack socket for use with a separate transmitter and the result is the NRD525 from the JAPAN RADIO COMPANY, a first class receiver purpose built for the dedicated short wave listener.

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from TRIO, the NEW TS440S, amateur band tranceiver and general coverage receiver.

with the advent of the TS440S

the compact HF transceiver that we have known since the late seventies, has taken a major step forward. The new transceiver has provision for fitting an internal aerial tuning unit **(AT440)** operating between 3.5 and 28 MHz. A front panel numeric keypad makes frequency selection and subsequent entry to one of the hundred memory channels or two VFO's a simple operation and of course, frequencies can be quickly selected from memory and transferred to either VFO. The TS440S is also an excellent general coverage receiver tuning from 100 kHz to 30 MHz. Combined with TRIO's now well-known attention to ergonomics, the performance and facilities of the TRIO TS440S make this the transceiver for your shack.

The TRIO TS440S operates from 13.8 volts DC, 20 amps. Input power is 250 watts pep on all modes throughout the band except on AM where it is 110 watts. When using the TRIO PS50 power supply unit transmission time at full output with the TS440S transceiver can be up to one hour in any mode.

Operating on USB, LSB, AM, FM and AFSK the TRIO TS440S has full and semi break-in on CW. Rapid transmit/receive switching also makes the TS440S suitable for AMTOR use. FM is now fitted as standard to the transceiver as is squelch which operates on all modes. Bandwidth selection can now be manual or automatic. When the bandwidth switch is in the auto position the rig selects the IF bandwidth to match the mode. Of course the rig's selection can be overridden. The TS440S has provision for four different bandwidths. The W (AM) and M2 (SSB) positions are fitted with 6 kHz and 2.4 kHz 455 kHz ceramic filters as standard, the M1 and N positions are for optional filters, e.g. 500 or 250 Hz CW (YK88C or YK88CN) in position N and a 1.8 kHz narrow SSB filter (YK88SN) in position N and a 1.8 kHz narrow SSB filter (YK88SN) in position M1. Alternatively a 2.4 kHz (YK88S) filter can be fitted in the M1 position resulting in an even better filter shape for SSB use. The TRIO TS440S has two switchable rates of AGC, fast or slow.

Careful appraisal of operating techniques has enabled TRIO to provide the TS440S with a comprehensive system of memories, search and scanning modes and keyboard frequency entry.

- **The two VFO's,** A and B can be used individually or when used together in split mode, for cross band and even cross mode contacts. Normally used on the same band, the system provides the same flexibility as if the operator were using a separate VFO and is ideal for DX working. Whilst listening in split mode, the transmit frequency of the other VFO can quickly be checked by pressing the front panel switch, T-F SET. A front panel control, A=B instantly puts the "idle" VFO on the frequency of the VFO in use.
- **The desired operating frequency** can be arrived at by use of the tuning knob and megahertz up/down switches. On the TS440S frequencies can also be entered by means of a front panel numeric keypad.
- **One hundred memory channels** are available, each storing frequency and mode. Frequencies can be entered into any selected memory channel from either of the VFO's or by using the keypad, memories 0 to 89 are simplex, memories 90 to 99 hold split frequencies. Both frequency and mode can easily be transferred from memory to either VFO. When transferring a split memory channel (90 to 99) the receive frequency is entered into VFO A and the transmit frequency into VFO B. Memories are scanned in banks of ten, e.g. 20 to 29, 40 to 49, 70 to 79 etc.
- **Two search ranges are available,** the frequency limits being user programmable. Two rates of scan can be set when in search mode.
- **When set to memory channel** instead of VFO, the entire contents of the one hundred memories can be swiftly reviewed by using the main tuning knob, the megahertz up/down switches on the front panel or the up/down buttons of the microphone.

Rapid selection of the required amateur bands is achieved by means of the front panel up/down switches. Alternatively the switches can be preset to step in megahertz units.

As well as RIT (receiver incremental tuning) the TRIO TS440S has XIT allowing fine tuning of the transmitted frequency.

On receive the front panel meter measures signal strength, on transmit it can be switched to read either power output, SWR or ALC levels.

The TRIO TS440S is fitted with a speech processor which can be switched on to enhance transmitted audio when working DX. To improve receive audio the transceiver has both botch filter and IF shift.

An optional computer interface (IF232C) is available for the transceiver.

For the blind operator the TRIO TS440S is ideal. When fitted with the VS1 board (optional), a digitally encoded girl's voice will announce on request the operating frequency and as each mode is selected a tone gives the appropriate morse letter (F for FM, U for USB, etc).

With the TS440S, TRIO have produced a transceiver that combines excellent performance with unparalleled operating facilities in an extremely compact package. The result is a transceiver suitable for mobile and portable use as well as the shack.

TS440S	**£950.00** inc. VAT
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Stand D4

IC-735, The Complete HF Radio

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

IC-505, 50MHz Transceiver

The IC-505 is a 50MHz band SSB, CW 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:- PS45 AC Power Supply.
All these features make the IC-505 a great transceiver for operation on the 50MHz band.

IC-R71E, General coverage receiver.

The ICOM IC-R71E 100KHz to 30MHz general coverage receiver features keyboard frequency entry and infra-red remote controller (optional) with 32 programmable memory channels, SSB, AM, RTTY, CW and optional FM. Twin VFO's scanning, selectable AGC, noise blanker, pass band tuning and a deep notch filter. With a direct entry keyboard frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency is altered without changing the main tuning control.
Options include FM, voice synthesizer, RC-11 infra-red controller, CK70 DC adaptor for 12 volt operation, mobile mounting bracket, CW filters and a high stability crystal filter.

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

Stand D4

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MMS1	The Morsetalker	**115.00**	**B**
MMS2	Advanced Morse Trainer	**169.00**	**B**

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MMC144/28	2m down to 10m Converter	**35.65**	**A**
MMC144/28-HP	2m High Performance Converter	**47.90**	**A**
MMC432/28-S	70cm down to 10m Converter	**39.90**	**A**
MMC432/144-S	70cm down to 2m Converter	**39.90**	**A**
MMK1296/144	23cm down to 2m Converter	**129.95**	**B**
MMK1691/137.5	1690MHz WX Satellite Converter	**145.00**	**B**

ATV			
MMC435/600	70cm ATV Converter, UHF output	**35.65**	**A**
MTV435	70cm ATV 20W Transmitter	**197.80**	**B**

PREAMPS			
MMG144V	2m RF Switched GaAsFET Preamp	**37.90**	**A**
MMG1296	23cm GaAsFET Preamplifier	**75.00**	**A**
MMG1691	1690MHz GaAsFET Preamp	**129.95**	**B**

OTHER PRODUCTS			
MMD1500P	1500MHz Divide by Ten Prescaler	**119.60**	**A**
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MMR7/3	7dB 3 Watt Attenuator	**14.50**	**A**
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WRITE ON ... *the page where you have your say*

STAR £10 LETTER

Early Broadcasting

Like many others I much enjoyed reading Part 1 of *The Birth of Broadcasting* by Tim Wander (*PW*, March 1986) but feel that to avoid the charge of British chauvinism some additions and amendments are needed.

If one overlooks the early relay of opera, etc. to subscribers over telephone lines in Budapest, Paris and London, etc. in the 1890s, the first *radio* broadcast of music as entertainment for anyone equipped with a radio receiver was almost certainly by Professor Reginald Fessenden from the high-frequency-alternator station at Brant Rock, USA, on Christmas Eve 1906, with Fessenden playing his violin, reciting verses from the Bible and playing a gramophone record of Handel's *Largo*.

It has been claimed that the first broadcast of music in the UK was from the radio-room of HMS *Andromeda* at Chatham in 1907. Regular, if experimental, broadcasts were made from February 1907 in New York by the De Forest Radio Telephone Co and a number of other American stations broadcast entertainment in the period 1907 to 1916 (see Patrick Robertson's *The Shell Book of Firsts*)

In Belgium there was Sunday afternoon broadcasting in the period before the outbreak of the first World War.

Tim Wander also does less than justice to PCGG (not PLGG) at The Hague which made its first scheduled broadcast on November 6, 1919 (not 29 April 1920) with a "musical evening" that had been advertised in the *Nieuwe Rotterdamse Courant* the previous day. The advertisement listed the programme of music and stated: "Everybody in the possession of a simple radio receiver can easily listen to this music at home. When using our amplifiers the

PW COMMENT

You Can't Win Them All!

TRYING TO UNDERSTAND and interpret the various clauses in the UK Amateur Radio Licence is something which has certainly taxed us in the *PW* editorial offices from time to time, as I am sure it has done for many radio amateurs. As I have observed before, the Licence suffers from having, like Topsy, "just growed", with amendments and additional clauses having been added over several decades, sometimes without any apparent thought for the effect of the change on another part of the document.

Over the years, I have tried to get clarification from the Home Office, and later the DTI, on several points which I felt were ambiguous. Sometimes the response has been: "You've got a Licence so you should know the answer to that question." Perhaps it is flattering that the simple passing of the Radio Amateurs' Examination should be thought to give such a clear understanding of an 8-page legal document.

We have, in recent times, managed to get some queries sorted out. For example, the question of cross-band working between a Class A Licence-holder transmitting on h.f. and a Class B Licence-holder transmitting on v.h.f. or u.h.f., which was said to be strictly forbidden by the terms of their respective Licences. I could never find anything about it there, and certainly it seemed illogical that the holding of a Class B Licence should limit or remove the general right of an individual under the Wireless Telegraphy Acts to listen to transmissions from Amateur stations.

A total revision of the UK Amateur Lience has been under way for many years. I hope that when a new version does finally see the light of day, many more anomalies will have been sorted out. Worse in some ways than the ambiguous clauses are those which you firmly believe to mean a particular thing, but suddenly discover mean something entirely different.

A case in point relates to a little item which appeared in *Eavesdroppings* in our December 1985 issue, concerning operation from Brownsea Island, a National Trust property with long-standing Scouting connections, which lies in the middle of Poole Harbour. As I am sure all you Licence-holders will know off by heart, Clause 1. (1) (a) tells you where, and under what conditions, you may establish your Station. The various sub-clauses say this may be: (i) at the main address; **or** (ii) At any temporary premises or location, but not for more than four weeks at a time; **or** (iii) At any premises without time limit, provided you give at least seven days notice to the authorities; **or** (iv) in any vehicle or vessel but not on the sea or within any estuary, dock or harbour; (v) as a pedestrian.

I had always understood that sub-clause (iv) was there to draw the distinction between the normal Amateur Licence and the Amateur (Maritime Mobile) Licence, and to stop you operating without prior permission on seagoing ships or ferries, where you might well interfere with the vessel's official radio services. Operation on inland waterways, (rivers, lakes,

> Did you hear about the amateur who was told he couldn't get permission to set up a special event station on Brownsea Island, because Brownsea Island is in Poole Harbour, and the amateur licence says you can't operate in a harbour!

etc.) was permitted, on the grounds that vessels using them would have little or no radio equipment fitted.

Now, as a result of publishing that little quip about Brownsea Island, I find that sub-clause does not mean that at all, according to the RSGB and the DTI's Radio Regulatory Department. They say that **ALL** operation is forbidden within any estuary, dock or harbour—you don't have to be on a vessel—on the grounds that it could interfere with passing ships. I'm not too sure where that leaves amateurs living in Portsmouth and Southsea, Hayling Island, the Isle of Sheppey, Canvey or Foulness Islands and many more. Ought the ban to be extended to amateurs living within, say five miles of any coastline? The mind boggles!

Strangely enough, the letter from the DTI infers that they're not worried about amateurs operating under their own callsigns, because their details will appear on the DTI database, and so they can be contacted quickly if they are causing QRM to shipping. The DTI are worried, though, about the Special Event Stations, whose callsigns are issued by the RSGB, and which don't get on to the DTI database.

If our Brownsea Island piece has misled any amateurs in their understanding of their Licence conditions, I apologise. I have to say, however, that in my opinion the DTI are wrong in their interpretation of the Amateur Licence as it is presently written. If the prohibition on operation within any estuary, dock or harbour is intended to apply universally, why does it appear in sub-clause 1. (1) (a) (iv), which refers only to operation in a vehicle or vessel? I rest my case!

On another matter entirely, it has just been announced by the DTI that the callsign, name and address data on Amateur Licence-holders held on the Post Office computer at Chesterfield will be released to parties other than the RSGB as from January 1987. They stress that information about the names and addresses of those licensees who have requested confidentiality will **NOT** be released, and that the data listing may only be used for the purposes of compiling a call-book.

We are particularly pleased at this announcement, as we have been working for some time on plans to produce a *PW Callbook*, but had been prevented from doing so by the DTI's refusal to make the necessary information available to anyone other than the RSGB. The reason for setting the date so far in the future is to allow time for any radio amateur who wishes to go "incognito" before the new arrangements come into effect, to tell the Radio Amateur Licensing Unit at Chesterfield of his or her decision.

Geoff Arnold

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.

music can be heard in the whole room. For more information and supply of receivers, amplifiers, telephony transmitting stations, etc., please apply to "Ned. (Nederlandse) Radio-Industrie', Beukstraat 8–10, s' Gravenhage." With some justice, the Dutch claim PCGG as the "world's first broadcast transmitter" and the equipment is still held by the Dutch Postal Museum in The Hague.

Recently with the help of Dick Rollema PA0SE, I told something of the history of PCGG in *Electronics and Wireless World* (February, 1986) and of Hanso Idzerda, who had set up Ned. Radio-Industrie in 1917, induced Philips to begin manufacture of radio valves (Philips-Ideezet) in 1918 and in August 1919 obtained a licence to broadcast speech and music over PCGG in order to boost the sales of his amplifiers and radio receivers.

During 1920 the attention of UK listeners was drawn to the Sunday "Hague Concerts" which could be received by the growing number of radio enthusiasts in England. The single-valve PCGG transmitter on 670 metres, using a crude form of narrow-band frequency-modulation (patented by Idzerda), contined broadcasting until October 1924. Modulation was effected by a carbon micrcrophone in series with a coil in parallel with the tuning coil of a power oscillator. In 1944 Idzerda was found by the Germans in possession of radio equipment (some accounts suggest he was detained trying to recover bits from a V2 launch site) and shot without trial. PCGG was thus broadcasting an advertised programme some months before even the first experimental transmissions by the Marconi Company or by KDKA in the USA as detailed in Tim Wander's article.

Pat Hawker G3VA
London

Tim Wander's book *2MT Writtle The Birth of British Broadcasting*, soon to be published, will deal in much greater depth with the history of broadcasting up to the establishment of the BBC. Watch these pages for details of availability and price.

Nostalgia

Sir: Glancing through some pre-war copies of *PW*, it occurred to me that I had read every single copy from the first issue more than half a century ago, and wondered whether this was a record.

During the thirties, the magazine ran technical competitions, and even now I can remember how thrilled I was to win one of these. There was an even greater thrill a decade later, when a colleague and I, by now both RAF Wireless Operator/Mechanics, had a two-page article printed in the August 1944 issue—together with a photograph of our new "Sensitive Signal Analyser" proudly displayed on the front cover.

Oh dear, the trouble we had in rubbing all those arrows and reference marks from the valves and components—they were supplied by "Arthur Murphy's Stores", which many readers will remember.

Douglas Byrne G3KPO
Ryde, IoW

Pen-friend Wanted

Sir: I'm 25 years old. For six years I have had a licence. My callsign is SP7JWK. For the last 5 years I was very nearly QRT because of my study, which consumed a lot of my time, but your magazine allowed me to be in touch with the hobby. Now I would like to ask you for help in finding somebody that I could write with. I want to improve my English and find friends among your readers.

Tomasz Stefanski
Komuny Paryskiej 225/8
26–110 Skarzysko-Kam
Poland

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.

Flying Telegraph Poles

A strange sight you may think, but it is becoming an ever more normal sight in the North of Scotland. Despite the awful winter weather that affects that part of the country, BT have always tried to help customers and reach stranded exchanges.

They are now flying in engineers, telegraph poles and cable drums anywhere in the North of Scotland. The helicopters are capable of carrying not only six passengers but three quarters of a ton of heavy equipment slung from a rope sling underneath.

I don't envy the engineers having to work outside in those type of conditions, helicopters or no helicopters!

Television Rallies

BATC are holding their television rally on Sunday May 4 at the Crick Post House, which is situated at junction 18 on the M1.

This year they have added a marquee for more trading space, not to mention a fun castle for the kids. There will be the usual full lecture programme and talk-in on 144MHz.

Doors open at 10.30am and admission is free, non-BATC members will be made most welcome too. Trade enquiries can ring ***Frank Elliott on 0533 553293.***

RAE Course

Starting on Thursday April 10 at 1900 there will be a C&G RAE course at The Clacton AE&Y Centre, Green Lodge, 180 Old Road, Clacton-on-Sea.

Further information can be obtained from: ***the Principal, Mr John Bird, on 0255 424151, or the course tutor, Mr J. Harris, on 0255 432621,*** during office hours.

A Morse class is also being arranged and if there is sufficient interest this will commence next autumn term.

Radio Rallies

Kelso, Borders and Galashields Amateur Radio Societies will once again be hosting the 3rd Anglo Scottish Rally in Kelso's Tait Hall. The event will be held on Sunday May 4, from 11am until 5pm.

There will be the usual Talk-in, Bring and Buy, Trade Stands, bar, snacks and raffle. Hopefully they will be able to organise a Morse Test Room, too.

The entrance fee will be £1, with junior ops, non-licensed YLs and XYLs very welcome and admitted free. There is something for everyone, so it could make an enjoyable Bank Holiday weekend.

For further information contact: ***André Saunders GM3VLB (0573) 24664, or Bruce Cavers GM4UIB (0573) 24654*** any evening.

The Cambridge & District ARC Rally and Car Boot Sale will take place on May 18, at Coleridge Community College, Radegund Road, Cambridge. It opens at 10.30pm (disabled 10am) and closes at 5pm. There will be talk-in, trade stands, Bring and Buy and Refreshments. Admission is 50p per person (children 25p) and free car parking.

The Car Boot Sale pitches are £4 for advance booking and £5 on the day. All enquiries should be directed to: ***G4TRO, 12 Millington Road, Cambridge CB3 9HP, or (0223) 353664.***

A Radio Boot Fair will be held at Whitfield, near Dover on Saturday May 10. "Boots" open at 10am with an entrance fee of 20p being levied.

There is room for 30 pitches so those interested should contact ***Ian Keyser, "Rosemount", Church Whitfield, Dover. Tel: 0304 821588.***

Plymouth ARC will be holding their Annual Rally on Sunday May 25 in the Plymstock Comprehensive School. This year as the rally has grown they will be using two halls with over 5000sq.ft. of space

Further details from ***Mervyn Collicott G0BNT, 10 Tor Road, Hartley, Plymouth, Devon.***

The East Suffolk Wireless Revival 1986 will be held on Sunday May 25 at the Civil Service Sportsground, Straight Road, Bucklesham.

All the usual features will be there—car boot sale, antenna testing range, radio displays, non-radio stalls, children's play area, model displays—in other words a day out for all the family.

With admission at 80p (unchanged from last year), more details can be obtained from ***Jack Tootill G4IFF, 76 Fircroft Road, Ipswich. Tel: 0473 44047.***

Region 14 Workshop

On Sunday April 13 between 1230 and 1630 there will be a workshop at the Wrangjolm Hall Community Centre, Motherwell.

There will be four "clinics" taking place simultaneously for advice, instruction and general tuition on the subject concerned. The speakers are:

John Brannigan GM4 IHJ on Satellites,

Gordon McKenzie GM4NUN on Computers in Amateur Radio,

George Burt GM3OXX on QRP and Home-Brew, and

Maurice Hately GM3HAT on HF Antennas.

Radio Amateur Information Sheets

The DTI have three information sheets, available on request, for the radio amateur. The first explains the work of the radio amateur licensing section of the Radio Regulatory Division, the second is about the amateur service allocation in the 50MHz band and the third is about Morse.

The first sheet is very informative and would explain the amateur licence to newcomers quite clearly. Information sheets two and three takes the form of question and answers on the subject concerned.

The address to write to for these sheets is: ***Department of Trade & Industry, Radio Regulatory Division, Amateur Radio Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.***

Silver DX

The well-known publication *DX Party Line* is celebrating its 25th anniversary on May 19. There will be a special telephone call-in program on the English Service of HCJB, The Voice of the Andes.

Although the details are still being worked out we will pass on any more information next month.

Radio Award

The Vale of Glamorgan Amateur Radio Award can be claimed after working four stations within the Vale of Glamorgan, as long as the contacts were after January 1985. Log entries should be submitted with claims being on any band but NOT through repeaters.

The cost of the award is £1.80 and further details can be obtained from: ***Ceri Jones GW1JCB, 7 Dawan Close, Barry, S. Glamorgan, on receipt of an s.a.e.***

Star & Garter Appeal '86

The Royal Star and Garter is a home for disabled Sailors, Soldiers and Airmen at Richmond, Surrey. Once again the West Middlesex Radio Group will be operating GB1RSG and GB2RSG over the August Bank Holiday weekend between 9am and 7pm Saturday to Monday.

They are looking for sponsors for the event as they cannot ask for donations over the air. They have extended their thanks to all those who worked the stations and sent in unasked-for donations last year, not to mention all those visitors who donated in their collection bottle.

Further details from: ***Roger Oakley G1DDR, 62 Seward Road, Hanwell, London W7 2JL. Tel: 01-579 7860.***

Instant Morse

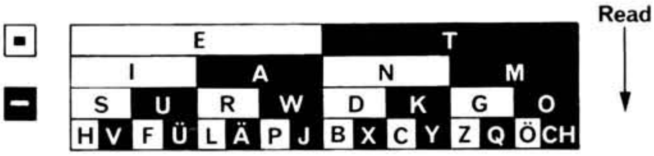
Browsing through the Chalk Pits Museum's stock of old *I & R Bulletins*, I was drawn to an article written in 1932. It was not the Morse which gripped my attention, but a superbly simple pattern of black and white squares with the letter superimposed on them. I have a great interest in codes and ciphers of all kinds and so I read on. The author claimed that with this in front of one, Morse could be read with ease, beginning with slow speeds and working up. My entire knowledge of Morse is ..._ (I grew up during WWII!) and _._. __._ from living with it, I find it hard to resist puzzles and challenges so I decided to try out this magic Morse recognition.

My very first attempt was to press the SW button on the music centre, probably the first time it has ever been off v.h.f. Radio 3 or 4, and tune until I found a Morse signal that seemed at a civilised speed among the fading and foreign stations. The system works, it really does! The bad Morse signal was not at beginner's speed, but I could recognize and write down about 1 letter in 4 the first time I tried it out — and I still don't know any more of the Morse code.

The first digit of a group, a, or _, instantly divides the alphabet in half, and from there one reads downwards to the letter, so that three dots carries the eye down three consecutive white squares to the letter S: two dashes followed by a dot, means looking down two consecutive black squares followed by a white—letter G. It is very much quicker and easier to do than to explain!

David Kahn says in *The Codebreakers,* "Samuel B. Morse designed his code in 1838 with economy in mind, and it was not a random assignment of symbols given to the alphabet. He went to a newspaper and counted the letters in a typecase, noting that there were 12 000 letter e's, 9000 letter t's and 8000 each of letters a, n, o, i and s. He gave the popular letter e the briefest symbol, a dot, and the next, the letter t, a single dash, etc. Time was money in the telegraphic world, and with this assignment of his possible permutation of two symbols in four places, he made it possible for 100 letters of English text to be transmitted in 940 dots (1 dash = 3 dots) whereas in a random assignment the same message would need 1160 dots. It was a very obvious saving of transmission time and operator fatigue".

Joan Ham



Hamfest Trip to Friedrichshaven

Alan Hooker G4DEM has arranged a fantastic trip to the Hamfest in Friedrichshaven. The total capacity of the coach is 55 and already it is half full.

For only £155 it could be the trip of the year for the amateurs concerned.

The proposed itinery is that the party will set off at 6am on July 3 on a coach with all facilities (toilet, coffee machine etc). The ferry will take them over the Channel and then it's off into Europe. A bed and breakfast stop will be at Novotel in Aachen before travelling on to Friedrichshaven, where the party will stay for the evenings of the 4th–6th.

All manner of trips could be arranged other than the rally, so for more details contact: Alan Hooker G4DEM, 42 Netherhall Road, Doncaster. Tel: 0302 25690.

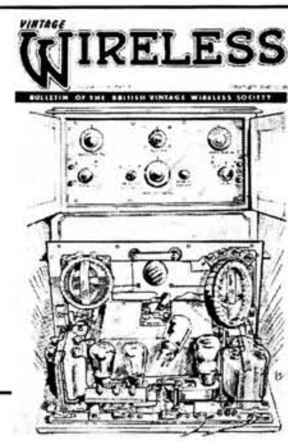
Wembley '86

An Amateur Radio & Electronics Hobby Fair will be held on July 5 and 6 at The Wembley Conference Centre, London.

Included in the two-day show will be a wide variety of retailers and manufacturers of amateur radio equipment, RTTY, satellite TV and communications, microwaves, components, 934MHz, amateur TV to name but a few.

It's being organised by ***Amateur Radio Promotions, Woodthorpe House, Clapgate Lane, Birmingham.***

When we get more details of such things as opening hours and entrance prices we'll pass the news on.



Vintage Wireless

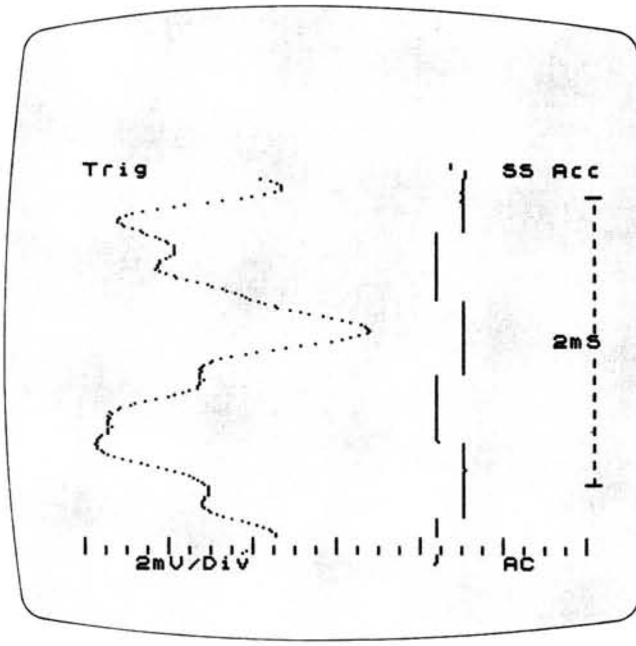
The British Vintage Wireless Society have just sent us a copy of their latest newsletter. It's packed full of items of interest to the vintage wireless enthusiast. Details of membership can be obtained from: ***The Membership Secretary, Gerald Wells, 23 Rosendale Road, London SE21. Tel: 01-670 3667.***

PRODUCTS *... compiled by G8VFH*

Spectrum as a Storage Scope

If you have ever wanted to look at a passing electrical signal which only occurs at random intervals you will know that you need a storage 'scope. These are expensive pieces of equipment usually out of the reach of the amateur, but it is possible to use a home computer to simulate a storage 'scope.

Owners of Spectrums can use the computer with a new plug-in module which, together with the software provided allow use of the monitor as the screen and the Spectrum as the storage 'scope.



The AliDin Scope connects to the expansion port of the Spectrum and has three signal input connectors. The software is provided either on cassette or microdrive cartridge. All the normal 'scope controls are available using the Spectrum's keyboard instead of the usual knobs and the settings are displayed on the screen along with the scales and other useful operating information.

The waveform displayed on the monitor screen is a continuously updated one, just as with a normal 'scope, but the waveform may be captured and held, either on the screen or in memory, while a normal waveform is displayed for comparison.

A "screen copy" function is provided so that the waveforms can be recorded on a printer, and the control setting such as timebase, amplitude and trigger mode will also be printed along with the waveform.

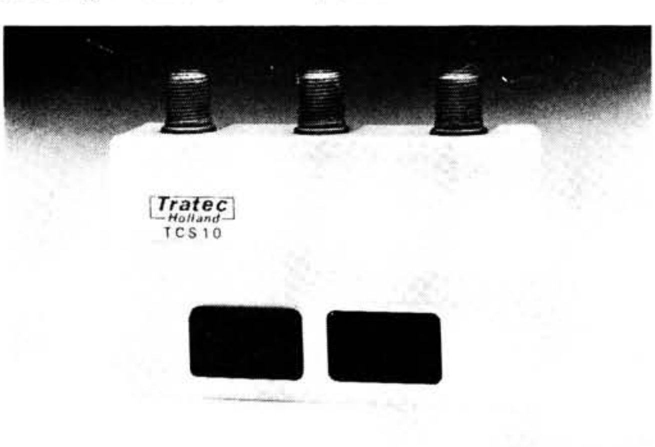
Other features include single-shot capture and trace accumulation, making this a very useful piece of test gear.

The AliDin hardware costs £49.95 with handbook and a signal lead, while the software to drive the module retails at £24.95. AliDin say that further software is to be introduced to allow the module to work as an intelligent chart recorder or as a waveform spectrum analyser.

For more details contact ***AliDin, 39 Kingsclere Road, Overton, Hants RG25 3JB. Tel: (0256) 770488.***

Coaxial Switch

The Tratec TCS-10 coaxial switch has been designed for use in "low-cost" consumer and industrial applications such as switching TV sets from a CATV outlet to a VCR or satellite receiver. Brief specifications give the switch a return loss of better than 20dB, insertion loss of 0·2dB and an isolation of 90dB. 75 ohm F-type connectors are fitted to the unit which is housed in a radiation-proof, ruggedised die-cast housing.



Apart from the obvious satellite broadcast uses the TCS-10 is suited for switching at any frequency up to 1·4GHz and can be used for low-power transmitting applications, when it will handle up to 400W p.e.p. The unused port is terminated by a 75 ohm load to give maximum isolation.

For further information and prices contact ***Mr. K. van der Schaaf, POB 385, 3900 AJ Veenendaal, Netherlands. Tel: (0)838521984.***

SUDD by G4HLX

The two satellites designed and built by the University of Surrey, UoSAT-1 (OSCAR-9) and UoSAT-2 (OSCAR-11), have been highly successful experiments in low-cost spacecraft engineering.

Now, using the Spectrum UoSAT Data Demodulator (SUDD) program, written by G4HLX for the 48K Spectrum and Spectrum+ computers, the true low-cost ground station can be set up. All that is needed is a simple 145MHz f.m. receiver connected directly to the Spectrum. The program will also work from signals recorded onto a tape recorder.

SUDD demodulates 1200 baud ASCII data from the satellites and requires no special interface—just a direct connection from the Spectrum "EAR" socket to the audio output of the receiver or tape recorder. Data received may be displayed as text, or printed on a suitable printer. Telemetry frames are decoded to provide all analogue channels and status points. Checksum tests are performed and the algorithm used for interpreting the data minimises loss of information through data corruption.

The screen display shows a "front panel" featuring "lights" for valid mark and space tones, parity errors and framing errors and a bar "gauge" to show the remaining space in the data buffer.

The demodulated data may be saved on tape or microdrive for reading into the user's own programs, or for loading back into SUDD later. The program is fully microdrive compatible and copies automatically onto microdrive cartridges.

Supplied on a cassette with a detailed seven page instruction booklet, SUDD costs £4.50 inclusive of postage and packing for the UK and Eire (Overseas add £1) and is available direct from ***N. P. Taylor G4HLX, 87 Hunters Field, Stanford-in-the-Vale, Faringdon, Oxon SN7 8ND.***

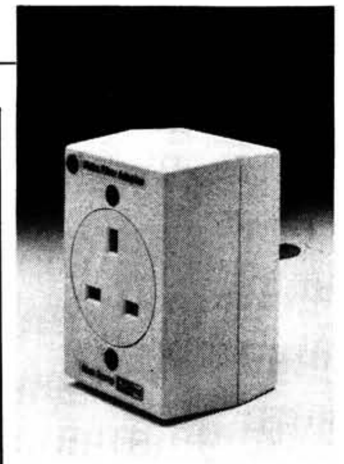
PRODUCTS ... *compiled by G8VFH*

Automatic Strippers

How often have you needed to strip the insulation from the ends of some cable and haven't got a proper stripper? I must admit that ever since I can remember I have used my front teeth to perform this vital operation, but when it comes to the heavier cable even my teeth object and I have to use something stronger. Penknives, scalpels, sidecutters all tend to nick the conductors giving rise to premature fracturing, and hot strippers are generally too expensive for the hobbyist to contemplate.

Plasplugs have just released a neat automatic wire stripper that can be used in one hand, and will strip the insulation from cables up to 7mm diameter without damaging the conductors. It will also cut the cable to length and can be used on single, twin or multi-core cables. The length of insulation stripped off can be easily set using the graduated scale provided—up to a maximum of 20mm

The stripper—British made by ***Plasplugs Ltd., Sheridan House, Vernon Street, Derby DE1 1FR***—can be bought at good d.i.y. stores for just under £4.



Mains Filter

Plagued with spikes on the mains upsetting your home computer? If you are then Duraplug's latest product was designed just for you.

Their Mains Filter Adapter fits directly into an ordinary domestic 13A socket outlet and provides a continuous "laundering" of the electrical supply to plugged-in appliances, such as computers, word processors, televisions and video recorders.

Technical details show that the unit can handle 750VA at 50Hz with a filter performance of better than 50dB for frequencies over 600kHz. The transient suppression characteristics are given as 0·2W (max.) average power dissipation, an energy rating of 12 joules with a peak current of 500A and a typical response time of 50ns.

The Duraplug Mains Filter Adapter sells for around £18 including VAT from good electrical shops, but in case of difficulty the unit can be purchased directly from ***IML, Blair House, High Street, Tonbridge, Kent,*** for £17.90 including VAT and postage.

Digital Multimeters

Level Electronics have added two digital multimeters, the HC5040 and HC5040T, to their range of instruments.

Both have $3\frac{1}{2}$ digit liquid crystal displays with 0·5in characters.

The ranges covered are 200mV to 1kV d.c. voltage, 200mV to 750V a.c. voltage, 200μA to 10A d.c. and a.c. current, and 20Ω to 20MΩ resistance. A continuity buzzer and diode test range are also provided. Accuracy is quoted as ±0·25 per cent of reading plus one digit on the d.c. voltage ranges, with an input impedance of 10MΩ. A transistor gain range is incorporated in the "T" version of the instrument.

Both models have cases moulded in high impact ABS plastics, measure 170 × 87 × 42mm and weigh just 375g.

Prices are £37 for the HC5040 and £39 for the HC5040T—plus VAT of course. ***Levell Electronics Ltd., Moxon Street, Barnet, Herts. EN5 5SD. Tel: 01-440 8686.***

Z Match Mod Kit

G3LLL of AEUK/Holdings has sent me some information on their new kit which enables the KW EEZE match and other Z matches to cover Top Band.

The kit includes switch, coil and full instructions and is claimed to be very simple to install. It is also claimed that it will match, efficiently, impedances from 10–200 ohms and therefore it should be able to resonate 1·8MHz dipoles or wire antennas from 15–60 metres long.

The kit is available from ***AEUK/Holdings, 45 Johnston Street, Blackburn BB2 1EF. Tel: (0254) 59595*** and costs £6.75 inclusive of postage.

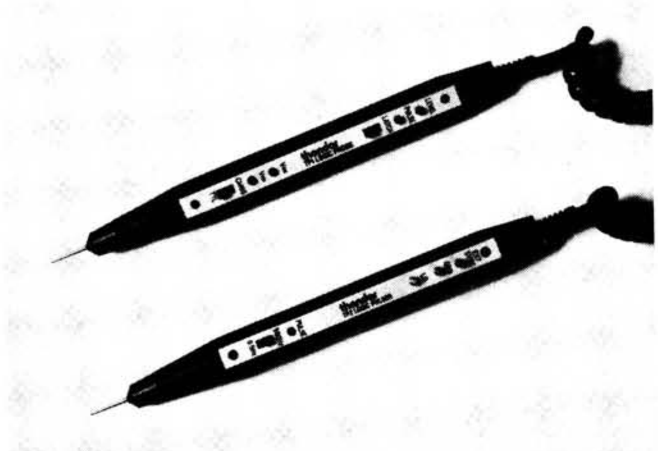
Logic Probe

The Thandar TP1 Logic Probe, and its stablemate the TP2 Logic Pulser, are useful tools for checking both c.m.o.s. and t.t.l. circuits.

The TP1 can show fourteen different circuit conditions and detect pulses as short as 10ns, while the TP2 can inject a signal directly into a circuit without causing damage to sensitive components.

Used together they can stimulate and monitor the response of components "in circuit", thus greatly helping with tricky faultfinding.

Both probes cost £23 each plus VAT, and further information can be obtained from ***Thandar Electronics Ltd, London Road, St. Ives, Huntingdon, Cambs. PE17 4HJ. Tel: (0480) 64646.***



Receiving DXTV

Ray Howgego BSc G4DTC looks at the world of receiving DXTV and how newcomers need to organise themselves.

The closure of the British 405-line network has left the v.h.f. TV bands wide open to the reception of distant signals and has bestowed on the DXTV enthusiast an opportunity not to be missed. The intention of this article is to suggest techniques for optimising the receive system, either for the established station or for the newcomer who requires an immediately working system of ultimate sensitivity. Much useful information has already been published on propagation, transmission standards and so on, and it is not the author's intention to reproduce it. Suffice it to say that the author regards it as the exception, rather than the rule, to find the bands devoid of distant signals, a consideration of major significance to prospective occupiers.

The Tuner

Although a domestic TV will invariably be used to produce the final picture, the versatility of the sytem will be enhanced by the employment of an outboard tuner, a simple two-way switch connected at the input of the i.f. strip allowing the TV to be switched between internal and external tuners. It is advisable to switch off the supply current to the internal tuner when not in use as some signal will still leak through the switch in addition to the production of spurious signals by the internal tuner's local oscillator. Use of an external tuner is advised in that it allows accurate frequency calibration (every u.h.f. channel may be marked on a home-made dial), and might be essential for coverage of Bands I and III. If the TV is not mains-isolated, all connections to outboard units should be made via 1nF capacitors of 500 volts working.

Surplus tuners are readily available or may be easily removed from redundant 405-line TVs and stripped of their sometimes elaborate tuning mechanisms. There is considerable variation in their suitability for long distance work. For Bands I and III, the permeability, continuous-tuned units are preferred; those using the BF200 series transistors also have particularly low noise. If one does not mind a step backwards and since the use of a pre-amplifier will be advocated, a valved tuner will offer superior performance in terms of strong-signal handling and freedom from cross-modulation. The increased noise factor can be offset by a low-noise pre-amplifier of sufficient gain.

At u.h.f., the type of tuner having three mechanically tuned lines at the signal frequency is preferred. Varicap tuners, in addition to the awkward requirement of a 30V line, can suffer from spurious f.m. sound-carrier phase modulation under the influence of the a.m. vision carrier when confronted with high signal levels. However, the tuner used in the recent Grundig colour projection TVs, if available, represents virtually the ultimate in commercially produced units. The ubiquitous BF180 or AF239 r.f. amplifiers in mechanically tuned units can be replaced, with a bit of fiddling, by more recent bipolar, or even m.o.s.f.e.t. devices, offering a substantial improvement in noise factor. A noise factor of 7dB or more at 800MHz is high by modern standards and may be halved at little cost.

Two further points are worth mentioning: first, by the addition of an extra stator plate to each section of a mechanical tuner, coverage of amateur TV on the 430MHz band is possible; secondly, that most mechanical tuners have exceptional frequency stability. The author has used one as a converter for 430MHz, its i.f. adjusted to 28MHz by a small capacitor across the i.f. coil, and has copied s.s.b. with little retuning necessary.

The Antenna

In Band I the advantages of multi-element, high-gain antennas are debatable, such beams are highly directional, resulting in missed signals. They become even more directional if designed for high gain **and** bandwidth. The sole advantage offered by the beam is the rejection of high angle cosmic noise, but this is not unusually as dramatic as it should be. At certain times of the day, noise from the sky can maximise near the horizon, that is, in the beam heading. The author finally settles on the double-V, the once familiar X shape favoured for its rejection of automobile interference due to its high front-to-back ratio (25dB possible) and its absence of side lobes. It offers a slight forward gain (3dB) with a marked reduction in cosmic noise over the dipole, and is not over directional. Details are given in Fig. 1 for such an antenna at 55MHz; although of good bandwidth, it may be cut to other frequencies by proportionally scaling the elements. Mounted with elements in a horizontal plane it occupies no more space than a rotatable

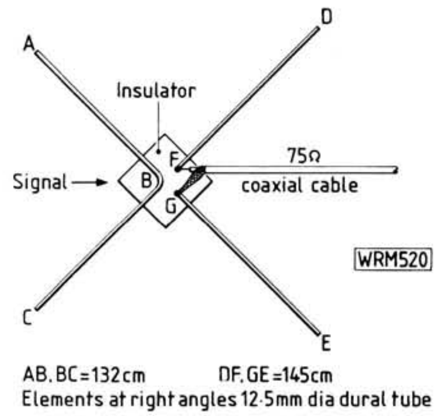


Fig. 1: A Double-V antenna tuned to 55MHz and suitable for Band I DXTV, for which it should be mounted with elements in a horizontal plane

dipole and may be easily fitted to the top of a pipe (the rotator) with the aid of a plumbers' compression joint or cistern inlet. It must be observed that the parasitic element is a **director** and will face into the received signal.

In Band III, where the external noise level is comparable with front-end noise, there is a clear advantage in using a multi-element beam and designs for the amateur 144MHz band may be scaled down to suit 175–230MHz. However, it is useful to recall that a dipole cut for the higher Band I frequencies becomes a $3/2\lambda$ dipole in Band III, matching well into 75Ω cable and offering slight gain in its major lobes. It is also worth noting, particularly with respect to my later comments regarding cross-modulation, that a Band I dipole offers virtually no rejection of u.h.f. signals, being a 5λ centre-fed antenna in Band IV and can be quite useful at these frequencies. The addition of further elements does not significantly improve this situation.

The Antenna Amplifier

Let us first consider Band I (45–75MHz), probably the best loved and most reliable of the DX bands. The external noise level received by the antenna, which will determine the ultimate sensitivity of the system, will be of the order of 6–10dB. The noise factor of the first amplifier in a transistor, or even valved tuner, should be substantially below this with the result that one's initial reaction to low signal strengths, that is to build a pre-amplifier, might be ill-founded.

These are some simple tests that may be carried out to evaluate the performance of an established system:

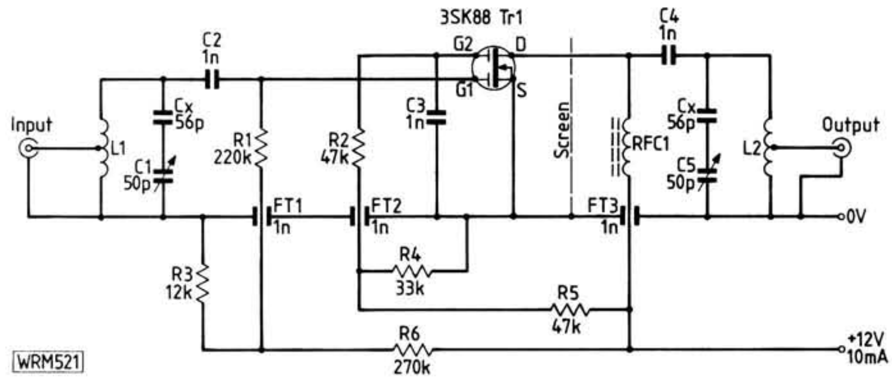


Fig. 2: A low noise antenna pre-amplifier for all v.h.f/u.h.f. bands with suitable choice of tuned circuits. For Band I (45–75MHz) L1 and L2 are 8 turns of 22 s.w.g. on a 6mm former, wide-spaced and tapped at 3 turns. For Band III both coils are reduced to 3 turns, tapped at 1 turn and C1 and C5 are reduced to 20pF. RFC1 is about 30 turns of fine wire on a 3mm ferrite rod. All capacitors are miniature ceramic plate type and FT1–3 are 1nF feed-through capacitors

(1) Disconnect the tuner from the i.f. strip; only slight or no noise should show on the screen.

(2) Connect the tuner with a 75Ω dummy load aross its antenna socket; note the noise level, which should have increased significantly. If it did not, and the tuner was working correctly, extra i.f. amplification is certain to be necessary and should be considered before proceeding. A single v.h.f. transistor in a common base configuration at about 35MHz should suffice.

(3) Assuming test 2 was successful, disconnect the dummy load and plug in a Band I antenna. If the noise on the screen shows an obvious increase, the tuner noise level is low enough and a pre-amplifier will produce little or no improvement. If however no increase in noise was observed, a pre-amplifier will be essential.

For Band III operation it may be assumed that an amplifier using recent devices will always improve signals, the external noise being invariably lower than tuner noise. The same applies at u.h.f. although care must be taken to ensure that one has improved the signal-to-noise ratio, rather than creating more of both. Certain cheap consumer pre-amplifiers do the latter, the increased contrast masking the increased noise.

Returning to Band I and having decided that an amplifier might be a useful addition, if only to give the peace of mind that comes from achieving the ultimate, it is worth considering the major pitfalls, the worst of which is cross-modulation. There is nothing more infuriating than spending hours trying to discern the writing on a distant test card only to find it to be the local Channel 4 transmitter. Most commonly, two local u.h.f. channels appear on the screen interlaced in a peculiar fashion at a spot on the dial equal to their difference in frequency; for example, in the London area, at 56MHz which is the difference between ITV, BBC 1, BBC 2 and C4 in various combinations.

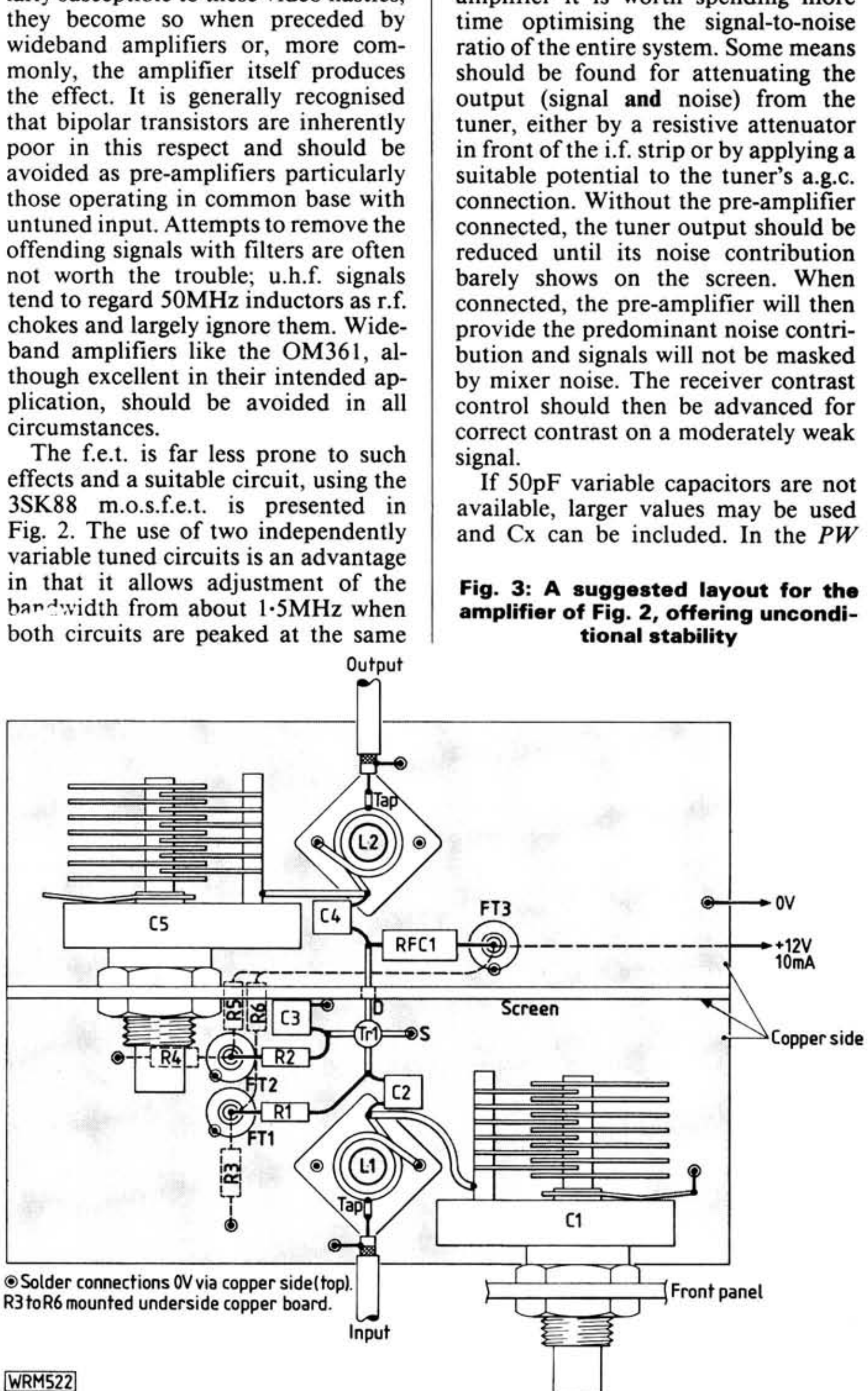
Although the author has found that tuners, in themselves, are not particularly susceptible to these video nasties, they become so when preceded by wideband amplifiers or, more commonly, the amplifier itself produces the effect. It is generally recognised that bipolar transistors are inherently poor in this respect and should be avoided as pre-amplifiers particularly those operating in common base with untuned input. Attempts to remove the offending signals with filters are often not worth the trouble; u.h.f. signals tend to regard 50MHz inductors as r.f. chokes and largely ignore them. Wideband amplifiers like the OM361, although excellent in their intended application, should be avoided in all circumstances.

The f.e.t. is far less prone to such effects and a suitable circuit, using the 3SK88 m.o.s.f.e.t. is presented in Fig. 2. The use of two independently variable tuned circuits is an advantage in that it allows adjustment of the bandwidth from about 1·5MHz when both circuits are peaked at the same frequency, to several megahertz when either of the circuits is detuned. The reduced bandwidth is useful while searching for weak signals or for separating adjacent channels, while the wider bandwidth will improve definition if the signal strength improves. The gain will be about 25–15dB depending on bandwidth with a noise factor specified for this device (although impossible to achieve in such a circuit) of 1·1dB at 150MHz. No trace of cross-modulation has been identified and the two tuned circuits provide good pre-tuner rejection of u.h.f. signals. Normal v.h.f. constructional practice should be observed, a suitable layout being suggested in Fig. 3, and the transistor will still loaf along at a gigahertz (15dB gain; 3·5dB n.f.). It is possible to use miniature slide switches for bandchanging.

Having successfully constructed the amplifier it is worth spending more time optimising the signal-to-noise ratio of the entire system. Some means should be found for attenuating the output (signal **and** noise) from the tuner, either by a resistive attenuator in front of the i.f. strip or by applying a suitable potential to the tuner's a.g.c. connection. Without the pre-amplifier connected, the tuner output should be reduced until its noise contribution barely shows on the screen. When connected, the pre-amplifier will then provide the predominant noise contribution and signals will not be masked by mixer noise. The receiver contrast control should then be advanced for correct contrast on a moderately weak signal.

If 50pF variable capacitors are not available, larger values may be used and Cx can be included. In the *PW*

Fig. 3: A suggested layout for the amplifier of Fig. 2, offering unconditional stability



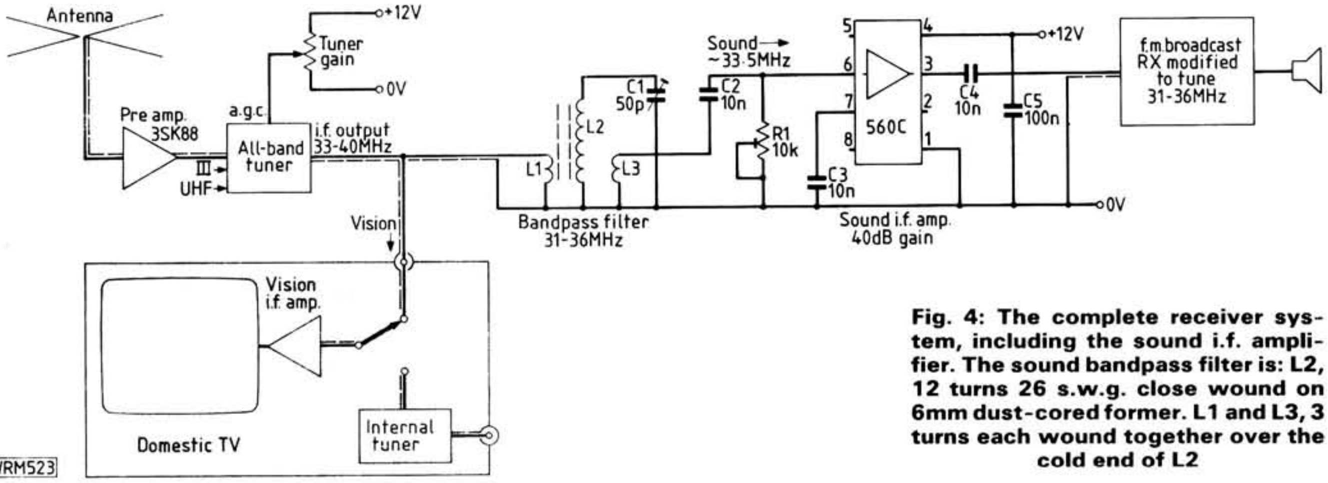


Fig. 4: The complete receiver system, including the sound i.f. amplifier. The sound bandpass filter is: L2, 12 turns 26 s.w.g. close wound on 6mm dust-cored former. L1 and L3, 3 turns each wound together over the cold end of L2

prototype, we used 500pF capacitors with 56pF for Cx and the results were very satisfactory. The tuning range of the unit was 40–93MHz, the gain was 23dB (both tuned circuits peaked), the 6dB bandwidth was at 12MHz (both tuned circuits peaked). The maximum input was 50mV.

DXTV Sound

For a number of years the author tolerated the comment "nice picture but where's the sound", only to plunge the unsuspecting visitor into a quite incomprehensible analysis of why a British TV could not reproduce continental sound. Some attention was given to this problem and the added thrill of simultaneous sound and vision well repaid the time spent on it. British-standard TV receivers use an intercarrier sound i.f. strip at 6MHz, the difference in frequency between the vision carrier and the sound sub carrier. Unfortunately, continental Europe transmits its sound 5·5MHz removed from the vision carrier producing no response at all from British-standard sets.

One answer is to retune the 6MHz i.f. strip but this then makes the set unsuitable for local signals. In addition the system relies on both sound and vision carriers being present at the receiver, by no means a certainty as far as distant signals are concerned. Selective fading often causes one or other of the carriers to disappear, producing excessive fading on intercarrier sound circuits. In particular, for reasons unknown to the author, fully quieting sound is often received from Moscow TV for up to 15 minutes before the slightest trace of a picture emerges. Occasionally the sound accompanies a picture from another country.

It was decided therefore that a completely separate f.m. sound i.f. strip was essential, fed directly from the tuner and tunable over the i.f. passband. Most British i.f. strips operate at 39·5MHz vision and 33·5MHz sound carrier frequencies. However, some sets of oriental origin do not adhere to this standard and the sound i.f. strip was made to tune over 31–36MHz to accommodate all possibilities.

The simplest technique, although a little daunting at first sight, is to modify an existing f.m. broadcast receiver by rewinding its coils. In practice this is not so difficult provided that a dip-oscillator is to hand to check the rewinding, and no other components will need changing. The local oscillator coil must be rewound to tune from about 42–47MHz (well within the range of the variable capacitor), and all signal frequency coils should tune around 31–36MHz. Tracking between circuits will have been degraded but, in the final system, only a limited tuning range (less than 1MHz) will be used and the circuits may be aligned within that range. An old Sinclair FM80 module worked well in this application having only one (printed circuit) coil at the signal frequency, easily removed, as was the oscillator coil, with a sharp knife.

The tuner will need to be preceded by a wideband amplifier of about 30–40dB gain to achieve full quieting on the weakest signals. This is conveniently provided by a 560C i.c. A diagram of the complete system is shown in Fig. 4. The simple tunable bandpass filter was included to reject the vision carrier which otherwise caused cross-modulation in the 560C i.c. but is only necessary when dealing with high signal levels. The preset resistor R1 alters the base bias of the first transistor in the i.c. and requires careful adjustment for optimum signal-to-noise ratio, while C1 is simply peaked for best signal.

The unit is best tested on a local u.h.f. transmission. Having tuned for best vision, the sound receiver is swept through its tuning range until the sound is heard. For continental signals, the sound receiver will need to be set 500kHz higher and all circuits aligned at this frequency. The results are far superior to the intercarrier sound system. Even on weak signals of British origin the sound will be fully quieting whereas before it was noisy and subject to excessive fading. ***PW***

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Access

Weather Watch–2

In this part of the series, Jeff Maynard G4EJA looks at the meaning of the codes used in weather data transmitted by RTTY.

Each different type of data is represented in the decoding manuals by one or more letters (both upper and lower case being used). For example, when the coded figures are to represent the air temperature in degrees celsius then the manuals indicate *TT*. Similarly the code *sss* indicates the depth of snow in centimetres. Thus using these two examples, a manual might indicate that a particular 5-figure group had the meaning *TTsss*. This would mean that the first two digits translated to air temperature in °C, and the third, fourth and fifth digits indicated snow depth in centimetres (for example, *02003* would mean 2°C and 3cm of snow).

These symbolic letters go from *A*, indicating the World Meteorological Organisation (WMO) region in which a buoy has been deployed, through to *z*, indicating present ice conditions and trends over the preceding three hours. Note that the symbolic designator *NN* is different from *nn* and from *NNN*.

Thus the manual might indicate that, say, a synoptic report from a land station would be coded in the form:

MMMM YYGG
IIiii Nddff VVwww PPPTT

In order to decode this it would be necessary to look up each data element in turn for decoding instructions. *MMMM*, for example, indicates the report type (and in this example, for a land station synoptic report, would have the value *AAXX*). *YY* indicates the day number in the month and *GG* the time of observation to the nearest hour.

Any decoding therefore involves a multi-level approach. A key entry (such as *AAXX*) will indicate the type of report. Knowing this, the general format of this type of report can be ascertained. This will be in the alphabetic terms described above. Each group of figures can now be identified (by cross reference to the data identifiers in the manual) and decoded. The decoding may be a simple actual value (such as temperature) or may, itself, require reference to a look-up table. For example *VV* gives the horizontal surface visibility in km according to a table ranging from *VV=00* (meaning visibility less than 0·1km) to *VV=99* (meaning visibility of more than 50km).

To identify the start of a signal so that the key letters can be readily found, the RTTY signal is divided into three parts: the leader, the information and the end signal. The print-out Fig. 2.1 illustrates a leader preceded by the *NNNN* end signal of the previous messages. All meteo messages are terminated by *NNNN*.

```
NNNN
ZCZC 299 27550
SXUK21 EGRR 301200
MMXX 3012
```

Fig. 2.1

The first line of the header of all meteo messages starts with the start-of-message indicator *ZCZC*. This is sometimes followed by a 3-digit serial number (*299* in the example shown) and also sometimes by a further identification group (*27550* in this case).

The second line is the abbreviated heading and has the general form shown in the decoding manuals as: *ttAAii CCCC YYGGgg*. To interpret this it is necessary to refer to the manuals for each group of letters. In the example shown, the first group is received as *SXUK21* and can be decoded thus. The group *tt* (there is no group *t* in the manual so there is no chance of confusion) has the value *SX* which is given to mean "miscellaneous surface data".

AA represents a geographical indicator whose value in this case—*UK*—is fairly obvious. Some other geographical indicators are also obvious, such as *US*, whilst others relate to international callsigns, such as *DL* for West Germany. Some could be confusing, *SM* is Suriname for example. The group *ii* decodes to a bulletin differentiation number and can safely be ignored.

The manual tells us that *CCCC* is the international 4-letter location indicator for the station originating or compiling the bulletin. It does not, unfortunately, list any of the possible values of this indicator. To identify the meaning of *EGRR* requires reference to the *List of Air Codes and Communications* also published by Joerg Klingenfuss. The compiling station in this example is Bracknell (all UK weather station identifiers begin with *EG*). None of the codes is recognisable without a reference list.

The final group in the abbreviated heading—*YYGGgg*—is easy to decode. *YY* signifies the day number of the month and *GGgg* the time in hours and minutes, UTC, of the observation. In both cases the figures translate directly (30th of the month at 1200 for the example under discussion). The final line is, strictly speaking, part of the message text but it does identify the type of information that follows. As such it is heading type information.

```
NNNN
ZCZC 724
SMNL23 EHDB 301200 RTD
AAXX 30124
```

Fig. 2.2

```
NNNN
ZCZC 388 19105
SMPO1 LPMG 301200
AAXX 30124
```

Fig. 2.3

MMXX indicates synoptic data reports from a land station and *3012* gives the day number in the month (30) and time to the nearest hour (1200 UTC) of the observation. The main types of report identification letters seen in h.f. meteo transmission include:

AAXX synoptic report from a land station
BBXX synoptic report from a sea station
PP.. upper wind report
TTAA upper level pressure, temperature, humidity and wind report
ZZXX drifting buoy report

There are about fifty different types of report. Each of these has its own format for the information following the header. You can perhaps begin now to see the scale of the decoding problem.

The print-out Fig. 2.2 shows message serial number *724* giving synoptic reports at main synoptic hours (*SM*) from the Netherlands (*NL*). The information is the regional distribution and originated at De Bilt meteo station in the Netherlands—*EHDB* (although it was transmitted by Paris meteo on 8·163MHz). The data originated on the 30th of the month at 1200 UTC (*301200*). The suffix *RTD* indicates a delayed routine message. The text contains synoptic reports from an automatic land station (*AAXX*) and was observed at 1200 UTC on the 30th of the month when the wind speed was 4 knots (*30124*).

The print-out Fig. 2.3 shows the international nature of meteorology with this report also received from Paris. It relates to the meteorological situation in Portugal (*PO*) and was observed at the meteorological centre in Lisbon (*LPMG*).

Decoding the body of the data takes time and patience as well as access to

```
NNNN
ZCZC 319 29502
SMFI20 EFKL 301200 COR
AAXX 30124
02929 42980 43407 10158 20043 40203 54000 80001=
```

Fig. 2.4

the decoding manuals already mentioned. Anyone seriously interested should give some thought to computerising the decoding. Although laborious when done manually, the decoding mostly consists of referring to look-up tables and doing a simple translation or transposition (and is, therefore, ideally suited to computerisation).

Complete decoding instructions are beyond the scope of this article. However, some examples of the more common type of information may well be sufficient to whet the appetite of the would-be weather forecaster. The print-out Fig. 2.4 is a transmission received from Bracknell on 4·489MHz of a synoptic report prepared by the Met Centre in Helsinki (*EFKL*) of Finnish data (*FI*).

Each data line in the text of this type of message represents readings from a particular observing station. In this example there is only a single observing station whose index number is *02929* (Joensuu, Finland according to Herr Klingenfuss' book). Taking each group of figures in turn, the data decodes as follows:

42980 indicates that precipitation data is not included (and the group *6....* is therefore not transmitted), the station is manned (and the group *7....* is omitted), there are no clouds below 2500m and the surface horizontal visibility is 30km.

43407 indicates 4 oktas of cloud cover, and a wind direction of 340° at a speed of 7 knots. (An okta is one eighth of the hemisphere of sky visible to an observer. Therefore 4 oktas means that 50 per cent of the sky is cloudy.)

10158 gives the air temperature as being positive (*0*) with a value of 15·8°C.

20043 gives the dew-point temperature. Again, this is positive and with a value of 4·3°C.

Note that a group beginning here with the digit *3* would give the atmospheric pressure—in tenths of a hPa—at zero metres above sea level. (One hectopascal (hPa) is the SI equivalent of one millibar.)

40203 indicates that the pressure at mean sea level is 1020·3hPa.

54000 says that the atmospheric pressure has been steady for at least three hours and the pressure tendency during the last three hours has been zero.

Note that a group beginning here with the digit *6* would give the precipitation since the last report—no group beginning with *6* indicates no precipitation. Similarly group *7....* describes the present weather in one of 99 different categories.

80001 describes the cloud cover. In this case there is no stratocumulus, stratus, cumulus or cumulonimbus, no altocumulus, altostratus or nimbostratus, but cirrus cloud is present in the form of filaments not progressively invading the sky.

Note that a group *9..11* would indicate the height above ground of the lowest cloud seen. Now you can see why we did not fully decode the example given in Fig. 1.2 in Part 1 of this series!

Some reports are much easier to decode and one, in particular, can be done without the aid of any tables. The print-out Fig. 2.5 shows an example of an "aircraft routine operational" or ARP meteorological report. These identify the aircraft and its position, and report on temperature and wind speed.

For example, the first line of Fig. 2.5 shows an Air France flight AF243 at a position of 46°N 8°W at 1051 UTC flying at a height of 31 000 feet, reporting an air temperature of −51°C and a wind speed of 20 knots at 210°. Similarly, the last line refers to a Jugoslav Airlines flight JU506 at 55°N 10°W, 1226 UTC, 33 000 feet reporting an air temperature of −55° and a wind speed of 40 knots at 170°.

The final decoding example (Fig. 2.6) relates to a Bracknell transmission again (4·489MHz) and gives upper atmosphere pressure, temperature, humidity and wind reports for Sweden as compiled at the Swedish Meteorological and Hydrological Institute at Norrkoping (*ESWI*).

Following the line beginning *TTBB* the data are grouped in pairs up to the entry *21212*. Each pair defines the pressure, temperature and dew-point depression (in hPa, degrees celsius and standard isobaric surfaces respectively). Each pair represents the data for a series of levels beginning with the station level (*00... .....*). In the example shown, at level *00* (the station level), the pressure is 22hPa, the temperature is +17·2°C and the dew-point depression is 14°C.

At level *7* the pressure has risen to 450hPa, the temperature has dropped to −30·1°C and the dew-point depression is 9°C. Following the indicator *21212* the pressure is repeated by level together with wind speed and direction. Thus at station level *00* the wind is 170° at 10 knots.

Code group *41414* indicates cloud data following. In this example it decodes to: 1 okta of cloud cover; cumulus with little vertical extent; cloud at 1500 to 2000m above ground; no altocumulus type clouds; cirrus in the form of filaments.

The remaining data in this example is used for regional (i.e. local) information and consequently decoding details are not generally available.

In the final part of this series, we shall look at other forms of weather information transmissions, including VOLMET, facsimile and satellites.

```
ARP AF243 46N008W 1051 F310 MS51 210/20=
ARP SPAR60 54N020W 1219 F350 MS38 340/16=
ARP SU301 61N030W 1225 F350 MS52 360/80=
ARP SU301 62N020W 1146 F350 MS40 240/10=
ARP PA67 55N030W 1226 F350 MS54 330/87=
ARP JU506 55N010W 1226 F330 MS55 170/40=
```

Fig. 2.5

```
NNNN
ZCZC 421 39413
UKSN3 ESWI 301200
TTBB 8012/ 02365
00022 17264 11950 12863 22850 05061 33790 00458 44705 05160
55650 09758 66550 18161 77450 30159 88370 41160 99300 513//
11246 585// 22192 583// 33157 525//
21212 00022 17010 11811 34517 22747 31501 33354 02517
44229 33506 55109 11518
41414 11701
51515 11907 35009 22800 34514 33600 01506
52525 92844 10862 35007=
```

Fig. 2.6

A Versatile Valve Monitor/S-meter

Valved communications receivers need a unit to check the performance of the valves. Chas E. Miller describes a project that fits the bill.

A number of readers have asked me if it is possible to construct a small unit, either "add-on" or integral, which will permit instant and simple checks to be made on the performance of valves in a classic communications receiver.

The unit described here fulfils this need very effectively and also provides S-meter facilities if required, using a perfectly standard 0–1mA meter.

To appreciate how the monitor section operates it is first necessary to examine the traditional methods of checking valve performance. Undoubtedly the best is measurement of the various anode currents, but since this entails breaking the h.t. supply to each valve in turn it is seldom used in practice, and the much easier alternative of voltage measurements adopted. This is fairly effective as regards valves handling a.f., since they are likely to have quite high anode load resistors across which substantial voltage drops occur when the correct anode current is being drawn. When compared to optima quoted in service manuals such readings are a reasonable indication of whether the valves are doing their job properly.

For r.f. purposes voltage tests are not so reliable, partly because the d.c. resistance between an anode and h.t. may well be only that of an i.f. transformer or similar, and partly because the very act of applying a test prod may cause instability and a change in anode current. This is particularly troublesome when local oscillators or b.f.o.s are concerned.

From the foregoing it will be seen that it is not practical to have one voltmeter with a switch selecting permanent test leads to the various valves. Even if it were, two other problems would remain: first the meter scale would have to be calibrated accurately, probably in two ranges to cater for the varying test voltages; and secondly the readings would still have to be compared to the prescribed optima. These two difficulties can be eliminated by arranging matters so that when each valve draws its correct current a certain pre-determined reference voltage is applied to the meter terminals. Thus simple 0–1 markings (in 0·1mA steps for example) are quite sufficient to establish whether or not the anode currents are in order; so long as the needle registers within a certain sector of the dial, all is well.

The reference voltage is obtained in the following way: into each anode h.t. feed an extra series resistor is added, its value such that the pre-determined voltage shall be dropped at the rated current. The voltage may conveniently be 0·25V, which will give half-scale readings on a 1mA meter adapted to read 0·5V full-scale. All that is needed for this is a meter series resistor (Rm in the diagram) which will give a total of 500Ω between the meter terminals. For instance, if the meter internal resistance (normally quoted on the dial) should be 100Ω, the series resistor must be 400Ω. This is equivalent to a sensitivity of 1kΩ per volt. The h.t. series resistors are calculated from the correct anode current of each valve, as stated in the service manual, or, if the latter is not available, as determined from actual measurements.

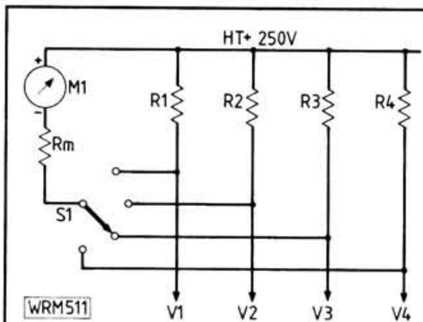


Fig.1(a): The basic monitor circuit (single line h.t.). Resistors R1–4 are series h.t. feeds to valve anodes. Resistor Rm is meter series resistor. See text for values

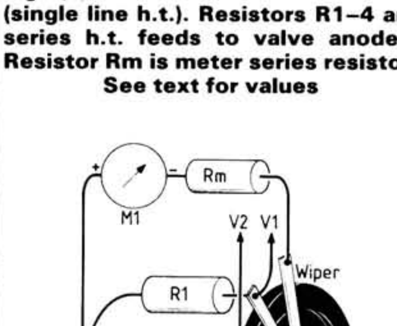


Fig. 1(b): Practical layout for the basic monitor circuit

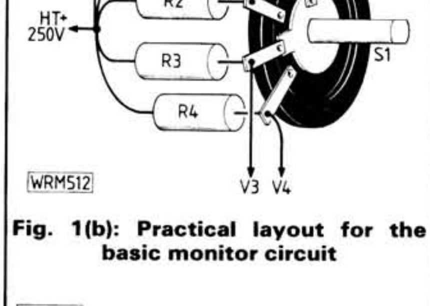


Fig. 1(c): Typical h.t. supply circuitry. Break h.t. feeds at points marked "X" and take each to the appropriate series resistor

"Operating conditions" as shown in many valve manuals are not to be depended on, since the currents quoted therein often differ widely from those obtained in an actual receiver. As a working example, let us consider the receiver section "A" of the well-known WS No. 19 or "Tank Set".

The valve line-up of the set is as follows: 6K7G r.f. amplifier, 6K8G frequency-changer, 6K7G i.f. amplifier, 6B8G detector. The anode current of these valves is given in the official servicing manual as, respectively, 10, 1·4, 3·9, 4·8, 7·9 and 5·5mA. The meter, being in parallel with the extra h.t. resistor, passes 0·5mA when registering half-scale, and this amount of current must therefore be deducted from the figures just quoted when the value of the series resistors is calculated. Ohms Law gives the values as 26, 277, 73·5, 58, 33·78 and 50Ω. There is no need to make up the exact values of the first five, the nearest standard values being 27, 270, 75, 56 and 33Ω. Although the wattage does not exceed a few milliwatts for any of the resistors it may be necessary to use wire-wound types in some cases merely because they have different standard values. In the case of the No. 19 set an output stage may well have been added employing such a valve as a 6F6G or 6V6G, and the reader may wish to include this on the monitor.

Depending upon the exact conditions of use, such a valve will draw between about 25 and 40mA, calling for a series resistor of between about 10 and 6Ω. It is important to remember that the value will be more critical with the higher current that passes through it. The values quoted earlier will give half-scale readings ± a few millivolts; to account for the slight discrepancies such as valve tolerance, it is suggested that the centre part of the scale representing 0·24–0·26V be considered as indicating satisfactory performance. If desired the relevant section could be lightly coloured to make it prominent.

The Selector Switch

In receivers employing a single h.t. line (again such as the 19 set) monitor functions can be carried out with a single-pole switch having as many ways as there are valves to be checked. The extra series resistors may be mounted between the actual switch tags and an adjacent tag strip, which will provide a common h.t. supply. From each switch tag a lead will supply h.t. via a series resistor to the appropriate valve. The meter will be connected between the switch wiper (negative) and h.t. line (positive). The meter series resistor may be in either the negative or positive lead for the simple monitor as described, but if S-meter facilities are to be incorporated the resistor should be in the negative lead for reasons that will become apparent later (Fig. 1).

Receivers with Two HT Lines

Some receivers have a second h.t. line, possibly around 100V below that of the main, which supplies valves requiring lower anode potentials. In many cases the second line will be regulated by a neon stabiliser such as the VR150/30. For such receivers a two-bank monitor switch will be required, since the positive terminal of the meter will have to alternate between the main and lower h.t. lines as appropriate. The h.t. series resistors may be wired across the switch banks (Fig. 2) so that the wipers will contact either end of each as it is selected. The h.t. end of each resistor will be taken to the relevant supply line.

Provision for S-meter Switching

The S-meter will require an extra way on the two-bank switch, the latter being needed even if there is only one h.t. line. However, it is possible to use the S-meter alone if monitoring facilities are not required, in which case no switching at all is called for (Fig. 3).

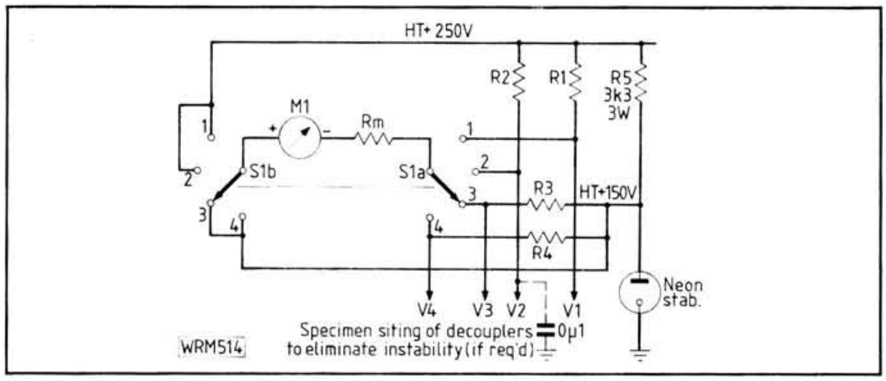


Fig. 2: Monitor adapted for two h.t. lines. Valves V3 and V4 now fed from 150V line, meter positive taken to 250V and 150V as required by S1b

How the S-meter Works

In its simplest form an S-meter could be a milliammeter inserted in the h.t. feed to a valve (normally the first i.f. amplifier) controlled by the receiver a.g.c. The reduction in anode current resulting from a.g.c. action when a station is tuned in would cause the meter to give a reduced reading in proportion to the signal strength. Such an arrangement would not be satisfactory in practice since the meter would work "backwards" and it would not have a proper zero point, as no-signal would be represented by the steady anode current reading.

As an alternative some receivers use modified "bridge" circuits which give forward readings as signal strength increases, but which are rather complicated in design and require frequent adjustments to establish the zero point. The design described uses only three or four components other than the meter and will retain its calibration for long periods. Adjustments, when needed are extremely simple.

To obtain meter readings the series resistor method is again employed (R6 in Fig. 3). Its value is selected so that when the anode current of the valve changes from no signal input to a signal estimated at S4 in the SINPO scale (or 7–8 on the RST scale), the potential difference across points A and B will alter by approximately 1V. The actual voltage at point B with respect to chassis is not material. To quote examples found by experiment, popular i.f. amplifier valves such as the EF39, 6K7G, KTW63 and 6BA6 were found to have a change in anode current of 1mA from no signal to S4. (It is well known that no two operators will agree on what constitutes an S4 signal, however, so the final choice of components may be varied to suit individual taste.) In a fairly typical communications set a first i.f. amplifier KTW63 was found to draw 3·7mA at no signal, and 2·7mA at S4. Thus, if R6 was made 1kΩ, the p.d. across points A and B would vary between 3·7V and 2·7V respectively. If we can arrange for the p.d. across points C and D to equal the highest found across A and B, under no signal conditions the p.d. between B and D will also be equal, and no meter reading will be obtained.

However, the arrival of a strong signal will cause the anode current to fall, and thus the p.d. across A and B to be reduced. As this happens the p.d. across C and D remains constant at 3·7V, and thus the p.d. across B and D gradually increases and the meter will start to show readings, climbing to 1V with an S4 signal. By making the full-scale deflection of the meter 1·25V, S4 will be represented by a four-fifths scale reading, irrespective of what the actual calibration figures may be. Differences of opinion on the nature of S4 are very simply catered for by slight changes in the meter f.s.d. reading, brought about by altering the value of Rm(2). For a 1·25V f.s.d., Rm(2) should be such that the total resistance between points B and D is 1·25kΩ. When the meter has already been given a series resistance for the valve monitor operation this must be taken into account.

Since we are dealing with arbitrary readings anyway, the total resistance value does not have to be utterly precise and may be obtained as a close approximation using ordinary 10 per cent resistors. Increasing Rm will give a higher f.s.d. and result in a lower meter reading for a given signal input. Conversely, lowering the f.s.d. will make the meter more responsive, but thus should not be taken to the point where a really strong signal would drive the needle "off scale".

The value of R6 is clearly important, because unless it is accurate an exact zero reading on the meter cannot be obtained. In practice R6 will be variable around 1kΩ either by making it a 2kΩ potentiometer, or (say) a 1kΩ potentiometer in series with a 680Ω fixed resistor. This potentiometer will form the "set zero" control for the meter.

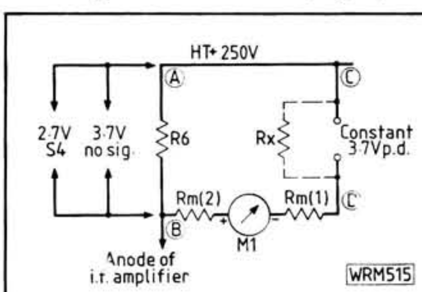


Fig. 3: Basic S-meter circuit with no signal. The p.d. across A–B = p.d. across C–D. Therefore p.d. across B–D = 0V and meter reads zero. With S4 signal, the p.d. across A–B = 2·7V, making B 1V positive with respect to D. The meter then reads four-fifths full scale. Resistors Rm(1) and Rm(2) are selected to give 1·25V f.s.d.

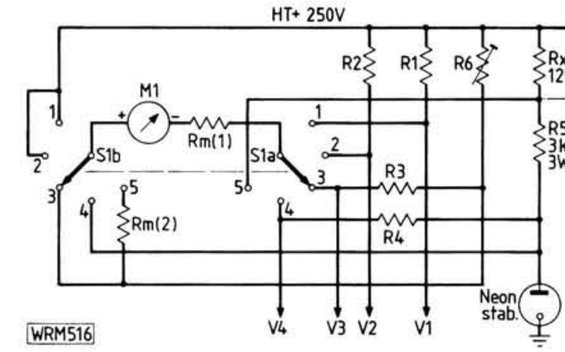


Fig. 4: The S-meter is added to the monitor switch. Valves V1–3 are fed from the 250V line and V4 is fed from the 150V line. Note when monitoring V3 the meter is connected across R3 only, but R6 is still in circuit. When in the S-meter mode, the meter is connected from the junction of Rx and R5 to the lower end of R6, via Rm(1) and Rm(2). Valve V3 is an a.g.c. controlled valve which operates the S-meter

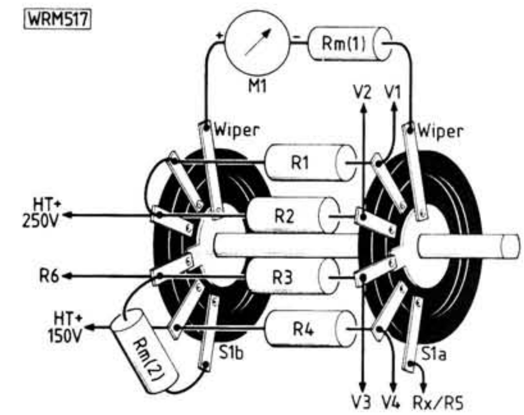


Fig. 4(b): Practical layout for Fig. 4

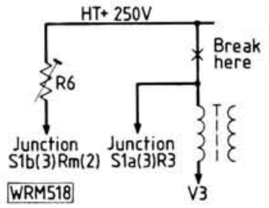


Fig. 4(a): Inserting R6 into V3 anode feed

Obtaining the C–D Fixed Potential

It is vital that this should remain effectively constant irrespective of changing signal inputs to the set. It is most easily obtained where there is a lower, stabilised h.t. line as mentioned earlier. The principle of the neon stabiliser is that it will maintain the current flow through an h.t. dropping resistor at a certain value as the demands of the valves that it supplies fluctuates. The current is typically 30mA. Thus, if an extra resistor of 123Ω is placed in the existing h.t. dropping chain, at the high potential end, a p.d. of 3·7V will be obtained across its terminals. In practice a 125Ω standard value would be used, the slight increase in p.d. being taken care of by the "set-zero" potentiometer.

Note: this method should not be used in receivers having a low h.t. line that is unstabilised, as the voltage will almost certainly change with variations in signal input. Instead, the same method should be employed as is used for sets having a single h.t. line, as follows:

The anode current of a tetrode or pentode a.f. output valve stays reasonably constant over quite large variations in power delivered to the loudspeaker. For communications use, the latter is likely to be small in both respects. An extra series resistor in the h.t. supply to the anode is therefore an effective way of obtaining the constant p.d. This was demonstrated practically in a receiver employing a KT63/6F6G output valve. The anode current was measured as somewhat lower than that quoted in valve manuals, due to the use of unusually high cathode bias resistors in this particular model, at 24mA. A 150Ω series resistor gave a p.d. of 3·6V, which was acceptable. The resistor was by-passed by a 50μF 10V electrolytic, and no variation in the p.d. was measurable even with quite large amounts of modulation.

Initial Setting of the S-meter

The receiver is left switched on for ten minutes or so to allow the valves to warm up thoroughly and to settle down. The antenna and earth terminals should be shorted to permit no signals to be picked up, and the potentiometer R6 adjusted for meter zero. That is all.

With normal inputs to antenna and earth terminals the meter will respond to incoming signals, and those of familiar strength will soon enable the operator to establish the kind of readings to be expected. Any subsequent need for adjustment of R6 will be indicated by the failure of the pointer to return to zero. Experience suggests that long-term stability is excellent.

Wiring the S-meter into the Switch

In the S-meter position of the switch the positive terminal of the meter is connected to the lower end of R6 via Rm(2). The negative terminal goes via Rm(1) to the junction of Rx and R5, which is approximately 3·7V below the 250V h.t. line, and stabilised by the current flow through R5 and the neon. This is equivalent to the basic circuit shown in Fig. 3.

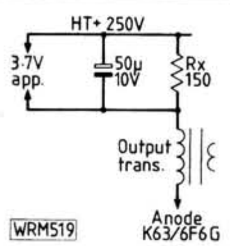


Fig. 5: Obtaining 3·7V constant p.d. from output valve (see text). Resistor Rx is chosen to suit the specific output valve

Note that when V3 is monitored the positive terminal of the meter is connected to the junction of R6 and R3, placing the meter across R3 only, although current continues to flow through R6.

Constructional Notes

When the unit is to be added-on to a receiver via connecting leads it may be necessary to decouple the various h.t. to anode feeds with 0·1μF capacitors at the set end (Fig. 2). These are unlikely to be needed when a monitor is built into a set. Some receivers may have an aperture on the front panel adaptable for holding a small meter (e.g. where there is a tiny built-in loudspeaker of very limited frequency response and use). There may also be redundant controls, one of which could be exchanged for the monitor selector switch, and another, if available, for the meter zero-set potentiometer. For example, the R1155 meter balance, meter amplitude, etc. controls. I certainly do not advocate the cutting of fresh holes in a vintage radio, and would always suggest an add-on unit as preferable to disfigurement.

The S-meter may be used with virtually any type of i.f. amplifier valve controlled by a.g.c., even though the anode current may differ from the examples quoted. Retaining R6 at 1000Ω (set the potentiometer for this value), and with the S-meter itself unconnected, note the voltage drop across R6 under no signal and S4 conditions. Select Rm(2) so that the meter f.s.d. is slightly more than the difference between the two voltages just recorded. Selected Rx to give a constant p.d. equal to the voltage drop across R6 with no signal. Set zero as described previously. ***PW*** multiple choice... multiple choice...

QUESTIONS

multiple choice... multiple choice...

If you are an aspiring RAE candidate or just feel like testing your knowledge of amateur radio these multiple choice style questions will fill your needs. The questions are typical of those appearing in both the RAE papers, but they are not taken from these papers. For the answers, together with explanatory notes to help you, please turn to page 42.

Paper 2 Section 2. Electrical Theory—capacitive reactance

Question 7–1

$\frac{1}{2\pi fc}$ is the formula for reactance of a circuit that contains

- ☐ **a.** pure resistance only
- ☐ **b.** capacitance only
- ☐ **c.** inductance only
- ☐ **d.** capacitance and inductance

Paper 2 Section 2. Electrical Theory—units

Question 7–2

1000kHz is the same as

- ☐ **a.** 0·001MHz
- ☐ **b.** 0·01MHz
- ☐ **c.** 0·1MHz
- ☐ **d.** 1MHz

Paper 1 Section 1. Licensing Conditions—user services. Clause 1 (1) (c)

Question 7–3

How often can a radio amateur take part in exercises of disaster relief operations with the Red Cross or other "user services"?

- ☐ **a.** not more than 4 times a month
- ☐ **b.** not more than 12 times a year
- ☐ **c.** not more than 4 times a month and 12 times a year
- ☐ **d.** as often as required

Paper 1 Section 1. Licensing Conditions—validity of the morse test

Question 7–4

After passing the morse test, you must apply for a Class A Licence within

- ☐ **a.** 1 month
- ☐ **b.** 3 months
- ☐ **c.** 6 months
- ☐ **d.** 12 months

Paper 2 Section 7. Measurement—voltmeters

Question 7–5

A meter with a full-scale reading of 500 volts has an internal resistance of 2 megohms. What is its sensitivity?

- ☐ **a.** 4000 ohms per volt
- ☐ **b.** 40 000 ohms per volt
- ☐ **c.** 400 000 ohms per volt
- ☐ **d.** 4 000 000 ohms per volt

Paper 2 Section 6. Propagation and Aerials—diurnal variation

Question 7–6

During daylight hours skywaves from "top band" (1·8MHz) are

- ☐ **a.** ionised in the stratosphere
- ☐ **b.** reflected in the F layer
- ☐ **c.** absorbed in the D layer
- ☐ **d.** scattered by the troposphere

Paper 2 Section 1. Operating Practices and Procedures—Q code

Question 7–7

In the Q code, QSY means

- ☐ **a.** send more slowly
- ☐ **b.** change frequency
- ☐ **c.** make contact
- ☐ **d.** confirm contact

Paper 1 Section 1. Licensing Conditions—user services. Clause 1 (1) (c)

Question 7–8

How often can a radio amateur use his equipment to help with events such as sponsored walks?

- ☐ **a.** not more than 4 times a month
- ☐ **b.** not more than 12 times a year
- ☐ **c.** not more than 4 times a month and 12 times a year
- ☐ **d.** as often as required

Paper 2 Section 2. Electrical Theory—capacity, units

Question 7–9

Another way of labelling a 1000pF capacitor is

- ☐ **a.** 0·001μF
- ☐ **b.** 0·01μF
- ☐ **c.** 0·1μF
- ☐ **d.** 1μF

Paper 2 Section 2. Electrical Theory—phase difference

Question 7–10

In an a.c. circuit containing only pure resistance, the current

- ☐ **a.** is in phase with the voltage
- ☐ **b.** lags the voltage by 90 degrees
- ☐ **c.** leads the voltage by 90 degrees
- ☐ **d.** is independent of the voltage

Paper 2 Section 6. Propagation and aerials—sunspots

Question 7–11

A maximum number of sunspots occurs at intervals of approximately

- ☐ **a.** 5 years
- ☐ **b.** 11 years
- ☐ **c.** 17 years
- ☐ **d.** 28 years

The 11-Year Sunspot Cycle–2

Most of Part 1 was devoted to historical records concerned with solar activity, now F. C. Judd G2BCX looks at the effect of the impending sunspot cycle 21 minimum on amateur radio DX on the h.f. bands.

Sunspot cycles of more recent times were also dealt with in Part 1, including the approaching end of the present sunspot cycle 21, which began in approximately June 1976.

Adding 11 years to the above data will give the time for the commencement of the next cycle (No. 22) as June 1987, but although the event is commonly referred to as "the 11-year sunspot cycle" the period is not always exactly 11 years. As mentioned in Part 1, a sunspot cycle may vary by a year or so, more or less. Records reveal that there have been cycles as long as 15 years and as short as 8 years.

The mean level curve of cycles 8 to 20 (see Fig. 1.6 Pt. 1) gives a date for the minimum of cycle 21 close to June 1987. However, **no prediction to do with solar activity can be termed infallible.** For this article, as much up to date information as possible has been obtained from World Data Centres of solar terrestrial phenomena such as the Rutherford Appleton Laboratory at Chilton, Oxfordshire, the Boulder Centre in Colorado, USA, and also from the Royal Observatory of Belgium in Brussels.

Sunspots

The general nature of ionospheric radio propagation has been explained in a series of articles by the author which were published in earlier editions of *Practical Wireless* (between Jan '85 and Sept '85). Most radio amateurs are familiar with the term "sunspots" which are the appearance of small dark areas on the surface of the sun. The duration of sunspots is quite variable and whilst some may last for only a few days, others may exist for a number of **solar rotations**, i.e. the rotation of the sun itself which is equal to about 27 earth days. The exact nature of the spots is not known but they appear to be vortices in the matter comprising the photosphere (the normal bright surface of the sun). The spots appear dark because their own surface temperature is only about 3000K, whereas the quiet photosphere has a temperature in the region of 6000K.

Sunspots tend to appear in groups and a single group may contain a few isolated spots or dozens of them. Apart from the different kinds of radiation they emit, which ultimately causes ionisation of the upper regions of the atmosphere known as the ionosphere, sunspots have a very strong magnetic field and for some of the larger ones this may be as high as $0{\cdot}4Wb/m^2$ (weber per square metre) or 4000G[1].

The Sunspot Cycle

To measure **sunspot activity** an index is required, the most common being the "Wolf" number R given by:

$$R = k(10g + s)$$

where g is the number of groups and s is the number of individual spots that can be observed.

The additional factor k takes observatory and observational characteristics into account. However, the derived R number is weighted quite considerably in favour of groups which makes its value as index somewhat questionable. On the other hand, it is still valuable as an index in that it provides a large homogeneous sample of data and has done so for a very long time. For those professionally engaged in h.f. radio communication and ionospheric propagation studies, sunspot data can be obtained on a daily basis and as monthly or yearly averages[2].

At sunspot minimums the value of R may fall to less than 10 (usually between 8 and 10) but at times close to the maximum, or at maximum, may reach values between 50 and about 190. Many attempts have been made to predict the periodicity of both present and future sunspot cycles but such predictions have never been particularly successful.

The End of Cycle 21

This cycle began from the minimum of the previous cycle No. 20 in June 1976 as can be seen from Fig. 1.6 (Part 1) and it is interesting to follow its progress downward from the peak which occurred approximately December 1979 with an R count of about 165.

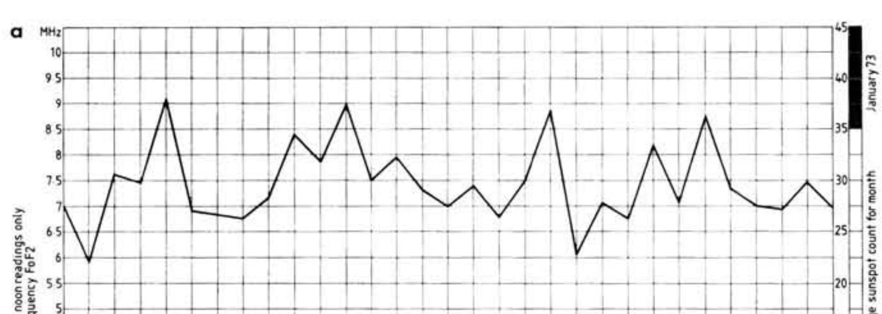


Fig. 2.1 (a): Sunspot count v Fo–F2 noon critical frequencies for the month of January 1973. (b) Sunspot count v Fo–F2 critical frequencies for May 1976

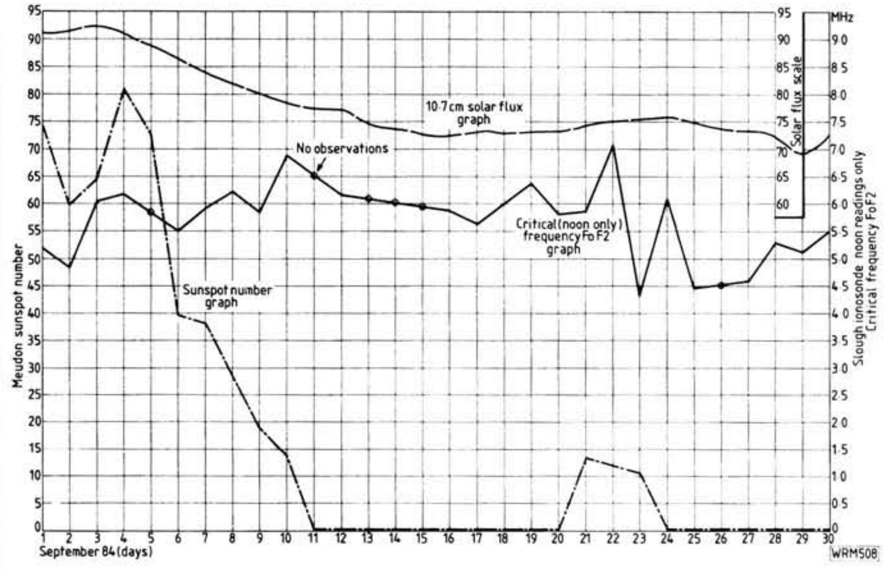


Fig. 2.2: Relationship between 10·7cm solar flux, the Fo–F2 noon critical frequencies and the sunspot count for September 1984. Courtesy of the Rutherford Appleton Laboratory. Critical frequencies from the Slough Ionosonde

The time from the beginning of the cycle to its peak is about 3½ years. The graph ends at October 1984 or about 5 years from the time of the peak so the total period to this date is 8½ years. Taking 11 years for the complete cycle puts its end and the commencement of the next cycle (No. 22) at about the end of 1987. The cycle could however prove to be short, or it could be a little longer than 11 years.

The conditions produced during the "fall" period of a sunspot cycle can be illustrated and to do this we go back to sunspot cycle 20 as at January 1973 or about 3½ years before the absolute minimum of that cycle and the start of cycle 21. The graph (a) in Fig. 2.1 illustrates the noon (GMT) Fo–F2 critical frequency variation for January 1973 and as can be seen the frequencies are relatively high, most of the time being above 7MHz with the highest on day 5 at 9·2MHz, a condition that signifies favourable DX on the h.f. bands up to and including 28MHz. The lower graph (b) is for May 1976, one month prior to the minimum of that cycle (No. 20) when the noon Fo–F2 critical frequencies average around 5MHz, the highest being on day 17 at 6MHz thus resulting in generally poor DX conditions but with possible activity on 14MHz depending on the time of day and the day itself.

We now take a similar case but this time for September 1984 during the "fall" of the present cycle 21. Information supplied by the Rutherford Appleton World Data Centre STP indicates a gradual although erratic fall in the noon Fo–F2 critical frequencies the highest being 7·1MHz on day 22; coincident with a small rise in sunspot activity during days 21 to 23. The fall in the 10·7cm solar flux is consistent with the fall in the Fo–F2 noon critical frequencies and the sunspot count. At this time DX is already poor, with little or no activity on the 21 and 28MHz bands.

Maximum Usable Frequency

Taking a standard winter-time **sunspot minimum** Fo–F2 critical frequency curve as in Fig. 2.3, which covers a 24-hour period, we can get some idea of m.u.f. (maximum usable frequency) at any time during the 24 hours by using a multiplying factor of 3·5. For example, at about half way up the daytime portion of the F2 curve the m.u.f. would be in the region of 18MHz and about 22MHz at the noon F2 peak. As the F2 critical frequency falls again toward the night-time period, so also does the m.u.f. Note: the four standard E, F1 and F2 curves for winter and summer sunspot maximums and minimums were included in

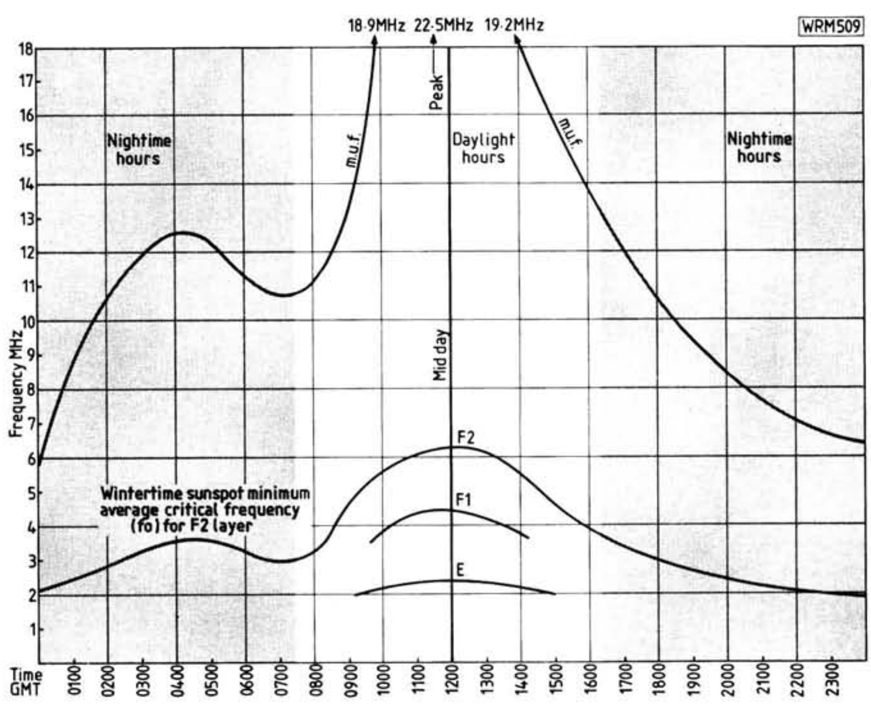


Fig. 2.3: The m.u.f. for typical wintertime sunspot minimum v average Fo–F2 frequencies through 24 hours

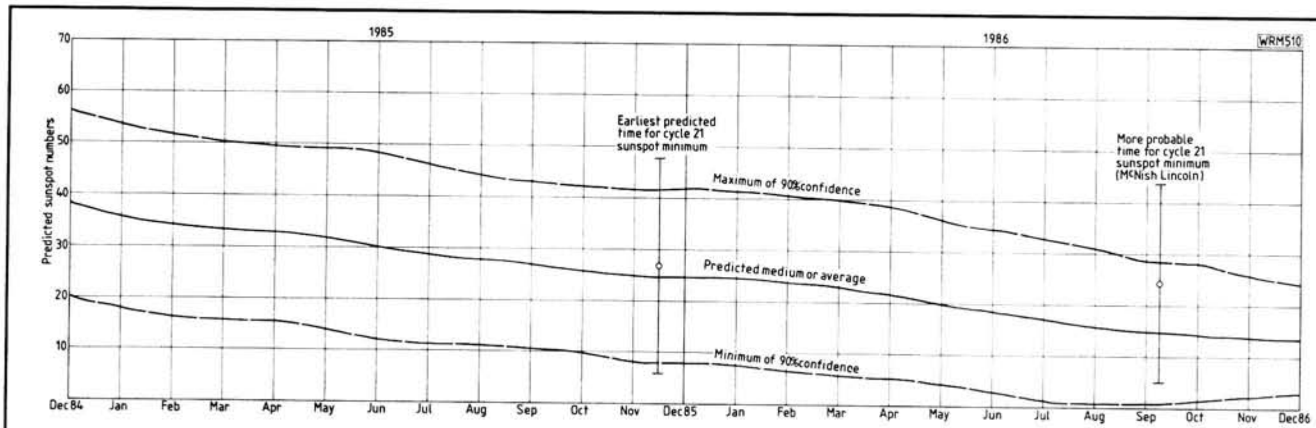


Fig. 2.4(a): Predictions of sunspot counts continuing from the main cycle graph in Fig. 1.6. Earliest possible minimum of cycle November/December 1985

Fig. 2.4(b): Further extension of Fig. 2.4(a) of predicted sunspot counts with a more probable time for the cycle No. 21 minimum as September 1986.

Part 3 of Radio Wave Propagation March 1985 in *PW*. It must also be stressed that whilst a relatively high m.u.f. may seem attractive from the DX point of view, it is essential in order to take full advantage of it for long distance operation, that radiation from the antenna being used for the particular frequency must be at a very low vertical angle with respect to earth.

Predictions

The graph in Fig. 2.4 has been produced from information contained in *Sunspot Data Bulletin No. 7* from the Royal Belgian Observatory and shows the continuation of the "fall" of sunspot cycle 21. The curves show a 90 per cent confidence maximum and minimum and a predicted average. The earliest possible time for the minimum, as in Fig. 2.4(a), is about December 1985. The curves in Fig. 2.4(b) lead to a second prediction around September 1986 as at this time 90 per cent confidence maximum has just started to rise and the average has more or less levelled out. However, the maximum is still falling so there is a probability that the absolute minimum may not occur until about June 1987.

There is at least one prediction that can be made with reasonable confidence. Conditions for h.f and DX will get worse before they get better although there will be occasional openings at the higher frequencies, as the author and many other radio amateurs have experienced through at least four successive 11-year sunspot cycles. Providing the next cycle (No. 22) produces a fairly high level of sunspot activity, then conditions for DX on all the h.f. bands should be on the upgrade and reasonably consistent about three years after the start of the cycle which we can only really predict as occurring sometime between the end of 1985 and about June 1987. Most, but not all of us, will be around for the beginning of sunspot cycle 23 which should be a year or two before the end of the present century, or just after the start of the next. ***PW***

References

(1) Radio Communication and Sunspots by John Kenewell. *Practical Wireless*, April 1983.
(2) *Ionospheric Radio Propagation* by Kenneth Davies. Dover Publications Inc. New York, USA.

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 Garrard SP25 MkIII record deck, base and cover; Heathkit AFM-1 tuner and S-99 amplifier; 200 valves; contents of Junk Box; 190 *Practical Wireless* 1948-66; 185 *Wireless World* 1951-66. Would exchange for home workshop equipment or w.h.y? Tom Baker. Tel: 0742 553595. *B102*

Have spares—electrical, mechanical, radio and TV. Would exchange for Service manuals/circuit diagrams of Leak 25TL plus amplifier and Cossor oscilloscope 1045K. Truran. Fair View, Greenbottom, Chacewater, Truro TR4 8QQ. *B103*

Have Ultimate cylinder head assembly for Cooper S or A series, tunnel ported, sleeved push rod holes, 17/16 inlets, highly polished, completer with matched manifold and pair modified carbs. Little used. Would exchange for 144MHz mobile or handheld with amp. Tel: Halifax 59680. *B105*

Have Shibaden SV-610 reel-reel video recorder with reel of tape, not sure if 100% working. Would exchange for scanner, Bearcat 220FB preferred. If not any scanner considered, a.m. or f.m. handheld, etc. Tel: Abingdon 35916. *B125*

Have two cabinet aquariums, fully set up for marine use. Would exchange for Yaesu/Trio/Icom h.f. transceiver and/or scanner, or BBC model B micro. W.h.y? Tel: Carmarthen 232370 after 7.30pm. *B141*

Have Jones 882 electric sewing machine in g.w.o. value about £70. Would exchange for any receiver or h.f. transceiver in g.w.o. age not too important, must be working. W.h.y? Tel: 01-200 3825. *B152*

Have Realistic DX302 digital h.f. RX. Would exchange for either Pocomotor AFR 2000 or 1000 all mode decoder or Timestep Electronics weather satellite receiver, interface, software (BBC), NOAA system. John. Tel: 0709 374747 (S. Yorks). *B155*

Have Vectrex video computer screen, joystick, 5 assorted cartridges, a.c. supply, cost £65 new 6 months ago. Would exchange for any short wave receiver, working. 120 Fairholme Court, Hemlington, Middlesbrough TS8 9LE. *B161*

Have extensive Minolta 35mm camera outfit with 1.2 standard lens. Would exchange for best receiver offered. Tel: 021-556 7696. *B175*

Have American Super Eight cine Projector (115V). Would exchange for proven RTTY software for my Texas TI-99/4A computer. Write: Nev Kirk G3JDK, 54 Allendale Road, Rotherham. *B181*

Have Dunlop golf clubs, two woods, eight irons, putter, bag, shoes, etc. Would exchange for KR600RC rotator or similar or w.h.y. G3KEC. Tel: Looe 3651. *B182*

Have AMX Mouse, RH Electronics light pen, Wordwise wordprocessor, £200 games software for BBC micro. Would exchange for w.h.y? Tel: Bournemouth 525095. *B186a*

PW "Arun" Parametric Filter

Ben J. Duncan describes a powerful weapon in the audio processing armoury

A Vero G-Range case gives an attractive finish to the unit

The task of extracting a readable signal from crowded bands is usually looked upon as a matter of judicious adjustment of the various knobs controlling the r.f. parameters of a receiver. However, aside from the presupposition that the receiver in question sports a row of knobs to adjust, tweaking of the r.f. gain and i.f. filtering characteristics doesn't in itself guarantee readable reception. That's all part of the fun isn't it?

Less flippantly, a workable means of improving performance in this area is to process the audio output of the receiver. The advantages here are fourfold:

1. Audio processing facilities can be added with little interruption to the wiring and aesthetics of the receiver, hence maintaining resale value.
2. There are no worries about upsetting the finely tuned r.f. and i.f. sections of an elaborate set.
3. Audio processing can improve the readability of signals on *any* receiver (even a domestic portable); it's not just limited to sophisticated communications receivers.
4. Processing at audio frequencies permits stable, sweepable filtering characteristics which are not easily achieved at r.f.

Filter Characteristics

Parametric filters, or "equalisers", are widely used in professional audio systems, but the term "parametric" is etymologically rather shaky and, in this context, has no connection with r.f. parametric amplifiers! Perhaps the best description of the filter is *"A circuit in which each of three parameters that govern filter performance can be continuously varied"*. These are: amplitude, (GAIN, *boost* or *cut*), *Q* (or bandwidth) and centre FREQUENCY.

The possible manipulations are displayed graphically in Fig. 1. For comparison, the tone controls on a domestic hi-fi set up exhibit a fixed centre frequency and a *Q* that is both fixed and also very low, i.e. broad. Moreover, these controls tend not to hinge around a centre frequency, but instead, operate altogether either *above* (treble) or *below* (bass) a broad slab of mid-range frequencies. By contrast, the parametric filter's "tunable and variable bandpass" scheme is ideal for homing in on a specific area of the spectrum, enabling potent treatment without undue effect on adjacent parts of the spectrum.

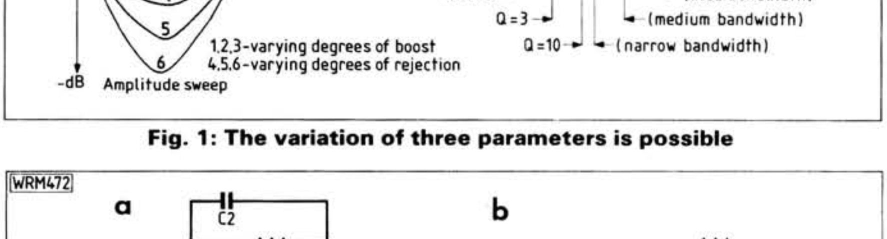


Fig. 1: The variation of three parameters is possible

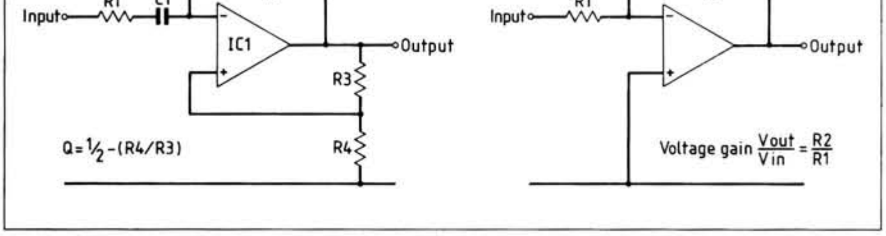


Fig. 2(a): Wien Bridge bandpass filter; (b) basic op-amp inverting amplifier

Moving on to Fig. 2(a), the heart of the filter unit is a frequency selective circuit which is really just a "slugged" i.e. non-oscillating, version of the classic Wien-Bridge oscillator in disguise. Alternatively, the circuit can be approached as follows: Ignore for a moment R3 and R4 and imagine that the non-inverting (+) input of IC1 is earthed. The arrangement is now essentially that of the archetypal inverting amplifier, as shown in Fig. 2(b). Remembering for this circuit that the gain is given by R2/R1—referring to Fig. 2(b), and then returning to Fig. 2(a), we can write the gain equation as (R2‖XC2)/(R1+XC1), where XC is the reactance of the capacitors at a given frequency. The effect of the series and parallel *CR* networks is to produce a frequency dependent peak in gain—in other words, a bandpass effect. The centre frequency (fo) of the gain peaking is given by: $fo = 1/2\pi CR$. Thus, by adjustment of either both C or both R values, we can alter the centre frequency. As a general rule, it's easier to alter the resistors.

Going one step further, replacing R1 and R2 with a dual-ganged potentiometer gives us a sweepable centre frequency. Next, replacing R3 and R4 and connecting their centre tap to the op-amp's non-inverting terminal provides some controlled positive feedback to sharpen up the response curve. This equates to raising Q and the technique is much the same as applying positive feedback to improve the selectivity of an r.f. stage, though it's not so finicky. Nonetheless, as is clear when you enter a few values into the Q equation, as Q approaches 10, the relative values of R1 and R2 in terms of setting Q become critical. For instance, if we make R3 equal 10kΩ, adjusting R4 to 18kΩ gives a Q of 5; with 19kΩ, Q is 10 and with 19·9kΩ, Q rises to 100! In this example, as R2 tends to 20kΩ, Q increases exponentially towards infinity, and oscillation becomes inevitable. Fortunately for audio applications, a Q in excess of 10 is not required and it is easy, with careful adjustment, to make the circuit perfectly stable with this Q value.

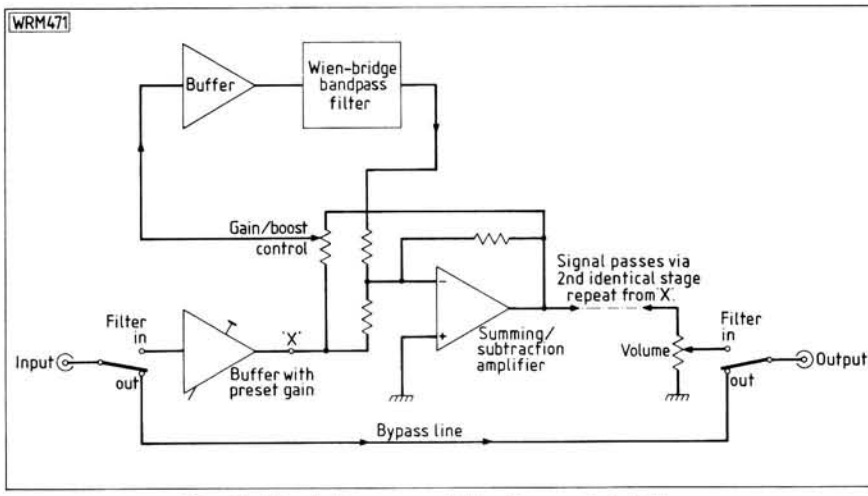


Fig. 3: Block diagram of the Parametric Filter

Circuit Description

The block and circuit diagram of the *PW* Arun parametric filter unit are depicted in Figs. 3 and 4 respectively. Integrated circuit IC2b is configured as an inverting amplifier and has two purposes. In the first instance it buffers the circuitry, providing a low and predictable source impedance for succeeding stages, together with a high input impedance to avoid loading the receiver at the "take off" point. Secondly, it provides some gain to counter the reduction in level that occurs when the steep rejection facilities are in use and thereby helps to maintain the S/N ratio. At the same time, the exact degree of gain can be adjusted by R23 to suit the receiver's output level. Alternatively, R23 can be replaced by a fixed resistor once a suitable value has been determined. The gain of this stage is determined in the same fashion as for that shown in Fig. 2(b), in this instance equalling (R22 + the preset value of R23)/R21.

As it stands, the Wien-Bridge bandpass filter examined in Fig. 2 can only *boost* signals at its centre frequency. In order to provide continuously variable boost and cut, the filter is placed in a feedforward/feedback loop configured around IC2a. With the slider of R24 towards R25, the circuit operates in the feedforward mode, and the properties of the Wien-Bridge filter (max. gain at fo) are reflected at the output of IC2a. As the slider of R24 is turned towards R28 negative feedback is progressively introduced, and after passing the centre point, further rotation causes the output of IC2a to *decrease* at fo. In other words, the Wien-Bridge filter's operation is inverted, and fo becomes the frequency of peak rejection. The overall result as the gain control is turned is continual gradation between signal boost and rejection referred to fo, with a null at the centre point, just like the operation of a tone control.

Looking more closely at the Wien-Bridge filter (IC3b and associated com-

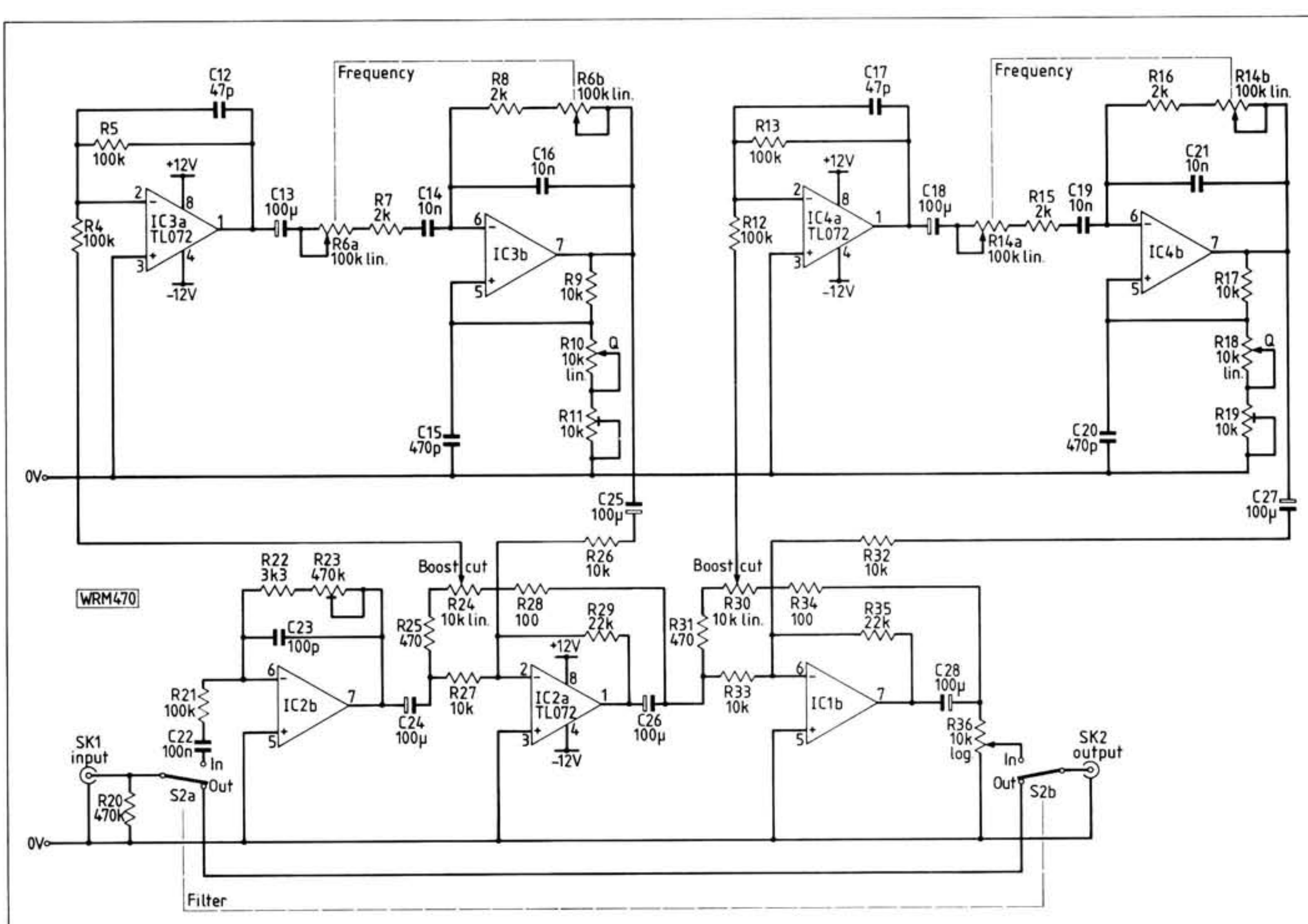


Fig. 4: Circuit diagram of the PW Arun Parametric Filter

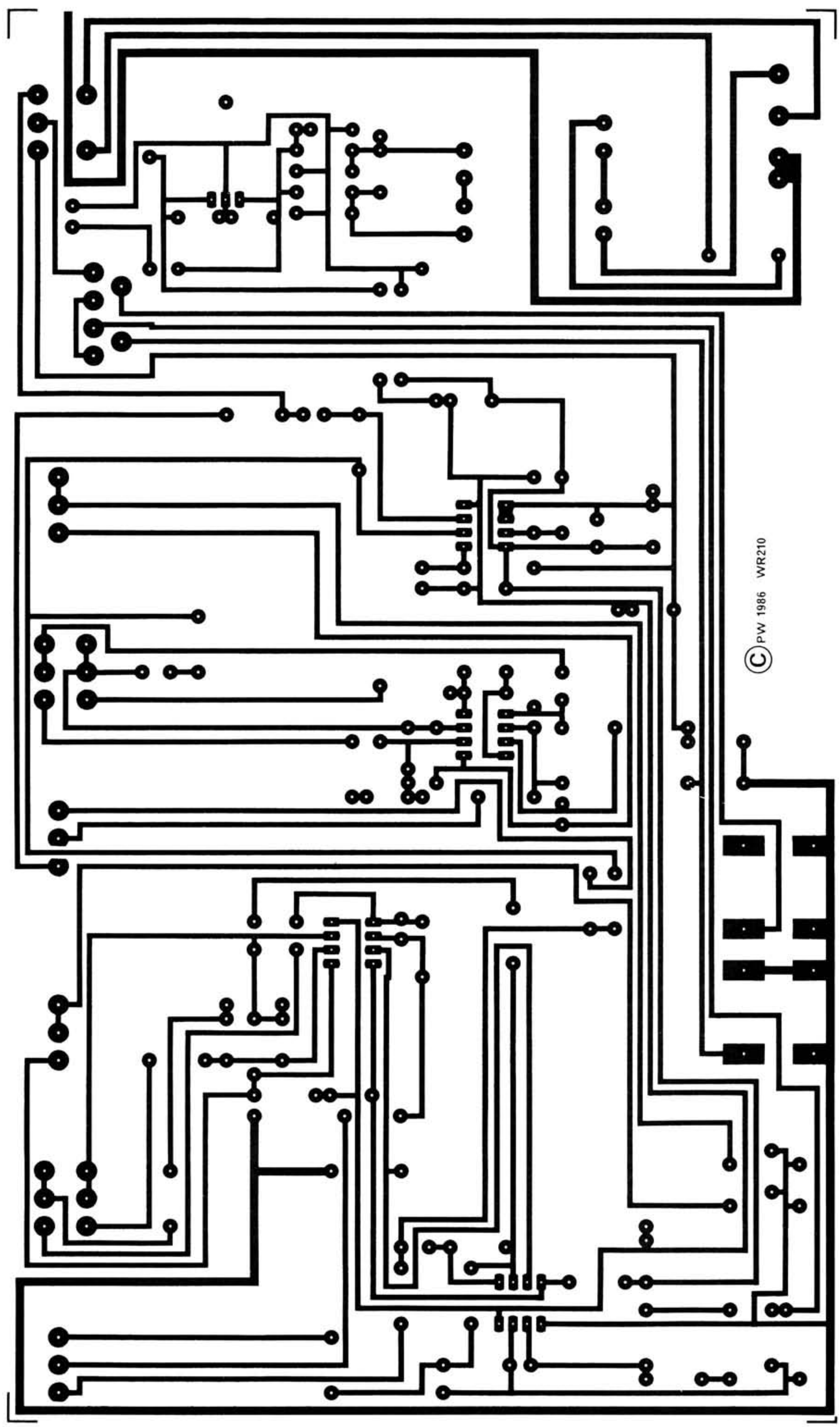
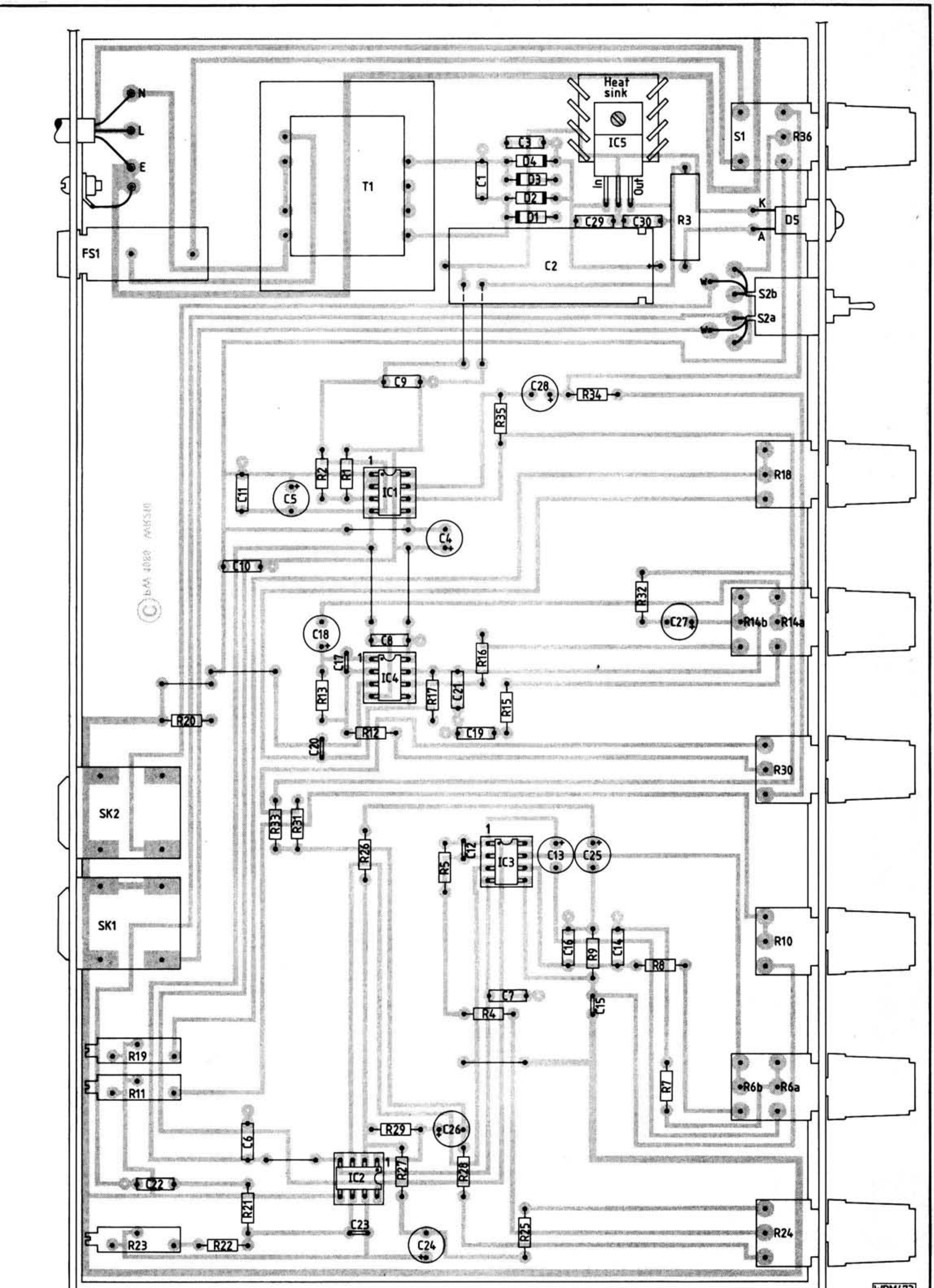


Fig. 5: PCB TRACK PATTERN AND COMPONENT LOCATIONS



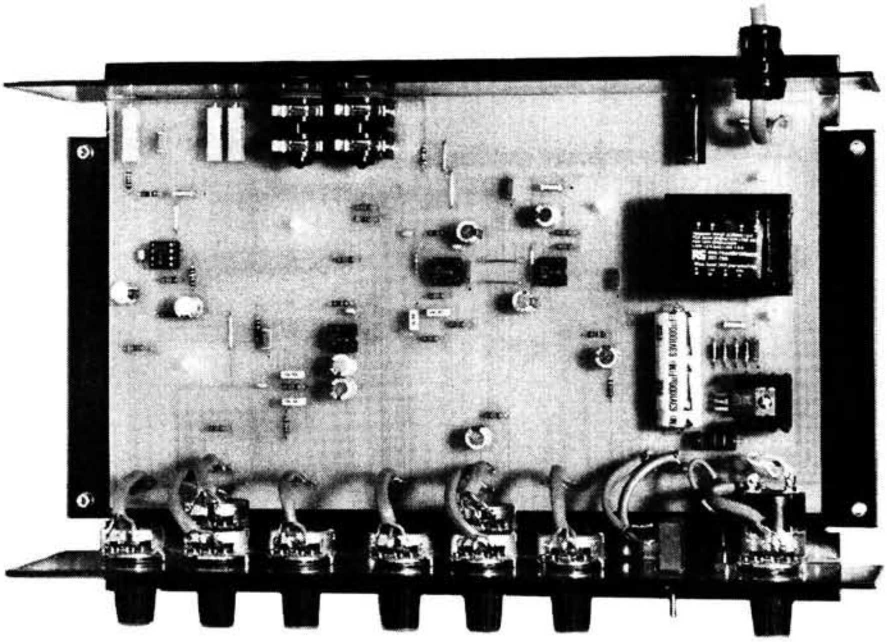
N
L
E
FS1
T1
Heat sink
IC5
In
Out
C3
D4
D3
D2
D1
C1
C29
C30
R3
C2
S1
R36
K
A
D5
S2b
S2a
C9
C28
R34
R35
R2
R1
1
IC1
C11
C5
C4
R18
C10
R32
C27
R14b
R14a
C18
C8
C17
IC4
R16
R13
R17
C21
R15
R20
R12
C19
C20
R30
SK2
R33
R31
R26
R5
C12
IC3
C13
C25
SK1
R10
C16
R9
C14
R8
C7
C15
R4
R7
R6b
R6a
R19
R11
R29
C26
C6
IC2
R27
R28
C22
R21
C23
R25
R24
R23
R22
C24
WRM473

ponents), R7 has been introduced to prevent the preceding stage looking into a virtual short circuit when R6(a) is set at minimum. As both *CR* networks must be identical in value (otherwise *Q* will become unpredictable), R8 is added in series with R6(b) to maintain the relationship. Note that the value of R6 can't be much greater than 100kΩ to avoid spurious phase shifts (caused by stray capacitance across the pot and p.c.b. tracks) which would upset the circuit's h.f. stability and the predictability of setting up fo. With this in mind, it is clear that the stopper resistor R7 puts a limitation on the frequency range that can be swept by R6; i.e. min./max. frequency = (R7 + R6a + XC14)/(R7 + XC14). So in practice, even to cover the relatively narrow bandwidth of interest to radio communications, R7 must be made as low as is feasible. For this reason, a buffer amplifier, IC3a is placed ahead of the Wien-Bridge filter to avoid the severe loading that any practical value of R7 would place on the feedforward/feedback potentiometer, R24.

As we saw earlier, *Q* becomes critically dependent upon resistor accuracy as it approaches a value of 10. For this reason, a multi-turn preset is provided so that *Q* can be set up empirically to the highest stable value. The panel Q control then allows adjustment downwards from this point. Capacitor C15 is intended to remove the positive feedback at high (supersonic) frequencies. This is a wise precaution, as inevitable stray capacitances can all too easily give rise to *uncontrolled* positive feedback (hence oscillation), the effect becoming progressively more likely above 20kHz. Likewise, the phase margin on IC3a is increased by C12 to keep the whole loop well "tamed".

Most of the remaining body of the circuitry is simply iterative, being a second, wholly independent filter. Cascading two identical filters in this manner greatly increases the power of the unit to discriminate—one filter can be set to attenuate the interference, whilst the other is used to emphasise the important parts of the signal.

Moving on to the output, R36 controls the output level, whilst S2(a)/(b) provides a BYPASS function, allowing rapid comparisons between the filtered and unprocessed signal. This is particularly valuable when interference fades or signals drift.



The power supply (Fig. 6) is a little unusual in that a *single* regulator provides the split (±12V) rails. Here, a spare op-amp in the dual package is used as an active potential divider, providing the +24V rail with an accurately balanced, low impedance centre tap. The resulting rails (0V, +12V and +24V) are then relabelled −12V, 0V and +12V by sleight of hand!

Construction Notes

The filter unit is mounted entirely on a single p.c.b. By far the best method of assembly is to work in terms of ascending component height, mounting links, resistors and diodes first of all. Next, presets, capacitors (except C2) and the i.c. sockets. Take care to observe the polarity of C4 and 5; the other electrolytics can be mounted in either direction for the time being. Sockets for the i.c.s are recommended unless you have access to an efficient solder sucker—otherwise the correction of errors is likely to lead to p.c.b. damage.

The p.c.b. is designed to accept Radiohm p.c.b. mounting pots but readers may have difficulty finding this type. However, apart from the extra work of dressing a set of wires and fitting Veropins, the use of readily available tagged pots is altogether acceptable, providing the link wires are kept short, preferably less than 40mm. Likewise, the BYPASS switch can be either a p.c.b. mounting variety *or* any readily available miniature toggle switch. Again, the latter should be linked to the board via *short* tails.

On the topic of safety, the live tracks on the p.c.b. are wholly surrounded by a thick *guard rail*, connected to earth. This prevents the creepage of mains voltage to proximate tracks should the board ever become damp. It also ensures prompt rupture of the fuse if any significant leakage occurs. Additionally, a layer of blank glassfibre board should be screwed to the underside of the p.c.b. With this in place, it's virtually impossible to come into contact with live terminals accidentally, assuming of course that the mains terminal pins have been sleeved. Blank glassfibre is a waste product available for a nominal fee from p.c.b. manufacturers. Alternatively, a p.c.b. offcut lying around your shack can be quickly etched down to bare glassfibre. This completes assembly in so far as testing can commence.

Testing and Setting Up

Prior to testing the board, carefully check the polarity of C2/4/5, D1–4 and IC1–4. In addition, carefully check the pot and switch wiring.

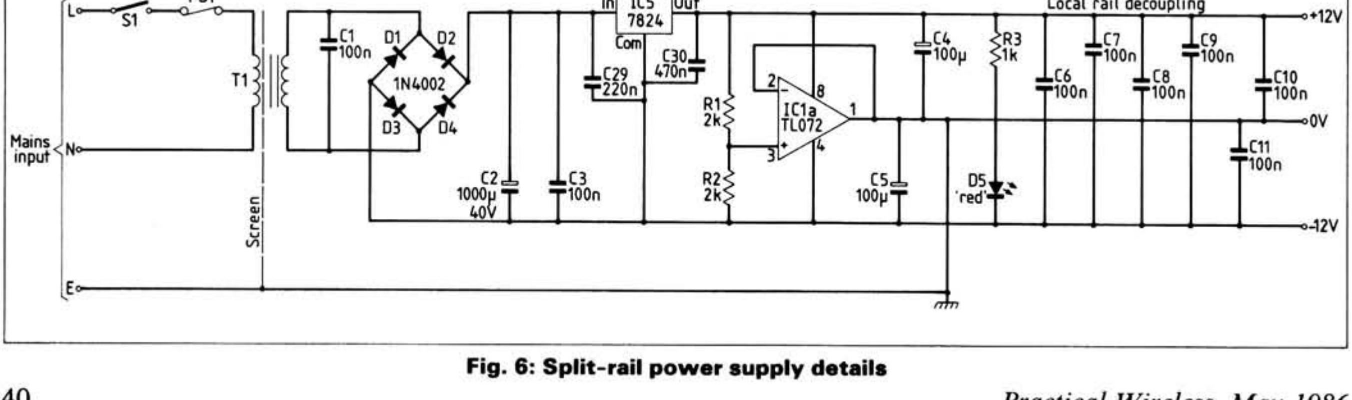


Fig. 6: Split-rail power supply details

SHOPPING LIST

Resistors

¼W 5% Carbon film

100Ω	2	R28,34
470Ω	2	R25,31
3·3kΩ	1	R22
10kΩ	4	R26,27,32,33
22kΩ	2	R29,35
100kΩ	5	R4,5,12,13,21
470kΩ	1	R20

¼W 1% Metal film

2kΩ	6	R1,2,7,8,15,16
10kΩ	2	R9,17

1W 5% Carbon film

1kΩ	1	R3

Potentiometers

Cermet multi-turn trimmer

10kΩ	2	R11,19
470kΩ	1	R23

Panel mounting ¼in, carbon track

10kΩ lin	4	R10,18,24,30
10kΩ log *	1	R36
100kΩ lin**	2	R6,14

* with s.p.s.t. switch S1
** dual

Capacitors

Polyester min. layer

100nF	9	C1,3,6–11,22
220nF	1	C29
470nF	1	C30

Polyester min. metallised, 5%

10nF	4	C14,16,19,21

Monolithic ceramic

47pF	2	C12,17
100pF	1	C23
470pF	2	C15,20

Electrolytic

100µF 16V radial	9	C4,5,13,18,24–28
1000µF 40V axial	1	C2

Semiconductors

Diodes

1N4002	4	D1–4
Red l.e.d.	1	D5

Integrated Circuits

TL072	4	IC1–4
7824	1	IC5

Miscellaneous

Printed circuit board; fuseholder, 20mm p.c.b. mounting with 160mA antisurge fuse; 6mm mono jack socket (2); transformer, 240V p.c.b. mounting, 12–0–12V, 6VA (RS 207–756); miniature toggle switch, d.p.d.t.; control knobs (7); case; 8-pin d.i.l. sockets (4); Veropins.

How Much? & How Difficult?
£50
Intermediate

Temporarily solder the mains cable to the p.c.b. pins and **sleeve.** Before fitting the glassfibre insulating board, carefully inspect the mains connections for minute slivers of stray wire or solder bridges capable of causing short circuits, then fit the glassfibre insulator. Finally, turn R6 and R14 to their centre positions; use a meter to determine this point, looking for a resistance reading of 50kΩ or thereabouts.

Turn on at R36 and connect the mains. Check that l.e.d. D5 lights. If not, disconnect immediately and carefully check the power supply assembly. Assuming the l.e.d. lights, test for 30 to 36V across C2. Then test for the −12V and +12V rail voltages from pin 1 on IC1 to the negative and positive terminals of C2 respectively. This confirms the power supply is working. If not, inspect IC1a, R1/2 and associated connections.

We can now move on to checking the performance of the unit. If you own audio test equipment, then the test procedure will be self-evident. If not, it's perfectly possible to set up and assess the filter unit by ear alone. Connect a convenient source (a radio programme is best) to the input and a test amplifier or headphones to the output. If the headphone/external loudspeaker socket of the receiver is used to obtain the audio input ensure that a resistor of equivalent value to the phones/speaker impedance is wired across the jackplug. This will avoid any distress to the audio amplifier stages of the receiver. With switch S2 set to BYPASS there should be normal reproduction. Set the Q controls R10/18 at minimum (fully anticlockwise) and the boost/cut GAIN controls R24/30 at their central positions. Move S2 to FILTER IN and adjust VOLUME control R36 for a comfortable level. Turn R24 to max (fully clockwise) and sweep the FREQUENCY control R6, listening for a corresponding "squawky" enhancement of the programme around the centre of the sweep. Next, turn the Q control R10 to maximum and note the sharper effect when the frequency is swept again. Repeat the same process with R24 set at minimum, noting the "hollow" sound as R6 is swept through the midrange frequencies. The *Q* preset R11 should now be turned clockwise a couple of turns. Test all three controls over their whole range, listening for oscillation or severe ringing (impulsive sounds are drawn out with a pipe-like quality when this occurs). Progress another two turns and test again. When oscillation occurs, first turn down R36 (to avoid hurting your ears!) and then turn back R11 until the circuit restabilises at all control settings. If you have a 'scope, it's a good idea to check that there's no supersonic oscillation—it's absence is a good sign that the circuit is stable.

Repeat the same procedure with the second filter, R14, 19, 30. At this point, it's possible for slight interaction to occur, insofar as the stable *Q* setting on the first filter now causes problems at certain control settings. However, this is quickly solved by tweaking R11 and R19 half-a-turn anticlockwise at a time, until the problem ceases.

If intractable oscillation does occur, even with R11 and R19 set at or near minimum (fully anticlockwise), this almost certainly indicates a circuit fault, such as an incorrect resistor or pot value. However, it's also worth empirically adjusting the values of C12, 15, 23 (etc) by ±100 per cent to counteract the effects of a freak combination of component tolerances. Next, switch off the unit and test the voltages with respect to 0V (pins 1 and 2 on IC1a on C13, 18, 24, 25, 26, 27 and 28. Swap these around where necessary to accommodate the polarity of the offset voltage appearing from the preceding stage. If the offsets are less than 0·1V, reversed electrolytics will come to no harm, and are best left alone. Conversely, offsets greater than 1V should be investigated, as they indicate a circuit fault, possibly an open circuit bias resistor or faulty op-amp.

One more adjustment remains to be made. Once the filter unit is wired to your receiver, adjust R23 to provide a signal level that's commensurate with audibility (with both filters in the maximum reject mode), and a clean response (with the filter at its maximum boost settings), not forgetting the ability of the gain control in the receiver *and* R36 to optimise the dynamics in everyday use.

PW

★ SPECIFICATION

Frequency response	−3dB @ 15Hz and 16kHz	
Gain swing	+15dB, −20dB	per Filter stage
Q range	0·5 to 10 (typical)	per Filter stage
Centre frequency range	150Hz to 6kHz	per Filter stage
Maximum output level	+18dBm (6V r.m.s.)	

multiple choice... multiple choice...

ANSWERS

multiple choice... multiple choice...

Are you cheating? If you are reading this page before page 31 then you are. Please turn to page 31 for the questions.

Question 7–1. Answer-b.

$$X_c = \frac{1}{2\pi fc}$$

X_c = capacitive reactance in ohms
f = frequency in hertz
c = capacitance in farads

Question 7–2. Answer-d.

The prefix k stands for 1000.
The prefix M stands for 1 000 000.
Note *exactly* how the units are printed—a small "k" denotes kilo (1000) a capital "K" is used in computer jargon and means 1024. Capital "K" also means absolute temperature in kelvin.

Question 7–3. Answer-d.

There is no restriction on the number of disaster relief exercises that a licensee can take part in. This contrasts with "other operations" (charity walks, etc.) which are limited to 4 a month and 12 a year. (Clause 1 (1) (c), revised June 1984)

Question 7–4. Answer-d.

On page 4 of *How to become a radio amateur* is the statement:

> *". . . success in the morse test remains a valid qualification for a period of twelve months from the date of the test for the purpose of obtaining an Amateur Licence . . ."*

Question 7–5. Answer-a.

To calculate the sensitivity, we divide the resistance by the full scale reading:

$$\frac{2M}{500} = \frac{2\,000\,000}{500} = 4000 \text{ ohms per volt}$$

Question 7–6. Answer-c.

During the hours of daylight the sun ionises the molecules in the region of the atmosphere some 80km above the earth called the D layer, and the sky waves from top band are absorbed in it. Hence reception by day is via ground wave. After dark the ions recombine, allowing the waves to pass through. They are then reflected back to earth by the F layer. This is the reason why broadcast stations in the medium wave band and amateur transmissions in the 1·8MHz and 3·5MHz bands have a longer range by night than by day.

Question 7–7. Answer-b.

Questions on the Q code in the RAE are unlikely to go beyond the few in common use by amateurs. In some instances the amateur usage does not correspond exactly with the official definition.

QRM	Man-made interference
QRN	Naturally occurring interference, such as static
QRP	low power
QRX	"Wait a moment"
QSO	a contact
QSY	change frequency
QTH	location (usually of a fixed station)

Question 7–8. Answer-c.

Clause 1 (1) (c) of the Amateur Licence draws a distinction between two situations

—disaster relief operations (exercises and the real thing),
—"other operations", that is sponsored walks and so on.

There is no restriction on the number of disaster relief operations, but

> *"other operations should not exceed 4 in any one calendar month and not more than 12 in any one calendar year."*

Question 7–9. Answer-a.

Yet another way of labelling a 1000pF capacitor is 1nF

$1\mu F$ = 1 microfarad = 10^{-6} farads = 1 000 000pF
1nF = 1 nanofarad = 10^{-9} farads = 1000pF
1pF = 1 picofarad = 10^{-12} farads = 1pF

In circuit diagrams and on components the "F" is often omitted:

1000p = 1n = $0{\cdot}001\mu$

Question 7–10. Answer-a.

In an a.c. circuit containing only resistance, the current and voltage will increase and decrease together; in other words, they will be in phase.

Question 7–11. Answer-b.

The last sunspot maximum occurred late in 1980, so the next peak should be in 1991 or 1992.

PAST GEMS

Another Great Advance in Television

Wireless Magazine May 1934

A couple of months ago even the best informed of those who are aware of the progress that is being made in the development of television would not have been sufficiently optimistic to have held the opinion that the broadcasting of high-definition pictures on the ultra-short waves was an immediate possibility. As a laboratory experiment with a short line between the transmitter and receiver such pictures have been produced by various workers, but the broadcasting of them presented an entirely different problem. Those who have had experience with ultra-short wave receivers will appreciate how tricky they can be and with the more exacting demands of television the difficulties are increased many times.

And now the Baird Company have shown that all the difficulties have been surmounted and that the broadcasting of high-definition television is quite practicable on wavelengths as low as 6 metres. This in itself is a remarkable achievement, but coupled with the facts that the pictures are perfectly steady and show all desired detail, proves what wonderful progress has been made.

On the occasion of the recent Baird demonstration of their new system the transmitter was situated in one of the towers of the Crystal Palace and the receiver was at Film House, Wardour Street, a position where it can be assumed interference from machine static would be as bad as anywhere. But the received pictures were entirely free from any trouble of this kind and remained perfectly clear during the whole of the programme which lasted about an hour.

The Baird Company have made a departure from their ordinary practice in this latest apparatus. The cathode-ray tube is being used instead of a mechanical device. The diameter of the end of the tube is twelve inches and this, of course, is the size of the picture.

HF RADIO–the Amateurs are the Lucky Ones!

Amateur Radio h.f. operators enjoy some advantages over professional radio users that many of us may not realise. Nigel Cawthorne G3TXF draws some comparisons.

Satellite and cable communications have taken over as the main carriers of international telephone and telex circuits, but even today there are still a few countries left that rely on h.f. radio for their telephone and telex communication with the outside world.

For the Amateur Radio operator trying to work some juicy DX on the h.f. bands, say an H44 station in the Solomon Islands, a knowledge of radio propagation is very important. Only at certain times of day and on certain bands is there likely to be an open path to the wanted DX station. DX openings, especially on the lower bands like 1·8, 3·5 and 7MHz can be very short. "Grey-Line" (sunrise–sunset) openings on the l.f. bands may last for a few minutes only.

The Amateur Radio h.f. operator, who can benefit from freaks of propagation and very short openings in making his DX contacts, has a major advantage over the professional h.f. user, to whom "circuit availability" is all-important. For example, the operators of an h.f. radio link from a third world African country to Europe that carries both telex and public telephone circuits, will try to offer their customers a round-the-clock service. The customers wanting to make telephone calls and send their telexes would not want to be told that they have got to wait for the "band to open" before they can put their calls through!

A communications technician in Mauritania (5T5-land) examines a 1kW balun unit that is connected between the 50Ω coaxial cable (seen coming out of the ground) and the feed-line on the log-periodic antenna

Even though the Amateur Radio h.f. operator has an advantage over the professional user because he can maximise his use of propagation phenomena, the professional user generally finishes up better off because he can select the best site available for his station, often with space no object. Amateurs usually have to set up their h.f. station on a predetermined and limited site, in other words, their own back garden!

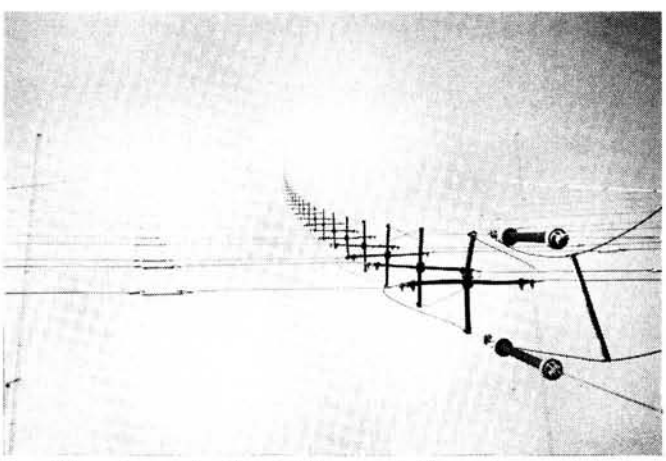
Frequency Agility and Antenna Bandwidth

There are nine Amateur Radio h.f. bands, covering the entire h.f. spectrum. This broad spectral spread from below 2MHz to just under 30MHz allows Amateurs to take advantage of many different propagation phenomena. Many professional users do not have such a wide range of frequencies to choose from. The fact that the h.f. Amateur Bands are clearly defined offers another advantage over the professional user. The Amateur can design his antennas for optimum performance on each of the bands on which he wants to operate. The professional user, on the other hand, tends to use "broadband" h.f. antennas, which are operationally more convenient where there is a need to regularly change frequency. A point-to-point h.f. link might have to change frequency up to six times a day in order to keep the circuit open.

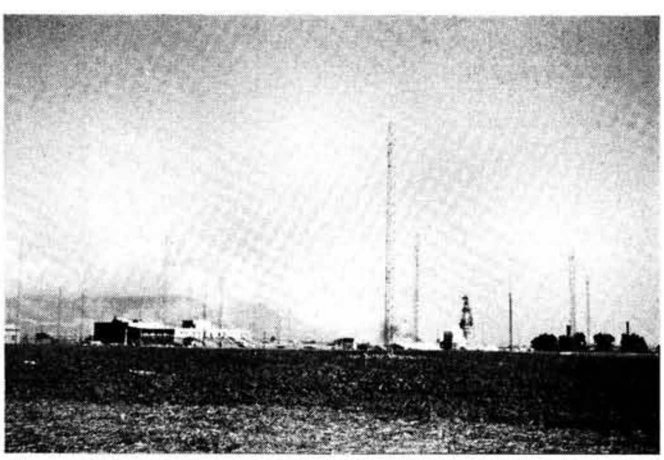
Log-periodic Antennas

Broadband antennas come in many forms. One which is commonly used in professional point-to-point radio services is the log-periodic antenna. These antennas can cover from as low as 2MHz right across the h.f. spectrum up to 30MHz, allowing the professional operator to change to any operating frequency without changing antenna.

The disadvantage of using broadband antennas is that their performance in terms of forward gain and front-to-back ratio is not as good as many Amateur beams and quads that are designed for specific relatively narrow frequency bands. The log-periodics can be fixed or rotatable, vertical or horizontal. Sometimes, wire log-periodic antennas are installed at 45°, to give a mix of vertical and horizontal polarisation or for use in space and angle diversity installations. The typical Amateur's back garden does not usually have enough room for space diversity!



Looking along a horizontal log-periodic antenna. Note the criss-cross feed system along the centre of the dipole elements. The nearest element is for 30MHz and the one away in the distance at the top of the mast is for 4MHz



General view of an h.f. communications centre bristling with all types of h.f. antennas. A mouth-watering sight for the h.f. Amateur with only a pocket-handkerchief back garden

Diversity is where two separate antennas are fed into separate receivers. The two signal paths are combined in the later stages of the receivers, whose a.g.c. systems are linked together so that the stronger signal at any time is favoured. Diversity reception is sometimes used on professional h.f. links to overcome the problems of fading and phase distortion on the radio path.

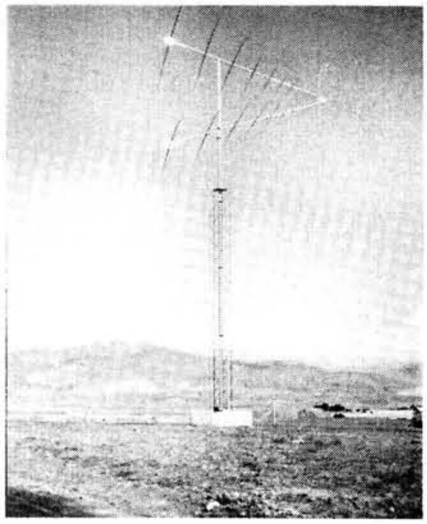
The fixed log-periodic is made up of a "curtain" of wires which have an open-wire feeder system down the middle. The longest element in the antenna curtain is equivalent to the length of a half-wave dipole at the lowest frequency of operation. Horizontal fixed logs are usually supported by and suspended from two masts. The feed point can conveniently be near ground level.

Rotatable logs can have either rigid or wire elements. The rigid element types look similar to amateur h.f. beams, except that their boom length is longer and they are more "pointed" in shape. Full-size rotatable logs that cover from about 6MHz to 30MHz require a massive boom and rotating mechanism to support and rotate the antenna.

In order to try to reduce the size of the rotatable log-periodic antenna, some manufacturers either fold over the ends of the elements used at the lower frequencies or end-load them in some way, so that that element lengths can be made physically shorter.

The forward gain of a log-periodic starts to fall off rapidly at the lower end of its frequency range. In fact, at the lowest frequency the performance of the log will probably not be any different to that of a simple dipole at the same height.

Where the professional h.f. user works on a fixed set of frequencies, he can sometimes do better to install antennas specifically for those frequencies, rather than use a broadband antenna system with its reduced efficiency. The Amateur h.f. operator has the advantage that he can optimise antenna performance for a particular band or even for a particular narrow



An impressive rotatable stacked log-periodic array at an h.f. communications station in Cyprus

range of frequencies within a band. For example, many 80m s.s.b. DXers cut and tune their antennas for about 3·790MHz, at the DX end of the band. Similarly, c.w. DXers will cut their antennas for the bottom end of each band.

Transmitters

A point of definition that is worth clarifying before briefly discussing some aspects of professional h.f. transmitters, is the question of "power". When a professional h.f. user talks about "a 10kW transmitter", he means "output power", i.e. 10kW of r.f. out of the transmitter into the feeder. A "150W" amateur transmitter is commonly taken as meaning 150W of d.c. input power to the final stage valve or transistor, though this is tending to change nowadays to output power, in line with the professionals.

In order to achieve the required degree of radio circuit reliability, the professional h.f. user has to employ powers in the range 1kW to 30kW for point-to-point links. A typical international h.f. public telephone and telex link might use a 5kW or 10kW transmitter. The cost of electricity to power such transmitters may become significant. A 10kW transmitter is probably going to require about 20kW of power from the mains, and where a station has perhaps two or three of such transmitters, the electricity bill can become a major item.

On the other hand, any Amateur Radio operator who is having problems with his electricity bills because of his radio activities, is probably running a lot more power than his licence allows!

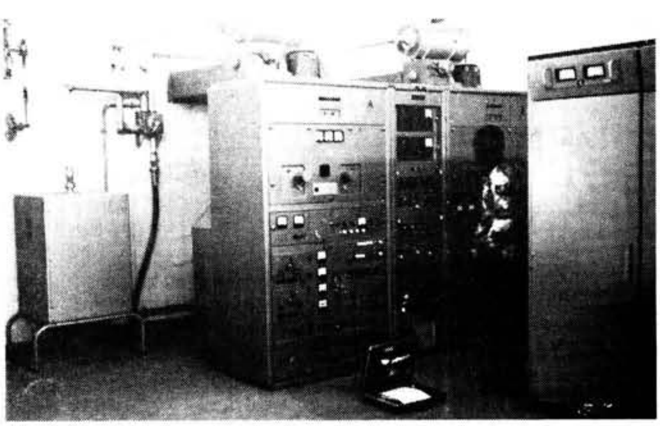
Beating the QRM

Amateur Radio h.f. operators are well used to having to "slide down a couple of kilohertz" to avoid some QRM which may appear during a QSO. This will not always be practical for the professional point-to-point operator, who may have to try an alternative allocated working frequency several megahertz away, which might not be so good for the propagation conditions at that time.

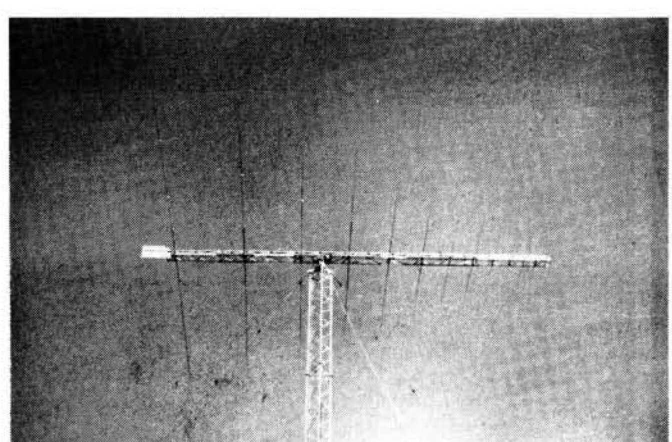
Worldwide Communication

Operating on the h.f. Amateur Bands, whether on c.w., s.s.b., RTTY or SSTV, provides regular worldwide radio communication with relatively low power and simple antenna installations. Our home QTHs might not be ideal, we cannot spend millions of pounds to build a station on dozens of acres of land, but we can put up efficient antennas, and we can use a high degree of operating skill both to take best advantage of propagation phenomena and to reduce interference during our contacts. Amateurs do not normally need to have 24 hour-a-day communication on the h.f. bands, but we do know that most mornings around breakfast time on 14MHz, we can contact Australia if we want to.

The professional h.f. user and Amateur Radio h.f. operator are both using the same radio spectrum, but their requirements and their approach are different. In many ways it is the Amateur Radio operators who are the lucky ones. ***PW***



Inside a professional h.f. communications station in Nouakchott, Mauritania, showing a pair of Marconi 7·5kW self-tuning h.f. transmitters. The two "barrels" on top of the transmitters are harmonic filters, and the dummy load can be seen standing to the left



Horizontal rotatable log-periodic antenna. These massive broadband types of antennas are in common use on h.f. communications links

CLUB NEWS

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

County Antrim

Lagen Valley ARS: Jim Jackson GI4TCS, Shantara, 21 Carnreagh, Hillsborough, Co. Down. Meets 2nd Mondays, 7.30pm in the Rathvarna Teachers Centre, Pond Park Road. Lisburn.

Avon

North Bristol ARC: Ted Bidmead G4EUV, 4 Pine Grove, Northville. Meets Fridays, 7pm in the Self-Help Enterprise Centre, 7 Braemar Crescent, Northville. April 18—Bring and Buy.
South Bristol ARC: Len Baker G4RZY (Whitchurch 834282). Meets Wednesdays, 7.30pm in Whitchurch Folkhouse, East Dundry Road, Whitchurch.

Bedfordshire

Dunstable Downs RC: Phil Morris G6EES (Dunstable 607623). Meets Fridays, 8pm in Room 3, Chews House, High Street South, Dunstable. April 11—Spectrum Checklog Program by G3XJO; 25th—The "Rig Doctor" looking at members' rigs.
Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm in the Church Hall, Ampthill Road, Shefford. April 10—Interference by G3UFB; 24th Computer Comms by G6KUK.

Berkshire

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

Buckinghamshire

Milton Keynes & District ARS: Dave White G3ZPA (M Keynes 501310). Meets 2nd Mondays, 7.30pm in The Meeting Place, Hodge Lea, North Milton Keynes. April 10—Special s.w.l. Evening.

Cambridgeshire

Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848). Meets 4th Thursdays, 7.30pm in Southfields Junior School, Stanground, Peterborough. April 24—Space Shuttle Video.

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. April 16—AGM.

Cheshire

South Cheshire ARS: Chris Wiseman G1PUV (Kidsgrove 73185). Meets 2nd and 4th Mondays, 8pm in the Crewe LMR Sports Club, Goddard Street, Crewe. April 14—AMSAT and OSCAR-10.
Chester & District ARS: Dave Hicks G6IFA (Chester 336639). Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm in the Chester RUFC, Hare Lane, Vicars Cross, Chester. April 8—PSUs by G3EON; 15th—Oscillators by G3SES; 22nd—Intro to Microwave by G3PER; 29th—Quiz.

Clwyd

Conwy Valley ARC: N. Vicars-Harris GW4VVW (Conwy 636376). Meets 2nd and 4th Thursdays, 8pm in the Green Lawns Hotel, Bay View Road, Colwyn Bay. April 10—GW3MZY to Lecture.

Cumbria

Carlisle & District ARS: Tony Leach G4WOQ (Scotby 500). Meets Mondays, 7.30pm in Uppersby Parish Hall, Uppersby Road, Carlisle.
Solway RC: D. G. Rayner G0AFP (Cockermouth 826461). Meets Wednesdays in the Maryport Educational Settlement, High Street, Maryport.
Westmorland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal. Meets 2nd Tuesdays, 8pm in the Strickland Arms, Sizergh, nr Kendal.

Derbyshire

Glossop & District RG: Geoff Sims G4GNQ, 85 Surrey Street, Glossop. Meets last Thursdays, 8pm in the Nags Head, Charlestown Road, Glossop. April 24—Satellite TV Reception by G3LEE.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Fridays, 7.30pm in the Cavalier Inn, West Street, Axminster.
Plymouth ARS: John Veale G4SCA (Plymouth 337980). Meets 1st and 3rd Mondays, 7.30pm in Plymouth Albion RFC, Beacon Park, Peverell, Plymouth.
Plymouth Polytechnic ARS: Darren Dalter G1ERM, 92 Alma Road, Pennycomequick, Plymouth. Meets Wednesday afternoons in the Science Block, top floor.
Tiverton (SW) RC: G. Draper G4ZNV (Crediton 235). Meets Tuesdays, 7.30pm in the Half Moon Inn, Fore Street, Tiverton.

Dorset

Flight Refuelling ARS: Ashley Hulme (Bournemouth 872503). Meets Sundays, 7.30pm at the FR S&SC, Merley, Wimborne.
Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Fridays, 7.30pm at Commander House, Constitution Hill Road, Poole. April 25—AGM and Construction Contest.

Dumfries & Galloway

Maxwelltown ARC: Trig Rodgers GM4NNC, 5 Elder Avenue, Lincluden, Dumfries. Meets 1st and 3rd Wednesdays, 8pm in the Tam O'Shanter Inn, Dumfries.
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 Establishment, Aberporth.
Pembrokeshire RS: Paul Delaney (Letterston 840249). Meets alternate Thursdays at the FE Centre, Tower Hill, Haverfordwest. Next meetings April 10 and 24.

Essex

Braintree & District ARS: Dave Willicombe G0DEC (Braintree 45058). Meets 1st and 3rd Mondays, 7.30pm in the Braintree CC, Victoria Street, Braintree. April 7—Arrow Electronics Rep.
Havering & District RC: D. St. J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm in Fairkytes, Billet Lane, Hornchurch.
Loughton & District ARS: John Mattison, Aylmers Farm, Sheering Lower Road, Old Harlow. Meets alternate Fridays, 7pm at Loughton Hall, Rectory Lane, Loughton.
Southend & District RS: Brian Wood G4RDS (South Benfleet 50494). Meets Fridays, 7.30pm in the Council Offices, Rayleigh.
Stanford-le-Hope & District ARC: J. R. Thompson G4OVG (S-l-H 642312). Meets Mondays, 8pm in St Joseph's Parish Rooms, Scratton Road, S-l-Hope.

Fife

Glenrothes & District ARC: Anne Edmondson GM4TCW (Glenrothes 744449). Meets Wednesdays and 3rd Sundays, 7.30pm in Provosts Land, Leslie.

Glamorgan

Rhonda ARS: John Howells GW4BUZ (Tonypandy 432542). Meets Thursdays. 7.30pm in the NUM Club, Tonypandy. May 1—Noise Bridges by GW4NOS

Gloucestershire

Cirencester & District ARC: G. R. Hayter G0AZD (Cirencester 5015). Meets alternate Thursdays, 8pm in the Phoenix Centre, Cirencester. Next meetings April 10 and 24.

Greater Manchester

West Manchester RC: Dave Comac G1IOO (Bolton 24104). Meets Wednesdays, 8pm in the Astley and Tyldesley MW, Meanley Road, Gin Pit Village, Astley.
Stockport RS: Mel Betts G4FFW (061-224 7880). Meets 2nd, 3rd and 4th Wednesdays, 8pm in the Magnet Inn, Wellington Road North, Stockport.
Trafford ARC: Graham Oldfield G1IJK (Urmston 9804). Meets Thursdays, 7.30pm in the 9th Urmston Scout Group HQ, Bradfield Road, Urmston.

Gwent

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

Hampshire

Andover RAC: Mike Adams G0AMO (Andover 51593). Meets 1st and 3rd Wednesdays, 8pm in the Wolversdene Club, Love Lane, Andover.

Basingstoke ARC: Dave Burleigh G4WIZ (Tadley 5185). Meets 1st Mondays, 7.30pm in Forest Ring CC, Sycamore Way, Winklebury, Basingstoke. April 7—Propagation by G3LTP.

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

Fareham & District ARC: Alan Chester (Fareham 288139). Meets Wednesdays, 7.30pm in the Porchester CC, Westlands Grove, Porchester. April 9—Predicting Lift conditions by G8OVI; May 3–5—GB2HAM from the PCA A&C Exhibition.

Farnborough & District RS: Peter Taylor G4MBZ, 12 Dunbar Road, Paddock Hill, Frimley, Camberley. Meets 2nd and 4th Wednesdays, 8pm in the Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough.

Horndean & District ARC: Dan Barnard G4RLE, 36 Guildford Road, Fratton, Portsmouth. Meets 1st Thursdays, 8pm in Marchiston Hall, London Road, Horndean. May 1—CW Techniques by G3JZU.

Winchester ARC: Robert Stone G4FPC (Winchester 64747). Meets 3rd Saturdays, 7.30pm in The Log Cabin, Stockbridge Road, Winchester. April 18—Goonhilly Down by G3WPI.

Hereford & Worcester

Bromsgrove ARS: Alan Kelly G4LVK (021-455 2088). Meets 2nd and 4th Tuesdays, 8pm at The Hundred House, Stourbridge Road, Bromsgrove.

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

Hereford ARS: F. E. G. Cox, 35 Thompson Place, Hereford. Meets 1st and 3rd Fridays, 8pm in the County Council CD HQ, Gaol Street, Hereford. April 4—Annual Construction Contest.

Kidderminster & District ARS: Tony Hartland G8WOX (Kidderminster 751584). Meets 1st and 3rd Tuesdays, 8pm in the Harrier FC, Hoo Road, Kidderminster. April 29—AMTOR by G3WHO.

Worcester & District ARC: Derek Batchelor G4RBD (Worcester 641733). Meets 1st and 3rd Mondays, 8pm in the Oddfellows Hall, New Street, Worcester.

Hertfordshire

Borehamwood & Elstree ARS: Tony G0DDJ (01-207 3809). Meets 3rd Mondays, 7.30pm in The Wellington, Theobald Street, Borehamwood. April 21—Quiz Session.

Cheshunt & District ARC: John Watkins G4VMR (Dane End 250). Meets Wednesdays, 8pm in the Church Room, Church Lane, Wormley. April 16—Lecture by the Club Chairman; 30th—Brains Trust Session.

Stevenage & District ARS: Frank Wilson G4ISO (Baldock 893735). Meets 1st and 3rd Tuesdays, in Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage. April 15—Video/Film Show.

Verulam ARC: Hilary Claytonsmith G4JKS (St Albans 59318). Meets 2nd and 4th Tuesdays, 7.30pm in The RAFA HQ, New Kent Road, off Marlborough Road, St. Albans. April 22—LF Antennas by G3BDQ.

Welwyn Hatfield ARC: Dave Fairbanks G0AII (Welwyn Garden 326138). Meets 1st and 3rd Mondays, 8pm in Knightsfield Scout HQ, Welwyn Garden City. April 7—Packet Radio Demo by G0CYC and G6YIQ; 21st—Workshop Night.

Humberside

Hornsea ARC: Richard Gutteridge G4YTV (Skirlaugh 62498). Meets Wednesdays, 7.30pm in The Mill, Mill House, Atwick Road, Hornsea.

Scunthorpe ARC: G. Parkin-Coates G6OSA (Doncaster 873827). Meets Tuesdays, 8pm in the Hobbies Centre, Grange Farm, Franklin Crescent, Scunthorpe. April 27—Radio Rendezvous at 11am with talk-in via GB2HRR.

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesdays, 8.30pm in Downe Village Hall, High Street, Downe.

Bredhurst R&TS: J. Scott G4ZTF (Medway 374670). Meets Thursdays, 8.15pm in Parkwood CC, Parkwood Green, Rainham. April 17—Kent Repeater Group.

Cray Valley RS: B. Rowe G4WYG, 19 Maderia Park, Tunbridge Wells. Meets 2nd and 3rd Thursdays in the Christchurch Hall, Eltham. April 17—AGM.

Darenth Valley RS: L. F. W. Thomas (Swanley 63368). Meets last Wednesdays, 8pm in the Crockenhill Village Hall, Swanley.

Dartford Heath DF Club: Peter Sharman G8DYF (Greenhithe 844467). Meets at the Horse & Groom, Leyton Cross, Nr Dartford Heath prior to the hunt. April 15—Pre-Hunt Meeting; May 2—AGM at the Scout Hut, Broomhill Road.

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

East Kent ARS: A. G. Stone G4UPJ, 86a Joy Lane, Whitstable. Meets 1st and 3rd Thursdays, 7.30pm in Herne Bay Youth Centre, The Cabin, Kings Road, Herne Bay.

S.E. Kent (YMCA) ARS: John Dobson (Dover 211638). Meets Wednesdays, 7.30pm in the Dover YMCA, Godwynhurst, Leybourne Road, Dover. April 16—Fox Hunt; 23rd—Scarab: May 7—Crime Prevention by PC Norman.

West Kent ARS: Nigel Peacock G4KIU (Tunbridge Wells 33586). Meets Fridays, 8pm in the AEC Annex, Quarry Road, Tunbridge Wells. April 18—AGM; May 2—Construction Contest.

Lancashire

Bury RS: Miss C. J. Ashworth G1PKO (061-764 5018). Meets Tuesdays, 8pm in the Mosses Y&CC, Cecil Street, Bury. April 8—Fibre Optic Transmitters by G4KLT.

Fylde ARS: H. Fenton G8GG (Lytham St Annes 725717). Meets 1st and 3rd Tuesdays, 7.30pm in the Kite Club, Blackpool Airport. April 15—Special Code Instruction Session.

Preston ARS: George Earnshaw G3ZXC (Preston 718175). Meets 2nd and 4th Thursdays, 7.45pm in the Lonsdale Club, Fulwood.

Rolls-Royce ARC: L. Logan G4ILG (Barnoldswick 812288). Meets 1st Wednesdays, 8pm in the RR S&SC, Barnoldswick.

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

Skelmersdale & District ARC: Gordon Crowhurst G4ZPY (Ormskirk 894299). Meets Thursdays, 7.45pm in the Beacon Park Centre, Dalton Lane, Skelmersdale.

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

Lincolnshire

Sleaford & District ARC: Dave Beilby G2HHK (Sleaford 304454). Meets 3rd Sundays, 7.45pm in Hale Magna Village Hall, Great Magna.

London

Acton, Brentford & Chiswick ARC: W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London. Meets 3rd Tuesdays, 7.30pm in the Chiswick Town Hall, High Road, Chiswick, London W4. April 15—Current Amateur Radio Affairs.

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 Haringey Sea Cadet Corp Training Ship Wizard, White Hart Lane, Wood Green, London N22.

Southgate ARC: Bob Snary G4OBE, 12 Borden Avenue, Enfield. Meets 2nd Thursdays, 7.30pm in the Holy Trinity Church Hall, Green Lanes, Winchmore N21. April 10—Junk Sale.

Wimbledon & District ARS: George Cripps G3DWW (01-540 2180). Meets 2nd and last Fridays, 7.30pm in the St John Ambulance HQ, 124 Kingston Road, London SW19. April 11—Electric Shock Treatment by G3ESH, G0CLK and the St John Ambulance; 25th—Radio Propagation During Sunspot Cycle 21 by G2FKZ.

Lothian

Lothian RS: Robin Thompson GM4YPL (Winchburgh 890177). Meets 2nd and 4th Wednesdays, 7.30pm in Harwell House Hotel, Ettrick Road, Edinburgh. April 9—Construction Time and d.f. Rig Check.

Merseyside

Wirral ARS: R. E. Bridson G3VEB, 14 Zig Zag Road, Wallasey. Meets 1st and 3rd Wednesdays, 7.45pm at Club HQ, Ivy Farm, Arrowe Park Road, Birkenhead.

Wirral & District ARC: Peter Morton G6CGJ (051-677 7376). Meets 2nd and 4th Wednesdays, 8pm in Irby Cricket Club, Mill Hill Road, Irby. April 9—Skydiving; 23rd—GB2WDC active for St George's Day.

Middlesex

Echelford ARS: Peter Coleson G4VAZ (Sunbury 783823). Meets 2nd Mondays and last Thursdays, 7.30pm in The Hall, St Martins Court, Kingston Crescent, Ashford.

Edgware & District RS: John Cobley G4RMD (Hatfield 64342). Meets 2nd and 4th Thursdays, 8pm in Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. April 10—Clandestine Radio by G3VA; 19th—Participation in the Queensbury Festival: 24th—Discussion Session.

RS of Harrow: Dave Atkins G8XBZ (Rickmansworth 779942). Meets Fridays, 8pm in the Harrow Arts Centre, High Road, Harrow Weald. April 11—INMARSAT by LA1YQ; 25th—SSTV, RTTY & Other Modes by G6GCM.

Nottinghamshire

Mansfield ARS: Angela Fisher G1DZH (Mansfield 652812). Meets 1st Fridays and 3rd Tuesdays in the Victoria Social Club, Princess Street, Mansfield. May 2—AGM.

ARC of Nottingham: Ian Miller G4JAE (Nottingham 232604). Meets Thursdays, 7.30pm in the Sherwood CC, Woodthorpe House, Mansfield Road, Nottingham. April 10—10GHz Operation; 24th—Packet Radio; May 1—23cm Band.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets 2nd and 4th Thursdays, 7.30pm in the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop. April 8—VHF Then and Now & the RSGB Award Scheme by G5UM; 22nd—PSUs by G8VHB.

Oxfordshire

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

Powys

Echo Lima RC: Owain Betty (Rhayader 810125). Meets at 2 Oakfield Cottages, Rhayader. April 15—Membership Matters.

Shropshire

Salop ARS: Simon Pryce G6MOJ (Shrewsbury 67799). Meets Thursdays, 8pm in the Olde Bucks Head, Frankwell, Shrewsbury. April 17—Visit to Iron Bridge Power Station; May 1—Junk Sale.

South Shropshire RC: G. Cowan, 5 Woodrows, Woodside, Telford. Meets Thursdays, 8pm at the Brosley SC, Brosley. The club incorporates the Wenlock ARS and Severn Valley RS.

Somerset

Taunton & District ARC: A. Moxon (Taunton 78903). Meets Fridays, 7.30pm in the Basement, County Hall, The Crescent, Taunton.

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm in The Recreation Centre, Chilton Grove, Yeovil. April 10—Lamda Diode Oscillators by G3MYM; 17th—AGM; May 1—Fading and Fade-out by G3MYM.

Staffordshire

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

Strathclyde

Ayr ARG Group: R. D. Harkness (Ayr 42313). Meets alternate Fridays, 7.30pm in the Community Leisure Centre, 24 Wellington Square, Ayr. April 18—"The other man's shack" by GM3KJF; May 2—AGM.

Helensburgh ARC: Dave Reid GM0BZF, 28 Bainfield Road, Cardross, Glasgow. Meets Thursdays, 7.30pm in the Cairndhu Nursing Home, Old Cairndhu Hotel, Rhu Road, Helensburgh.

West of Scotland ARS: Ian McGarvie GM4JDU (Brediland 2708). Meets Fridays, 7.30pm at 154 Ingram Street, Glasgow. April 18—RSGB Region 14 Rep.

Suffolk

Felixstowe & District ARS: Paul Whiting G4YQC (Ipswich 642595). Meets 2nd and 4th Mondays, 8pm in the Feathers, Walton High Street, Felixstowe.

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

Surrey

Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays and last Thursdays, 7.45pm in St Swithuns Church Hall, Grovelands Road, Purley, Surrey.

Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam, Sutton. Meets 3rd Fridays, 7.30pm in the Downs LT Club, Holland Avenue, Cheam. April 18—The 50MHz Band by G5KW; May 16—AGM.

Sussex

Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesdays, 7.30pm in the North Lodge Bar, County Hall, Chichester.

Crawley ARC: Dave Hill G4IQM (Crawley 882641). Meets 2nd and 4th Wednesdays, 8pm in the United Reform Church, Ifield Drive, Ifield. April 23—Antennas by G3TNO.

Edenbridge ARS: John Grevatt G8VCH (East Grinstead 24748). Meets 2nd Wednesdays, 8pm in the Scout Hut, High Street, Edenbridge.

Hastings E&RC: Dave Shirley G4NVQ (Hastings 420608). Meets 3rd Wednesdays, 7.45pm in the West Hill CC, Croft Road, Hastings and on Fridays, 8pm in the Club House, Downey Close, St Leonards-on-Sea. April 16—Junk Sale.

Horsham ARC: Paul Drawmer G4YFY, Treforest, Dragon Green, Shipley. Meets 1st Thursdays, 8pm in the Guides HQ, Denne Road, Horsham. May 1—Data Bases and Demo by G3IEE.

Southdown ARS: R. Wilson G1BAB (Eastbourne 890234). Meets 1st Mondays, 7.30pm in the Chaseley Home, Southcliffe, Eastbourne and Tuesdays and Fridays in the Wealdon Council Offices, Vicarage Field, Hailsham. April 7—144MHz DX, 50MHz and Linear Amps by G8VR.

Tyneside

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

Warwickshire

Atherstone ARC: Roy Fuller G6YQU (Chapel End 393518). Meets 2nd and 4th Mondays, 7.30pm in the Physics Lab, Atherstone Upper School, Long Street, Atherstone. April 14—Clandestine Radio whilst Jap POW by G3BA; 28th—AMTOR by G3WHO.

Rugby ATS: Kevin Marriot G8TWH, 41 Foxon's Barn Road, Brownsover, Rugby. Meets Tuesdays, 7.30pm in the Cricket Pavillion, BTI Radio Station, "B" Entrance, Hillmorton, Rugby.

Stratford upon Avon & District ARC: David Boocock G8OVC (S-u-A 750584). Meets 2nd and 4th Mondays, 7.30pm in the Baptist Church, Payton Street, S-u-A. April 14—Electronic Building Blocks; 28th—SWR Matters by G3PGQ.

Cover Date	Deadline	For events from early
July	April 15	June
August	May 15	July
September	June 15	August

West Midlands

Coventry ARS: Robin Tew G4JDO (Coventry 73999). Meets Fridays, 8pm in Baden Powell House, 121 St Nicholas Street, Radford, Coventry. April 11—Operating Techniques by G3BA; 25th—144MHz d.f. Hunt.

Dudley ARC: John Tisdale G4NRA (Kingswinford 278300). Meets 1st, 2nd and 4th Mondays, 7.45pm in the Allied Centre, Greenman Alley, off Tower Street, Dudley. April 28—Small Antennas for the Back Garden by G3BA.

Midland ARS: Tom Brady G8GAZ (021-357 1924). Meets every week night in Unit 5, Henstead House, Henstead Street, Birmingham 5. April 15—50 Years of Amateur Radio by G3BA.

Mirfield RC: C. Marks G4ZPJ, 63 Alvis Walk, Chelmsley Wood, Birmingham. Meets Mondays, Tuesdays, Wednesdays and Thursdays, 7pm in the Mirfield CC, Yockleton Road, Lea Village, Birmingham.

Willenhall & District ARS: John Phillips G4UPF (Wombourne 782076). Meets Wednesdays, 8pm in the Cross Keys, Prouds Lane, Willenhall.

Wiltshire

Devizes & District ARS: Peter Greed G3MQD, 18 Nursteed Park, Devizes. Meets Fridays, 8pm in the Devizes Football SC, Devizes.

Salisbury R&ES: Neil Underwood G4LDR (Salisbury 22809). Meets Tuesdays, 7.30pm in Grosvenor House, Churchfield Road, Salisbury.

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

Yorkshire

Halifax & District ARS: D. L. Moss G0DLM (Halifax 202306). Meets 3rd Tuesdays, 7.30pm in the Running Man, Pellon Lane, Halifax. April 15—Radio in the RNSCC by G4SCC.

Keithley ARS: Mrs K. A. Conlon G1IGH (Bradford 496222). Meets last Tuesdays, 8pm in the Victoria Hotel, Keithley.

Spen Valley ARS: Tim Clough G4PHR (Mirfield 499397). Meets Thursdays, 8pm in the Old Bank WMC, Mirfield. April 17—AGM; May 1—AR from a Different World by G3GJV.

Todmorden & District ARS: Val Mitchell (Todmorden 7572). Meets 1st and 3rd Mondays, 8pm in the Queen Hotel, Todmorden. April 7—Talk by UK Atomic Energy Commission.

Wakefield & District RS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. Next meeting April 8 and 22.

North Wakefield RC: S. Thompson G4RCH (Morley 536633). Meets Thursdays, 8pm in the Carr Gate WMC, Lawns Lane, Wakefield. May 1—Crime Prevention.

PAST GEMS

On Your Wavelength

Amateur Wireless
March 11, 1933

Motor-Car Radio

I wonder when the idea of automobile radio is going to catch on in this country? In America the radio manufacturers are much more vigorous in exploiting every possible avenue of sales, and in consequence there is quite a considerable technique already in existence for this class of reception. The sets themselves are of a comparatively simple type. In many cases they are 3- or 4-valve superhets capable of giving a selection of local programmes without very much else.

The more expensive sets run to more valves than this, but whatever the set there is a very definite market, and many car manufacturers in the States fix automobile sets on to the dash or on some other suitable position as a standard fitment. Over here a set in a motor-car is an absolute novelty, and there seems to be no serious move in any quarter to cater for this market.

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Spurious Mixing Product Calculator
Callsearch File
Radio Logbook
Orbits Calculator (RS3–RS8 and OSCAR 8)
TV Colour Test-pattern Generator

Cassette 5
Antenna & Feeder Calculator
Radio Range Calculator
Single-layer Coil & Resonance Calculator
QSL Card Printer
Meter Shunt & Multiplier Calculator
Reactance/Impedance Calculator

FOR THE BBC Model B

Cassette 6
Transmission Lines Calculator
Tuned Output Stage Design

Cassette 7
Universal Locator/Contest Score Calculator
Bearing & Distance Calculator
ATV Test Card Generator
Logbook
Satellite Tracking

FOR THE SINCLAIR ZX81

Cassette 1
Morse Tutor*
QRA Locator/Contest Score Calculator*
Distance & Bearing Calculator*
Spurious Mixing Product Calculator*
Morse Tutor
Callsearch File
Radio Logbook
Orbits Calculator (RS3–RS8 and OSCAR 8)

Cassette 2
Structured Morse Learning Course

Cassette 4
Antenna & Feeder Calculator
Radio Range Calculator
Single-layer Coil & Resonance Calculator
QSL Card Printer
Meter Shunt & Multiplier Calculator
Reactance/Impedance Calculator

* These programs will run in 1K. Remainder require 16K of RAM

FOR THE DRAGON 32

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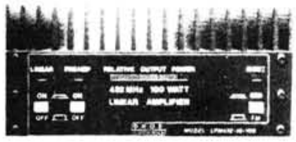

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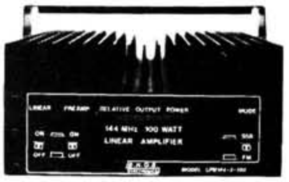

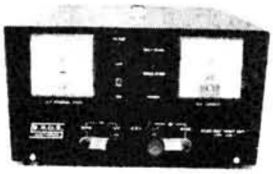

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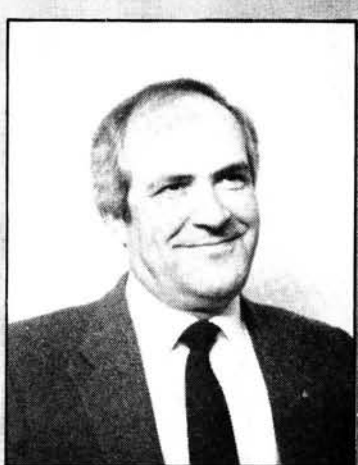

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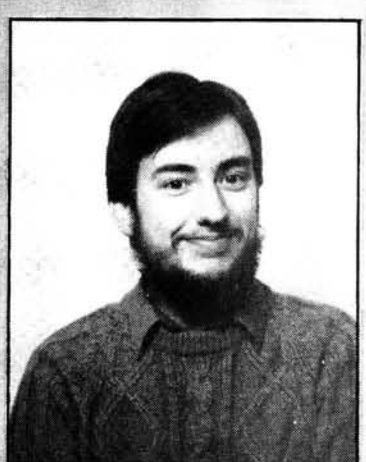

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Access

BARCLAYCARD VISA

ON THE AIR

AMATEUR BANDS

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

by Eric Dowdeswell G4AR

Many people still refer to the "new" WARC bands although they were available following the World Administrative Radio Conference of 1979 but the allocations only became effective in January 1982. After that it was up to the various national administrations to decide when and which bands would be released to amateurs. Generally speaking it was a matter of first shifting existing users to other frequencies.

The three WARC bands are comparatively narrow and thus it is not possible to accommodate all the usual Amateur modes of transmission on each band. The recommended IARU band plans are as follows.

10·100 to 10·150MHz Known as the 30m band this is used by amateurs on a secondary basis, that is the band is shared with other non-amateur services. The whole band is c.w. only except for the sector 10·140 to 10·150 allotted to RTTY/c.w. Power restrictions are the same as the UK h.f. bands.

18·068 to 18·168MHz The 17m band is allotted to amateurs on a primary basis but because some of the existing services are still operational the UK restrictions are 10W output and horizontally polarised antennas with not more than unity gain over a half-wave dipole. The plan for this band is: 18·068 to 18·110MHz c.w.; 18·110 to 18·168 c.w./telephony, 18·100 to 18·110 for RTTY.

24·890 to 24·990MHz The 12m band is broken up in much the same way as 17m, namely 24·890 to 24·930 c.w. 24·930 to 24·990 c.w./telephony, and 24·920 to 24·930 RTTY. Power and antenna limitations as for the 17m band.

General

A mobile rally will be held on Sunday April 13, at the Killyheviin Hotel, near Enniskillen, with talk-in on S22 and SU8, with much for the family including boat trips on Lough Erne. Starts officially at 1pm but doors open earlier. More from Cliff Corderoy GI4CZW, 9 Tarmon Brae, Enniskillen, N. Ireland.

Special event station GB4JAG will be in operation in liaison with the Jaguar Drivers Club by the Milton Keynes & District ARS on Saturday April 5. The station will be active from 9.30am to 7pm on the h.f. bands and 2m s.s.b. All contacts and s.w.l. reports will get a special QSL card depicting a 1956 D-type Jaguar car. More from Stuart Lightfoot G1GOF on Bedford 767904.

The Wisbech & District ARC is organising three special event stations GB0SGD, GB4SGD and GB6SGD in celebration of St. George's Day although the stations will be active from April 20 to May 17. A St. George's Day Award will be issued for making certain QSOs on h.f. and v.h.f. Full details of the award from G4KHF, "Leon", Lutton Gowts, Long Sutton, Spalding, Lincs. See News in April.

DX Bands

Fred Sammon GI4PCY of Enniskillen, Co. Fermanagh, answered my plea for logs and information on the new WARC bands. It so happened that the transistors blew on his FT-7B rig and not feeling like spending £50 for replacements decided to go QRP and built a rig for the 10MHz band. He has a direct conversion receiver and 1W c.w. out on the transmitter side, feeding a long wire running E/W and a doublet N/S.

He finds the 10MHz band only of use during daylight hours and an hour after sunset, generally with bad QSB on signals, with most activity confined to 10·1 to 10·12MHz. On c.w. Fred has worked mostly round Europe with GM, HG, SP7, PA0, F, SM, HB9, OK1 and YU.

Ron Pearce of Bungay, Suffolk, says he has a Trio R-600 in conjunction with a Partridge VFA antenna and reported VE1CC, VO1MP, 9H1EW, P43BB on s.s.b. around 3·8MHz. From Kings Norton, Birmingham, **John Court** reports on 80m s.s.b. with 4N3E with cards to YU3HAM, ZB2FK, YN1GI, TI5FBP, FM5WS, using an Eddystone 730 receiver coupled to a CB antenna.

Dave Chambers G4SYT (Epsom, Surrey) has an inverted-V dipole at 10m at the centre used with his Trio TS-940S. He has been working plenty of good stuff around 3·8MHz s.s.b. but thought his "gotaway" list might prove more interesting! It includes V44KAC on St. Kitts with cards to WB2LCH, ZD9BV on Gough Island, ZL2BT on 3·792MHz at 0715Z, 6W2EX, YB0ZAF, KH0AC on N. Marianas at 2110Z, TF5TP, 8P9AF, SU1ER at 2250Z, BV0BG (this on 14·197MHz at 0950Z), YS1RRD, HK4CUR, J88BK on 3·838MHz at 2125Z,CU1CB and CU2DG (new prefix for the Azores) and ZD7CW. Most of this stuff logged during the evening hours except where given otherwise.

A new prefix for Aruba is now P4, with P43BB already noted above. ZF8 will apply to Little Cayman Is. and ZF9 to Cayman Brac. UV1OO in Franz Josef Land has been heard on 3·5MHz c.w. Others to note are N2DHZ/VP2V and NY6M/KH2 on Guam.

Mike Willgoss G4XRR, late of Weymouth, is safely ensconced in a new QTH by this time but actual location unknown. He managed to complete work on his four-element 10m quad and will have a 12m-tall tower at his new QTH. Best of luck OM in the new shack.

Tony Granbäck SM3-7128 of Matfors in Sweden sent a useful log, including some c.w. catches which are always welcome as a change from s.s.b. Tony has a Drake R4B receiver now. On 1·8MHz on c.w. TF3SZ, VP2VA with a card already received from QSL manager VE3MJ, plus 5N8BAV on s.s.b. On 3·5MHz c.w. TG9NX and on s.s.b. 8Q7CG, DU7RLC, JC8VCE, KL7NT, TG9RZ, TI2US, TK5BF/P and WK6LK several times. On 14MHz it was only 9J2DS and Z22JE. On to 21MHz c.w. and 3B8FK, 4K6AJ, 5H3BH, TA2G and ZC4IM, with, on s.s.b., 5H3QM, 7P8CM, A25/W6KG and ZS2BA/P.

Fred Tagg of Sherwood, Nottingham, has an Icom R-71 receiver with a whip antenna mounted about 8m above ground, plus an MM2001 for copying RTTY. Fred is an ex-Navy type and was mainly concerned with the met and marine frequencies so not surprising his log is all c.w., for Top Band, where he logged stations in DL, HB9, LA2, PA0, OK, RA, SP, UA3, UO5, UP2, YU, W3YOZ, W3BEN, W1CF and ZB2J.

First log from **R. R. Watters** of St. Austell, Cornwall, who runs a Yaesu FRG-7700 and matching FRT-7700 a.t.u. fed from an inverted-L 20m-long wire. Sticking to the 14MHz band he caught such as D44BC, HI3AAI, S79CW, TZ6FS (YL op), VK2AG and other VKs, VP2MO, VU2NR, ZL1BD, 6Y5BW, 7J6AAA, 9Y4RT and V85GA. Not bad for someone who has only been on the bands for a few months!

A letter from **Mohamad Mat Jusoh** 9M2-65434 of Selangor, Malaysia, says he has a Sony ICF7600D receiver and he is hoping to take his local licence exam very soon. So far on 3·5MHz s.s.b. he has logged YB3LU, YB5LB, YC0IHN and YD9CCB. On 7MHz just HL1E and HL5BEX.

Thanks to **Melvyn Dunn BRS86500** of Grimsby for another of his regular reports using a Yaesu FRG-7700 fed from a 40m-long antenna. Starting on 80m around 3·8MHz he logged OY2A, J88AR (QSL Box 106, Kingstown, St. Vincent), 8P9AF (QSL VE3LGI), 5N3RTF (QSL DK2IN), P4DO (QSL PJ3DO), VK2AVA, VK7AE, VK9LM, PZ1AP (QSL Box 566 Paramaribo), 8R1RPN (QSL Box 12282, Georgetown), YB0TK, 8Q7CG (QSL I5JHW), C6ANI, 5V7AS with cards to IT9AZS. Not bad for 80m! Only one of interest on 7MHz was CO2CL, with J37XB on 14MHz plus SV0DR with cards to Box 66 Rhodes, on 21MHz. Late catch on 1·8MHz was 4X6DK. Among many new QSLs received by Melvyn was one from FT8XA on Kerguelen Island, plus TR8JLD, 8P9AB, P29FG.

Brian Fields G4XDJ is back in the fold I'm glad to say, with news of his QRP doings using the *PW* Severn rig with 1W output to a grounded delta loop antenna. Brian has had a lot of correspondence on his rig from other readers sorting out little problems. So on 7MHz it was HA9OA, UC2SLO, GJ2FMV, RT4UF, UB5FFV, UA6LAK, YO5ALI, ON6QE also on QRP, GM3AGC and GI4MBO. Melvyn goes on to report a virtual blackout of the band around February 8 and the next few days, the only signal being that of his brother G4SKX three miles away! This was undoubtedly the effect of the big aurora that was seen as far south as Devon and the south of England.

Another avid QRPer is **Phil Dykes G4XYX** of Poole, Dorset, who sent a long screed on the auroral event. Briefly, Phil runs a modified CB rig to give him 10W p.e.p. on 28MHz, fed into a two-element quad. On 7MHz it's c.w. only with 3W and an 8m vertical ground plane. On February 7 he worked KA1LZR with 579 both ways on 7MHz c.w. for over half an hour at around midnight. Later the band opened up to Europe with very strong signals being received. Around midday the 28MHz band opened up with 9Y4BA and 9Y4CK both S9 signals. Many Gs arrived on the scene and chaos reigned! Phil says the manners of these Gs "were no better than the oft criticised south European friends!" DX noted included CU2AX, HC4MG, HH2HA, HK4GGK, J37AH, as well as CE, LU, ZS and 4X mostly at S9. Around 1600Z the band closed and Phil had a last QSO with N4HAT. The next day at 1500Z, 28MHz opened up again but with strong auroral effects and many strong UK, LA, PA0 and EI stations. By 1730Z the band was quiet again, but at 2230Z it opened up again and Phil worked an SM6 and an OH, and later another SM and several Gs. On February 9, 28MHz opened up very briefly around midday.

Stations worked by Phil over the last month on 28MHz s.s.b. were DL5RF, EA8AKN, HG7JBS, LA7CO, N4HAT, OE5ODL, YU7OPQ and SM6KYP. On 7MHz c.w. K1QPM, N4NBM, PZ1AV, UA3, UA6 and UT5.

George Hitchins is now BRS88435, in Frimley, Surrey, and runs an RF3100LBE receiver and 20m-long antenna, and his report covers 15 to 80m. On 21MHz he caught CE5CQD, DX2BBF; on to 14MHz and FK8CP, J28EL, OE5JTL/YK, 5H3BH and HL0Y (QSL JH2PDS). Found on 7MHz were CP8GB (QSL POB 35, Riberalta) F/TK5BF, TU4BP/MM off Algerian coast, PJ9ZB and VR6JR. To 3·8MHz and TL8CK and OY2A.

Bruce Milburn of Alfreton, Derbys, lost his 40m-long antenna due to icing-up so used a temporary wire inside to feed his DX200 receiver. Logged around 3·8MHz were EA9RM, ON7ZM/EA8, VE2HQ, VK7AE for a fairly rare part of VK, VK9LM, 4X4GE, 5B4GJ, 5V7AS and 7X2KM. Sole catches of note on 14MHz were JY5OL and VK5AEA.

Keep the logs coming by the 15th of the month, but not too early or the info gets a bit out of date! Sample log sheet from me for an s.a.s.e. to show what is wanted.

VHF Forum

In the March issue I mentioned the practice of cross-band working with 50MHz from 2m or 10m and my near neighbour **N. G. Hyde G2AIH** has pointed out that the frequencies in common use for this purpose are 144·185MHz and 28·885MHz. He says he has had cross-band QSOs using these frequencies prior to the general release of the 50MHz band.

There is no point in reproducing once again the general regulations covering the new 50MHz band but mention should be made of the very necessary rules concerning maximum output power linked to antenna gain. If QRM is caused to certain v.h.f. channels on the Continent there is a good chance of the allocation being further restricted or withdrawn. It seems to me that careful monitoring of such channels will soon reveal the fact that conditions are abnormal, if these stations are heard, and a good time to avoid operation on those frequencies.

The very strong aurora active around Febrary 7/10 probably allowed many listeners and operators to hear the effect the aurora has on radio signals in the v.h.f. and u.h.f. regions. On, say, the 28MHz band the effect was to enhance DX signals so that they were either S9 or not there at all. On 144 and 432MHz the effect is to make the signals extremely rough and "buzzy" to the extent that it is often almost impossible to decipher callsigns or reports, sometimes needing two or three overs before this basic info can be exchanged.

Basically the aurora occurs when there is a flare on the surface of the sun and vast quantities of energy are released across a very wide range of electromagnetic frequencies. The highly charged particles eventually reach the vicinity of the earth and travel along the lines of the earth's magnetic field, then forming a vast auroral curtain as they cause ionisation of the atmosphere in the neighbourhood of the E layer. Hence the effect of the aurora on the h.f. bands which may cause a black-out on these frequencies for many hours or even a day or so, with a slow drift back to normal.

The aurora is seen in the north of England and Scotland relatively frequently but in February it extended down to the south of England. However, the auroral curtain does do something good for the amateur! It reflects v.h.f. and u.h.f. signals quite well although causing severe distortion of speech and a very rough tone to develop on c.w. signals. So the technique is to turn one's beam antenna towards the north for the signals to be bounced back to, hopefully, some exotic DX, with the DX station also aiming his antenna northwards.

If the solar flare is big enough it can last long enough to cause a further auroral effect to be noticed after the next rotation of the sun in about 26 to 28 days after the primary outburst.

ALL REPORTS BY THE 15th PLEASE

RTTY

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

by Ron Ham BRS15744

Although the 14MHz band conditions seemed generally poor between January 15 and February 14, I was delighted to log strong RTTY signals from JA8IYI working into Spain at 0825 on January 16 and JA1ACB in QSO with an A3 at 0850 on the 19th. DX came again for a short while around 0920 on February 6, when I copied 579 RTTY from VK2DFY. He was in turn, receiving good signals from the German station being worked. "VY FINE FRED ALL COPIED," said the VK to the DJ, adding, "GEAR HERE YAESU FT-980, RUNNING 100W INTO A THREE ELEMENT TRI-BAND YAGI. THE WX HERE IN MAITLAND IS ABOUT 32 DEGREES CELSIUS TODAY, VERY WARM." While copying this signal it was snowing and −6° outside my QTH, but that Australian signal, especially after a dull period, really increased the temperature inside my shack hi!

Around 0830 on January 26, I was interested to copy the callsign of IT9EPX, made up of letter "X" 5 characters high,

Fig. 1 ▼

Country (Prefix)	Band (MHz)			
	3·5	7	14	21
Antigua (V2A)			X	
Austria (OE)		X	X	
Australia			X	
Balearic Is (EA6)			X	
Brazil (PP7,PP8,PR8,PY)			X	
Bulgaria (LZ)			X	
Canada (VE)			X	
Canary Is (EA8)			X	
Ceuta & Melilla (EA9)			X	
Eire (EI)			X	
England (G)	X	X	X	
Finland (OH)			X	
France (F)		X	X	
French Guiana (FY7)			X	
W. Germany (DF,DJ,DK,DL)	X	X	X	
Gozo & Comino (9H4)			X	
Greece (SV)			X	
Guyana (8R)			X	
Holland (PA)	X		X	
Hungary (HA2)			X	
India (VU2)			X	
Inini (FY5)			X	
Israel (4X4,4Z4)			X	

Fig. 2 ▶

Country (Prefix)	Band (MHz)			
	3·5	7	14	21
Italy (I)		X	X	X
Japan (JA,JR,KA)			X	
Kuwait (9K)			X	
Lebanon (OD)			X	
Luxembourg (LX)			X	
Malta (9H1)			X	
Nigeria (5N)			X	
Norway (LA)			X	
Oman (A4)			X	
Poland (SP)	X		X	
Portugal (CT1)			X	
Rhodes (SV5)			X	
Rumania (YO3)			X	
Sardinia (IS0)			X	
Sicily (IT9)			X	
Spain (EA)			X	
Sweden (SM)	X		X	
Switzerland (HB9)		X		
USA (K,N,W)			X	X
USSR (RB,UA,UB,UK,UT,UZ)			X	
Wales (GW4)			X	
Yugoslavia (YU)			X	

Country (Prefix)	Band (MHz)		
	3·5	7	14
Argentina (LU)			X
Australia (VK)			X
Brazil (PY)			X
Canada (VE)			X
Canary Is (EA8)			X
Cyprus (5B)			X
England (G)	X		
Germany (DF,DJ,DL)	X	X	X
Greece (SV)			X
India (VU)			X
Indonesia (YB)			X
Israel (4X4)			X
Italy (I)		X	X
Kuwait (9K2)			X
Malaysia (9M)			X
Namibia (ZS3)			X
Netherlands (PA)	X		
New Zealand (ZL)			X
Oman (A4X)			X
Philippines (DU)			X
Scotland (GM)			X
South Africa (ZS6)			X
Spain (EA)			X
Sudan (ST)			X
Sweden (SM)	X		
Switzerland (HB9)			X
Togo (5V7)			X
USA (K,W)			X

when he signed off his QSO with G4OJJ. Among the other interesting stations G4OJJ logged was, "This is I8CEE-QRP-QRP" at 0835 on the 22nd, and signals through the mailbox of IK6CL on several days.

While having a tune around the RTTY bands on February 9, I noted that the news bulletin of the German Amateur Radio Teleprinter Group (GARTG) can be copied on Sundays at 0800UTC on 7·035MHz and 0900UTC on 3·587MHz at a speed of 45 baud. Reports are welcome by Wolf Puenjer DL8VX, PO Box 901130, D-2100, Hamburg 90, W. Germany.

QSL cards or contest log sheets are worth getting confirmed, because the British Amateur Radio Teleprinter Group (BARTG) issue a Quarter Century Award on receipt of satisfactory proof that two-way RTTY contacts with 25 different countries has been achieved by licensed amateurs and from s.w.l.s on a "heard" basis.

The certificate is printed in red, green and black and endorsement stickers are available for each additional 25 countries worked or heard. At the end of 1985, enthusiasts from 57 countries had claimed the award and I was pleased to see that Peter Lincoln BRS42979, Aldershot, is on the roll of honour with 50 confirmed countries to his credit. All details available by sending an s.a.e. to the BARTG Awards Manager and keen RTTY DXer, Ted Double G8CDW, 89 Linden Gardens, Enfield, Middlesex EN1 4DX.

"Despite the low propagation level on h.f. in general, data communication traffic has been quite good with forty prefixes logged," writes **Len Fennelow G4ODH**, Wisbech. He adds, "Once again patience has been rewarded with two new ones on 14MHz RTTY—Antigua V2A and Guyana 8R". **Dave Coggins** in Knutsford had a reasonable haul of RTTY stations between January 15 and February 9, when he copied signals from 2 countries on 3·5MHz, 3 on 7MHz and 19 on 14MHz. Dave's log has been included with the logs of **Bob Borzych G4WWD** in Liphook and Len Fennelow as well as my own log to compile the list of RTTY signals heard or worked during this period (Fig. 1).

"The station A4XZK is Tom G4CMG, who used to live in Hindhead and is now working in Oman," writes Bob Borzych on his impressive AMTOR log which includes about 20 countries heard or worked (Fig. 2).

SPACE & SATELLITES

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

by Pat Gowen G3IOR

Current Satellite News

OSCAR-10: Users in Northern Europe will be happy to learn that OSCAR-10 passed its most southerly latitude Apogee point of 26·33° south (i.e. its inclination angle) on the first day of March, and is now on the way back North once again. It will reach the equator in January 1987, and get to the most Northerly latitude of 26·33° north in early 1988. For many would-be users in Northern climes it has been unavailable for the past few months, as it is either sub-horizon or, even when above, cannot be "seen" if one's antenna is screened by surrounding buildings or ground rise. Winter wet houses and roofs offer considerable attenuation to 145MHz, and even more at 435MHz, and beaming some 800W e.i.r.p. to neighbours' TV antennas is not always conducive to good relations! It is for these reasons that much of the high activity usually found on this ultra-DX satellite has been rather low recently, and this has not been helped by the social timing or the schedule dictated by the eclipses.

RS-5 and 7: The USSR satellites have shown a marked level of increased activity over the last full time transponder-on period of operation, with many of the usual OSCAR-10 users identified on the RS series. RS-5 has a progressively ailing battery, but, in continuous sunlight, holds its own and produces uninterrupted transponder operation. RS-7 has a much healthier battery, and had both the transponder and ROBOT on simultaneously for the entirety of the non-eclipse period that terminated 23 January. (Remember it is often off during Wednesdays, a non-use day for run-of-the-mill QSOs, when both satellites are reserved for telemetry studies, switching experiments, educational and scientific regimes and for transmitting orbital data.)

Copious numbers of European stations were copied by **Bill Kelly** in Belfast, although he had some problems with some of the weaker stations on s.s.b. at the high end of the pass band. In Asia he lists UV9FB, RA9ADJ, UA9BEA, UA9YB, UA9FB, UA9FDZ, UL7CBP, etc. His DX includes some exotic callsigns, such as GB2SAT (G4GUO and G4ZHG on the Isle of Man), EB8QC (Canary Isles, Africa), CO3OF, SV3RCZ, but strangely no W's! Your scribe was active, and worked lots of Europeans, plus EB8QC, KL7QIF, RA9IE, RH8AD, UA0LAQ, UA0UCW, UZ0LWG, UL7s CCY, RCP and TCB, lots of UA9's, W0IZ, WA4YQW, K9VCM, AA3O, N7ZL, K7BBO, and W0CA/4. At least some two hundred different stations were identified.

As this issue reaches you, the RS-5 and 7 satellites will be approaching full orbit sunlight again, and if the batteries continue to hold out, will be on again full time from the first week in April until the last week in May. This eclipse, limiting the solar cell charging of the batteries for some 35 minutes per orbit, will continue until the first week of August, and then we have full time solar power until the third week of September, this dark period then staying with us until the first week of December.

RS-9 and 10: Considerable excitement resulted in early February, the expected launch time of the pair of new satellites, when Kimio JA9BOH, Miki JR1SWB, and Hans ZS6AKV all reported a new satellite sending fast telemetry on 29·400MHz. Nevertheless continuous monitoring in Europe by many alerted stations, all anxious to measure passes in order to find the period, increment, etc, produced not a signal!

Billy Kelly heard the still functioning RS-1 on 29·400MHz, sending its "55" for "RS" and "5515" for "AK15" (because all letters are sent as the figure "5"). By comparing this with the last known Keplerian element set computer tracking passes, it appeared to be this old friend that was heard, only operative whilst it was in full sunlight, as the battery has long been open-circuit. Later enquiries showed that delays had occurred with the launch vehicle for RS-9 and 10, and that the new date for lift-off is now set for the end of May.

Here is the entire listing of all frequencies to be employed by both RS-9 and RS-10, that are now awaiting completion of the launch vehicle for orbital placement. Note that the effects of vacuum, lift-off vibration and temperature changes may bring about a slight change on the nominal frequencies stated when the satellites are operational.

RS-9 Satellite:

TLM Beacon on 435·395MHz: 2 watts to GP antenna, made by UA3CR. This will be flown, but a licence is awaited to permit activation.

TLM Beacon on 29·402MHz, c.w.: Parameters similar to RS-3-8 series, with final calibrations yet to be released.

Transponder Mode "A" uplink: 145·860–145·900MHz. (40kHz b/w)

Transponder Mode "A" downlink: 29·360–29.400MHz. Linear and non-inverting.

ROBOT uplink: 145·820MHz. ROBOT downlink: 29–320MHz. Single frequency c.w.

RS-10 Satellite:

Mode "A" Beacons, c.w. TLM and/or ROBOT: 29·457 and 29·503MHz.

Mode "A" Transponder uplink: 145·960–146·000MHz (40kHz b/w).

Mode "A" Transponder downlink: 29·460–29·500MHz, Linear and non-inverting.

Mode "K" Transponder uplink: 21·260–21·300MHz.

Mode "K" Transponder downlink: As Mode "A" downlink.

Mode "K" Beacons: As Mode "A" (29·457 and 29·503MHz).

Beacon Powers: 250mW or 1W commandable.

Mode "K" ROBOT uplink: 21·140MHz.

Mode "K" ROBOT downlink: 29·457 (main) or 29·503MHz (secondary) commandable, power level also.

Telemetry format: As RS-9 information. Final parameters awaited.

Mode "T" Transponder uplink: As mode "K"

Mode "T" Transponder downlink: 145·957–145·997MHz.

Mode "T" Beacons 145·957 and 145·997MHz (passband edges).

Note that the transponder uplinks can be mixed to give a joint downlink, thus giving a wider communications basis to h.f. and v.h.f. stations and wider field of activity.

RS-10 DX Possibilities

Some surprises may come to experienced v.h.f. and u.h.f. satellite users with RS-10, as despite the still decaying solar flux, we might still experience some valuable sub-horizon access and audibility.

RS-10 has a transponder mode "K", with a 21MHz uplink, and a 29MHz downlink, so for the first time we may have a satellite which is capable (at times) of being heard, and if we are really lucky, worked whilst it is over remote parts of the world far below our horizons. On the "T" mode of 21MHz uplink and 145MHz downlink, we shall probably hear stations entering the passband when the satellite is far too remote for them to hear the two metre transponded signal resulting.

dressler

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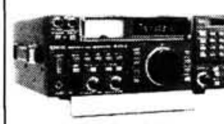

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MET ANTENNAS
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The really intriguing possibility is that we stand quite a good chance of propagation literally from the other side of the world! No one has positive proof why this antipodal region is an area where communication is enhanced, but it makes sense if one realises that whereas other parts of the world have only two possible signal paths to your station (the long and the short path great circle routes), at the point exactly opposite your station—where you would emerge if you dug a hole straight down, a signal can take off in any direction, and it has good possibilities of propagating to your station. This is because all routes from the antipodal point come together again at your station. Furthermore, the fact that antipodal stations are at similar points angulated and distant from the magnetic poles, with similar dip angles, and the antipodal dusk is the opposites dawn and vice versa also needs to be considered.

With almost an infinite number of routes available from the antipodal point it is odds on that sooner or later one of them will propagate a signal for you. Indeed, for 20 years or so it has been generally accepted that signals from satellites over your antipodal point are quite common at h.f. frequencies.

Unfortunately you will tell me that if I dug this hole straight down, it would emerge in the sea some distance from the nearest land, and it is this very fact that may explain why we do not hear much of antipodal propagation from fixed stations. The satellite over the antipodal point is not so restricted, and will furthermore be high above the nominal F2 and the limiting E layer. (Readers may wish to review *Practial Wireless*, page 64 and 65, "HF satellites" in the August 1985 issue to see the effects possible.)

RS-10 will be accessible at times from ZL whilst over the UK antipodes. Quite recently Cosmos 1686 (attached to the Salyut 7 space station) has been heard in the UK around 2000UTC whilst antipodal, on a frequency of 19·955MHz. With the solar cycle due to start climbing again in the next year or so, it is not impossible that even though ZL New Zealand is out of range of the UK on OSCAR-10, we might just get through to Irving ZL1MO, and Ian ZL1AOX on Mode K antipodal. Similarly, it should be accessible from G when it is over ZL one hour later, so we await the first UK to New Zealand satellite QSO.

The Space Shuttle Programme

The dramatic and tragic loss of *Challenger* and its crew of seven astronauts on Tuesday January 28 may result in a cessation of all Shuttle flights until May or June 86. Then, when the flight program restarts, it may feature test flights without payloads up to the Autumn of 1986.

Missions of importance from the point of view of Space Radio that are now at risk are:

1. The Hubble Space Telescope, which will not now be launched until the Shuttle has been thoroughly tested, and may be even further delayed noting that if it is launched in 1986 it will not have the essential relay facilities which would have been provided by the TDRS (the Geostationary Tracking Data and Relay Satellite used for Shuttle communication relay) which was lost with *Challenger*.

2. The Galileo Jupiter probe, which may well now miss the Jupiter launch window in May 1986. Jupiter windows occur only every 13 months, so the next chance for launch will not be until June 1987. Also needing a Jupiter launch window is the "Ulysses" Solar Polar Explorer, which first needs to go to Jupiter in order to get the giant planet's gravity slingshot assistance to fire the spacecraft into an orbit above the Sun's poles.

Unfortunately the ambitious program to launch both "Galileo" and "Ulysses" in the same Jupiter window now looks impossible with one less Shuttle. It therefore appears that at least one of these missions may have to wait until July 1988 for a launch, which portends a serious setback for important scientific knowledge. Ulysses was going to tell us a great deal about the Sun, particularly the polar regions, where Coronal holes that cause most of our Auroras emanate from. The spacecraft would have been placed first in earth-orbit by *Challenger*, then boosted by the new Centaur upper stage to travel far out of the ecliptic plane via Jupiter, reaching the solar south pole by early 1990, thence passing over the north pole of our Sun in late 1990, when the mission would have terminated. In addition to vital solar information, Ulysses would have provided scientific measurements of regions of the solar system where none had previously been made.

3. Shuttle Amateur Radio experiments. The earlier planned Packet Radio Experiments, even before *Challenger* was lost, were dubious, as the planners were clearly having second thoughts about putting these ambitious Amateur Radio Experiments on to missions with low inclinations, e.g. round the Equator orbits. It is now appreciated that unless these Packet missions use high inclination orbits, northern USA and Canada will get very poor coverage, and Northern Europe will get no coverage at all, so it follows that long delays may now occur before these experiments fly. Other planned shuttle Amateur Radio Experiments may suffer, as the overload that will occur with only three shuttles now available (*Atlantis, Discovery* and *Columbia*) plus the delay will undoubtedly mean that space on board will be at a premium.

4. The impact of the loss of launch capability may well affect the launch of the Phase IIIc spacecraft, already officially now postponed to September 1986, as many important commercial payloads may seek replacement of Shuttle launches by now going to the European Space Agency for Ariane transport. This may mean that additional Ariane-1 launches may now be planned before the first Ariane-4 launch, thus postponing the carrier that was to have taken Phase IIIc into orbit.

The loss of the TDRS relay satellite in *Challenger* means that the NASA plans to go to full "S" and "X" band microwave communications must be delayed. With only one TDRS already in orbit instead of the three required it will be quite a long time before NASA close down their u.h.f. stations completely. The sole gain would seem to be that keen listeners should have their Shuttle u.h.f. communications sources available for some years yet, particularly over the Indian and Pacific Ocean passes.

Polar Orbits via Shuttle launches from California were due to start in Autumn 1986. Whether this will now happen seems doubtful. These orbits are particularly interesting to stations at high latitudes such as Northern Europe, as all of the California launches will overfly Europe, unlike the Cape Kennedy launches, from which only one in four flights are over Europe.

Satellite	NOAA-9
Epoch Time	86016·32397729
Inclination	98·9783°
RAAN	334·7563°
Eccentricity	0·0014773
Arg of Perigee	219·4310°
Mean Anomaly	140·5786°
Mean Motion (r.p.d.)	14·11402249
Decay Rate (r/d²)	$2{\cdot}8e^{-07}$
Epoch Rev	5641
SMA (km)	7229·897
Anom Period (min)	102·026194
Apogee (km)	870·850
Perigee (km)	849·488
Beacon (MHz)	137·500

UoSAT Demodulator

A cassette program, "SUDD" (Spectrum UoSAT Data Demodulator) that enables Spectrum computer users to de-code OSCAR-9 and 11, has been produced by G4HLX. It performed impeccably for your author, giving perfect copy. This program, like "UO1-EAR" and "UO2-EAR" by G4INP and G4IDE (see March *PW*, page 50) is strongly recommended, as a user gets updated Keplerian elements, satellite and space news, and the basis for many fascinating experiments direct from the satellites.

For the Beginner

The series of articles on getting started on the Mode "A" satellites continues with details of additional facilities, and the details of a good Mode "A" downlink antenna for a limited station.

The "ROBOT"

Both RS-5 and RS-7 have a computer, controlled memory automatic c.w. QSO system, with a high degree of flexibility built in, and a similar system is also aboard both RS-9 and RS-10. They are active single frequency crossband coupled to an automatic calling and answering complex and termed the "ROBOT". They are capable of responding to a given call, serialising QSOs, and holding a log in the memory for later space to earth retransmission upon command.

RS-5 has a ROBOT uplink of 145·826MHz (uncorrected for Doppler shift) and a downlink on 29·331MHz, but it will be noted that when calling, 145·830MHz is nominated by the information following a "CQ" call. RS-7 has an uplink of 145·835MHz (although 145·840 is stipulated in the call) and its downlink is on 29·341MHz without Doppler correction. In this treatise the RS-7 ROBOT function will be referred to as a working example, although the format required is identical to the facility on both satellites. RS-7 is, in practice, easier to access and use, due to it having less problems from terrestrial f.m. from those that persist in illicitly using the spaceband in Western Europe for terrestrial QSOs.

Sometimes the channel used is active, but the ROBOT is not commanded "on", in which case a single frequency transponding channel is available if not required by the command station. At times the 29MHz downlink channel will be outputting the ROBOT's listing from its storage memory of up to 64 stations it has worked on its previous orbits around the world, each in consecutive QSO order with the serialised contact number attached. The speed of the transmission may be fixed, or, can be set automatically to respond at the speed of the calling station between 8 and 45 words per minute and thus adapt to the required Morse sending rate of the user.

The −10dB attenuator pad may be commanded in or out by the command station, as indicated by the telemetry system, and two different power levels can be selected for the downlink transmission. One may respond to the ROBOT at the same speed as heard from it, or call at your own speed, but the ROBOT will quickly adapt after the first letter or so. Whatever the system, the sequence when the system is active is the same, and starts with the call given from the satellite:

"CQ CQ CQ DE RS7 QSU FQ 145840KHZ K"

This 15 second duration call, if no replies are heard, is sent every minute, and is followed by a 45 second wait for a response. If nothing is heard, the "CQ" call is repeated.

The awaiting potential caller should have his transmitter available set to 145·835MHz, less up to 2kHz if the satellite is approaching, or plus some 2kHz if the satellite is receding, to allow for the Doppler shift of the uplink frequency at the fast moving spacecraft. If using a beam, he will have it pointed at the satellite, tracking in azimuth and elevation. During a quiet period between the CQ calls, the station may place his carrier on, and the tone at the same audio resultant frequency of the satellite's downlink will be heard as a steady carrier. If the carrier is absent or broken, then either a slight change of uplink frequency or a more accurate beam heading is desirable, or else the Faraday rotation, the multi-path effect or the attitude of the satellite's antennas are having an adverse effect, taking the signal out below the squelch level of the receiver of the ROBOT. On no account should the carrier be placed on if another station is working the ROBOT, or the keying of the transmission will be blocked and his contact ruined.

Following the "K" at the end of the calling sequence of the ROBOT, the user should now call at the same speed, once only, with good, clean, correctly spaced Morse, in the following format, where my own callsign is used as an example:

"RS7 DE G3IOR AR"

The "AR" must be sent barred as a continuous signal, and not as a separate "A and R", or the automatic return will fail to be activated. A "K" is superfluous, and is not required. If the call is sent slowly, then the satellite may come back "QRS QRS" indicating that the slow sending speed is being matched. If "QRQ QRQ" is given, then the caller is matched faster. When the auto-speed response is commanded in, the sytem will adapt to the sender's speed after a short training period, and then respond within the 8–45 w.p.m. limitation. If blocking is present (often due to f.m. presence) then the reply will be "QRM QRM". If definite parts of a call are recognised, the response may then be "RPT RPT" or QRZ? QRZ?" if it can identify that you are in there. In any of the cases of non-identified response, the calling sequence should be repeated, once only. When the complete calling procedure has been fully entered, as monitored on the downlink frequency, without any loss of content or with QRM addition, the ROBOT will reply:

"G3IOR DE RS7 QSO NR 123" (for example).

It will repeat this again, and then go on to say:

"OP ROBOT TU FR QSO 73 VA" and then

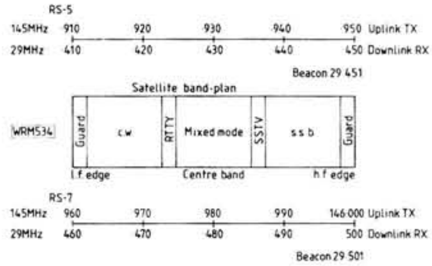


Fig. 1

close down to await the next caller, which if none, will result in another CQ call.

Note that the ROBOT does not give you an RST following your call and serial number. If this is required, then one may observe the telemetry channel prefixed "IS" (or "SS" whilst under command) on the second frame of telemetry (see page 56, February *PW*). The number following "IS" (or "SS") should have 10 subtracted, and then a decimal place put in between, and will give you "S" units at the ROBOT receiver. Allow also for the telemetry channel prefixed "AS" (or "SS") which if reading 00 is full sensitivity, and if reading 10 has the ten decibel attenuator pad in circuit to help keep out the f.m. QRM caused by indiscriminate space band intruders. You may also note that the serial number indicated on channel "AD" (or "UD") has increased by one since your QSO.

Remember that the ROBOT can only handle one caller at a time, and if access is not obtained please avoid QRM to any awaiting ready callers. It is quite permissible to use powers of greater than the normal 100W e.i.r.p. maximum if needs be to ensure breaking the squelch level, as it being a single station device, others are not being depressed as they would be when using excess power into an a.l.c. controlled sharing transponder. It is better to be sure of a quick and effective QSO rather than to cause unnecessary QRM and waste time in a short pass when others may be patiently waiting.

When the ROBOT log memory is full with sixty-four QSOs stored, the sytem will revert to a two-way single frequency c.w. transponder, until it comes into range of one of the control stations (normally RS3A in Moscow) when it is commanded to transmit its log. It will then orbit the earth transmitting the callsigns and serial numbers of all the QSOs made since the last memory clearing, and these are kept at the RS3A command station in order to confirm any QSL card requests made via P.O. Box 88 at the Central Radio Club in Moscow. Following this, the ROBOT memory will be cleared, and the auto-CQ sequence re-started commencing with the next number to the last held in the previous log, restarting again at 001 when 1000 has been reached.

RS All-Rounder

We mentioned last month that one should use uplink and downlink antennas that agree in angles of elevation, otherwise you could end up in a situation where the satellite downlink signals are being heard by you when it cannot hear your uplink, or worse that it can hear your uplink when you cannot hear the downlink of your own or others' signals.

Not many stations have the real estate or means to erect the optimum azimuth-elevation controlled multi-element beams with circular or cross polarisation that would idealise the ability for continuous

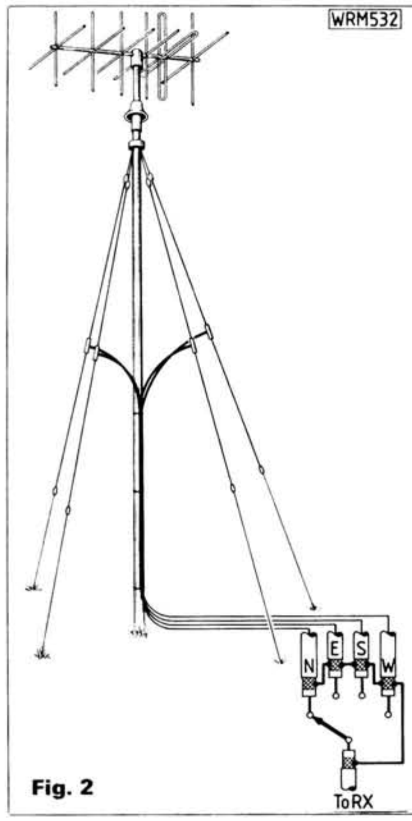


Fig. 2

horizon to horizon satellite access and copy, but, we can certainly compromise toward that ambition without the need of acres and outlay. Most v.h.f. stations will have a good 144MHz band Yagi surmounting a 6–12m metal pole, but will lack a similar antenna for h.f. The antenna drawn in Fig. 2 is a simple add-on to such an existing antenna that will give excellent results.

It consists of four sloping dipoles, each at 90° to each other, and each at 30° to the mast, taking the place of the guys that would normally exist. Normally, hard drawn copper wire would be used, but really any conductor will do, and it is even feasible to split any existing guy-wires into suitable lengths with insulators at the ends and the centres so that these act as antennas themselves.

Each dipole is 4·88m (16 feet) long, and is centre-fed with low cost 52Ω coaxial cable (75Ω TV cable will do at a pinch), with the inner of the coaxial line joined to the top half and the outer braid to the bottom half. All the feeders are brought back at 90° from the mast, and run back to the shack, where all the coaxial outers are joined. A four pole switch is connected to the line centres, and the wiper connected to the feedline to the receiver, so that any one dipole may be selected to give signal optimum on the receiver according to the satellite azimuth, elevation and preferred polarisation. The antenna has a marked gain, a wide angle, and provides excellent capture to give a good signal to noise ratio even at maximum DX low angle passes, thus permitting you to work the furthest possible stations at the limits of the satellite. If fade out due to cross-polarisation occurs, then it is only necessary to switch antennas to bring the signal back in again. This antenna was used by G3IOR to work over 100 countries via the Mode "A" satellites, by G4CUO to work all US mainland States, and by KO5I to regularly work into Europe from Texas, an optimum path.

Finally, to conclude our series on the current Mode "A" satellites, Fig. 1 shows the band-plan, with the uplink and downlink frequency relationship on RS-5 and 7. Remember to allow for Doppler shift, with signals higher at the start of the pass and lower at the end, as these frequencies are for zero-Doppler "TCA", i.e. the Time of Closest Approach. Above everything, keep your transmitted power down to the absolute minimum, never allowing your downlink to be stronger than the beacon, or you will blot out the weak stations that constitute the DX you would otherwise work. Concentrate on your received signals, and you will maximise your DX and everyone elses also!

In the next guide for beginners, we shall start to deal with satellites with elliptical orbits, such as OSCAR-10.

VHF BANDS

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

by Ron Ham BRS15744

One of the most scientifically interesting parts of the radio frequency spectrum and covered by this column, is 28 to 108MHz, representing wavelengths from 10 to 3m respectively. This range includes three amateur bands in which international beacon stations operate, 28–29·7MHz (10m), 50–50·5MHz (6m) and 70·025–70·5MHz (4m) and two f.m. broadcast bands, 66–73MHz (used in Eastern Europe) and 88–108MHz (used throughout Western Europe and the UK). Signals in both of these f.m. bands are subject to the influence of sporadic-E disturbances and the latter is subject to abnormal conditions within the troposphere. The 40–68MHz band is covered on the monthly Television column, usually under the headings Band I or Sporadic-E, depending on the time of year.

Although the entire range is subject to the whims of sporadic-E, the most vulnerable area is 40–80MHz, which should be good news for amateurs using the 50MHz band for the first time this summer. Unfortunately, during an intense sporadic-E, the 70MHz area is full of East European broadcast signals which limits amateur activity in the 70MHz band. Early warning of sporadic-E is possible by listening for television synchronising pulses on 49·75MHz or by checking the German and Norwegian beacon frequencies in the 28MHz band. The beacons are DL0IGI 28·205, DK0TEN 28·257, DF0AAB 28·277 and LA5TEN 28·237MHz. The effect of a sporadic-E disturbance usually begins around 50MHz, lasts about 3/5 hours and, according to its intensity, gradually spreads its influence down to 28MHz and upwards to 100MHz, with occasional peaks, perhaps suddenly for less than half an hour, in the 144MHz band. On the other hand, the onset of a tropospheric opening often begins around 80MHz with interstation warbles in Band II and again, depending on the intensity of the event, it gradually works upwards and brings DX in the 144 and 430MHz amateur bands. It also causes havoc in the v.h.f. (Band III) and u.h.f. television bands. What with world-wide DX possible at the 28MHz end, limited range v.h.f. DX likely at the high end, the chance of detecting signals via aurora or meteor scatter and hearing solar noise, it becomes obvious why this part of the spectrum is really important to the scientific observer. The 28MHz band should be active during the h.f. NFD and the 21/28MHz s.s.b. contest on June 7 and 8 and October 12 respectively. Also the 70MHz band ought to be good for contests on April 20, July 5 and 6 and September 21.

Solar

"Communications have been pretty bad over the last month, even the BBC World Service broadcasts have suffered fade-outs most evenings on all frequencies," writes **Bob Anderson** on January 31. Bob leads and solar group in Johannesburg and in this report says: "January has been dead except for the 14th and 15th, when one group of about 8 sunspots made itself visible in what seemed to be the high latitudes and then vanished."

"Sun noise on 144MHz much greater than previously measured on February 4 and up to S9 on 50MHz on the 5th," writes **David Butler G4ASR**, Hereford.

In Sevenoaks, **Cmdr Henry Hatfield**, using his spectrohelioscope at 1000 on the 8th, observed two sunspot groups, six spots, nine filaments and a flare. "The first of these groups came into view on the east limb on January 30. Both are the most active things that I have seen for many months," said Henry. By the 13th, this lot was around the west limb and during his observation around 1030, he found another group of two medium and four small spots, 2 filaments and a few quiet prominences. "This group is active and contains what looks like the remnants of two medium sized flares and a filament," remarked Henry. He added, "Things are much quieter to the eastward of this group which is now nearing the west limb." Henry also recorded various degrees of radio noise at 136MHz throughout the event.

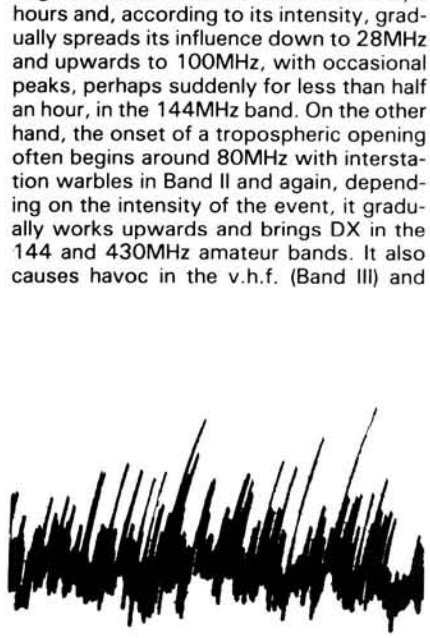
"We may virtually have run out of sun spots and violent magnetic activity but the aurorae and the magnetic storms are still trickling away. Most activity is derived from the coronal holes with occasional transient events," writes **Ron Livesey**, Glasgow. He is auroral co-ordinator for the British Astronomical Association. Ron continues, "Visual auroral reports were received for the nights of January 10 and 11, 18 and 19 as well as 21 and 22. My own magnetometer detected activity on the 9th, 21st and 25th." Reports that the aurorae on the 10th had rayed structures, on the 18th glows and on the 21st arcs, reached Ron from observers in Dundee, on the weathership *Starella* at station Lima and mid-Scotland respectively. **Dr. Roger Stapleton**, St. Andrews, reported radio aurora on the 21st.

The January issue of *Solar News*, the magazine of the London Solar committee, contains details of visual observations for the last quarter of 1985 with drawings of the sun's disc showing the positions of active areas, sunspots and other events during the period. Subscription and membership details are available by sending an s.a.e. to Bert Chapman, "Brindles", Mill Land, Hooe, Battle, East Sussex TN33 9HT.

Prevailing conditions on the sun can never be taken for granted; for example, after weeks of quiet, I recorded a major solar storm at 143MHz, between February 2 and 8. The event began with several small bursts of radio noise on the 2nd and developed into a continuous noise storm on the 3rd, it then sent my pen to full scale on the 4th and 5th. It reduced to violent swings on the 6th and 7th (Fig. 1), various small bursts on the 8th and a solar noise storm and bursts on the 13th and 14th. The period of activity ended with two large bursts on the 15th.

The lower trace in Fig. 1 shows a typical receiver noise line on a quiet day and the upper trace is a mere 6 minutes of the solar storm on the 7th.

This is the first storm of this length and magnitude that I have recorded since May 1984, so I was not surprised to find the 14MHz band almost blacked out for most of the 8th and 9th. I also wasn't surprised to learn from the BBC's weatherman, at 2125 on the 8th, that an aurora was in progress. This event must have lasted for some time, because I heard tone-A c.w. and "ghostly" s.s.b. voices on 144MHz between 0140 and 0200 on the 9th and although most of the v.h.f. broadcast



◀ Fig. 1

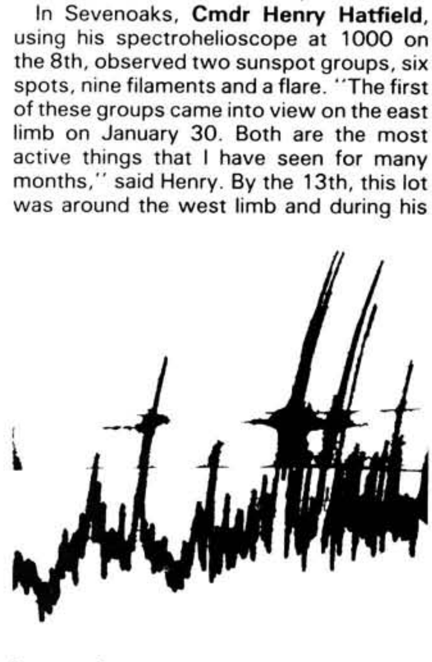


Fig. 2 ▲

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UR70	70 ohm coax	per metre	0.35	(0.10)
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stations were off the air at that time, I heard transmitter carriers, with auroral "burbles", on four spots between 67 and 71MHz and sixteen spots between 87 and 102MHz.

Apart from reading a bit of a GI4's callsign on 28MHz, the general c.w. speed on both bands was too fast for me, and my Tono 550 CW/RTTY reader does not respond to the foul tones of auroral reflected Morse code signals. "All signals heard were subject to rapid flutter and appeared rough," writes **Fred Pallant G3RNM**, Storrington, after hearing some weak stations on 14·21 and 28MHz during the afternoon of the 8th.

Aurora

Although **Andy Stafford G4VPM**, Paignton, missed out on the auroral activity during the evening of the 7th, he made up for it on the 8th. At 1445 he began by working GM4DGT and making his new square on 144MHz total up to 113, followed by QSOs with G3BRA, G4OEU, EI4DQ, GM3JOB and EI4FO. New square 114 came at 1533 when he worked EI9BG and at 1708 GM4UFD pushed the score to 115. Meanwhile he exchanged tone-A reports with SM1MKT and GM4DJS and heard SP7PGO plus RQ2GAG, UQ2GM and other stations in GI, OZ, PA, ON and DL. "This aurora covered a big area," said Andy.

He was active again in another phase of this spectacular event. At 2353 he contacted SM1MUT, Gotland Island, at 1619km (as the crow flies!) and gaining new square 116, OZ1DOQ was worked at 0002 on the 9th and then came the jackpot for Andy, RQ2GAG at 56A both ways. You've guessed it, new square 117 and another country (No. 28) around 1936km. Before the auroral score. Would congratulations be in order, hi!

During the aurora, David Butler made tone-A contacts with 95 stations on the key and 4 by s.s.b. covering 18 countries across Northern Europe on 144MHz. Among his notable QSOs were HG0HO, HG8ET, UP2BH, UP2BFR, UQ2GMD and YU3ES, between 1400 and 1800km. David's QTH is around 200m a.s.l. and his antennas include a 16-element long-Yagi and LDF4-50 Heliax on a (guyed!) tower some 35m a.g.l.

During the event, **Dave Coggins**, Knutsford, logged part-auroral signals from G3COJ, G4AXT, G4NGW, G4XNS, G5PQ, GI4SNA, GW3NNF and F2YT and auroral-E signals from LA1JDA, LA4MAA, LA5CBA, LA5WQ, LA7CO and LA6JU on 28MHz. "At 1230 on the 8th, one or two broadcast stations were heard with rapid/warbly signals between the 21 and 5MHz bands, 14MHz activity was almost nil and 28·21MHz completely dead," said Dave. He added: "Later on in the period signals down to 6MHz were starting to get really disturbed."

While his friend and neighbour, **Tony Usher G4HZW**, was making tone-A QSOs, until about 0230 on the 9th, Dave kept an ear open on 50MHz and logged G3IMW, G3OBD, G3PFM, G3TCT, G4BNO, G4IDE, G4IFX, G4JLH, GM4NOC, GM4YPZ and GW3XJR who was using only 500 milliwatts. "I found all frequencies from v.h.f. to a fair way into the medium wave band were affected by auroral and some rapid and watery QSB," reports Dave.

Gordon Pheasant G4BPY, Walsall, worked GM3WOJ and heard GM0BZD and GM4YPZ, with his beam due north. "The most intense aurora I have ever heard," remarked **Norman Hyde G2AIH**, Epsom Downs, who, after a land-line alert from G3FSD, heard a lot of activity and worked GM3ZBE, GM4NFC and GM4YPZ. "The first phase subsided around 1730 and the second began about 2030 and during the second phase, with my beam pointing north, signals from G4JLH, well to the south of me on the Isle of Wight, were received with auroral characteristics," said Norman. He also logged signals from LA, PA and SM.

"The main event this month must have been the solar noise, which lasted for about three days with me at strength 6 on 50MHz and 3 to 4 on 28MHz," writes Gordon Pheasant. "While in QSO with G3FSD, G4HME and G4UFU on the 144 and 50MHz bands on February 7, a high level of background noise was observed by all stations," said Norman Hyde. "However, when I found the sun quiet at 143MHz during my observation on the 9th, I thought this solar event was over. Perhaps it was, but, on the 10th, another solar noise storm was in progress and Fig. 2 shows the rise in noise and one of the many typical bursts as the sun entered the beam of my radio telescope's antenna. This storm accompanied by many big individual bursts continued through the 11th, 12th."

Fig. 3 ▶

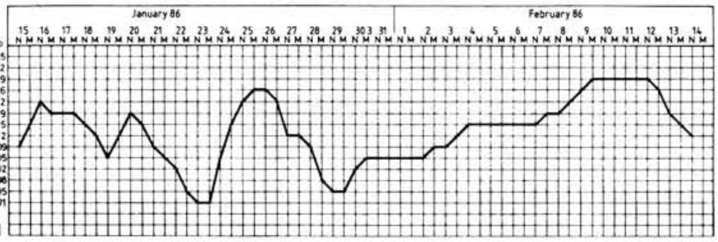
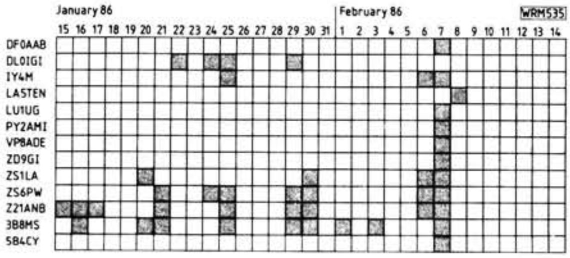


Fig. 4 ▶



Propagation Beacons

"Apart from the brief appearance of DL0IGI during the late afternoon of January 25, from my point of view, the 28MHz beacon sub-band was absolutely dead," writes Norman Hyde.

"A very quiet month beaconwise, but for the effect of the solar storm, particularly on February 7, when the band opened early to South Africa. My computer controlled receiver picked up good signals from Z21ANB and ZS6PW at 0830. Things really started to happen at 1330 when I logged the Adelaide and Gough Island beacons VP8ADE and AD9GI and at 1440 the propagation began to move into South America, when I logged the Argentine and Brazilian beacons LU1UG and PY2AMI for the first time this year," writes Gordon Pheasant. He also copied back-scatter signals from the German, Italian and UK beacons DF0AAB, IY4M and GB3RAL.

"February 7 was a good day," said Fred Pallant G3RNM, after logging the beacons in Bulawayo Z21ANB, Cyprus 5B4CY, ZD9GI, Mauritius 3B8MS, and South Africa, ZS1LA and ZS6PW. Fred also heard the 14MHz beacons, OH2B and 4U1UN/B, between 14 and 1500 on February 4. Like Dave Coggins he heard the Norwegian beacon LA5TEN on 28·237MHz during the aurora on the 8th. Bill Kelly, Belfast, reports hearing a new South African beacon ZS1LAR around this frequency at 1400 on the 7th.

"The list is shorter than ever this time," writes **Ted Owen**, Malden, who only logged GB3RAL on a few days during the period and the Cyprus and Mauritius beacons during the opening on February 7.

"Usual stations monitored, but nothing heard," comments Henry Hatfield.

In addition to receiving Z21ANB and ZS6PW on January 28 and 29, **Chris van den Berg**, The Hague, also logged signals from the 144MHz band beacon at Wrotham GB3VHF on 144·925MHz on the following days, January 15 to 19, 22, 25 to 27, 29 and 30, February 3 and 4 and 7 and 10.

"The 14MHz beacons have been fairly consistent companions during the month, the only notable event was the very strong signal from LU4AA on January 19 at 589, the best I have ever heard it," writes **Len Fennelow G4ODH**, Wisbech. During the 26-day period between January 15 and February 9 Len copied CT3B and OH2B on 8 days, LU4AA on 4 days, W6WX on 7 days, ZS6DN on 15 days, 4U1UN on 19 days and 4X6TU on 14 days.

My thanks to Dave Coggins, Norman Hyde, Bill Kelly, Fred Pallant, Ted Owen, Henry Hatfield, Chris van den Berg and Gordon Pheasant for their detailed logs which enabled me to prepare our monthly 28MHz beacon chart, Fig. 4. Norman Hyde received signals from the 50MHz beacons GB3NHQ daily from January 15 to February 10. Both Norman and I logged the 28MHz beacon GB3RAL daily throughout the period.

"The prime function of GB3SX has been taken over by GB3RAL, located at the Rutherford Appleton Laboratory site at Slough. GB3SX is transmitting, using low power on 28·200MHz for 5 minutes each half-hour as a preparation for transmissions of geo-physical information, which the RSGB Propagation Studies Committee hopes to arrange," writes **Alan Taylor G3DME**. He is the international co-ordinator for the I.B.P. programme which now covers operations on both the 21 and 28MHz bands.

The 28MHz (10m) Band

Briefly, one can say the band was dead throughout this period; however, Fred Pallant heard some weak c.w. at 1316 on January 16 and an LA6 and a UA6 at 1110 on the 21st. I received c.w. signals from G4FO and G4BUE around 1100 on February 2, so people are trying to use the band. Dave Coggins also heard UA6 and during periods of short-lived sporadic-E logged F6IRG, HB9DAX, I0DGB, I40WH, I5KJE and IK6HIQ, all at good strength. "G4HZW, G4XBP and G0BSU: received by ground wave," said Dave.

Tropospheric

Despite short-period lows of around 29·3in. (992mb) on January 23 and 29 and a high of 30·3 (1026mb) on the 25th and 26th, the atmospheric pressure, measured at my QTH, fluctuated between 29·7 (1005) and 30·1 (1019) from January 15 to February 7. Then it climbed to 30·4 by the 9th, where it remained until the 12th, as shown by the slightly rounded figures, taken from my barograph at noon and midnight, in Fig. 3.

In Malden, Ted Owen's barometer readings were similar to mine with lows on 987 and 994mb on January 23 and 29 and highs of 1025 and 1032 on days 16, 17 and 26, then 1032–1036 between February 10 and 12 inclusive.

I heard a few French stations in Band II on February 9 and 12 and logged the Wrotham Beacon at 589 during the evening of the 9th.

TELEVISION

Reports: as for VHF Bands, but please keep separate

by Ron Ham BRS15744

After reading about my television activities in the county paper, local residents were full of such questions as, "Can you really get pictures from Russia?", "What do you see?", "How do you know where they come from?" and the one I liked best, "won't you get into trouble for doing that?". No doubt other TVDXers can tell similar stories because it only needs the appearance of a large mysterious looking Yagi, which sometimes turns as if by magic, to start a rumour suggesting that the occupant is "nuts" and that the "thing" on his roof is responsible for those strange lines and criss-cross patterns which, periodically, disrupt normal television pictures.

However, to take a more serious view, these are valid questions from lay-people whose general knowledge of television ends with the daily entertainment which they get from their favourite BBC or IBA station. Questions on these lines are often asked by radio enthusiasts wishing to add equipment for TVDXing to their existing stations.

In my opinion, a prospective DXer should keep three important facts in mind. First, there are millions of viewers throughout the world, divided into many nations with people of widely differing life styles and languages, who obviously want to see news and programmes to suit their particular taste. Secondly, with this in mind, and to help overcome such problems as line-of-site signals over undulating terrain, international broadcasting authorities have installed thousands of strategically sited TV transmitters. These operate on a fixed and often shared frequency within the v.h.f. Bands I and III, 40–68MHz and 175–230MHz and the u.h.f. Bands IV and V, 471–608MHz and 615 to 856MHz, respectively. Lastly generally speaking, TV transmitters have a limited service area, perhaps a radius of 80km. Everyone is happy until a natural disturbance occurs within the Earth's atmosphere and so while it lasts, the range of these transmitters can be increased by a factor of between 10 and 50 times. This results in chaos at the receiving end. This is known as co-channel and/or adjacent channel interference.

Under these circumstances the reception of long-distance television pictures is possible. Signal paths are influenced in Band I by a disturbance known as sporadic-E and in Bands III–V, by ducting in the troposphere.

Briefly, the former is most likely to occur during daylight hours between April and September, with peaks in June and July and the latter, at any time when the atmospheric pressure is high and starting to fall. Don't forget readers, that there is only ONE radio frequency spectrum and it is used daily, in many countries, by all kinds of people from the armed forces and government services to CB and amateur radio enthusiasts, so we must all share and share alike.

To find a television station, which is our special interest, we must first know the frequency it uses, the time it transmits and the type of unusual propagation required to bring its signal our way. Station identity depends on the type and length of an event and how many signals are appearing together on the frequency we have selected.

Keep an eye open for captions like those on the clocks from Holland, Fig. 1, received by **Keith Hamer** and **Garry Smith** in Derby, and the IBA Television South, Fig. 2, seen by **Roger Wallis** in Solihull. Other such guides include the Spanish regionals, Murcia, Fig. 3, logged by **Sam Faulkener** in Burton-on-Trent and Dabadabada, Fig. 4, and Gamoniteiro, Fig. 5, received by **Len Eastman G8UUE**, in Bristol.

Most test cards give some form of identity, like the two German regionals, Figs. 6 and 7, seen by **Nicholas Wythe** in Folkestone. Norwegian and Yugoslavian test cards are also clearly marked and worth looking for during sporadic-E events in Band I and Scandinavian stations are often seen in Band III, while a tropospheric opening is in progress. Pictures from the USSR are usually prominent on Ch. R1 49·75MHz, when sporadic-E is about so watch out for their news captions BPEMR and HOBOCTN and cyrillic text on pictures as in Figs. 8 and 9 logged by **Major Rana Roy** in India. The photograph in Fig. 8 suggests a programme about experiments and I think that the reporter's name is at the bottom of Fig. 9. An English/Russian dictionary is a useful addition to the DXers bookshelf.

On the subject of suitable antennas, I find that a rotatable combined Bands I and III Yagi is ideal for the v.h.f. television signals, but for Band I only, during the sporadic-E season, good results can be achieved with a horizontally mounted dipole, facing east. It all depends upon how keen you are on the subject and how much you are prepared to spend on dedicated antennas and please remember, unlike amateur radio, CB and broadcast listening, you will not get results every day.

However, when the bands are open it is very rewarding, especially if you have a camera and record your observations. While browsing through the latest catalogue from Aerial Techniques, I found many interesting items for the new and established DXer. They included a wide range of antennas and accessories for Bands I, II, III, IV and V, amplifiers, converters, filters, rotators and colour receivers, suitable for DXing, by Contec, JVC and Thomson. Among the accessories which caught my eye is a Triax coaxial antenna switcher for mast-head mounting and a roll/tilt clamp that allows the antenna to be rolled through 360° and tilted for elevation. This catalogue is well illustrated and readers interested should send 65p to David Martin, himself a DX enthusiast, at 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH.

Band I

In Belper, **Tony Mancini**, keeps a regular watch on the TV bands and received the Czechoslovakian CST.01 and RS-KH and Spanish RTVE-1 test cards on Chs. R1 and E2 respectively on January 28, RTVE-1 on the 29th and CST on the 30th. Between 0800 and 1400 on February 2, he saw various sports from Czechoslovakia and the test card SR-PRAHA followed by a Bratislava logo INTERVISION, then a conference with CCCP in the top righthand corner and the TN news caption. Tony logged signals from Czechoslovakia again on February 3, 7 and 8 and his haul included the sight of test cards from Sweden TV1 during the afternoon on Ch. E3.

One interesting observation I made occurred during heavy rain around 0930 on January 21, when a strong burst of picture on Ch. R1 interrupted a bout of precipitation static. "During the massive aurora on February 8, I saw smeary TV images on Chs. E2 48·25MHz, R1 49·75MHz, E3 55·25MHz and R2 59·25MHz," writes **Dave Coggins**, Knutsford. He continued, "The channels most affected were E2 and R1. Signals were very strong on my Waltham Mini Star receiver and 2-element home-brew beams. Some of the auroral pictures came in with severe smearing but the auroral-E mode of propagation produced some spectacular signals for a short while, but I could not identify their countries of origin."

SSTV

Although the 14MHz band conditions were nothing special between January 15 and February 14, I logged pictures from stations in Italy and Yugoslavia on the 19th and 25th, Canary Islands on the 26th, Italy

Fig. 1

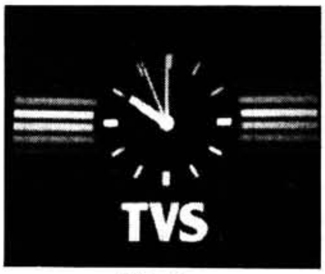


Fig. 2

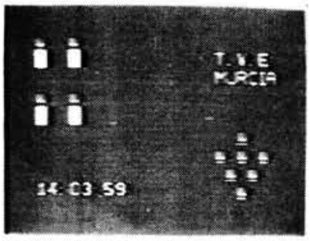


Fig. 3

Fig. 4

Fig. 5

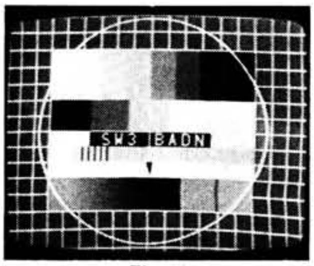


Fig. 6

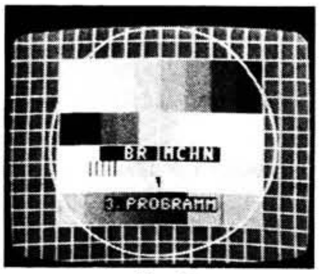


Fig. 7

Fig. 8

Fig. 9

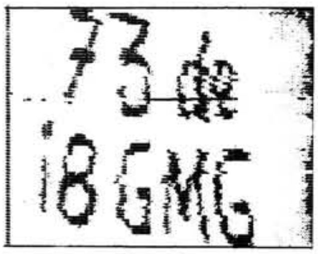


Fig. 10

Fig. 11

Fig. 12

on February 1 and Italy, Portugal and Yugoslavia on the 2nd. At 1030 on January 19th, I heard an irate voice on 14·230MHz (the SSTV calling channel) repeating, "QSY QSY QSY This frequency is for SSTV" and at 1116 a YU was sending the caption, "SORRY QRM".

Despite both hazards for SSTV signals, QRM and QSB, on this day I copied various captions such as, "CQ CQ SSTV DE I8XYZ PSE K", "G4KWP DE YU2NX", "73 DE 18CMG", Fig. 10, followed by "QRX" and a drawing of Italy, Fig. 11 and "CIAO GEORG", Fig. 12. I believe he was in QSO with George Ross in Romford, because I later received the caption "G4IEI de I8CMG" along with "CT1 PORTO SSTV", which I don't think was connected.

Congratulations to **Clive Catton G1BSN** and **Nick G4HCK**, both from Grays, who from Nick's shack exchanged SSTV pictures on 14MHz with VK2ADE in Killara between 1035 and 1130 on January 25. Among the captions they copied, using a BBC computer and Robot monitor, were, "HOW DO YOU COPY" and that all important one, "G4HCK DE VK2ADE". Nick used 100 watts from a KW Atlanta to a TA33 antenna and s.s.b. communications was made between pictures. These stations are interested in further SSTV QSOs and usually monitor 14·230MHz on saturday mornings. Also keep a look out for Nick's pictures on 144MHz.

Between January 15 and February 10, Dave Coggins, copied pictures from EA3PE, EA3FAA, I4JKE, YU1AYK and a smeary image from an EA8. "Local SSTV on 144MHz received a sudden surge by the arrival of G6YQJ, Littleport, Cambridgeshire, and the Norfolk stations, G8XOC, Stoke Ferry, G1ACO, Kings Lynn, G1MIA, Southery and G1EMW, Wareham, using BBC or Sinclair Spectrum computers," writes **Richard Thurlow G3WW**, March. He adds "They join G4UJU, Newmarket and Cambridgeshire stations, G4VYG, Toft, G0BDD, Ramsey St. Mary and G6HFS, Hardwick. G4UJU and G4VYG are using home-brew gear." At 1532 on February 6, Richard swapped pictures with EA5FIN, 15HHE, K1DUM, K1QVX, N59H and VOIBL around 14·230MHz and on the 9th, he exchanged 36 seconds of colour pictures with GJ4TAF and GJ4YCR on 3·5MHz.

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

The demand for photocopies of the circuit of the little two-transistor reflex receiver, used by **John Ratcliffe** of Southport, Queensland, Australia, was considerable —see January '86 *PW*, page 62—in fact, I had no idea so many keen home-brewers exist, both here and abroad! Many readers have already built the set and, being impressed with it, some are now trying out l.w., tropical band and s.w. versions. I do hope they will send along the results of their efforts to me, so that all *PW* readers can benefit!

DX Report

(Note: Frequencies in kHz: Times in UTC = GMT).

Transatlantic DX: Because the transatlantic signals have been coming through earlier, a number of listeners unaccustomed to m.w. DXing, have been tempted to "burn the midnight oil!" **Len Eastman G8UUE** of Bristol and **Alan Jarvid** of Cardiff heard CJYQ, St. Johns, Newfoundland, on 930, for the first time —quite a thrill no doubt!

James Bliss of Narborough, Leicester, heard CJYQ on six nights—as early as 2300 on one of them! He says: "I heard WMRE Boston, on 1510 at 0100 for a fleeting moment—I must admit I find it difficult to stay awake in the wee small hours these days!" **George Morley** of Redhill, Surrey, listened to CJYQ on 930, too, but spent most of his time checking the s.w. bands for a change!

A high rise flat in Bransholme, Hull, is not the ideal location for m.w. DXing, but **John Cooper,** who uses a Panasonic RP2000 portable, heard WMRE at 0130 and Radio Globo, Sao Paulo, Brazil 1100 at 0115—a considerable achievement, since dedicated DXer **Bill Kelly** of Belfast says conditions have been unexpectedly poor! Bill noted only WMRE, WCAU Philadelphia, 1210 and WXQR New York, 1560 from the USA: Canadian CKLM Quebec, 1570; Caribbean Beacon, Anguilla 1610 and Radio Vision, Venezuela 950, all between 0001 and 0200.

Graham Powell of Pontypridd, S. Wales, also found conditions poor, with signals mainly from New York—WINS 1010; WHN 1050; WNEW 1130 and

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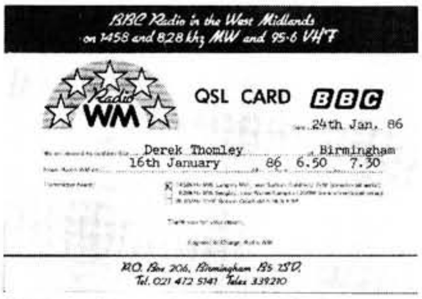


QSL card sent in by Derek Thomley

WQXR. Others were CJYQ; WBAL Baltimore, 1090; Radio Globo, Brazil 1100; plus a possible reception of WMAQ Chicago, 670 at 0100—awaiting their QSL! **Stuart Brooks** of Carluke, Strathclyde, seemed to do rather better. In addition to CJYQ, WINS, WHN, WMRE, WCAU and Caribbean Beacon mentioned by Bill and Graham, he heard WKBN Younstown, Ohio 570; WBZ Boston, 1030; WTOP Washington DC, 1500; CKYQ Grand Bank Nfld, 610; CKCW Moncton NB, 1220 and XEBBC Tijuana on 1470 at 0202.

Andy Kennedy of Leicester has been experimenting with a home-made loop antenna. It covers 430 to 1900kHz and has a single coupling turn at present, although he intends to try an f.e.t. pre-amp with it soon. Already, it is proving to be superior to a very long, dis-used telephone wire, which he used previously with his CR100 receiver. He also heard CJYQ, WINS, WHN, WMRE and the Caribbean Beacon. In addition he received VOCM St. Johns, Newfoundland 590 at 0322; CKLM Montreal 1570 at 0316—in French, and from S. America, Radio Globo located in Rio, at 0304 on 1220.

Tropical storms have made m.w. DXing impossible "Down Under". In an interesting letter, John Ratcliffe mentions that they usually get tropical cyclones in the Coral Sea during March, which make m.w. reception well below standard! So far this year, he has been unable to hear any sign of the BBC l.w. Droitwich transmitter, on 200kHz, due to almost continuous static.

Other DX

Writing from Dendermonde, Belgium, **Mauric Andreies** says he suffers from the "multi-storey flat" problem and has to use a home-made active antenna. However, his impressive log included E. Germany 531; Andorra 819; France 837; Italy 846 and 900; W. Germany 1017; Czechoslovakia 1098; Sweden 1179; Norway 1314; Ulster 1341; USSR 1386; Luxembourg 1440 and Austria 1476.

By way of a change, Graham Powell checked the l.w. band with his Grundig 14400SL receiver and logged W. Germany and Rumania on 155; France 164; USSR and Morocco on 173; E. Germany 179; W. Germany 185; Sweden 191; BBC 200; W. Germany and Morocco on 209; Monaco 218; Norway 218; Poland 227; Luxembourg 236; Denmark 245; Algeria 254 and Czechoslovakia 272.

Darren Taplin of Tunbridge Wells, Kent, has been searching for more DX using his DX-150A receiver plus 25m wire antenna and heard Radio Tirana, Albania, on 1458 at 1630 and Radio Prague, Czechoslovakia, on 1287 at 1659. **Wyn Mainwaring G8AWT** of Cowes, Isle of Wight, has been trying to receive BRT's *Radio World* programme from Brussels, Begium, on 1512 at 1915, but has problems with interference from other stations and fading—maybe a good loop antenna would help.

Julian Wood of Buckie, Scotland, has been monitoring the band with his Trio R2000 receiver. Interference from TV line time base oscillators limits his results, but his log includes Radio Luxembourg, 1440; Radio Monte Carlo, Monaco, 1467 and Stargrad Poland 1503 at 2249. **Margaret Sadler** of Leeds has also been enjoying the programmes from Radio Monte Carlo.

According to **Andrew Hill** of Cheslyn Hay, Staffs, VOA have recently launched *VOA Europe* on 1197, from Munich. Broadcasting mainly news, news features and pop music, it can be heard in the UK from 0001 to 0200, 0700 to 1100 and 1300 to 1700.

"One language that can be difficult to identify is Danish" says **Bill Stewart** of Lossiemouth, Scotland. For those of you making language identification recordings —see Feb '86 *PW*, page 64—Bill suggests the nightly broadcasts in Danish, on 1269 from Deutschlandfunk, W. Germany, at 1900, may be useful.

A look around the bands between 2345 and 0420 by Bill Kelly, resulted in Algeria, 549; Volgograd, USSR 567; Marseille, France 675; Berlin, E. Germany 1359; Valencia, Spain 1413 and Vatican Radio 1530, being logged. Portuguese style light music, broadcast by RRE Portugal on 927, was enjoyed by Stuart Brooks, at 2323.

Local Radio DX

Derek Thomley of Birmingham says: "I sent a report to my local station Radio WM and got a terrific response! I reported on two transmitters, Langley Mill and Sedgely, which I received at good strength 104km north of Sandbach, Cheshire, while driving north. I received two QSLs and car stickers—I have found that a comprehensive report and a friendly letter produce a good response."

Another letter about reports came from **Roy Spencer** of Nuneaton, Warks. He received a letter from the Engineer in charge of Radio Northampton, which pointed out that many local broadcasters do not keep a log, so programme details such as presenters, newsreaders or "jingles" are the proof of reception—not records, as they are more difficult to check.

Andrew Rogers of Bristol, Avon, says he finds the best time to listen for local radio DX is after 0100, when many of the high power European stations have closed down.

British DX Club

This club publishes a monthly bulletin called *Communication*. If you would like to see a sample copy and have details of the Club, please contact their Secretary: Colin Wright, 54 Birkenhall Road, Catford, London SE6 1TE.

Books

The new and up-dated Fourth Edition of *Dial Search* is now available. This excellent 46-page paperback book is a guide to European l.w., m.w. and v.h.f. stations.

Freq (kHz)	Station		Roy Spencer, Nuneaton	Derek Thamley, Birmingham	Andy Kennedy, Leicester	Dave Pannell, Pickering	Andrew Rogers, Bristol	Peter Edwards, Abingdon	Bill Kelly, Belfast	James Sneddon, Motherwell
603	Invicta Sound	IBA					X			
630	Radio Bedfordshire	BBC						X		
666	Devonair Radio	IBA					X	X		
756	Radio Shropshire	BBC						X		
774	Radio Kent	BBC						X		
774	Severn Sound	IBA					X			
828	2CR	IBA					X			
828	Radio WM	BBC		X						
828	Chiltern Radio	IBA						X		
873	Radio Norfolk	BBC				X				
936	Radio GWR	IBA					X			
954	Radio Wyvern	IBA					X			
990	Beacon Radio	IBA					X			
1035	Northsound Radio	IBA				X	X			
1107	Moray Firth Radio	IBA					X			
1107	Radio Northampton	BBC	X							

Freq (kHz)	Station		Roy Spencer, Nuneaton	Derek Thamley, Birmingham	Andy Kennedy, Leicester	Dave Pannell, Pickering	Andrew Rogers, Bristol	Peter Edwards, Abingdon	Bill Kelly, Belfast	James Sneddon, Motherwell
1152	BRMB Radio	IBA					X			
1161	Radio Broadland	IBA					X			
1161	Viking Radio	IBA			X		X			
1161	Radio GWR	IBA					X			
1170	Swansea Sound	IBA					X			
1170	Radio Orwell	IBA					X			
1260	Radio GWR	IBA					X			
1278	Pennine Radio	IBA					X			
1305	CBC	IBA					X			
1359	CBC	IBA					X			
1431	Radio 210	IBA					X			
1458	Radio London	BBC								X
1458	Radio WM	BBC		X						
1458	Radio Manchester	BBC								X
1476	County Sound	IBA					X			
1602	Radio Kent	BBC							X	

Also included are coloured maps, tabulated s.w. station details and 80 signature tunes used by broadcasters. It costs £3.00, plus 30p p&p from George Wilcox, 9 Thurrock Close, Eastbourne, East Sussex BN20 9NF.

QSL Addresses

BBC Radio Cumbria: Hilltop Heights, London Road, Carlisle, Cumbria CA1 2NA.

BBC Radio Devon: PO Box 100, St. Davids Hill, Exeter, Devon EX4 4DB.

BBC Radio Lincolnshire: Radio Buildings, PO Box 219, Newport, Lincoln LN1 3DF.

SW BROADCAST BANDS

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

by Brian Oddy G3FEX

For the Newcomer SWL

Many of you will have noticed that, sometimes, Broadcast Stations are to be found where they are least expected on your receiver dial. They appear on bands not assigned for broadcasting at all! Why is this?

Well I'm afraid that this is a very common problem, especially with the simpler type of shortwave receiver and, without getting too technical, I will try to explain these problems.

In the early days of radio it was usual to detect the signals directly from the antenna and convert them back to the original audio signals. As the wavelength grew shorter, i.e. the frequency increased, these signals became more and more difficult to handle owing to losses, etc. Other problems existed, too, such as lack of selectivity. A new type of reception was evolved, therefore, which converted the signals at the antenna to a much lower frequency where they could be more easily handled, amplified and made more acceptable in every way. This was brought about by the introduction of the **Superheterodyne** ("superhet" for short) receiver. It is most likely that the receiver you are using is of this type for, although modern technology could now produce a much superior version of the early type receiver, these still have a number of problems associated with them.

The basic principles of the superhet receiver were discussed in "Newcomer SWL", December *PW*, pages 66/67, but let us reconsider the operation of the **Mixer** (sometimes called Frequency Changer) stage. When an incoming signal (fc) is mixed with a lower frequency locally generated oscillation (fo), it can be shown that two new signals are produced, namely, sum and difference frequencies fc + fo and fc − fo. For example, if fc is 10MHz and fo is 9·5MHz, then, fc + fo = 10 +9·5 = 19·5MHz, and fc − fo = 10 − 9·5 = 0·5MHz or 500kHz. Since we want to make the incoming signal (fc) lower in frequency, we can ignore the sum frequency 19·5MHz. It is the 500kHz signal which is interesting and is called the **intermediate frequency** or i.f.

It is important to realise that the locally generated oscillation (fo) can be also placed above the incoming signal (fc) and still produce the same i.f. In the example, if fo becomes 10·5MHz and fc remains at 10MHz, then, fo + fc = 20·5MHz, but fo − fc = 500kHz as before. It also follows that any signal, spaced above and below the local oscillator by the i.f., will be mixed with the oscillator to produce an i.f. signal, and this is where a serious problem arises.

The selectivity of the tuned circuits associated with the desired incoming signal (fc), at the input of the mixer, may allow unwanted signals on the other side of the local oscillator to enter, too, and be mixed to produce an i.f. When this happens, so called **image signals**, or **second-channel signals** appear.

Consider now a practical example. A superhet receiver is set to receive 14·200MHz (fc) in the 14MHz amateur band. The oscillator is operating higher than the incoming signal and the i.f. of the receiver is 455kHz—a typical figure. In these circumstances the oscillator will be set to 14·655MHz, i.e. 455kHz above the incoming signal and normal reception occurs. However, broadcast signals are heard on 14·200MHz—as though they are operating there—which is not the case! Why is this?

A broadcast station in the 19m broadcast band, operating on 15·110MHz, can also mix the local oscillator on 14·655MHz to produce an i.f. of 455kHz and this will appear to the listener as though these signals are operating in the amateur band! From this example, it can be seen that an image signal originates from a spot twice the i.f. away from a **real signal**—on the same side as the local oscillator is operating, relative to a real signal.

If, in our example, the receiver is now tuned to 15·110MHz the real broadcast signal will be found there at greater strength than on 14·200MHz. Note that the local oscillator is now operating in 15·565MHz and if a strong signal is present on 16·020MHz this, too, may mix with 15·565MHz to produce an image on 15·110MHz!

So, how then can one be sure that a signal is a real signal and not an image? Unless it is actually known which side of the incoming signals the local oscillator is operating, the best method is to search at twice the i.f. frequency above and below the incoming signal, which may be weaker or stronger than the original one. If it is weaker, then the original signal was a real one. Conversely, if it is now stronger, then this is the real one and the original signal was an image. It may be that the i.f. frequency is not known either, in which case, an intelligent guess is needed!

How can these images be eliminated then? In the case of the simple receiver, as the frequency of reception is raised, the tuned circuits associated with the incoming signal become effectively less selective. Some image reduction may be possible by adding tuned r.f. amplifier stages ahead of the receiver—often called a **pre-selector**. More complex superhet designs make use of double (or even triple) frequency conversion systems to overcome these problems.

Double Conversion Receiver

A double conversion receiver is shown in Fig. 1. Instead of converting the incoming signal fc straight away to a low i.f., the signal is instead mixed with a local oscillator operating at possibly many megahertz above fc to produce a high frequency **first i.f.** Since any image signal will be derived from a band twice this high i.f. above fc, it will be attenuated by the circuit tuned to the incoming signal, because of the large frequency difference involved.

The level of the first i.f. may be increased by an amplifier stage, incorporating a filter tuned to the first i.f. to aid selectivity, before entering a **second mixer** stage, where it is mixed with a **second local oscillator** to produce a low frequency **second i.f.** The second i.f. amplifier response may, in some designs, be changed by selecting filters of different bandwidth in relation to the nominal i.f. frequency, to provide **variable selectivity**. Finally, the second i.f. is detected (or demodulated) and the resulting audio is amplified to drive a loudspeaker or headphones.

These are just a few of the features found in complex receivers—no wonder they cost more!

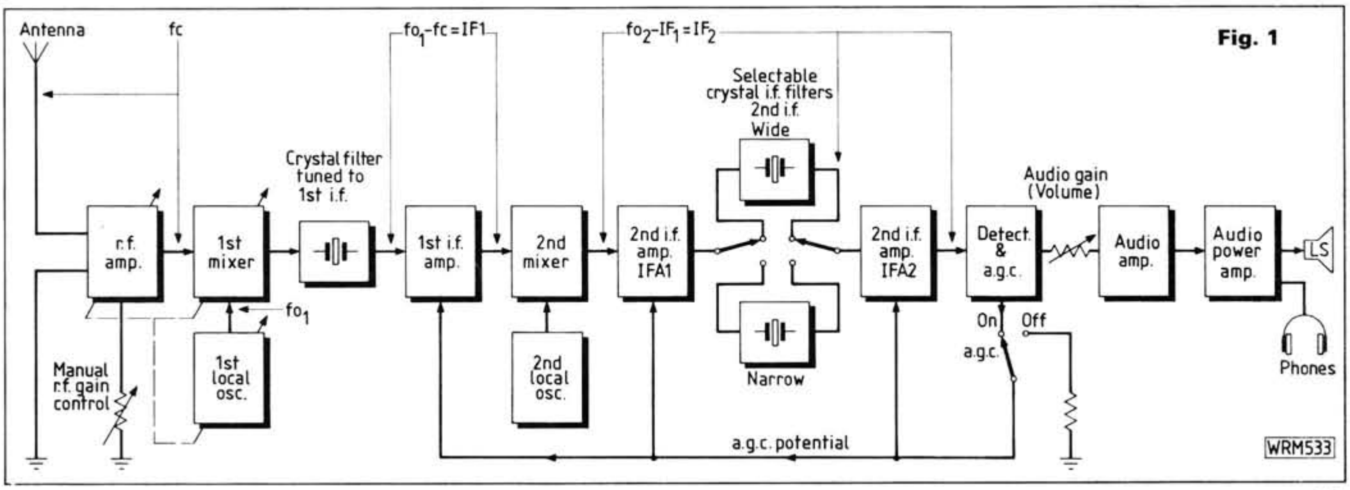


Fig. 1

Sent in by Harry Armstrong

Conditions on the 21 and 25MHz Bands

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

Once again there have been no reports of any signals on the 25MHz (11m) band. Since we are at the bottom of the present solar sunspot cycle, most broadcasters have vacated this band.

The 21MHz (13m) band continues to produce some interesting signals during daylight hours in the UK. Signals from Radio Moscow are very strong in the UK and **Andre Newall** of Twickenham, Middlesex, has been hearing their World Service transmission to Africa and the Middle East on 21·530, from 1400. He also heard their transmission in Russian to Asia, on 21·565. Also noted in his log was Vatican Radio, broadcasting in Portuguese and Spanish to Africa on 21·725 at 1300. While many s.w.l.s may not understand these languages, it might be worthwhile recording them as a guide to language identification—see February '86 *PW*, page 64. The same could apply to Radio Free Europe on 21·745, when they transmit to Europe in Bulgarian at 1400; to UAE Radio Dubai with Arabic and English, on 21·605 between 1000 and 1400, or to Radio Cairo, Egypt, broadcasting in Thai and Indonesian to Asia on 21·465, at 1130! All of these stations were received by Andre on his new Grundig Yachtboy receiver.

Old timer s.w.l. **George Morley** of Redhill, Surrey, has taken a break from m.w. DXing to survey the s.w. scene for a change! On the 21MHz band he found Radio RSA, Johannesburg, beaming to Europe on 21·535 at 0830, with a programme in Afrikaans. Later, at 1032, he heard News in English from UAE Radio Dubai, on 21·605. According to **John Ratcliffe** of Southport, Queensland, Australia, this station has a good signal there, too, at 0530 on 21·700. The BBC transmission of World News on 21·550, from their Masirah Relay station, at 0615, was the only other signal logged by John on 13m.

In Kuala Lumpur, Malaysia, **Ghazalie Abdullah** has also been listening to the UAE Radio Dubai transmission on 21·700 at 0530. He uses a Kenwood R2000 receiver plus a Hy-gain TH6 Yagi antenna! Two other 21MHz band signals were noted in his log—Radio Berlin Int. on 21·540 at 0835 and Radio Nederlands, broadcasting Media Network programme at 1150.

Philip Rambaut of Macclesfield, Cheshire, sent along the only reception report of RAI, Rome. Their 21·690 transmission at 1640, in Somali and Italian, is targeted on Africa.

The 17 and 15MHz Bands

Many interesting signals can be received from several continents on these bands, during daylight. As might be expected, the 17MHz band closes rather earlier than the 15MHz band. Soon after dusk both are unusable in the UK.

Radio Australia, logged by George Morley, can be heard on 17·715 around 0830 when conditions are suitable. UAE Radio Dubai on 17·830 at 1043 and Radio RSA on 17·780 at 1525, were also noted by him. Using a DX150A receiver and a 25m long wire antenna, **Darren Taplin** of Tunbridge Wells, Kent, received Radio HCJB, Quito Ecuador, on 17·790 at 1900—always a popular station—but their 17MHz band signal is often weak or non-existent just now.

At her listening post in Leeds, **Margaret Sadler** has been enjoying the broadcasts at 0830 from Radio Nederlands, via their relay station in Madagascar, on 17·575. These are actually beamed to Asia and the Middle East at this time. Philip Rambaut has also listened to them, but later, via their relay station Bonaire, Neth. Antilles, on 17·605 at 1845. His log also mentions Radio Algeria on 17·745, broadcasting to Africa in French at 1732 and RSI Surinam, on 17·755 at 1746, via Brazilia, Brazil.

An interesting log from **Robert Taylor** of Edinburgh, Scotland, includes RCI Montreal, Canada, on 17·820—their daily seven minutes News programme, in English, can be received at 1538. He also mentions Radio RSA, Johannesburg, on 17·780 at 1545—which is a very poor signal, most days. **Roy Spencer** of Nuneaton, Warks, has been busy with his DX400 receiver and indoor directional antenna, checking the 17MHz band. He noted Radio Pakistan on 17·660 at 1100 and WYFR, Oakland, California, beaming to Europe via their Okeechobee, Florida transmitter on 17·845 at 1645, in his log.

Listening in Selangor, Malaysia, **Mat Jusoh** logged Radio DW, Cologne, via their relay in Cyclops, Malta, on 17·780 at 1245 and RBI, Berlin on 17·875, which beams to Asia at 1345. However, John Ratcliffe says, "Radio Moscow is the only consistent signal to be found 'Down Under' on 17MHz, at 0615".

Long distance signals can be heard on 15MHz (19m) in the early morning. KTWR (TWR) Agana, Guam—rare station for many s.w.l.s—was received by Margaret Sadler at 0822 on 15·115. Another rare DX spot—North Mariana Isles—attracted the attention of **Ted Tew** of Northallerton, Yorkshire, for he found KYOI in Saipan, broadcasting on 15·190 at 0850.

By listening carefully on this band, many interesting stations may be found during the day, too! Radio Pakistan, Islamabad, for example, on 15·605 at 1100; AIR New Delhi, India, on 15·320 at 1130 and Radio RSA Johannesburg on 15·220 at 1300 were logged by George Morley. AFRTS from Greenville, USA, on 15·430 at 1530; Radio Portugal on 15·105 at 1600 and RCI Montreal, Canada, on 15·325 beaming to Europe at 1645 were all noted by Robert Taylor. A number of broadcasters in the USA were mentioned by Philip Rambaut, too, including WINB Red Lion PA on 15·295 at 1800; WRNO New Orleans on 15·420 at 1840 and WHRI South Bend, Indiana, on 15·355 at 1845.

WYFR, Oakland, California, transmits to Europe on 15·566, from 1600 and **Julian Wood** of Buckie, Scotland, who has a Trio R2000 receiver, has been getting good reception of their programmes at this time. Signals from Africa No. 1, Bagon, on 15·475, logged by Fred Tagg of Nottingham and others, have been good and can be heard from 1700. Fred uses an Icom R71 receiver plus 3m vertical whip fixed to a chimney.

The 11, 9, 7 and 6MHz Bands

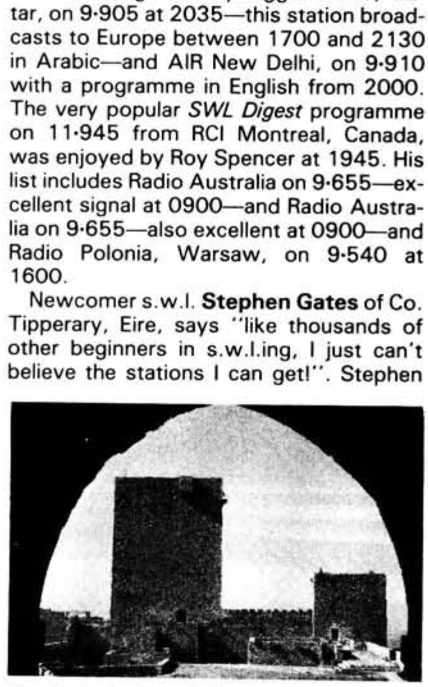
There is plenty to interest the s.w.l. on these bands, since many broadcasters have migrated here on account of the conditions on the higher frequencies! Almost all the stations reported last month are still being heard.

Newcomer s.w.l. **Alan Hollingworth** of Southsea, Hants, used his 20-year-old Rigonda Symphony receiver to check the 11MHz (25m) band. Radio Moscow on 11·705 at 0930; Radio Budapest, Hungary, on 11·910 at 1030; Radio Bucharest, Rumania, on 11·940 at 1045 and the Voice of Greece, Athens, on 11·645 at 1540, all came in well. Moving down to 9MHz (31m), Alan logged SRI Berne Switzerland at 1300 on 9·5354 and Vatican Radio beaming to Europe on 9·645 at 1445. A good signal was received on 7MHz (41m) from Radio Australia, transmitting on 7·205 at 1545. A round-up of Sports News, was received by **Fred Tagg** on 6MHz (49m) from Radio DW, Cologne, on 6·075 at 1635. He enjoyed, too, a talk about early Submarines from the Voice of Turkey, on 9·560 at 2330.

Alan Merritt of Abingdon, Oxford, has been very busy listening to these bands, with his Vega receiver. His extensive log included Vatican Radio on 11·740 at 1610; Voice of Israel, Jerusalem, with a programme about the country's History Museums, on 9·435 at 0200 and Radio RSA, Johannesburg, with *DX Corner*, on 9·585 at 2100. Very good signals were heard by Alan, from Radio Australia on 6·035 at 1510. A DX programme from Radio Sophia on 6·070, was noted on 2130 and new stations for him included Radio Vilnius, Lith. USSR, on 5·905 at 2300; Radio Baghdad, Iraq, on 6·050 at 0300 and Radio HCJB Quito, Ecuador, on 6·230 at 0530.

Darren Taplin has been busy here, too! He received Radio Denmark, on 9·720 at 1058; Voice of Israel, on 9·009 at 2008 and Radio Baghdad on 7·170, which transmits to Europe at 2130. In his check of the bands, George Morley logged Doha, Qatar, on 9·905 at 2035—this station broadcasts to Europe between 1700 and 2130 in Arabic—and AIR New Delhi, on 9·910 with a programme in English from 2000. The very popular *SWL Digest* programme on 11·945 from RCI Montreal, Canada, was enjoyed by Roy Spencer at 1945. His list includes Radio Australia on 9·655—excellent signal at 0900—and Radio Australia on 9·655—also excellent at 0900—and Radio Polonia, Warsaw, on 9·540 at 1600.

Newcomer s.w.l. **Stephen Gates** of Co. Tipperary, Eire, says "like thousands of other beginners in s.w.l.ing, I just can't believe the stations I can get!". Stephen



Radio Exterior de Espana sent in by Mr Stewart

uses a simple cassette radio, which covers 6 to 18MHz and has a built-in whip antenna. A report to Radio Tirana resulted in a QSL, and a New Year card, too!

A QSL card and broadcast schedule has now been received from Radio New Zealand by **Ron Pearce** of Bungay, Suffolk—see April '86 *PW* "On the Air". Apparently, they are still using their two 7·5kW transmitters to broadcast to the Pacific, Australia and Melanesia. Brief details are:

Pacific Service:

1725 to 2005UTC	11·780
1725 to 2005UTC	15·150
2255 to 0045UTC	17·705
0345 to 0630UTC	17·705
0045 to 0355UTC	17·705 Sat only

Australia and Melanesia:

2255 to 0045UTC	15·150
0345 to 0630UTC	15·150
0855 to 1105UTC	11·780
0855 to 1115UTC	9·600
0045 to 0355UTC	15·150 Sat only

Using a Vega receiver, plus 25m wire antenna, **Andrew Hill** of Cheslyn Hay, Staffs, listened to a News broadcast from Radio Afghanistan, via the USSR on 5·900—he noted poor sound quality, although the signal was strong at 1900. Radio Finland, another interesting station, was logged at 0730 on 6·120.

Dave Middlemiss of Eyemouth, Berwick, heard the Voice of Israel offer their Broadcast Schedule to s.w.l.s, during a transmission to Europe on 7·410, at 2030—send for a copy to: Israel Radio, External Services, Jerusalem.

The 5, 4, 3 and 2MHz Bands

Conditions on these bands are good just now and with careful listening, much DX can be heard. An interesting log from **Simon Hamer** of New Radnor, Wales, included, CPBS Beijing China, 3·220; Radio Orion, SABC, 3·250; LBS Liberia 3·255; ABC Brisbane, Australia, 4·920 and SBC Singapore 5·052. **Fred Pallant G3RNM** of Storrington, Sussex, heard Africa No. 1, Gabon, 4·830; SABC Afrikaans Service, 4·880; Chad, 4·904 and Radio Bata, Eq. Guinea, 4·926.

Michael Sargeant of Bolton, Lancs, concentrated on these bands and logged, AIR Delhi, 3·905; BBC via Singapore, 3·915; Radio Alantida, Peru, 4·790; Radio Nac. Manaus, Brazil, 4·845; GBC Ghana, 4·915 and Radio Sutatenza, Columbia, 5·095. Another keen DXer, **Andy Kennedy** of Leicester, noted, Radio RSA, Johannesburg, 3·320; Radio Tachira, Venezuela, 4·830; Radio Reloj, Costa Rica, 4·832; Radio Anhanguera, Brazil, 4·915 and Caracol, Colombia, 4·945 in his log.

Dedicated DXer **Tim Shirley** of Bristol, heard many of the previous stations, also, Mali Bamako, 4·738. Margaret Sadler added ELWA Monrovia, Liberia, 4·760; FRCN Nigeria, 4·770; ORTN Niamey, Niger, 5·020 and R. Diff. TV Togolaise, Togo, 5·047 to her list. In his check here, George Morley found Lanzhou, Ganau, China, 4·865; Ecos Del Torbes, Venezuela, 4·980 and Radio Sutatenza, Bogota, Columbia, 5·095. Philip Rambaut has been busy here, too! His list includes, Radio Doula, Cameroon, 4·795; Radio Burkina, Ouagadougou, 4·815; ORTS Dakar, Senegal, 4·890 and Radio Garoua, Cameroon, 5·010.

Station Addresses

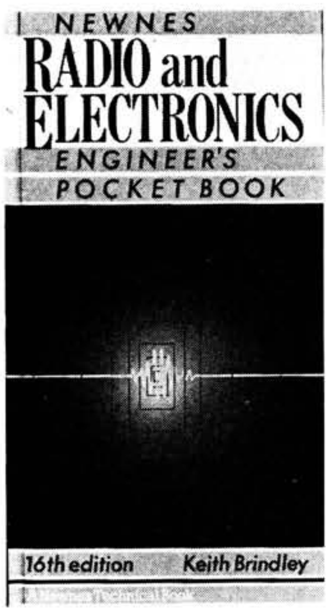
Radio RSA, PO Box 4559, Johannesburg 2000, South Africa.
Radio Australia, GOP Box 4280, Melbourne, Australia.
Radio Nederlands, PO Box 222, 1200 JG Hilversum, Holland.

BOOKSHELF

... available from book stockists

NEWNES RADIO AND ELECTRONIC ENGINEER'S POCKET BOOK by Keith Brindley. Published by Newnes Technical Books
170 pages, 88 × 190mm (hardback). Price £5.50
ISBN 0 408 00720 6

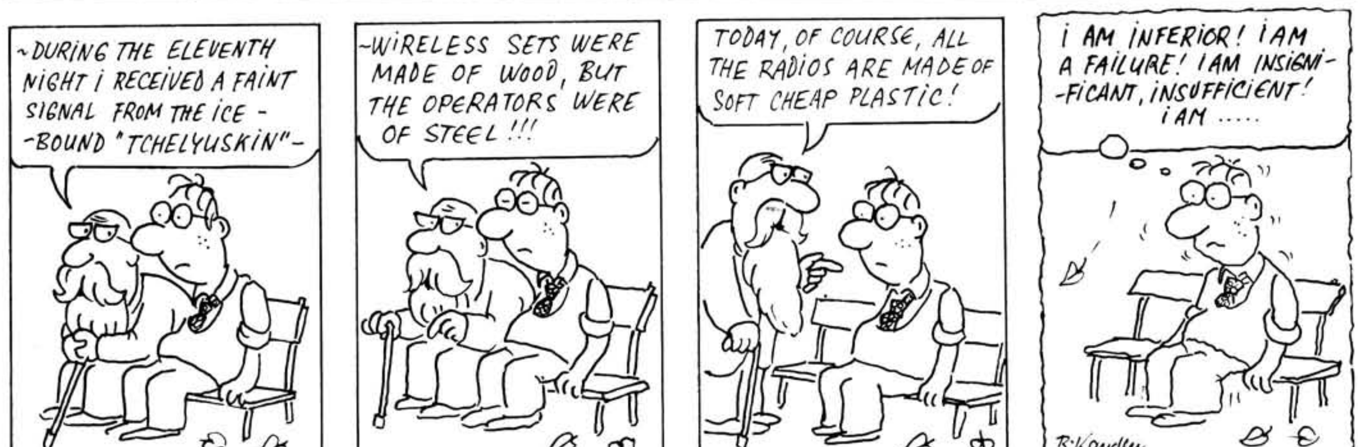
This is the 16th Edition of this useful little publication, replacing its much smaller predecessor, which appeared originally in 1978. During that time the calculator has become commonplace, and so this 1985 edition has dropped many of the old "ready-reckoner" type of tables which used to form the backbone of so many engineer's reference books.



In the material that has been retained, all the text has been reset in a far more readable type-face and the opportunity has been taken to make the size of type and drawings more consistent and appropriate to the particular item. The Contents and Index listings are clear and comprehensive.

The author has added several new tables of units, conversion factors, symbols, etc., of the sort which are increasingly encountered nowadays even in hobbyist books and magazines, making this an essential addition to any radio or electronics enthusiast's bookshelf.

BENNY



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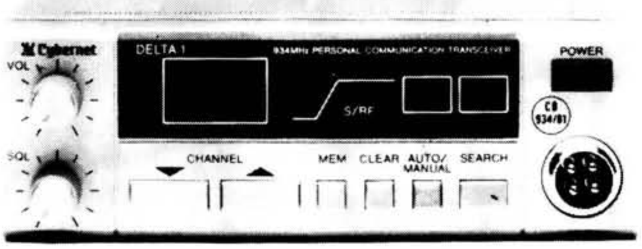

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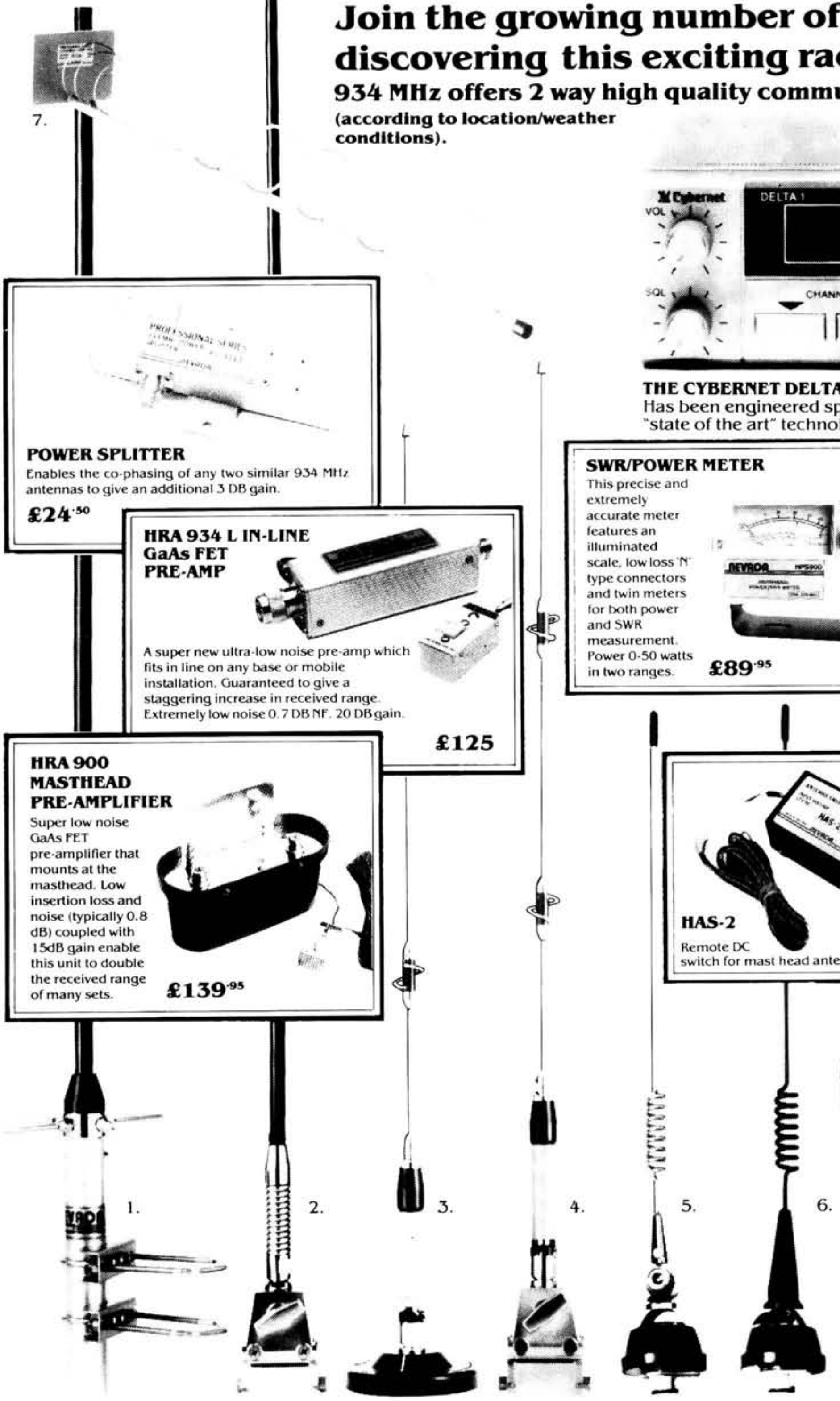

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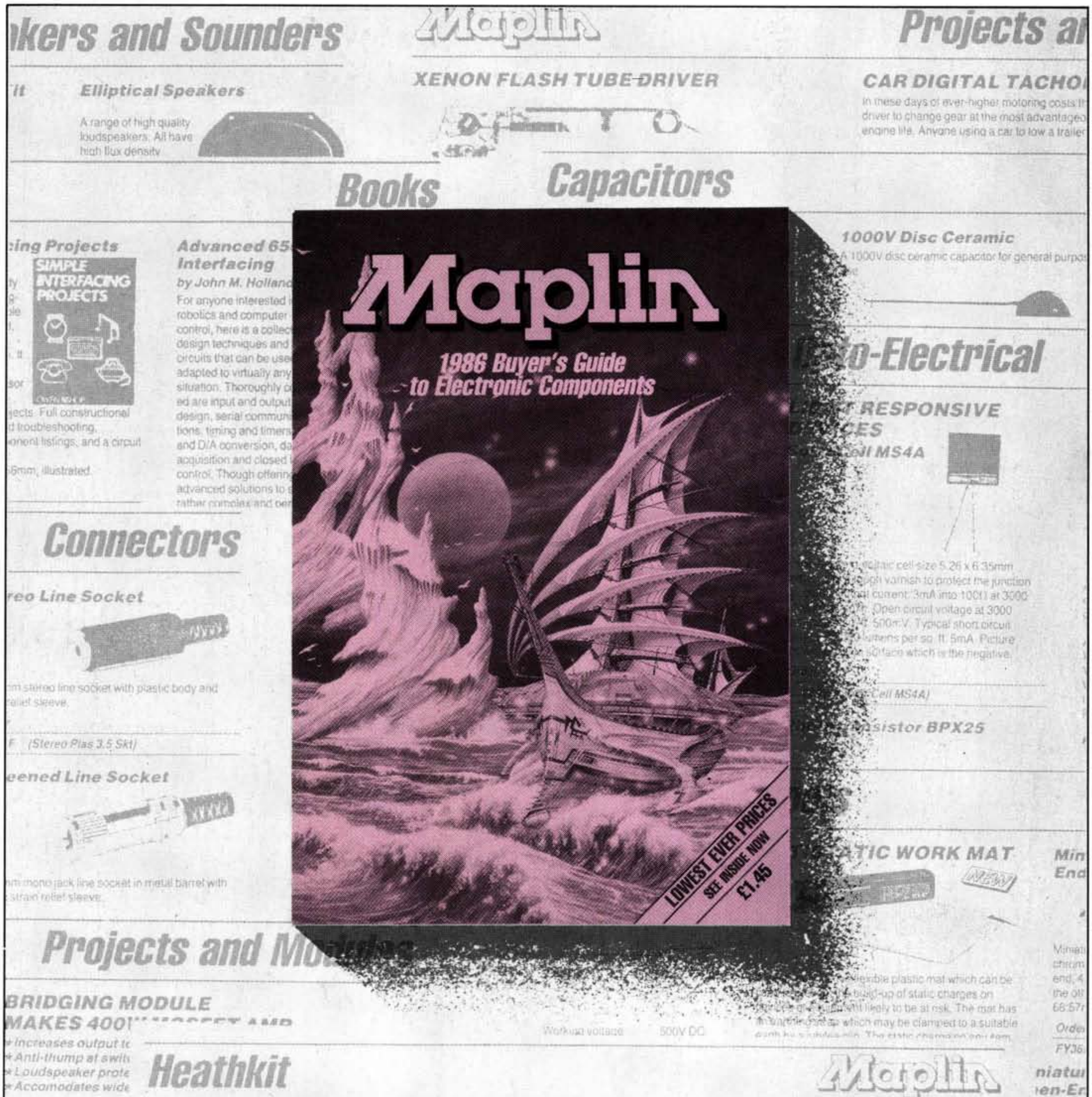

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