JUNE 1986 £1·10

Practical Wireless

The Radio Magazine

RECEIVER SPECIAL

FEATURES INCLUDE

CIRCUITS • MODIFICATIONS
RESTORATION • REVIEWS

PREVIEWED
The JRC NRD-525 Receiver

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

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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	Special Price £399	(—)
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)
TS440HFTX		New £950	(—)
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	36.50	(1.50)
SP122	1.8-60MHz PWR/SWR/PEP	85.00	(1.50)
SP220	1.8-200MHz PWR/SWR/PEP	59.99	(1.50)
SP225	1.8-200MHz PWR/SWR/PEP	109.95	(1.50)
SP420	140-525MHz PWR/SWR/PEP	71.00	(1.50)
SP425	140-525MHz PWR/SWR/PEP	109.95	(1.50)
SP825		165.00	(1.50)

TOYO

T430	144/432 120 W	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	89.00	(2.50)
KP200	Memory 4096 Multi Channel	179.00	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1759.00	(—)
SP980	Speaker	86.09	(2.00)
FT757GX	HF Transceiver	879.00	(—)
FC757	Auto A.T.U.	318.00	(2.00)
FP757HD	Heavy Duty PSU	199.00	(2.00)
FP757GX	Switched Mode PSU	199.00	(2.00)
FT290	2m M/Mode Port/Transceiver	369.00	(—)
FT290	With Mutek front end fitted	399.00	(—)
FT690	6M M/M Portable Transceiver	289.00	(—)
FL2010	Linear Amplifier	79.00	(1.00)
MMB11	Mobile Bracket	33.00	(1.00)
NC11	Charger	10.00	(1.00)
CSC1	Carrying Case	6.50	(1.00)
YHA15	2m Helical	7.50	(1.00)
YHA44D	70cm 1/2wave	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

4 amp	40.50	(2.00)	
6 amp	63.00	(2.5u)	
12 amp	86.50	(3.00)	
24 amp	125.00	(4.00)	

BNOS

6 amp	69.00	(2.50)	
12 amp	115.00	(3.00)	
25 amp	169.00	(4.00)	
40 amp	345.00	(4.00)	

SMC

RU120406	4 amp Power Supply	14.95	(2.35)

Aerial Rotators

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

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	26.50	(1.00)
Welz	2 way 'n' Skts	46.50	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)
Kenpro KP21	N2 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	14.25	(1.00)
CT20N	20W Dummy Load N. Plugs	22.50	(1.00)
CT530	300W Dummy Load	82.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)

TOKYO HI-POWER

HC200	10-80 HF Tuner	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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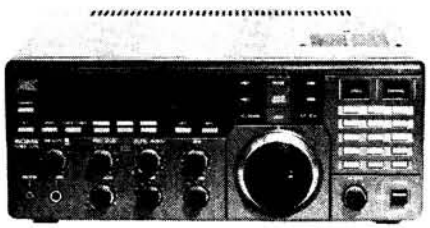
Practical Wireless
The Radio Magazine

JUNE 1986 VOL 62 NO. 6 ISSUE 951



THIS MONTH'S COVER

Our cover shot was taken by Peter Newton Photography of Matlock. Telephone 0629 4401.

We are sorry that, due to pressure on editorial space, the final part of "Weather Watch" has been held over.

Regular Features

NEXT MONTH

HOME CONSTRUCTION SPECIAL—

Getting Started, Kit Building, Simple Projects, etc.

On sale June 5

PLEASE NOTE OUR NEW ADDRESS

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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
swr/power meters.

Two SWR/POWER meters from DAIWA, each having the excellent crossed needle meter system for ease of operation.

First the NS448 with a range from 900 to 1300 MHz. Impedance 50 ohms. Power range forward 5/20 watts, reflected 1.6/6.6 watts. Coaxial cable connections are N type.

NS448

NS448 meter **£75.00**
Carriage £2.50

Frequency range of the new meter is 1.8 to 150 MHz. Impedance 50 ohms. Power range is switchable, 15/150/1500 watts. Meter reading is also switchable, average, normal PEP and hold PEP. SO239 connectors.

NS660P

As well as being able to connect the aerial and transceiver cables directly to the back panel of the NS660P, provision has also been made for the connection of a remote sensor head (U66V) which adds the frequency range 140 to 525 MHz. The advantages of the remote sensor are that it adds UHF capability to the NS660P and can be placed directly in the coax run without the need for additional lossy RF cable. By using the optional extension cable (SC20) the sensor can also be located up to 20 metres away from the meter eg. adjacent to the aerial.

NS660P meter ..... **£100.00** inc. VAT Carriage £2.50

Optional Head (U66V). Frequency range 140 to 525 MHz. Maximum 300 watts. N type connectors.

U66V remote head ..... **£48.00** inc. VAT Carriage £1.50
SC20 extension cable **£25.85**

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.

NRD525 ..... **£1,098** inc. VAT Carriage £7.00

LOWE ELECTRONICS LTD.

Chesterfield Road, Matlock, Derbyshire DE4 5LE
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from TRIO, the **NEW** TS440S, amateur band transceiver 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.	Carriage £7.00
AT440	**£125.00** inc. VAT.	Carriage £7.00
PS50	**£192.60** inc. VAT.	Carriage £7.00

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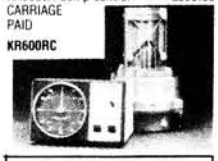

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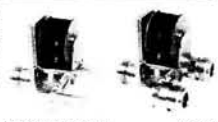

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T3-170L

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ICOM are proud to launch their new flagship. The IC-751 was good, the new ICOM IC-751A is even better. With a general coverage receiver 100KHz – 30MHz it is a full featured all-mode solid state transceiver that covers all the WARC bands. The IC-751A has an excellent 105db dynamic range and features pass band tuning, notch filter, adjustable AGC, noise blanker and RIT. A receiver pre-amp provides additional sensitivity when required. On C.W. the electronic keyer is standard and 40 w.p.m. at full break-in is possible. The FL32 500Hz C.W. filter is fitted as is sidetone on receive mode. On SSB the new FL80 2.4KHz high shape factor filter is fitted.

The high reliability transmitter, full 100% duty cycle designed for SSB, CW, AM, FM, RTTY and Amtor, with a high performance speech processor to enhance the IC-751A transmitters operation. With 32 memory channels and twin V.F.O.'s, scanning of frequencies and memory are possible from the transceiver or from the HM12 mic supplied.
The IC-751A is fully compatible with ICOM auto units such as the AT500 automatic antenna tuner and the IC-2KL linear amplifier. Options available: PS35 internal A.C. P.S.U., PS15 external A.C. P.S.U., EX310 voice synthesizer, SM8 and SM10 desk mics and various filter options.

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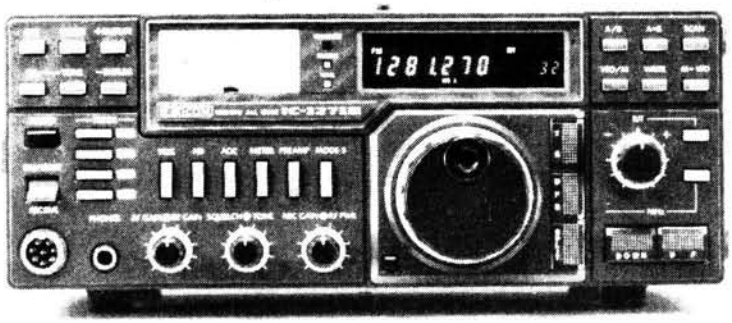
	H = HELP	↔	Frequency Steps
F0	Frequency	↑ V	Up/Down (arrows)
F1	Select Mode	M	Memory Channel
F2	Freq/Memory Scan	, .	Memory Up/Down
F3	Mode Scan	/	VFO/Memory
F4	VFO→ Memory	B	Bargraph Select
F5	Memory Write	@	Occupancy On/Off
F6	Memory Clear	:	Scan Stop Off/On
F7	Set 'SIG' Level	S	Change Set
F8	Memory File Read	DEL	Speech (If fitted)
F9	Memory File Write	Q	Quit

IC-735, The Compact 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 programme 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.

ICOM

IC-1271E, 1·2GHz Multimode Transceiver



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

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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IC-3200E Dual-band

If you are a newly licensed or just undecided about which band to first operate, then the ICOM IC-3200E is just the answer. This is a dual-band (144-146/430-440MHz) F.M. transceiver ideally suited for the mobile operator. The IC-3200E has a built in duplexer and can operate on one antenna for both VHF and UHF, and with 25 watts of output power on both bands (the low power can be adjusted from 1 to 10 watts) you can never be far from a contact whether simplex or 2m/70cm repeater.
The IC-3200E employs a function key for low priority operations to simplify the front panel and a new LCD display which is easy to read in bright sunlight, 10 memory channels will show operating frequencies simplex or duplex, and four scanning systems memory, band, program and priority scan. Try this exciting set from ICOM the IC-3200E, when only the best will do.
Options include IC-PS45 AC power supply, HS15 mobile boom mic, SP10 external speaker, UT23 speech synthesizer and AH32 dual-band mobile antenna.

Telephone us free-of-charge on:

HELPLINE 0800-521145.

Mon-Fri 09.00-13.00 and 1400-17.30

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

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

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

Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
A.R.E. Comms, Earlestown, Merseyside, 09252-29881.
Arrow Electronics Ltd., Chelmsford, Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holdings (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
D.P. Hobbs, Norwich, 0603-615786.
Dressler (UK) Ltd., London (Leyton), 01-558 0854.
D.W. Electronics, Widnes, Cheshire, 051-420 2559.
Eastern Communications, Norwich, 0603 667189.
Hobbytronics, Knutsford, Cheshire, 0565-4040. Until 10pm daily.
Poole Logic, Poole, Dorset, 0202 683093.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
Radio Shack Ltd., London NW6, 01-624 7174.
R.A.S. Nottingham, 0602-280267.
Ray Withers Comms, Warley, West Midlands, 021-421 8201.
Scotcomms, Edinburgh, 031-657 2430.
South Midlands Comms. & branches, 0703 867333.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-42043.
Reg Ward & Co. Ltd., S.W. England, 0297-34918.
Waters & Stanton Electronics, Hockley, Essex, 0702-206835.

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Enjoy the pleasures of "home brew" equipment with a project from C. M. Howes COMMUNICATIONS. All our kits have clear instructions, a fibre-glass circuit board that has the parts locations screen printed on it for easy, accurate assembly, plus all board mounted components. Whether you are an experienced operator planning to build a transverter or QRP transceiver, or a newcomer looking for a first receiver, we have interesting designs to suit. With our kits, you don't have to be an "old hand" at construction to enjoy the satisfaction of using home built equipment. Choose a worthwhile project for those rainy summer weekends!

MTX20 20M CW TRANSMITTER

We are pleased to announce the introduction of the new MXT20 CW transmitter for the 20M band. This equipment can be considered to be the "big brother" to our very popular CTX40 and CTX80 QRP kits. Like the CTX transmitters, the output power is adjustable, all the heatsinking is onboard, and one crystal is included. The maximum output power of the MTX20 is rather greater at about 10W, but you can still turn it down to about 2W to take part in the G-QRP Clubs activities.

- ★ RF output adjustable from around 2 to 10W at 13.8V DC.
- ★ Output transistor will survive the unplugged antenna!
- ★ One crystal provided – room for two more on the PCB.
- ★ Provision to VXO the crystal by adding a tuning capacitor.
- ★ All heatsinking mounted onboard.
- ★ Full key shaping and output filtering.
- ★ Provision for adding an external VFO.
- ★ Easy to build and align.

You can use the MTX20 with your general coverage receiver, or you can use it in conjunction with our DcRx20 for a simple, but very effective station. Great for holiday and portable use!
MTX20 Kit: £19.95 **Assembled PCB Module: £26.95**

HC220 and HC280 TRANSVERTERS – use your 2M rig on 20 and 80M!

The HOWES HC220 and HC280 offer an excellent alternative to an HF transceiver. At the present point in the sun spot cycle, is there any sense in spending a small fortune on a 9 band HF rig? The two most active HF bands can be worked using your existing 2M SSB/CW rig and our transverters – and at a considerable saving in cost too.
Both the HC220 and HC280 offer a good 10W RF output from missmatch proof transistors. The 2M drive level required is adjustable between .5 and 5W, but it can be easily modified to accept 10W or so. If you are competent with a soldering iron, you should be able to build a HOWES transverter. The full, clear documentation and the component locations printed on the double sided, solder masked PCB, make construction a pleasure. Work the world with an FT290!
HC220 2M in, 20M out transverter Kit: £48.90 **Assembled PCB: £79.90**
HC220 2M in, 80M out transverter Kit: £48.90 **Assembled PCB: £79.90**

HOWES TRF3 SHORTWAVE BROADCAST RECEIVER

This super little receiver has been designed to bring the pleasures of a home built receiver within the reach of the newcomer, as well as the experienced constructor. Simple and easy to build, the HOWES TRF3 uses the time honoured TRF principle – but in this case, it is implimented with modern, silicon technology. Frequency coverage is 5.7 to 12.8MHz in three bands with a 50pF tuning capacitor (available at £1.50). This can be easily adapted and extended if you wish to experiment.

- ★ Up to 2W audio output for 'speaker or 'phones.
- ★ Can operate with large or small antennas due to switchable input impedance and attenuator.
- ★ Operates from 9 to 14V DC at approx. 15mA quiescent.
- ★ Band and input selector switches included.
- ★ Seven pages of clear, informative documentation.

This kit is not only fun to build and use, it is also educational. The documentation does not simply help you build it, it also helps explain how it works. Use of the receiver can be educational too! Compare the news and political output of the various countries for yourself! The HOWES TRF3 makes a facinating project.
HOWES TRF3 Kit: £13.90 **Assembled PCB Module: £18.90**

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER

This simple, but very effective, single band receiver is available for 20, 30, 40, 80 & 160M. Up to 1W audio output, stable FET VFO, and amazingly good performance for a simple set. A case and a couple of tuning capacitors are the only major parts to add to finish your receiver. Suitable tuning capacitors for all but the 160M version are £1.50 each.
DcRx Kit: £14.80 (please state band required) **Assembled PCB Module: £19.90**

SOME OTHER HOWES PRODUCTS	KIT	ASSEMBLED PCB
CTX40(40M) or **CTX80**(80M) QRP CW TX	£12.95	£18.95
CVF40 or **CVF80** VFOs for CTX	£9.30	£14.90
ST2 Side-tone/Practice oscillator	£7.30	£10.80
AP3 Automatic Speech Processor	£15.90	£21.40
CM2 Quality Mic with "VOGAD"	£10.25	£13.75
XM1 Crystal Calibrator with 8 o/p.	£16.80	£21.30
PA2/15 10dB 15W Linear Amplifier	£18.90	£23.90
PA2/30 8dB 30W Linear Amplifier	£22.90	£27.90
CO1 TX/RX switching for linears	£9.80	£13.80

COMING SOON! A new QRP ATU kit – send for details!
If you would like more information on an item mentioned above, or any of our other products, simply drop us a line, enclosing an SAE. We have an information sheet for each kit, plus a general catalogue.

Please add 80p P&P to total, except airmail outside Europe – £2.00 per kit.
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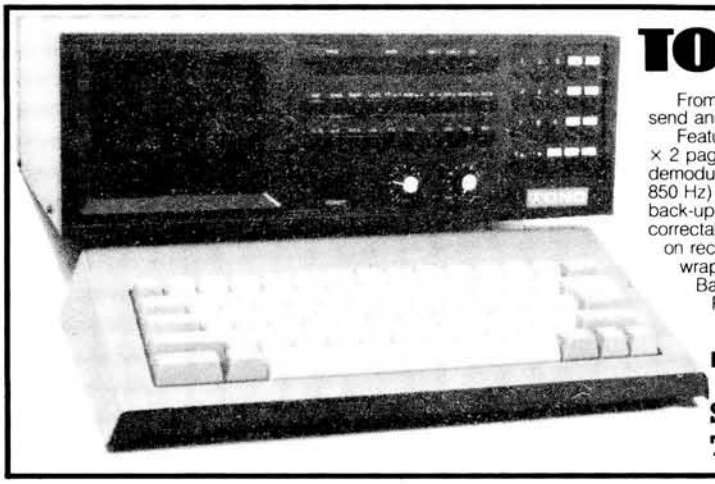

TONO FOR RTTY. 5000E

From the famous TONO stable comes the new THETA – 5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASCII.
Features include: 5" high resolution monitor displaying 400chr. × 16 lines × 2 pages, ARQ/FEC, time clock, Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTL level); 3 shifts (170, 425 and 850 Hz) and two tones (2125 and 1275 Hz); manual or automatic Tx/Rx; Battery back-up memory (72 chars × 7 channels and 24 chars × 5 channels); type ahead correctable buffer memory; Morse code 5–100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A, B and L – the list goes on and on . . .
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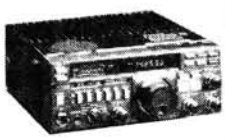

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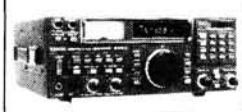
ICOM R71



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50MHz to 1300MHz
Gain 17dB Typical

TECHNICAL SPECIFICATIONS FOR ARA 500

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

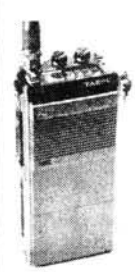
£110.00

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

TRIO KENWOOD TH-21/TH-41

YAESU FT209/709

YAESU FT203/703



ICOM IC2E/IC02E

ICOM IC4E/IC04E

LINEARS

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

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

RECEIVE PRE-AMPS

MODEL	FREQUENCY	NOISE	GAIN	PRICE
EWPA 560	50-600-1GHz		16.5dB-1dB	£69
IP3 order	+18dBM			
ERPA 1296	1.25-1.30	0.8	17-18dB	£77
ERPA 435	430-440	0.5	15-18dB	£69
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Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glass fibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £110. See Review in August Issue p.15

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★ 20 memories ★ 12v DC operation **£399**

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Other versions to customer specification.

PRE-AMPLIFIERS ★ REVCO PA2 in-line Masthead pre-amp, gain approx 18dB over the range 20-700MHz, with useful gain from 10-1,000MHz. Includes mains psu: **£49.95**

★ **MUTEK BBBA500u** pre-amp 20-500MHz, 9dB gain with low noise factor (3dB max) for use at Rx input, requires 12vDC **£35.50**

DC/DC TRANSISTORISED INVERTERS 12V input, 400V 200mA rectified and fully smoothed output **£9.50**
This unit is a chassis section cut from used R/T equipment, tidied, fully wired & tested. Free-standing but no luxuries like cabinet. 24v version – same price. SAE for details.

We have in stock a very large range of spare parts for PYE RADIOTELEPHONES. Models include Olympic, Westminster, Whitehall, Europa, Mascots and PF70 Series. Parts also available for Cambridge, Vanguard
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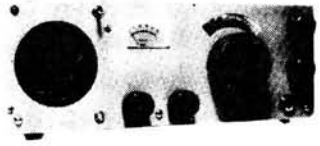
GENERAL COVERAGE RECEIVER KIT FCR 130

Model FCR 130 Receiver kit



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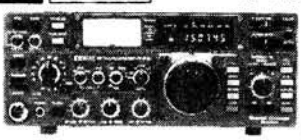

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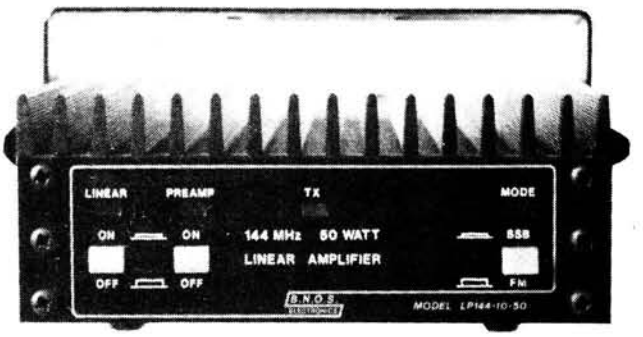

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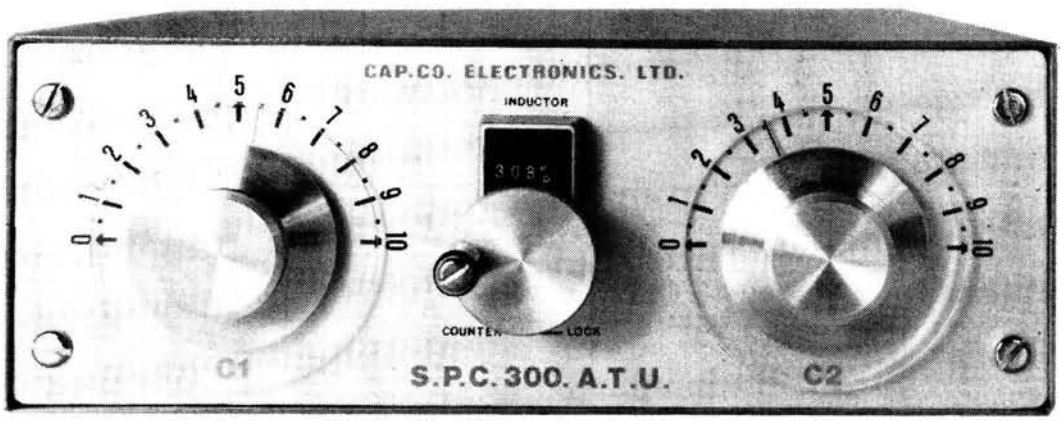

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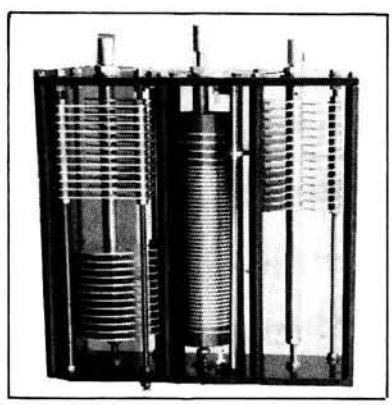

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WRITE ON ... *the page where you have your say*

Wartime Co-operation

Sir: The exchange, in wartime, of aircraft search and rescue information as mentioned by Douglas Byrne in April *PW,* did take place but did not involve direct communication with enemy stations. It was carried out by the maritime coast radio station of the then GPO (now BTI) and in Germany by Norddeich Radio DAN and Elbe-Weser Radio DAC.

It came about after Dunkirk in the period when shipping activity in the North Sea was very restricted and kept under Naval control, so that there was not so much call for the normal coast station services. However the stations continued, of course, to maintain a strict safety watch of 500kHz, the international distress frequency, and since all the survival radio equipment used in rubber dinghies was also on 500kHz the watch for distress calls from downed aircrew adrift in rubber dinghies was their responsibility. Probably the most active in this were Northforeland Radio GNF, Humber Radio GKZ and Cullercoats Radio GCC.

Whenever dinghy signals were heard, the coast stations took direction finder bearings and reported them to the RAF sea rescue HQ, who were responsible for any possible rescue operation. Very early on in this period, cases arose where the RAF had to say that the position indicated was out of their reach. In fact the Marconi Adcock d.f. systems of the GPO were very accurate and gave good results. Following suggestions from the civilian staff, when bearings indicated that the dinghy was out of reach from the UK, one coast station would call its neighbour on 500kHz in plain language and they would exchange the bearings obtained, knowing full well that the German stations would intercept the signals and that lives would be saved. Being taken prisoner of war was preferable to the alternative of being left to drift with little or no hope of rescue. The Germans rapidly followed suit.

Another aspect of the co-operation arose when aircraft were able to report to base that they were in trouble and likely to crash. If the position given showed that they would be out of reach of their own rescue services, the coast stations would be asked to broadcast the details in plain language on 500kHz. For example, Norddeich Radio might be heard broadcasting a distress message about an aircraft down in the seas off the UK east coast. The UK stations would copy this and if, say, the position given was off Yorkshire or Lincolnshire, GNF would call GKZ on the same frequency and ask in plain language "Did you hear that broadcast from DAN?" GKZ would reply "Yes received OK" and the Germans would know that if at all possible their men would be picked up. Similarly if GCC made a broadcast about an aircraft down near the coast of the Netherlands, DAN would be heard asking DAC a similar question. The exchange would be reported by GCC to RAF Rescue Group, who would know that if at all possible their men would be picked up.

I only know of one occasion when there was direct contact between a UK coast station and one in occupied France. That occurred when a coast station using the callsign FFU was heard calling Northforeland Radio. The GNF operator in something of a dilemma sat tight and waited to see what developed. FFU continued to call and GNF ventured a cautious "K" without using callsigns, but this didn't satisfy FFU who continued to call. After some minutes the GNF operator, knowing that FFU had only ever been used for air/sea rescue, acknowledged the call and gave "K". FFU then sent a long message in German plain language in which the name of Douglas Bader appeared. This was acknowledged very formally and the message passed to the RAF. A few minutes later RAF came through on the telephone in great excitement and said that Bader had failed to return

PW COMMENT

Restrictions

IF YOU WANT TO START AN ARGUMENT with the average radio amateur, just mention the idea of imposing special restrictions on the enjoyment of his or her hard-won transmitting licence. In our *News* pages this month, you will find an extract from *Hansard* regarding radio interference being suffered by residents of a Close in Pinner, Middlesex. The statement from the DTI says that operating power and frequency limitations may be imposed on the amateur concerned, if problems still exist when the apparatus affected by interference has been brought up to a reasonable level of immunity. Even the possibility of the licence being withdrawn is mentioned.

Enjoyment of rights by an individual cuts two ways. Most of you will have suffered at some time or another from neighbours with "bonfire mania" or a liking for all-night parties; with an all-consuming interest in tinkering with motor-bike/car engines, or with totally undisciplined children or pets, etc. We must all learn to give and take in our relationships with our fellow man, unless we choose to live buried deep in the country, or on an otherwise uninhabited island.

What does worry me about this particular news item is that, whereas previously a radio transmitter operator had a legal obligation to avoid interference only to other radio services, this obligation is now to be extended to any "radio sensitive" equipment. With just about every modern domestic appliance incorporating a microprocessor or at least some solid-state electronic circuitry, **any** use of an amateur transmitter in a built-up area could soon be threatened.

How is that "reasonable level of immunity" to be established? It is many years now since I had dealings with the first electronic lift controls to be fitted on a British passenger ship, which could be operated either with the control gear cabinet doors closed, in which case the circuitry failed due to overheating, or with the doors open, in which case the r.f. from the ship's transmitters upset the operation of the lifts. During those years, it seems that too few radio and electronic equipment manufacturers have learned the lessons of designing products which will operate satisfactorily in the sort of environment in which they will be used. Even the recently produced British Standard BS905:1985 on r.f. interference immunity of domestic radio/TV and hi-fi suffers from being aimed almost totally at the the effects of 27MHz CB transmissions. We understand from experts in the field that an equipment can comfortably meet the requirements of the Standard yet still be wide open to interferences from a 144MHz amateur transmitter, for example. Surely when the Standard was being drawn up, someone on the committee concerned asked the question: "What sort of radio transmitters are likely to be operating close to the equipment we're talking about?"

I hope that the DTI will not simply take the easy way out, and limit or close down the amateur's operation when interference proves difficult to cure, rather than leaning on the big battalions of industry, making them spend what would often be only a few pence per item sold, to give it adequate r.f. immunity. After all, with more and more radio services being introduced all the time, eventually the radio and electronic equipment manufacturers will simply **have** to get their products right—they can't go on shutting down every transmitter in every service that gives them trouble!

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.

from a fighter sweep over Northern France that morning and that the message said he was a prisoner and safe but had smashed up his artificial legs and wanted his spare pair. The following day RAF requested GNF to send back a message giving the position in France where the legs had been dropped during the night on a parachute. Some hours later another message was received from FFU saying that the legs had been found.

The sequel came a fortnight later when the GNF operator was called on to justify his actions in communicating with the enemy in time of war. Fortunately his explanation was accepted and he is still alive to pen this tale.

Wilfred Dunell G3BYW
Cambridge

Know the Feeling

Sir: After 30 years of tenancy, I recently moved my shack to a more comfortable room within the house. In doing so, I unearthed a host of long-lost treasures, amongst them a stack of *PW*s of the 1950s vintage. Reading through them, an article describing the construction of a Top-band transmitter caught my eye—but after a few minutes I found myself saying "What a load of codswallop; whoever wrote that?"

Somewhat chastened, I noted the author's name written below: "H. N. Kirk, Rotherham"—my own! Well, you're supposed to live and learn, aren't you?

H. N. Kirk G3JDK
Rotherham

SUBSCRIPTION SERVICE

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

OUR SERVICES

QUERIES

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

Components 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.

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CONSTRUCTION RATING

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

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

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

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

INSURANCE

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

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas (by surface mail).

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

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

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

In Parliament

Mr Wilkinson asked the Secretary of State for Trade and Industry what steps are being taken to deal with interference from amateur radio transmission suffered by the residents of Tudor Close, Eastcote, near Pinner, Middlesex; and if he will make a statement.

In his written answers to questions, Mr Butcher replied: Problems can arise when high power radio transmissions are made in close proximity to radio and television sets, or indeed a range of electrical apparatus not designed to receive radio. Such problems can be exacerbated by equipment which is deficient in its ability to reject unwanted signals or in the case of radios and televisions which have an inadequate or defective aerial or no aerial at all. The problem is growing because more and more homes now contain a great range of electric equipment; and high power transmitting equipment is now more widely available to the growing number of amateur radio licensees.

Radio amateurs generally take a responsible attitude to the problems their transmissions cause. Equally, manufacturers are keen to produce equipment which has adequate immunity. Regrettably, a few amateurs and manufacturers do not have such a responsible attitude; it is they who cause problems.

My officials are currently discussing with the British Radio and Electronic Equipment Manufacturers' Association and the Radio Society of Great Britain the implications for them of the new standard for television immunity currently under discussion internationally and procedures for dealing with individual cases where interference is caused. I would like to see sensible immunity standards observed by all manufacturers and importers of radio receiving and radio sensitive equipment. Where possible and appropriate, these will be enforced by order. Similarly, manufacturers and importers of radio and non-radio equipment should seek to ensure that their products do not cause interference to radio users. Orders do exist for some types of equipment, and where appropriate others will be made.

Where it proves impossible to resolve individual problems and the affected apparatus has been brought up to a reasonable level of immunity, I intend to vary the terms under which the relevant amateurs are licensed; where necessary (and I hope it will not be necessary often) licences will be revoked. (Our italics.)

In the particular case referred to by my hon. Friend, I will vary the powers which the amateur is licensed to use and restrict his use of certain bands. If this does not resolve the problem, I shall further review the position.

Satellite TV

Satellite TV Antenna Systems Ltd have received an order from Thorn-EMI Ferguson to supply complete satellite TV systems.

Peter Gray, Satvrn's Managing Director, says, "This spring, major High Street retailers will be stocking dish antennas and the necessary electronics. This is the breakthrough that our industry has been working towards and it follows the Government's de-regulation announcement of last May. We have been working on this project with Thorn-EMI Ferguson for some months and this order will enable us to consolidate our position and to compete effectively at home and in Europe. I am sure there will be a vast market for this new British consumer electronic product."

So keep a look-out in the shops, you never know what bargains you might find!

Frequency Changes

Two BBC Radio stations have changed their v.h.f. f.m. frequencies. These are BBC Radio Humberside and BBC Radio Sheffield.

Radio Humberside: It's the High Hunsley v.h.f. f.m. transmitter that has changed it's frequency to 95·9MHz. The medium wave transmitter from the Paull transmitter site will stay the same.

Radio Sheffield: The frequency of the Holme Moss v.h.f. transmitter has been changed to 104·1MHz, but the Crosspool transmitter will remain unchanged on 88·6MHz—as will the medium wave broadcasts.

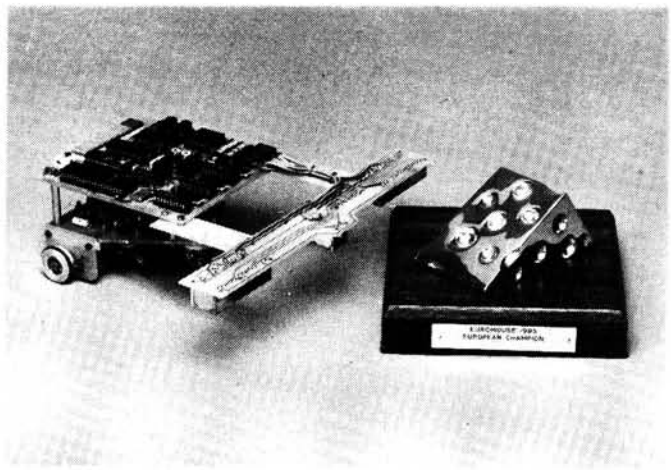
This information should be useful not only to those local listeners in the service areas of the transmitters, but those readers who spend many hours listening for local radio DX on both the medium wave band and the v.h.f. band. The various authors of "On the Air" are always pleased to receive reports from readers.

British Mouse is Best!

One press release to fall onto my desk this month reads, "The most intelligent mouse in Europe is British—official."

Well, with an opening like that you have to read on. It turns out they are talking about the performance of miniature robots. Each mouse had to show its intelligence by finding "a piece of cheese" in the centre of a maze. The quickest being the winner.

The winning mouse, designed by David Woodfield, dominated the competition with a first run in the unknown maze of 1 minute 6 seconds. The final run, when it knew the way took only 27 seconds.



In a similar competition at Expo '85 in Japan it found the centre of the maze in 1 minute 4 seconds—the Japanese mouse took 10 minutes to find the centre.

David Woodfield is the Chief Engineer for Intelligent Software, a company who specialise in the design of advanced electronic products and computer software.

New VHF FM Stations

Listeners in the Orkney Islands and along the most northerly coast of Scotland should have found their reception of BBC Radio Scotland and the BBC Network broadcasts greatly improved. The BBC have a new v.h.f. f.m. station at Keelyland Hill, a site already used as a TV site. It is much higher than the previously used site and a new transmitter and antenna system has been installed to replace the old equipment.

Hopefully, the new antenna system will give listeners using car and portable radios a much better service. The frequencies of the new transmitter are the same as before, so no re-tuning is needed. Listeners may find that they need to move fixed antennas slightly for optimum signals as the old and new sites are not quite in the same direction.

The frequencies in use are:

Radio Scotland	—93·7MHz
Radio 1/2	—89·3MHz
Radio 3	—91·5MHz.

In some parts of Orkney and the northern parts of Scotland there is an alternative service which may be useful. That is the Rumster Forest v.h.f. site. The frequencies in use here are:

Radio Scotland	—94·5MHz
Radio 1/2	—90·1MHz
Radio 3	—92·3MHz.

SWAX25

If that name means nothing to you, it's not surprising really. This group was only formed in January of this year. It stands for The South West AX25 Group, and was formed to promote packet radio and AX25 protocol. They will support the installation of amateur packet switching stations to assist the spread of an AX25 data network.

There were representatives of four repeater groups: GB3BS, GB3EX,GB3SD and GB3SH, present at the meeting as well as Devon RAYNET groups.

So, anyone wanting more details should contact ***Edward G3VPF, Brian G8IMB or Geoff G8BCH***—all QTHR.

Golden Jubilee

Wirral ARS Golden Jubilee Dinner and Dance will be held at Heswall, Wirral, on Saturday May 10. The time set is 7pm for 7.30pm. All details and tickets from ***Basil O'Brien G2AMV,*** QTHR.

A Golden Jubilee is no mean feat and *Practical Wireless* add their congratulations to the others being heaped on the club.

1936 ▲ 1986 ▼

New TV Relays

Two new TV relay stations are being built jointly by the BBC and IBA in Wales. They will bring good reception to around 450 people in all. One is for the people in and around Talley and Dyfed and the other for people in parts of Llansawel.

Talley: This new relay has been built about 10km north of Llandeilo, and by the time you read this it should be operational. The channels in use are:

Ch. 39—BBC1 Wales
Ch. 42—Sianel 4 Cymru
Ch. 45—BBC2
Ch. 49—ITV–HTV Wales.

Those sets equipped for teletext will be able to receive Ceefax on Ch. 39 and 45 and Oracle on Ch. 42 and 49.

Viewers in this area will need Group B antennas, vertically polarised mounted outside, the BBC and IBA don't recommend set-top antennas at all.

Llansawel: This relay should also be operational by now and is situated 15km north of Llandeilo. The channels in use here are:

Ch. 22—BBC1 Wales
Ch. 25—Sianel 4 Cymru
Ch. 28—BBC2
Ch. 32—ITV–HTV Wales.

Again, those viewers with teletext will be able to receive the various services on their respective channels.

This relay requires Group A antennas, again vertically polarised and mounted outside. Once more, set-top antennas are not recommended.

Special Event Stations

GB4LF: The 5th Annual Llantrisant Festival will take place on May 4 and 5. If your *PW* arrives on time you should just get the chance to work this station. The group running the station are hoping to show the public Amateur Radio in action.

They will be running s.s.b. and c.w. on the h.f. bands of 3·5MHz and 14MHz as well as 144MHz, from 10am until 6pm on both days. Special QSL cards are available and s.w.l. reports are also most welcome.

Further details are available from: ***Guy W. L. Morgan GW3POM, 8 Coed yr Esgob, Llantrisant, Mid Glamorgan CF7 8EL.***

GB2WEC: The Bournemouth and District RAIBC Group are running a special event station from the Wedgewood Electrical Collection in the Old Power Station, Bargates, Christchurch. The building will be open to the public on May 17/18 between 1000–1700.

They will be operating on all 5 main h.f. bands and 144MHz f.m., so talk-in is available for visitors.

This is the 5th year of running the station and QSL cards can be exchanged either through the Bureau or G6DUN QTHR.

GB2RGS: The Royal Grammar School in High Wycombe is holding its bi-annual Show day in the grounds of the school on May 27. The station will be on the 144, 14 and 3·5MHz bands from 1300–1730. All QSOs will receive a QSL card through the Bureau. They also have a range of special cards that will be issued for:

1. The six most distant stations worked.
2. The six stations worked closest to 1500.
3. Old boys of the school.

The station is being run by members of the Chiltern Amateur Radio Society.

There are many other attractions planned for the day, so it sounds like another good family day out.

GB4LAD: This special event station will be in operation during the annual fête of the Luton and Dunstable Hospital on June 7. The station is being run by two clubs, the Dunstable Portable ARG and the Dunstable Downs RC.

The station is being privately sponsored for the number of contacts, so would obviously like everyone to try to work the station. They will be "on-air" from 0800–1800GMT on the following bands: 3·5MHz, 14MHz and 144MHz s.s.b.

For further details contact: ***Tony G0COQ. Tel: (0582) 508259.***

Rally Calendar

Swindon & District ARC will be holding their amateur radio rally on **Sunday May 11**. It will be at Oakfield School, Marlowe Avenue, Swindon, between 10am and 5pm. Admission is 50p.

It really is a rally for the family. They have a bouncing castle, mini motorcycles, cartoon films and plenty of hobby displays to keep the non-radio elements of the family well pleased.

For the radio amateur they have the usual trade stands, RSGB books, BARTG and repeater groups as well as the ever famous Bring and Buy.

July 20: McMichael Mobile Rally. A three club line-up are staging this rally, the Chiltern ARS, Burnham Beeches ARS and Maidenhead & District ARC. It's the fifth annual mobile rally at the Haymill Centre, Burnham, near Slough.

There will be national and local traders, a "flea-market," an amateur TV station, and amateur h.f. station, radio controlled models, mini fairground, refreshments, even a CAMRA beer tent! So a day out for all the family at this popular rally could be on the cards.

For more details contact: ***R. M. Hearn G0BTY, 70 Herbert Road, High Wycombe, Bucks HP13 7HN.***

August 24: The 1986 BARTG Rally. It is being held at Sandown Park Racecourse on August Bank Holiday Sunday.

There will be ample free car parking, easy access by car, bus stops by the gate, refreshments, car boot sale, trade stands, talk-in (S22) and the gates will be open from 11.30am until 5pm.

For those unsure of the location, Sandown Park is located on Portsmouth Road, Esher, on the A307 just south of Kingston upon Thames.

Further details from: ***Peter Nicol G8VXY, BARTG Rally Manager, 38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB. Tel: 021-453 2676.***

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

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

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

St George Up-date

If you are thinking of applying for this award, don't forget you only have to contact either GB4SGD or GB0SGD on h.f. plus the required number of English stations depending on your world location.

The Wisbech & District Amateur Radio & Electronics Club also say that they would be very pleased to have any v.h.f. QSO outside of Europe!!

Details were given on page 17 in the April issue of *PW*.

New from Trio

Lowe Electronics have sent me brief details of some new pieces of gear of interest to readers.

The Trio TS-440S h.f. transceiver with general coverage receiver fitted, is intended for 13.8V d.c. operation and has all modes, including f.m., fitted as standard.

Input power is 250W on all modes except a.m. when it is 110W and when used with the optional PS50 power supply unit full output can be used continuously for up to one hour at a time.

A brief run-down of the features incorporated into the new rig shows that it has all-mode squelch; auto bandwidth selection; two v.f.o.s; 100 memory channels; frequency search key-pad frequency entry; r.i.t. and x.i.t.; speech processor and a notch filter and i.f. shift. A computer interface is available as an optional extra.

Price of the TS-440S is £950 incl. VAT while the PS50 p.s.u. will cost you £192.60. The optional AT440 internally fitted auto a.t.u. for 3.5 to 29MHz will set you back another £125 incl. VAT.

Also from Trio comes the TM-2550E 144MHz mobile rig with 45W r.f. output, 23 memory channels and both memory and frequency scan.

The rig automatically selects simplex or repeater shift according to the Band Plan and can optionally be fitted with digital channel link (d.c.l.). This system, which is compatible with the d.c.s. system enables your rig to automatically QSY to an open channel. The d.c.l. system searches for an open channel, remembers it, returns to the original frequency and transmits control information to the other d.c.l. equipped station that switches *both* rigs to the clear channel.

The TM-2550E will cost £399 incl. VAT, with the MU1 (DCL) adding a further £26.78.

For further details contact ***Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE. Tel: (0629) 2817.***

The Handigrip

This device takes the frustration out of holding small screws, pins and nails in position before applying the screwdriver. It could be of great benefit to readers who find difficulty in coping with assembling the multitude of small screws that hold modern radio gear together.

The Handigrip is a small plastics handle which holds the screw in its patented jaw. It is available in three sizes to suit a wide range of screws and each size is colour coded for ease of identification. Blue suits small screws, panel pins and tacks, red is for normal screws and nails, while green copes with monsters.

To use the Handigrip the extreme tip of the screw is placed in the circular gripper until it is held by the specially designed fingers. The screw can now be driven home without fear of it falling over or slipping around.

Available in packs of six (two of each size) the Handigrip costs 69p from d.i.y. and garage shops, and is made by ***Display Tiling Services Ltd., Unit 24, Enterprise Trading Estate, Pedmore Road, Brierley Hill, West Midlands DY5 1TX. Tel: (0384) 263123.***

The Workdek

If you are into building or repairing your own equipment then, unless you have a purpose-built workshop, you probably find that the XYL objects to the dining room table being used for the purpose.

The Workdek is a purpose designed workplace unit specifically aimed at miniature and model engineers, jewellers and watchmakers, radio and electronics enthusiasts as well as many professional areas.

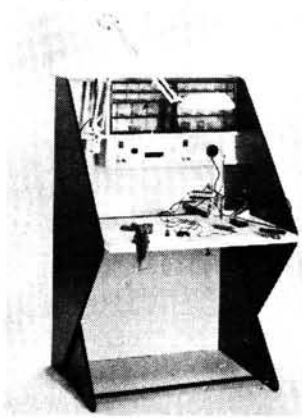
The desk unit comes flat-packed for easy self-assembly and includes two sets of Raaco 15-drawer storage units, electrical power supplies providing two 13A mains sockets together with 12V d.c. for small portable tools. An optional-extra panel provides a smoothed and regulated variable 0 to 30V d.c. supply together with a voltmeter.

The work-area has interchangeable work surfaces of either a laminate or soft vinyl—with other options available on request—as well as provision for holding clamps and additional tooling.

Further customising can be readily performed by the user to suit particular requirements and it is intended to produce a transportable Case Unit in the near future which will provide similar facilities for the customer who needs a mobile workplace.

The Workdek measures 841mm wide x 1322mm high x 792mm deep when closed and 890mm deep when open for use.

The cost of the basic unit is £253 including VAT and for further information and detailed specifications contact ***Elek Ltd., PO Box 32, Winchester, Hants SO22 5LX. Tel: (0962) 56452.***



Turbo-Log

Turbo-Log is a new program by Moray Micro Computing which has been specially written for the radio amateur and s.w.l. who wants a "no-fuss" program which will enable him or her to instantly check for a previous log entry and add a new entry as required.

The program is available on cassette or disc for the Commodore 64 and 128 home computers. It can also be used on the C16 and C/+4 computers.

The program was designed to give very quick access to callsigns previously logged and can scan upwards of 2400 callsigns in one second.

When using Turbo-Log the operator simply enters a callsign. If this has been previously logged the entry details are instantly displayed and, if required, a further single key-stroke will display any previous entry of the same callsign. If the station has not been previously logged an audible tone will indicate this to the operator who can then press just one key which immediately logs the new callsign, the time from the system clock and the date and band.

As radio amateurs are required, by their licence conditions, to keep a full station log in book format it is wasteful to use valuable memory in the computer to store this information. With the details provided by Turbo-Log it should be a simple matter to look up the log entry!

Turbo-Log data files can be created, loaded or saved to disc or cassette at any time and updated as required. This gives the opportunity to create special files for various operational modes such as RTTY, rare DX, Worked All Britain Award and so on.

Turbo-Log costs £14.95 on cassette and £16.95 on disc direct from ***Moray Micro Computing, Enzie Slackhead, Buckie, Moray, Scotland AB5 2BR. Tel: (05427) 384.***

Antenna Tuning Unit

Amcomm have introduced the AMCOMM 9000 Antenna Coupler developed from the popular AMTECH 300 unit and incorporating a 1:4 toroidal balun to permit connection of the transmitter to the antenna via 300Ω balanced feeder.

The unit utilises a capacitively tuned *T*-network for matching high impedance or low impedance antennas to low impedance TX output stages.

The unit is general coverage and will tune over the range 1.7 to 30MHz. Selection of frequency range is by means of a 12 position INDUCTOR switch.

The components in the Antenna Coupler are rated for power outputs of 100W and the low impedance connectors are PL259 sockets with high impedance balanced feeder connections made by insulated red and white screw terminals.

Further details available from ***Amcomm/ARE, 373 Uxbridge Road, Acton, London W3 9RN. Tel: 01-992 5765.***

Satellite TVRO Modules

Astec have introduced a range of modules for the growing TVRO (TV Receive Only) market in Europe.

The modules available in the range includes a series of tuner heads, a demodulator and a gain block and form the heart of satellite receiver systems.

The block conversion tuner heads, designated the AT1000 series, all have 950–1450MHz input, provide 30dB conversion gain, 6dB noise figure and standard 612MHz i.f. output. The frequency control options range from a low-cost, high performance v.c.o. controlled device, through a module with –256 prescaler output to the top-of-the-range unit with integral phase locked loop. All the modules use "high side" mixing and can be supplied with single or dual inputs.

The demodulator, AT3010, operates at 612MHz and employs state-of-the-art surface acoustic wave filtering and 8dB threshold extension and provides a composite baseband output.

Coupled with a suitable Astec modulator these modules provide the heart of a high performance, economical TVRO system.

Further details from ***Astec Europe, 8b Portman Road, Reading, Berks. RG3 1EA. Tel: (0734) 509411.***

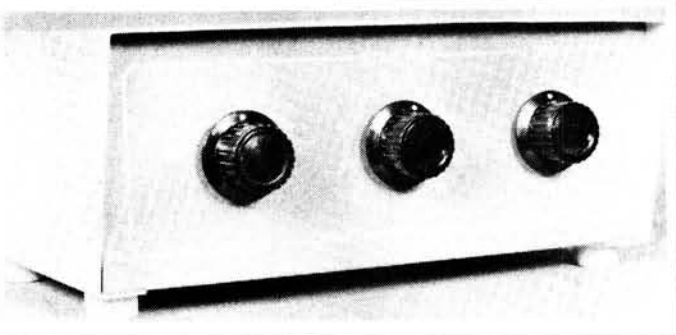
3-Digit DPM Kit

An ideal replacement for the traditional analogue panel meter has just been announced by Electronic & Computer Workshop. The K2032 three-digit miniature d.p.m. comes in kit form and is easily assembled to form a compact panel meter able to display readings from –99 to +999mV f.s.d. with over-range indication.

Resolution is claimed to be ± 1mV with a linearity figure of 0·1 per cent. Input impedance is 100MΩ and the temperature coefficient is 20nV/°C. Power requirements are 5V d.c. at 250mA.

The unit uses just two i.c.s with a small number of discrete components to achieve this performance while costing £17.90 incl. postage and VAT.

Details from ***Electronic & Computer Workshop Ltd., 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.***



Snap-in Bezels

If you are having trouble in making your front panels look good then the new range of snap-in bezels from Cirkit will be of interest.

The new products allow up to four components to be fitted into one panel cut-out, simplifying assembly and reducing the number of separate cut-outs.

Presently offering 24 permutations of switches, fuse-holders, filtered and unfiltered inlets—the Bulgin "Polysnap" range is available from ***Cirkit Distribution, Park Lane, Broxbourne, Herts. EN10 7NQ. Tel: (0992) 444111.***

The PW 144MHz Contest will take place between 0900 and 1700 GMT on 15 June 1986. Neill Taylor G4HLX takes us through the rules and general pointers for this year's event.

This year's *PW* QRP contest, the fourth such event, will again be held in the middle of June, when the day is long and, with luck, the weather is sunny, just right for a spot of portable operation with simple low power equipment. For those who prefer to remain at home, the distances to be worked will be enhanced by stations activating the hill-top sites, and some of the rarer squares may be available for contacts. All in all it should, as before, provide a day of good QRP operating, and enable users of 3 watts (or less) transceivers to compete effectively. The contest is open to all licensed amateurs, and you can either have a go on your own, or get together with some friends to form a group.

A report on the contest, with a summary of the results and details of the leading stations, will be published in *Practical Wireless*, a full detailed results list being available by sending a large s.a.e. with the entry. The overall leading station will receive the winners cup, certificates going to the runners-up, the leading station in each locator square, and in various other categories (e.g. leading single operator) at the adjudicator's discretion.

Please read the rules carefully. This year we are publishing the changed rules only —the rest were printed in *PW* June 1985. An s.a.e. will obtain a copy if you don't already have them. There are a few minor changes this year, partly in response to suggestions from entrants in 1985.

You will need to know the Universal Locator (IARU or "Maidenhead" locator) for the location of your contest station, as this forms part of the QSO exchange. A simple procedure for finding this locator from a latitude and longitude, requiring no computer or calculator, was also given in *Practical Wireless* June 1985.

Good Operating

Previous *PW* QRP contests have attracted comments about the generally good standard of operating. This trend will be helped if operators are careful. Another read through the Dos and Don'ts published last year is well worthwhile.

You should always send information in an accurate and un-hurried manner. To state the QSO exchange once, slowly and carefully, is far more productive than to gabble it all twice at high speed.

Don't Lose Points

You will avoid losing points through penalties if you are careful to present your entry as required by the rules. In particular make sure that all the information required by rule 6 has been provided on the covering sheet.

Your log should be an accurate record of what is sent and received. Points will be lost for errors. Take special care over /P suffixes on callsigns (the dropping of which is a common mistake). The log sheets must be A4 sized (the normal way up, not sideways), with columns arranged as in the sample shown here. The log submitted as an entry should be a neat copy—if a callsign can't be read, it can't be checked, and points may be lost.

Remember to clearly mark the first contact in each different locator square, and to provide a list of squares worked on the covering sheet.

We look forward to receiving your entries, log, comments and, if you have them, photographs. We hope you have an enjoyable day and plenty of DX!

RULES

1. General
Same as 1985 plus
The station must use the same callsign throughout the contest and may not change its location. Special event callsigns may not be used.

2. Contacts
Same as 1985 **minus** the paragraph reading
"..Entrants outside the British Isles may claim points for contacts with stations within the British Isles only (i.e. stations with the prefix G, GB, GD, GJ, GM, GU, GW or EI).

3. Power
Same as 1985

4. Scoring
Same as 1985

5. Logs
Same as 1985

6. Entries
Same as 1985 plus Entries must be postmarked no later than 30 June 1986. Late entries will incur a heavy penalty.

7. Adjudication
Same as 1985

PRACTICAL WIRELESS 144MHz QRP CONTEST

Date	Callsign	Locator	Sheet N° of

Time GMT	Callsign	Report & serial N°		Locator
		Sent	Received	

A Small 12 Volt Generating Set

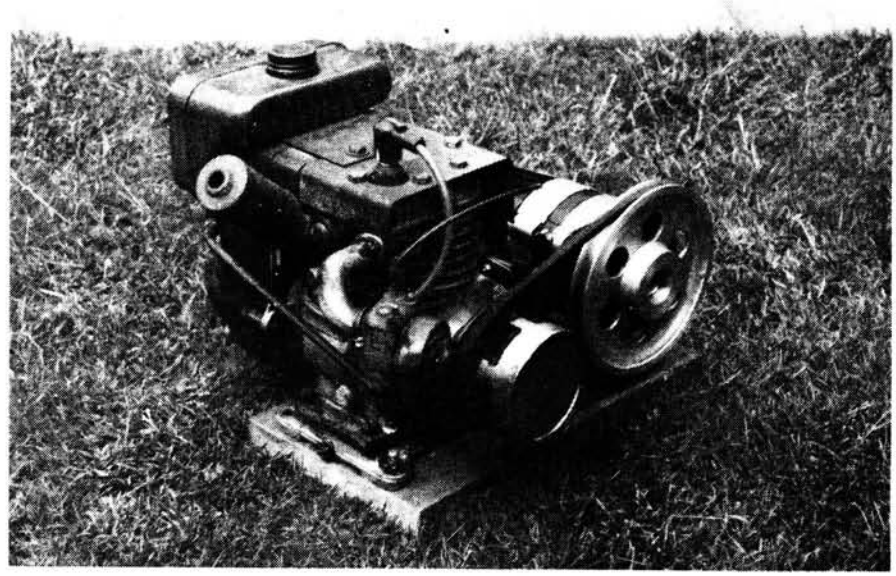
Over the past twenty years, Frank Rhodes G3TWO and John Roscoe G4QK, have had problems in getting hold of a small generating set for National Field Day. They have borrowed sets requiring extensive electrical and mechanical rebuilding, and have paid good money to hire sets that either turned up in a disgusting condition, or not at all! Here they pass on the basic ideas to help you build your own portable power station.

The advent of 12 volt transceivers has certainly made life easier, and one year in an emergency we requisitioned an XYL's Daf66—thoughtfully equipped with voltmeter—but it is hardly an economic proposition to use 1100cc of engine just to produce 250 watts of d.c.! There are other contests, and other occasions for going portable, so we thought we would look into the possibility of buying a set.

The motorcycle manufacturers produce some beautiful small generating sets. The cheapest ones generally give between 400 and 600 watts at 240V a.c. (sometimes at 60Hz), or 12V 8·5A d.c.—but not simultaneously. They are light, compact and quiet, but at around £240 completely out of our reach. There have been smaller units—possibly Italian in origin—producing about 200W at 12V d.c., some even equipped with silencing cabinets, but they seem to be thin on the ground. Certainly the local ships' chandlers and caravan suppliers knew nothing about them so we decided to build our own.

Lawn Mowers

A brief scan of the local "free newspapers" showed that motor-mowers were available from £15 upwards—if you were quick enough off the mark. We weren't! However, an ask-around produced a mower of lesser-known make with a broken blade, for which £10 changed hands. The engine turned out to be a Villiers fan-cooled 4-stroke of about 80cc capacity, complete with integral petrol tank and recoil starter. It originally drove through a single-plate clutch into a chaincase, but the input side of the clutch was thoughtfully provided with a V-belt pulley. The base of the engine was a flat plate with three mounting holes, which made life easy. The engine itself was not in a happy state—the head gasket had blown, the valves were not seating and the sparking plug was almost immovable. There was virtually no wear, though, on the cylinder bore. The light-alloy head was found to be undistorted,



The small portable generating set in its final form with the alternator fitted with a reverse rotation fan

and a new gasket was easily obtained for less than £2—though information on setting the valve clearances was not!

Engine Overhaul

The rehabilitation of the engine involved a great deal of time and patience, grinding-in the valves, cleaning all the bits, and re-assembling them. A certain amount of trial and error was involved with the non-adjustable tappets, but the reward for all this work was an engine that ran easily up to 4000 r.p.m.—measured with a borrowed tacho—on a light throttle. The only modification made was to fit a suppressor lead to the sparking plug. The rating for the engine is believed to be 3 b.h.p. at 3600 r.p.m.

Alternators

Car alternators are now so readily available that there is no point in using the old 3-brush type of car dynamo. The alternator consists of a coil, carrying direct current, rotating inside three stator coils set at 120 degrees to each other. In theory it requires an external source of d.c. to excite it, and this is certainly the most convenient way of using it. In an emergency, though, there is probably enough residual magnetism to excite it, provided it can be rotated at a high-enough speed. The energising current is fed to the rotor coil through slip-rings. These are much smoother than a commutator and carry such a low current that they give little trouble. The stator coils are star-connected to give a 3-phase a.c. output which is rectified by six diodes inside the casing, to give a d.c. output. These diodes are the most fragile part of the assembly—particularly if you indulge in heavy-current arc welding—and are not always easy to replace.

Although cars of quite moderate size now fit alternators of 60A or more, car breakers are unlikely to have anything over 45A—and quite enough, too! Here perhaps we can do a little flag-waving and advise you to stick to the Lucas ACR types. Not only are most spares readily available, but the regulators "fail-safe"—unlike one continental variety—and do not boil your battery electrolyte away. The alternator itself is reversible—but the cooling fan is not. So it is important to get this

right, as although the windings will run hot quite happily, the rectifiers will not. The direction of rotation is generally marked on the fan. In amateur applications the alternator is unlikely to be heavily loaded, so those with an aptitude for metalwork could no doubt produce an adequate fan for reverse rotation if required. The Lucas version costs around £5.

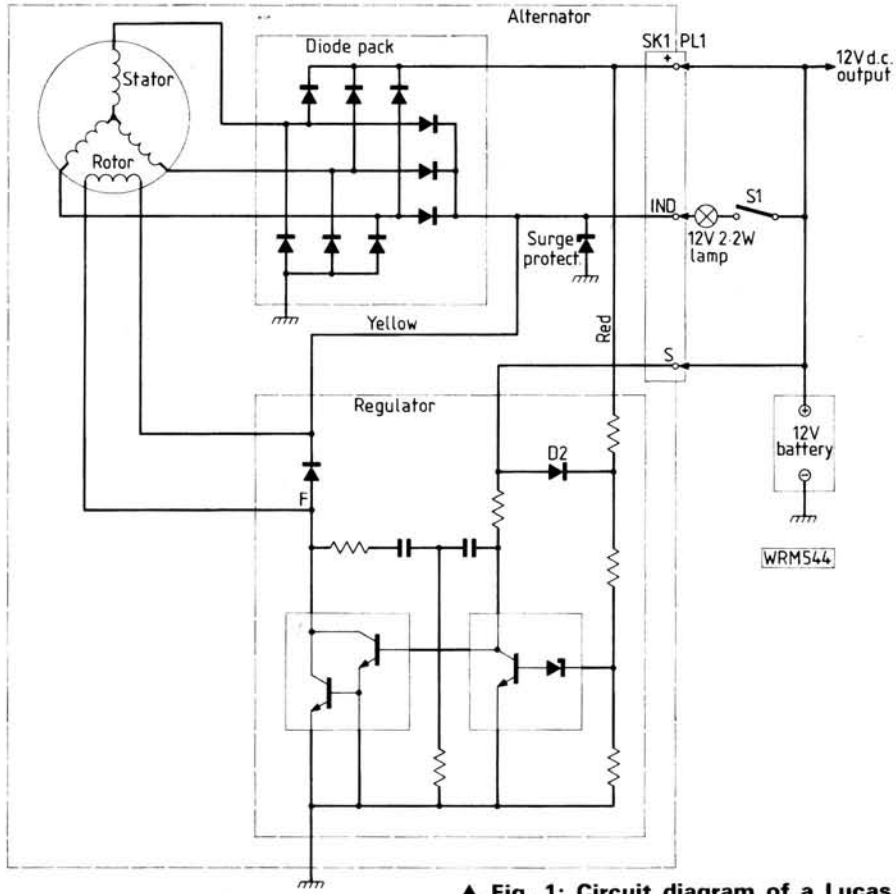
Regulators

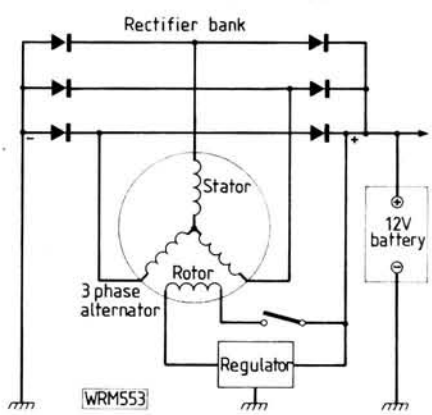
The regulator is a simple solid-state device which holds the output voltage constant by varying the input to the rotor coil. In the Lucas ACR Series alternators the regulator is inside the plastics end-casing and may be connected in one of two ways. Long leads from the alternator to the load or battery can produce an appreciable voltage drop, and in this case it is better for the regulator to obtain its feedback at the battery. This will ensure that the delivered voltage is correct. To enable this to be achieved Lucas make two versions of the Diode Pack and Regulator Assembly. These are identified on the alternator casing by a small self-adhesive label with either "Battery Sensing" or "Machine Sensing" printed on it. If you obtain an alternator which is labelled "Battery Sensing" then you must ensure that you either run a lead from both of the large tags on the alternator plug to the load, or connect the two large tags together at the alternator end.

The engine was first tried with a borrowed alternator rated at 45A. Then a local advertisement produced one of the smaller Lucas types (17ACR) rated at 36A at 3000 r.p.m.—unused for £15. Direct shaft coupling to the engine demands accurate alignment and a rigid baseboard, so it is much easier to use a V-belt drive. In our case the direction of rotation of the engine and alternator was the same, so the two units were initially mounted in a staggered fashion across a stout plank. Later a reverse rotation fan was fitted, and the two units now sit neatly side-by-side on a 200 × 355mm plank. The lower lugs of the alternator were mounted on a pivot, and a turn-buckle attached to the upper lug to tension the belt.

Connections

The alternator has a polarised connector with two large contacts and one small one. The large ones, which are internally connected on a "Machine Sensing" alternator, are connected directly to the battery through conductors of suitable size—the diodes will prevent any reverse current flowing. The connection to the smaller contact should be made to the battery via a 12V 2·2W lamp and a switch. The lamp will act as an indication that the alternator is supplying current while the switch enables you to disconnect the rotor coils from the battery when the generator is not running. You could of course refine the system even further by using the same switch to break the l.t. side of the ignition system—if you can get into the flywheel magneto. Just like a car system in fact!





▲ **Fig. 1: Circuit diagram of a Lucas ACR series alternator showing the three-phase diode pack, surge protection diode, solid-state regulator and the external connections to the battery and load**

◀ **Fig. 2: The basic three-phase car alternator circuit**

You must ensure that the battery is not disconnected while the alternator is running to avoid damaging the load.

The integral regulator is on the negative side of the rotor winding, and provision is made for testing the alternator by shorting the negative brush to ground, when full output is obtained. A dimple on the end cover of the alternator indicates where a hole can be drilled for this purpose. In addition, a diode is connected across the rotor winding to act as a surge suppressor. It behaves admirably as a sacrificial diode, placing a short across the winding if the alternator suddenly loses its load at full output. If difficulty is experienced in replacing this diode —"we don't carry spares, Sir, they never go wrong"—it can simply be disconnected and the alternator will still perform, although without the surge protection.

Once all these details had been settled, everything was ready to go—and go it did. The engine, though, was not happy, requiring a lot of throttle. Alternators fitted to cars are run at twice crankshaft speed, or even faster, and so are fitted with small pulleys. With a larger pulley fitted, the engine sounded much happier. On run-up tests for National Field Day no ignition noise was audible on the FT-757 being powered by the unit. During the actual event, with a 45Ah battery on float, the engine was gradually throttled down—remember that it has no form of governor—until the output was 6A on transmit and 4A on receive. Under these conditions the petrol consumption (2-star) was almost exactly one pint per hour, which we regarded as entirely satisfactory.

Developments

A second model is now under construction, based on £5-worth of extremely rusty mower. The engine, apparently one of the "Suffolk" family, has a simple air-vane governor and drives through a centrifugal clutch—again with the wrong crankshaft rotation. Has anyone ever come across a reversible camshaft?

Finally, if you prefer an a.c. output you can certainly have it—but remember that a rectified feedback voltage must be provided for the regulator somewhere along the line. **PW**

IC of the Month

Brian Dance reviews the Ferranti Electronics ZN414Z, ZN415E and ZN416E a.m. integrated circuits

Over 11 years ago Ferranti Electronics introduced their ZN414 device in a three-lead TO-18 circular transistor-type package. This product immediately became very popular amongst all constructors who required a simple radio receiver of the t.r.f. (tuned radio frequency) type for local station reception, although the device could not deliver enough power to operate a loudspeaker. Some form of amplification was really required to provide satisfactory volume even from a personal earphone.

The ZN414 device has now been replaced by the ZN414Z which is encapsulated in a TO-92 plastics package for simplicity and economy of circuit board space together with a price reduction of around 25 per cent. Electrically the ZN414Z is similar to the ZN414.

In addition, two new devices were introduced, the ZN415E and the ZN416E. Both of these are encapsulated in 8-pin dual-in-line (d.i.l.) packages and have an internal ZN414Z a.m. receiver section together with an on-chip audio amplifier which can drive a pair of headphones directly when fed from a 1·5V cell. The ZN416E can deliver more output power than the ZN415E.

It must be emphasised that these devices have been designed for use in simple a.m. receivers covering the long and/or medium wave band. They are not suitable for use at frequencies above about 2·5 to 3MHz, nor are they suitable for use in simple t.r.f. receivers for distant station listening or when good selectivity is needed to remove adjacent channel interference.

However, the small size of these devices combined with their low power requirements and circuit simplicity has rendered them very attractive for such simple consumer products as wrist-watch radio receivers with an earphone, solar powered receivers for fitting under a vehicle sun-visor, a sun-hat or even in sun glasses! The ZN414Z has already proved very popular for such applications and for use in toys, where operation from a single 1·5V cell makes it very attractive not only from economical considerations, but also because of the small size of the single cell.

The ZN414Z

The ZN414Z is an a.m. receiver which can be used in the circuit of Fig. 1 for signal frequencies in its useful working range of 150kHz to about 3MHz. At higher frequencies the gain falls to an unusable level and even at 3MHz is typically 25dB less than that at about 1MHz where the gain is near its maximum value. Similarly, the gain falls at low frequencies due to the reactance of the small coupling capacitors inside the device. The ZN414Z contains 10 transistors which form the signal frequency amplifier, the detector and the a.g.c. circuit of the simple t.r.f. receiver.

The simple circuit of Fig. 1 operates from a supply voltage in the range 1·2 to 1·6V with a supply current of less than 500μA. The power gain is typically 72dB, but this gain is very dependent on the power supply voltage. An important advantage of the ZN414Z is its high input impedance (typically 4MΩ) and therefore the loading on the tuned circuit is minimised, so reasonable selectivity for local broadcasting station reception can be obtained with the single tuned circuit shown.

The inductor L1 is normally a ferrite rod antenna with a single layer coil of about 65 turns for medium wave reception or a 300 turn multi-layer coil for long wave reception if a 140pF tuning capacitor is employed (Fig. 2). This circuit has the advantage for the inexperienced constructor that no alignment is required. Ferranti Electronics suggest that L1 may consist of 80 turns of 0·3mm diameter enamelled copper wire on a 500mm or 750mm ferrite rod for the medium wave band. Much finer wire is required for the multi-layer long wave band, but it is important to obtain a reasonable value of the quality factor, *Q*, so as to obtain adequate selectivity and, in the case of the long wave band, a reasonable sensitivity, since the ZN414Z gain is lower in this band. The exact number of turns is not important provided that the desired frequency band can be tuned with a fairly high *Q* value.

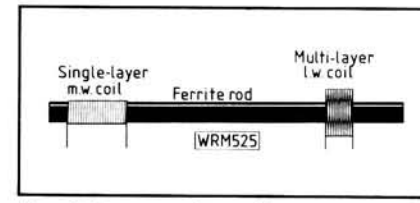


Fig. 2: Long and medium wave coils at the opposite ends of a ferrite rod to minimise interaction between them

The a.g.c. (automatic gain control) can be controlled by a suitable choice of the value of R1. The a.g.c. range is typically some 20dB, but is dependent on the value of R1. The threshold for the onset of a.g.c. action is typically 50μV with a 1·3V supply, but decreases as the gain is raised by increasing the supply voltage and is also dependent on the *Q* factor of L1.

The audio output is at least 30mV r.m.s. and can be used to drive a very sensitive crystal earpiece directly. The earpiece should be used in place of R1 and should have a resistance of not less than 250Ω. For the direct drive of an ear piece, the ZN415E or ZN416E is much more satisfactory.

Simple Receiver

The author has used a ZN414Z device to drive an LM380N audio power amplifier which in turn drives a loudspeaker. The circuit is shown in Fig. 3 and is probably one of the simplest radio receivers with a loudspeaker output which can be made.

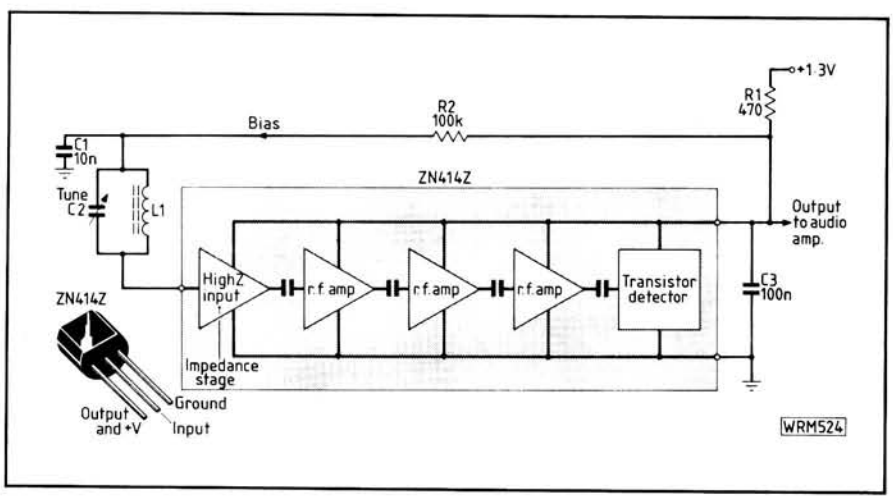


Fig. 1: A basic radio receiver using the ZN414Z showing the internal components in block form

In this circuit the two series-connected forward-biased diodes in conjunction with their series resistors provide the voltage for driving the ZN414Z device. This voltage is more stable than if a resistive potential divider were employed; the ZN414Z gain is very dependent on the supply voltage, so the use of the two series diodes helps to stabilise the gain. The gain may be increased by increasing the value of the resistor shown as 150Ω in series with the two diodes.

The components shown with a dotted line may be required at the LM380 output to prevent instability under certain circumstances, but generally this so-called Zobel network is optional.

If space is at a premium, the LM386 may be used instead of the LM380, since the LM386 is an 8-pin d.i.l. device.

The ZN414Z data sheet includes two circuits in which discrete component audio amplifiers are employed, one of these circuits employing a single transistor to drive a high impedance crystal earpiece and the other a five transistor amplifier to drive a loudspeaker.

The ZN415E

The ZN415E may be used in the very simple circuit of Fig. 4 to drive a pair of 64Ω earphones using a single 1·5V power cell. As indicated, the 100kΩ bias resistor required for the operation of the ZN414Z circuitry is incorporated on the i.c., as is the a.g.c. resistor which has a value of 1kΩ in this device.

The ZN416E is pin-for-pin compatible with the ZN415E, but provides more output power. It may be used in the circuit of Fig. 5. Roughly speaking the ZN415E will provide about twice the output of the ZN414Z, while the ZN416E can provide up to about five times the output of the ZN414Z. More details are given in Table 1.

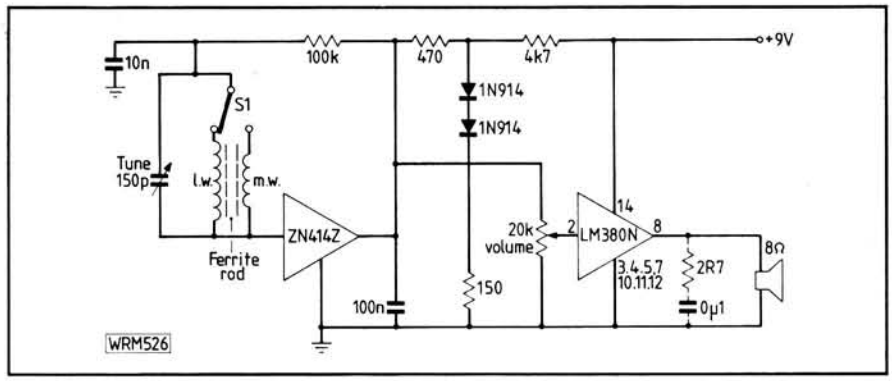


Fig. 3: A ZN414Z receiver with LM380 audio power amplifier

	ZN414Z	ZN415E	ZN416E
Voltage gain of output stage	—	6dB	18dB
Output voltage into 64Ω load before clipping (mV p-p)	60	120	340
Supply current (with 64Ω headphones in the case of the ZN415E & ZN416E)			
Typical (mA)	0·3	2·3	4
Maximum (mA)	0·5	3·0	5

Table 1

The high frequency response of the ZN415E and ZN416E is determined by the value of the capacitor from pin 7 to ground. If this capacitor has a value of 10nF, the upper cut-off frequency is typically 6kHz for the ZN415E and 10kHz for the ZN416E, whereas it is 20kHz minimum without any capacitor in this position.

Similarly the coupling capacitor between pins 2 and 3 of these devices determines the lower cut-off frequency. A value of 0·1µF for the ZN415E circuit or a value of 0·47µF for the ZN416E will provide a typical lower cut-off frequency of 50Hz.

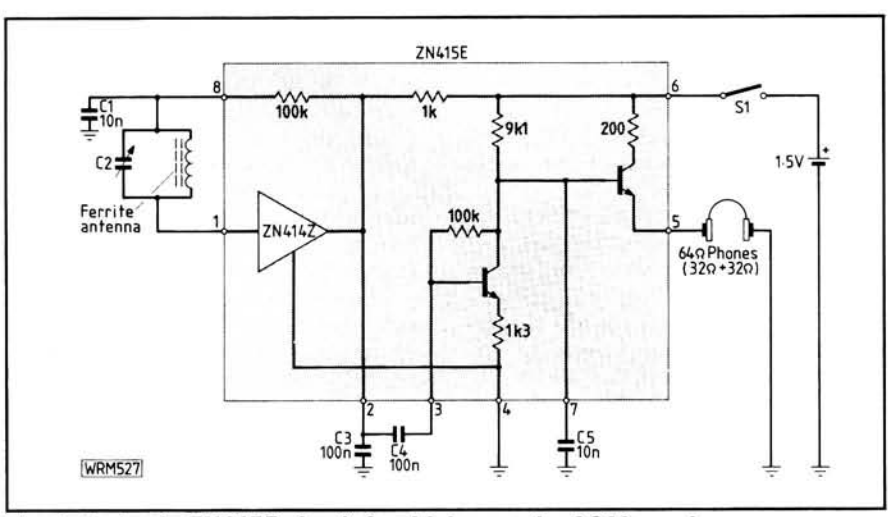


Fig. 4: A simple ZN415E circuit for driving a pair of 64Ω earphones

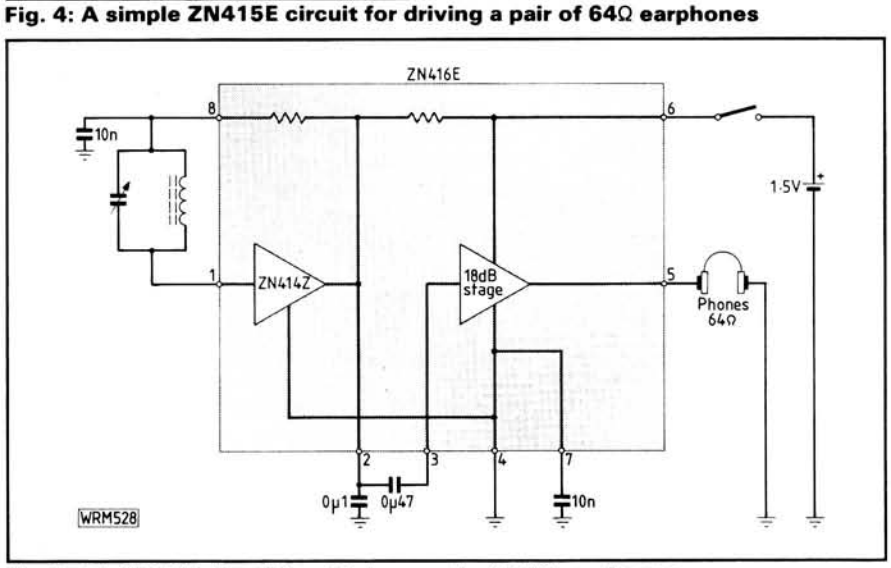


Fig. 5: A ZN416E circuit for driving a pair of 64Ω earphones

The ZN414Z as an IF Amplifier

Apart from its use in a t.r.f. receiver, the ZN414Z can be employed to provide a high gain i.f. unit in a superheterodyne receiver. One circuit of this type designed by Ferranti Electronics is shown in Fig. 6. Ceramic resonators are employed instead of i.f. transformers, since the need for circuit alignment is thereby avoided in the i.f. stages.

The bandwidth, and hence the upper limit of the frequency response, is determined by the characteristics of the ceramic resonators employed. They may, for example, provide a 6kHz bandwidth at the −6dB points and an 8kHz bandwidth at the −30dB points. A 40dB a.g.c. range can be obtained.

Layout Precautions

As the ZN414Z/415/416 devices have a high r.f. gain, reasonable precautions must be taken to avoid unwanted feedback, for example, by keeping all leads as short as possible and by soldering the output decoupling capacitor of the ZN414Z stage as closely as possible to the device. The ferrite rod and the tuning capacitor should be kept well away from the battery and loudspeaker and their associated connecting leads. The fixed vanes of the tuning capacitor should be connected to the input of the ZN414Z stage and the moving vanes should be connected to the 100kΩ bias resistor or to pin 8 of the ZN415E or ZN416E.

Conclusion

These devices are attractive because of the simplicity of the radio receiver circuits which can be quickly made using them.

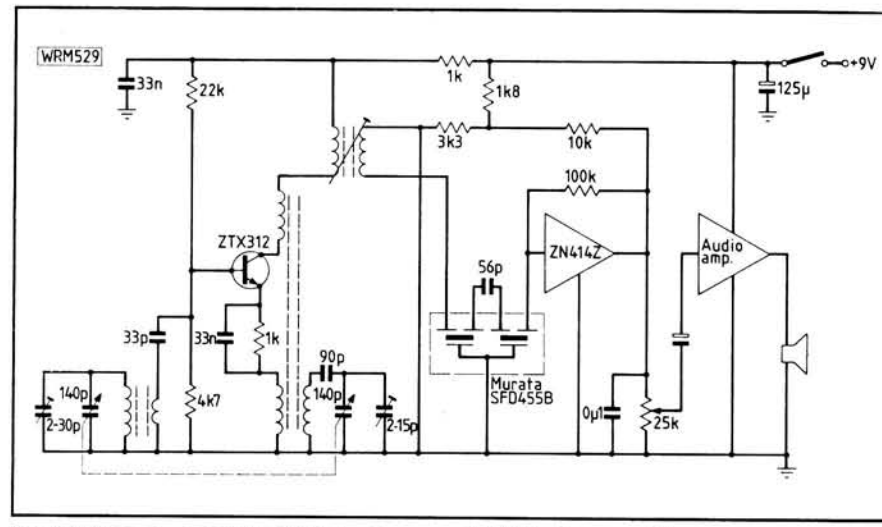


Fig. 6: The use of a ZN414Z device as a 455kHz i.f. amplifier

NEWS EXTRA

Granted Charitable Status

The Communications and Electronics Museum Trust, based in Portsmouth, has now been granted charitable status. The Trust incorporates the Winbolt Collection and the Wireless Museum at Arreton Manor, on the Isle of Wight.

The photograph shows (l–r) Lord Young, Secretary of State for Employment; Dr Graham Winbolt, whose collection of military equipment forms part of the basis for the museum; and Miss Elvia Myles, one of the workers on the MSC Community Programme.

Lord Young was visiting The Communications and Electronics Museum at Fort Widley, Portsmouth, early this year.

Thirteen MSC workers are involved in the scheme, whose task is to identify and catalogue each item from two collections of communications and electronic artefacts. They are creating a fully catalogued store and record system as the first step to creating the museum.

RAYNET Symposium

Nothing to do this Bank Holiday? You could just be in time for a RAYNET symposium in Aviemore. It will be held in the Avalanch Bar, Strathspey Hotel, Aviemore Centre, on Saturday 3 May. It is open to all amateurs interested in Emergency Communications.

The theme for the day is Co-ordination and Communication, and there will be a variety of lectures during the day.

Details from: ***GM3RFA on Fort William 3833.***

Digitally Assisted TV

Digitally Assisted Television (DATV) is a new concept proposed by BBC research engineers, it involves the transmission of analogue picture signals together with high data rate digital signals carrying control or supplementary information about the picture. One application might be to reduce the bandwidth of a high definition television (HDTV) signal so that it can be accommodated within a single DBS channel, previously planned for 625-line television services.

DATV is a bandwidth compression technique intended for use with high quality television signals.

Early results from the experiments at the BBC's Research Department at Kingswood Warren indicate that the DATV concept can offer HDTV picture quality in the home, even when the bandwidth of the signal has been reduced by a factor of between two and four.

DATV can also be used to improve the performance of 625-line television systems which have associated digital capacity, such as the MAC/packet family of transmission standards. However, when used to improve 625-line systems, there would be less freedom to exploit the DATV technique compared with its use to facilitate the transmission of HDTV systems using more than 1000 lines.

Hitachi Summit

In this country the summit conference for Hitachi Electronic Components will take place on June 9 at Wembley Conference Centre.

The conference is used to launch all of the very latest "breakthrough" technologies and products. This year for the first time the conference will include a procurement seminar.

Other conferences will be held at the Stockholmsmassans Kongresscentrum, Stockholm, on June 11 and in Munich on the 12th.

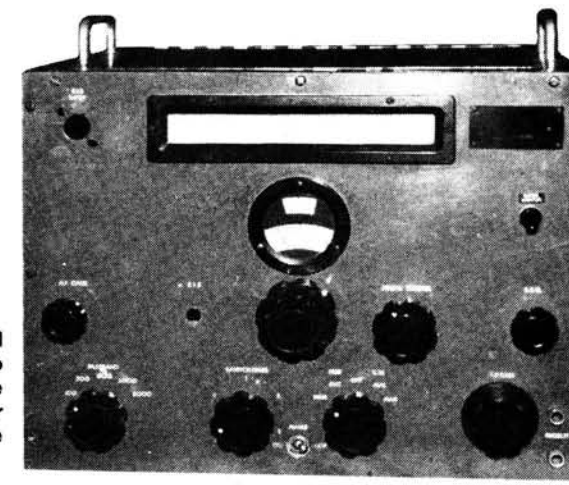
Valved Communications Receivers

Chas E. Miller looks at the CR100/B28.

The Marconi CR100 (alias B28) is one of that select band of receivers which every other enthusiast appears to have owned at one time or another—with good reason. These rugged, sensitive and reliable sets have given, and continue to give, excellent service in the 40-odd years that have passed since their *debut*. They were much used by the Royal Navy for world-wide communications purposes, and proved their merits beyond doubt. Sharp-eyed TV viewers can spot an example aboard HMS *Amethyst* when the film *Yangtse Incident* makes its occasional appearance on their screens. It may come as a surprise to the professional decriers of thermionic devices that the CR100 has a sensitivity, on average, of between 1 and 2μV on most of its 6 ranges, the latter figure being the maximum acceptable for service. This commendable performance was obtained with perfectly standard octal valves designed in the mid-1930s.

The tuning system, designed to make easy the rapid reselection of specific frequencies, uses a logging scale with an effective length of just over 4·5 metres. This is split down into 1250 divisions, giving a visual accuracy of 5kHz at 30MHz (0·016%), and correspondingly better at lower frequencies. Two levels of reduction ratio are provided, the main tuning knob giving 25:1, the slow-motion knob approximately 170:1. The tuning covers from 60kHz–420kHz and 500kHz–30MHz in 6 bands, as previously mentioned. The main dial is calibrated in frequency, but the logging scale is purely arbitrary in nature. Selectable i.f. bandwidths of from 6kHz down to 100Hz, and an a.f. amplifier with substantially flat response between 100Hz and 10kHz ensure that reasonably high quality speech and music or c.w. in the most difficult conditions may be reproduced effectively.

The CR100 is self-contained for a.c. mains operation, the power supply unit for the latter being built into the main chassis. The whole is housed in a cabinet made (we are told) of 16 s.w.g. motor-body steel. Clearly the motor cars of circa 1945 were of far superior construction to those of the present!



This CR100 was fitted with "R.I.S.", a system to suppress interference from a radar transmitter fitted aboard the same ship

General Specification

A 10-valve plus rectifier superhet employing 2 r.f. amplifier stages and 3 i.f. amplifier stages. Suitable for direct operation on a.c. inputs of 200/250V, 50Hz or on storage batteries via an external rotary convertor.

Frequency coverage: Band 1, 60–160kHz; Band 2, 160–420kHz; Band 3, 500–1400kHz; Band 4, 1·4–4MHz; Band 5, 4–11MHz; Band 6, 11–30MHz.

Sensitivity: <11MHz, 1–2μV; >11MHz, 1·5–4μV. These inputs give 20dB signal/noise ratio for c.w., and 10dB for a nominal 400Hz-modulated a.m. signal.

I.F. bandwidths: 6kHz; 3kHz; 1·2kHz; 300Hz; 100Hz, the last three with crystal phasing in circuit.

Antenna (aerial) inputs: for balanced and unbalanced inputs via rear-mounted sockets.

Audio frequency outputs: High or low-impedance loudspeakers may be connected (1kΩ or 3Ω), output power 2W. 600Ω line output at 2mW. Facilities for high/low impedance headphones, varying according to the precise model of receiver.

Cabinet dimensions: Width 406mm; depth 419mm; height 311mm (16 × 16·5 × 12·25in). Weight 37·2kg (82lb)—yes, that's nearly three-quarters of a hundredweight!

Controls: *Top row, l. to r.*—RF GAIN, TUNE, AERIAL TRIMMER, BFO TUNE. *Bottom row, l. to r.*—IF BANDWIDTH SELECT, BAND SELECT, MODE SELECT, AF GAIN. A MAINS ON/OFF switch is mounted at the bottom centre of the front panel, and jack socket for headphones are mounted at the bottom right-hand corner of the front panel. *Note:* Some receivers were fitted with a noise-limiter unit which was mounted on the inside of the front panel to the left of the tuning assembly. The control switch for this had a knob fitted between those for tuning and r.f. gain. The valve used was a CV554/D63.

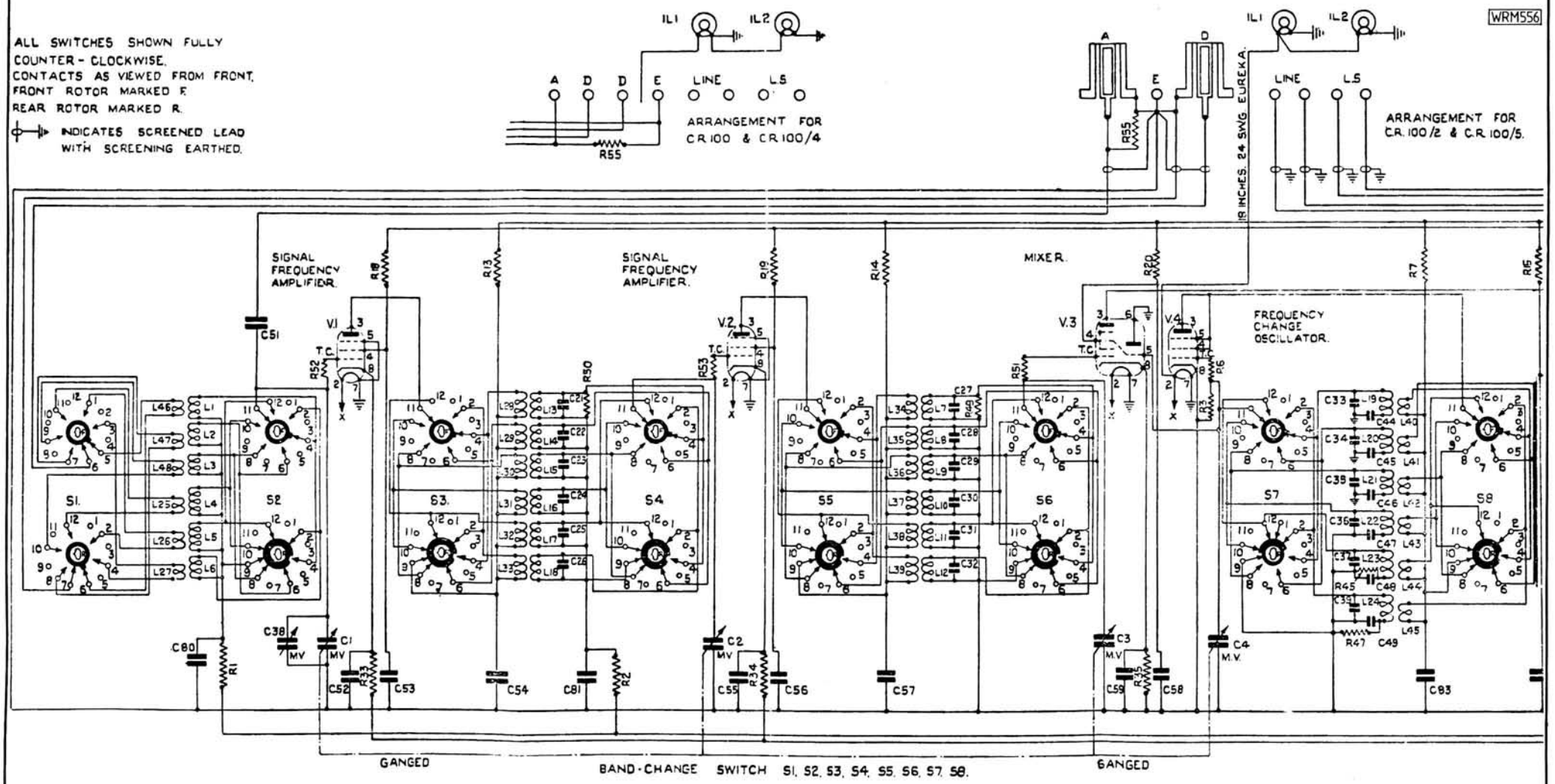
Circuit Description

The antenna input is transferred via a tuned r.f. transformer to the grid of the first r.f. amplifier V1 (VR100/KTW62). The band switching for these transformers (as with the other signal and oscillator circuits) selects the desired inductor(s) and shorts out the others, to prevent unwanted resonances which might otherwise upset operation. A second set of tuned r.f. transformers couples V1 to the 2nd r.f. amplifier V2 (VR100/KTW62), the secondary or grid winding being tuned. Both a.g.c. and manual gain control are applied to these first two stages.

A third set of r.f. transformers, again secondary-tuned, passes signals on to the grid of the mixer valve V3 (VR99/X66). This is a triode-hexode, but only the hexode section is used, the triode anode being earthed. The output of the separate local oscillator V4 (VR100/KTW62) is coupled to the triode grid and thence to G_3 of the hexode section of V3. V4 is triode-connected, G_2 and G_3 being strapped to the anode. V3 is operated without either automatic or manual bias/gain control voltage being applied.

Intermediate frequency signals at 465kHz pass from the anode of V3 to the grid of the first i.f. amplifier V5 (VR100/KTW62) via i.f. transformers

The CR100/B28 Receiver



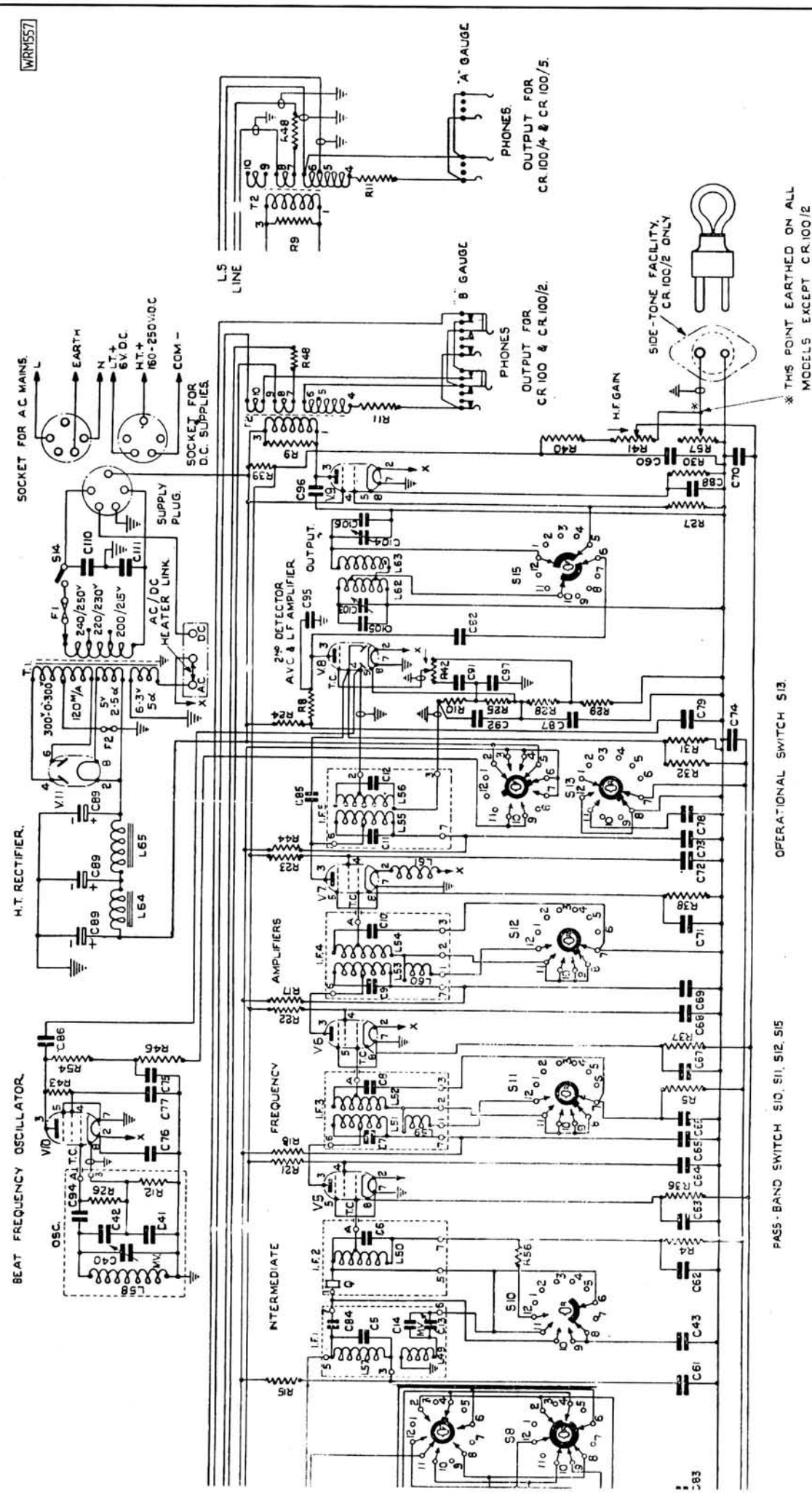


Fig. 1: Circuit diagram of the CR100/B28: *Top* the r.f., frequency changer and local oscillator stages; *bottom* the i.f., detector, a.g.c. and audio stages, plus b.f.o. and power supplies

IF1 and IF2, the assembly incorporating the crystal filter and phasing components. Transformers IF3 and IF4 pass the i.f. signals on to, respectively, the 2nd and 3rd i.f. amplifiers V6 and V7 (both VR100/KTW62). Whilst V5 and V6 are controlled by a.g.c. and the r.f. gain control, V7 has fixed cathode bias. The advantage of not applying a.g.c. to the final i.f. amplifier in any receiver is that the latter then effectively operates as an a.g.c. amplifier. All the i.f. transformers incorporate switchable extra windings for bandwidth selection, with the exception of IF5, which couples V7 to the demodulator diode. This latter is one section of the double-diode-triode V8 (NR68/DH63). The diode load is returned to the cathode of V8 to avoid blocking of signals due to the high cathode bias employed (approximately 16·8V). Only a small portion of this voltage is used to bias the triode section, its grid being returned to a junction of two cathode resistors at some 15V above earth, the resulting bias being approximately 1·8V. The full 16·8V is used to delay the a.g.c. obtained from the other diode section of V8. Its anode is coupled to that of the last i.f. amplifier via a 100pF capacitor. This method is far preferable to the alternative of coupling the signal and a.g.c. diode anodes, since the latter has the unfortunate effects of shunting the signal diode load and of reducing the a.g.c. voltage available. The a.g.c. decoupling, 0·1μF for a.m. work, is increased by a section of the mode switch by a further 1μF on c.w., to give a longer time constant. The constants are 0·1s on a.m. and 1s on c.w.

Amplified a.f. signals at the anode of the triode section of V8 are resistance-capacity coupled to the grid of the output valve V9 (NR85/ARP17/KT63). When the bandwidth switch is placed in the 100Hz position a special l.f. bandpass filter is interposed between V8 and V9. Centred on 1kHz, it has a pass-band of only 100Hz, matching the i.f. circuits and providing maximum freedom from interference on c.w. signals. The output valve is matched to the loudspeaker, 'phones, etc., by a multi-ratio transformer. This differs slightly in various marks of CR100, but will always provide matching for a 3Ω loudspeaker regardless of any other outputs it may give.

The built-in power supply unit is of conventional design, having a double-wound mains transformer and full-wave directly-heated rectifier V11 (NU20/U50). The input voltage selector incorporates a 2A fuse to protect the transformer primary. Some sets have an additional h.t. fuse in the connection from the h.t. secondary winding centre-tap to earth. The rating is 500mA, and a stowage clip for a spare fuse will be found inside the cabinet lid.

All receiver valve heaters are wired in parallel across a 6·3V winding on the transformer, but note that the connection is via a plug and socket assembly

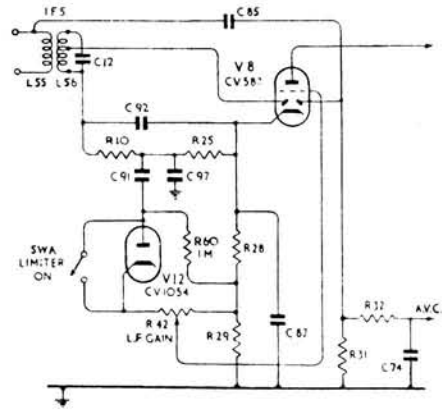


Fig. 2: The add-on noise limiter circuit

designated the a.c./d.c. heater link. For a.c. operation the link should be very firmly in the a.c. position; a bad contact here could cause overheating, voltage drop and other unwelcome effects. The d.c. position of the assembly is used when the valve heaters are to be fed from an external source, when the mains transformer 6·3V winding is automatically disconnected.

The h.t. supply to all valve anodes other than the two a.f. amplifiers is broken when the mode switch is placed in the OFF position. The heaters remain lit to keep the valves warm and reduce frequency drift whilst the set is on stand-by. The other positions of the mode switch are marked: MOD MAN, meaning a.g.c. and b.f.o. both inoperative; MOD AVC, meaning a.g.c. in operation, b.f.o. not; CW AVC, meaning both b.f.o. and a.g.c. in operation; and CW MAN, meaning b.f.o. in operation, but not the a.g.c.

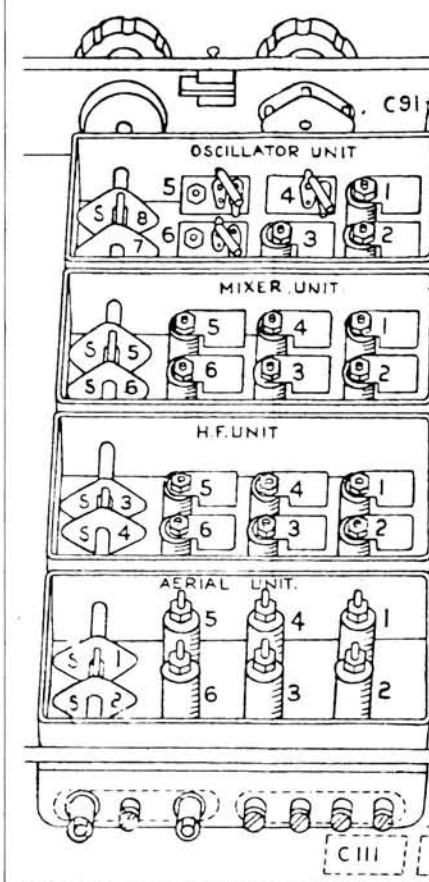
Some versions of the CR100 have a facility for sharply reducing the gain of the receiver when an associated transmitter is in action. This takes the form of an extra variable resistor in series with the normal r.f. gain control. When the transmitter is off the extra resistor is shorted out and has no effect, but during transmission it comes into action and raises the cathode bias on the controlled valves. The facility is called "side-tone", but is different to the feature of the same name found in modern transceivers, as the operator hears a sample of his transmitted signal, rather than the output of an audio oscillator keyed in step with the transmitter. The resistor would have been set by the operator to give a comfortable signal in his loudspeaker or 'phones for monitoring purposes. The point to watch here is that a shorting link should be in position in the "side-tone" socket at the rear of the receiver when it is used for reception purposes only. Should this link become loose or lost, the gain of the set would mysteriously drop to a very low level.

The b.f.o. (V10) uses an r.f. tetrode (VR100/KTW62) in a Colpitts oscillator circuit, with its output coupled to the signal demodulator diode via a 30pF capacitor. Both the core of the tuning coil and the capacitor shunted across it are adjustable, the latter being the operator's b.f.o. tuning control. With the core set correctly, the control will permit a variation of several kHz above and below the nominal i.f.

Re-alignment

The advice regarding re-alignment is, as always, that it should be undertaken only when patently necessary. If poor i.f. gain is suspected, a fairly simple test is possible which is certainly well worth carrying out **before** any i.f. transformer cores are disturbed. The equipment required for the test consists of a calibrated output meter and a signal generator with an effective attenuator. The output meter may be an Avometer on its 1A a.c. range, connected across the loudspeaker terminals, without the 'speaker itself being in circuit. Under these conditions, the meter will read 0·02A for 1mW output, and 0·24A for 100mW output.

The signal generator should be connected to the grid (top cap) of V3 with the cap connector itself disconnected. Switch the mode control to CW MAN, and the bandwidth control to 300Hz, with both r.f. and a.f. gain controls at maximum. Tune the signal generator around 465kHz for maximum response on the meter, ignoring for the moment the exact output frequency needed to achieve this. Reduce or advance the attenuator for a 100mW reading on the meter, with the bandwidth control changed to the 3kHz position. At this stage the generator output should be approximately 10μV to obtain the 100mW reading. The



WRM558

Fig. 3: Layout of the r.f. tuned circuits

generator output must then be transferred to the grids of V5, V6 and V7, in that order. With these valves, the connections to the top caps from the i.f. transformers must be preserved *in situ*. For V5 the generator output should have to be increased to 50μV; for V6, 1mV and for V7, 30mV. If the output has to be increased far above these levels, one or more stages may well be sub-standard, and it should be possible to determine which is or are suspect.

However, this is not the signal for attention to the i.f. alignment; the first step is to check the individual valves. If spares are not to hand it is possible to swap over certain types, such as the r.f. amplifiers and local oscillators, into the i.f. stages to discover if valve performance and not misalignment is at the root of the trouble.

The voltages on the various valve electrodes should be checked, lest a component failure should have caused (for example) an anode or screen grid voltage to have fallen, or a cathode voltage to have risen. It should also be appreciated that with the crude method of gain measurement just described, any discrepancy in the receiver's audio stages could be interpreted as i.f. failings. Thus the valve voltages in the a.f. stages should also be checked, and if possible the valves checked by substitution or on a reliable valve tester. Some significant voltage and current check figures are given in the table.

Note that with sets of advanced years the cathode by-pass capacitors on the a.f. amplifier valves have a habit of drying out and going open-circuit; bridging another capacitor across each in turn can have surprisingly health-giving effects on the quality and strength of the audio output.

If it has been positively determined that the i.f. transformers have to be re-aligned, the class of service for which the receiver is wanted must be considered before proceeding. If it is to be used for much c.w. work demanding the ultimate in sharp tuning, the re-alignment should not be attempted without the aid of a wobbulator (swept frequency generator) and oscilloscope, so that the correct response curves may be obtained visually. Should speech and music only be required, however, it is possible to achieve acceptable results with an a.m. signal generator and an output meter, which may again be an AVO on the 1A a.c. range.

Determine, if possible, which particular i.f. transformer(s) is or are off-tune by the method just described, then reconnect the generator to the top cap of V3 and set the bandwidth control to 1·2kHz. Try to bring the i.f.t.s into line with the latter setting, but should this prove difficult or impossible it may be assumed that the crystal phasing circuits are seriously unbalanced. It is pretty well a waste of time to try to adjust them without the proper equipment, and in any case they will be irrelevant for speech and music reception. Therefore, switch to 3kHz bandwidth and adjust the i.f.t.s for maximum deflection on the output meter. It should be perfectly possible to achieve the sensitivity figures quoted above, but the narrower bandwidths will almost certainly be wildly off specification. However, as stated, this is of no consequence when c.w. reception is not required.

"Front-end" Alignment

Marconi's recommend that the local oscillator should be aligned prior to r.f. alignment, in the following manner. Starting with Band 1, set the receiver tuning to 60kHz on the dial, the bandwidth control to 100Hz and the mode switch to CW MAN. Connect the signal generator to the grid of V3, but in this case leaving the top cap connection in position. Connect the output meter as for i.f. alignment. Inject a signal of 60kHz and tune the b.f.o. for its best note. The generator output should be set to maintain about 50mW output. The r.f. gain control may have to be backed off during alignment to prevent overloading of the 3rd i.f. amplifier.

Tune the core of L19 for maximum deflection, then change to 160kHz and adjust the associated trimmer for maximum. The two adjustment frequencies (along with those to be mentioned) will be found marked at the extreme ends of the appropriate section of the rotary dial. Repeat the core/trimmer adjustment until no further improvement is possible. Proceed to bands 2, 3, 4, 5 and 6 in that order, using the coils and frequencies listed in the table. Note that on the higher bands the bandwidth may have to broadened up to 3kHz. There are no adjustable trimmers on bands 4, 5 and 6, small fixed capacitors being soldered directly across the coil terminals. The Marconi method is to fit alternative capacitors until the desired results are obtained, a procedure known in the trade as "select on test", often abbreviated to "s.o.t." in circuit diagrams or component lists. Average values for the components are 7pF, 2pF and 4pF respectively. The writer has successfully fitted small Philips trimmers (concentric type) as an alternative to permit rapid alignment. On 30MHz, at the top end of band 6, take care that the oscillator is set to 30·465MHz. Accidental use of 29·535MHz (i.e. signal frequency *minus* i.f.) will give similar meter readings, but will result in tracking errors over band 6.

When all local oscillator adjustments are completed adjust the Antenna, RF and Mixer grid coils in the order shown in the table. The signal generator input will be to the antenna terminals for this process. Use the input terminals for an unbalanced antenna. Repeated adjustments at either end of each band will produce a close approximation of the ideal sensitivity figures. ***PW***

ALIGNMENT DETAILS

Band	Ant.	RF	Mixer	LO	Set dial	
					Core	Trimmer
1	L1	L13	L7	L19	60kHz	160kHz
2	L2	L14	L8	L20	160kHz	400kHz
3	L3	L15	L9	L21	500kHz	1·4MHz
4	L4	L16	L10	L22	1·4MHz	4MHz
5	L5	L17	L11	L23	4MHz	11MHz
6	L6	L18	L12	L24	11MHz	30MHz

VOLTAGE/CURRENT CHECKS

To Check	Test points	Meter readings	
		RF Gain max.	RF Gain min.
Unsmoothed h.t.	Pin 2, V11/chassis	300V	315V
Smoothed h.t.	Top of R7/ chassis	250V	280V
Common G_2 line	Junction R39-R40/chassis	80V	120V
Valves controlled by RF Gain	R36/chassis	0	25V
V9 cathode volts	Top R30/ chassis	15V	17V
V8 I_a	Across R24	1·4mA	1·6mA
V7 I_a	Across R44	6mA	9mA
V6 I_a	Across R17	6mA	0·3mA
V5 I_a	Across R16	6mA	0·3mA
V4	Across R7	197V	215V
V3 I_a	Across R15	1·7mA	1·9mA
V2 I_a	Across R14	6mA	0·3mA
V1 I_a	Across R13	6mA	0·3mA
V10 I_a	Across R46	1·5mA	1·6mA

Notes

1. The rectifier, V11, should be checked by substitution if the unsmoothed h.t. falls below 250V, or the smoothed h.t. below 210V.
2. Application of test leads to the anode of V4 will upset normal h.t./chassis readings, hence the method adopted. A tolerance of ± 10% applies to the readings suggested.
3. The readings for the various valve anode currents are obtained by shunting the meter across each associated anode decoupling resistor. Great care has to be taken to avoid shorting the h.t. to earth, or the negative test prod similarly. Insulated prods for both positive and negative meter leads are a "must".
4. Apart from the tolerances mentioned in notes 1 and 2, all meter readings have a permissible ± 20% tolerance.

PW REVIEW

In these days when so much radio equipment comes from the Far East, we look at two receivers from a little nearer home.

A major problem for most newcomers to the hobby of broadcast band DXing, whether on short waves or on the medium and long wave bands, is the seemingly frightening price of today's communications receivers. In my young days, it was possible to buy a small broadcast receiver covering medium and short waves (4 valves plus rectifier) made in Holland by Philips, for around £15, depending upon the exact type. If you were more ambitious, there were some nice little Hallicrafters sets finding their way across the Atlantic for a not much higher price. Of course, £10 a week was then quite a respectable wage, and the receivers were pretty unsophisticated.

If you were away from home, especially on board ship as I was, a short wave radio was the main or only source of news and entertainment. Long-playing gramophone records had only just been invented (I can still remember listening to a demonstration of one of the very first discs from Decca at a friendly dealer's in East Ham in London, in about February of 1951), and tape recorders were virtually unknown. The later development of these two sources of entertainment really hit the sales of short wave broadcast receivers, which almost disappeared from the market, in Europe at least. Of course, the cheaper sets had always been very difficult to tune to a known short wave station—there was no such thing as digital frequency readout, and often a tuning dial just 150mm long would be covering a frequency span of 10MHz or more, a factor which did nothing to promote their popularity with the casual user.

In the following years, the space exploration programme produced its spin-off of clever integrated circuits, cramming into one tiny chip the means of doing what might have taken a whole six-foot rack cabinet before. The computing power which could produce an accurate and easily read frequency readout, coupled with the low power requirements of analogue i.c.s, which could pack large parts of a radio receiver signal chain inside another tiny chip, resulted in the sort of portable broadcast-cum-communications receiver on the market today.

I know only too well from our editorial mailbag and from comments at rallies and exhibitions, that there is an interest in cheaper sets; for youngsters with limited pocket-money (yes, they do still exist!) or for the unemployed, or for anyone who's heard about the joys of listening to faraway places and wants just to try the hobby without spending a fortune.

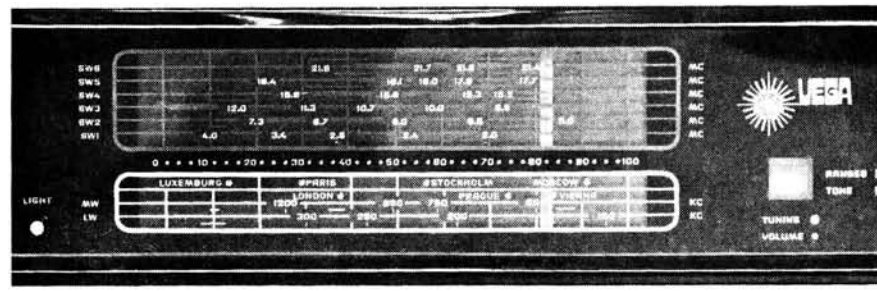
One source of very inexpensive short wave receivers is the Soviet Union. The Vega VEF 206 and the Vega Selena B210/2, both made by Tento in the USSR, and imported into the UK by Technical & Optical Equipment (London) Ltd., Zenith House, The Hyde, Edgware Road, London NW9 6EE. Both are quite widely available in the UK, though models do vary slightly from time to time. The Russian Technical and Optical Equipment shop, 263 High Holborn, London WC1, usually has one or other in stock, and they are also available by mail order through occasional advertisements in Sunday or daily newspapers. In these adverts, different names are used for the receivers, but you will easily recognise them from their descriptions and pictures.

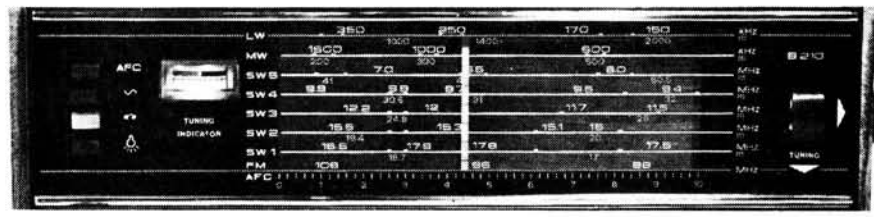
The 206, which is the smaller of the two receivers, has eight frequency bands including long wave, medium wave and six short wave bands (see specification table). It proudly boasts 10 transistors and 2 diodes, and runs from internal or external 9 volt supplies, with a rated current consumption of 14–80mA. Sockets are provided for connecting headphones (60Ω impedance), a tape recorder, and external antenna and earth, though there is no means of disconnecting the internal ferrite rod antenna which is used on l.w. and m.w. Controls comprise band-change, tuning, volume and tone, and

▲ The Selena B210/2 can be mains or battery powered

▲ The Vega 206

Tuning scales of the Vega 206. ▶ Where would you tune for a station on 15·1MHz?





▲ Tuning scales of the Selena B210/2. Can you spot the mistake on the SW1 scale? (No prizes offered)

there is a push-button switch to bring on the tuning-scale light.

The B210/2 has a wood-grain effect plastics cabinet, and again has eight wave bands. This time though, Band II f.m. is included, and the short wave bands are rearranged so that the tuning scales are less cramped. It is a pity that coverage of the Tropical broadcast bands has been removed from recent versions of the receiver. The accompanying leaflet explains that this band, previously included because it covered ship-to-shore services, has been dropped because those services now use the single sideband system, and that it is not possible to modify the Selena to receive s.s.b. transmissions (but see later). The 21·45MHz (13m) band is also missing. The B210/2 uses 19 transistors and 12 diodes. Power supply is either from internal 9 volt batteries or from a.c. mains (normally 220/240V, but internally adjustable for 110/127V). Sockets for headphones, tape recorder, and antenna and earth are provided on the back panel, but again the ferrite rod antenna cannot be disabled. Controls are similar to the Vega 206, except that there are separate bass and treble tone controls, and an a.f.c. on/off switch for the v.h.f. band. A tuning meter is provided.

The two receivers use very similar technology, with construction methods and layouts which, to Western eyes, are probably around twenty years old. The r.f. tuned circuits are mounted on a "turret" which is turned to select the desired frequency band by means of a large winged knob on the end of the case.

Undoubtedly the worst feature of both sets is the way the tuning scales are calibrated—they are apalling! As you will see from the photographs, there are a maximum of five points marked on any band, and some have as few as three. It's very difficult to judge what frequency the set is tuned to, for the points that are marked are not evenly spaced. Surely the repeatability of the tuning tracking from one receiver to another cannot be so bad that the manufacturer dare not mark more points. There is a logging scale on both receivers, but the tuning pointer is so thick (around 3 or 4mm) that this is not a great help. On the particular samples of these sets which we tested, the tuning adjustment on the 206 was smooth, without any backlash, but the 210/2 was not so free in its movement, and did have a little backlash.

For all that, both receivers give an acceptable standard of performance for their price, and should give a newcomer to the s.w. broadcast bands a chance to find out whether he or she ought to start saving for something bigger and better. By using an external b.f.o. unit, it **is** possible to receive s.s.b. signals (see *An Add-on BFO, PW* August 1985) though the frequency stability not surprisingly leaves a lot to be desired, and you will have to continuously adjust the receiver tuning to keep the signal resolved. Again, the performance is good enough to give the flavour, but really these are broadcast receivers, and fairly basic ones at that. The audio output quality is quite reasonable, in fact I am enjoying a concert on v.h.f. f.m. on the Selena as I write this review on my Amstrad word processor.

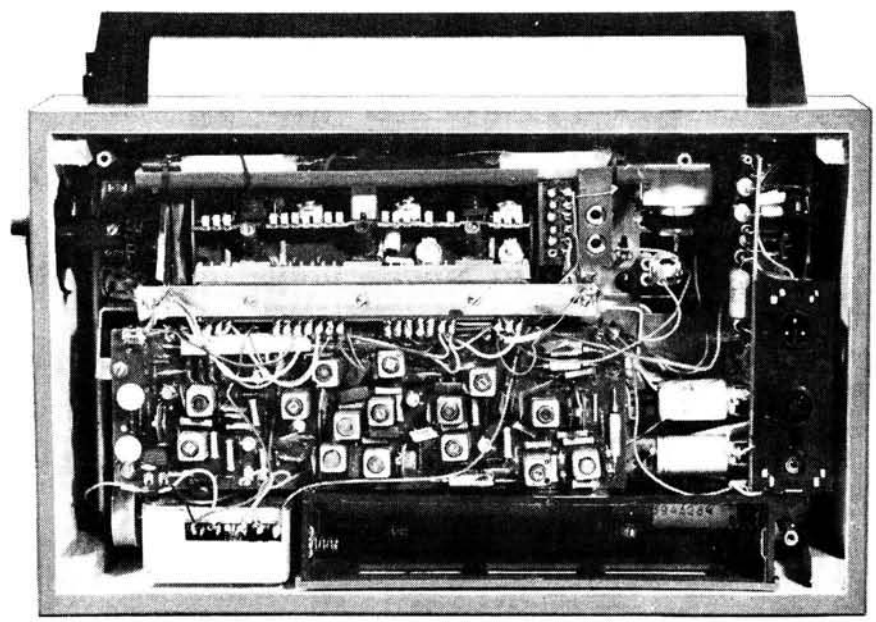
You should find the Vega Selena 210/2 offered at around £30, and the Vega VEF 206 for perhaps slightly less than that figure. It is difficult to be too specific, as the mail order outlets sometimes have special promotions, and prices can vary a lot.

Geoff Arnold

Frequency Coverage

VEGA VEF 206
150–405kHz (l.w. band)
525–1605kHz (m.w. band)
5·95–7·3MHz (49 & 41m bands)
9·5–9·77MHz (31m band)
11·7–12·1MHz (25m band)
15·1–15·45MHz (19m band)
17·1–17·9MHz (16m band)
87·5–108MHz (Band II)

VEGA VEF 206
150–408kHz (l.w. band)
525–1605kHz (m.w. band)
1·6–4·0MHz (Tropical bands)
5·0–7·5MHz (49 & 41m bands)
9·3–12·2MHz (31 & 25m bands)
15·1–15·45MHz (19m band)
17·7–17·9MHz (16m band)
21·45–21·75MHz (13m band)



An inside view of the Selena B210/2 showing the wavechange turret at the top ▶

Further FRG-7 Mods

This article by A. J. Cawthorne T.Eng(CEI) FSERT G3TDJ is intended to complement the excellent series by Mr P. D. Rouse which commenced in Practical Wireless *August 1984. It describes some further worthwhile modifications which can be easily implemented. A means of curing the prime source of drift, that in the second v.f.o. and b.f.o., is described with some improvements to the audio filters.*

The second v.f.o. drift is easily cured by fitting the "poor man's synthesiser" originally attributed to PA0KSB but produced at an astonishingly economic price in kit form by Cirkit as the ST80 to the G3WPO design. After making up the kit, the author fitted the ST80 as supplied, this resulted in a complete cancellation of drift, there remaining only the ±5kHz v.f.o. movement as described by the originators in References 1 and 2. Even from cold the FRG-7 v.f.o. now performs with quite remarkable stability.

The b.f.o. drift is best cured by scrapping the existing arrangement and substituting separate crystal controlled u.s.b./l.s.b. carrier insertion oscillators on a purpose-built p.c.b. controlled by the existing sideband switching. To allay any suspicions from the outset, yes, the crystals are relatively expensive, the author paid around £7 each several years ago, but it is necessary to look objectively at FRG-7 modifications and what can be achieved in receiver performance for a reasonable outlay when compared to the price of a new modern receiver.

The results, following stabilisation of the second v.f.o. and a new b.f.o. plus of course the installation of a decent mechanical filter, are so dramatic that several visiting amateurs have looked suspiciously around the shack not believing initially that the trusty FRG-7 was responsible for the performance audible.

The third modification to be described is recommended as desirable but not essential. That is the removal of the existing simple *CR* audio filters and the substitution of active band pass and low pass circuits using the existing selection arrangement. In the author's case the band pass filter is designed for c.w./RTTY use peaking on 900Hz with a 3dB bandwidth of 400Hz producing a fairly low *Q*. As described the centre frequency can be easily tuned to suit individual preference. The active low pass filter provides a sharp cut-off at approximately 1200Hz for the really noisy situation and has proved its worth in all modes, although of course much of the higher audio content is lost.

Fitting the ST80 Stabiliser

There is ample room inside the FRG-7 to fit the unit when built up, however to eliminate any chance of r.f.i. from the digital circuitry the author fitted the unit externally. The FRG-7 Digital Frequency Readout used by the author is also external. Manufactured by Timestep Electronics the DFM 7 is supplied with a smart case. As the requirements for the ST 80 stabiliser are the same as the DFM 7 i.e. d.c. supply and access to the second v.f.o. output, the ST 80 was mounted in the d.f.m. cabinet.

Details of the precise operation of the ST 80 is described fully in References 1 and 2. Basically, using digital techniques the stabiliser provides a d.c. correction voltage which controls a Varicap diode, capacitively coupled to the v.f.o. Any drift in the v.f.o. is compensated for by the correction voltage causing the Varicap diode to pull the v.f.o. in the opposite direction. The v.f.o. thus hunts around a centre frequency of ±5Hz with stabiliser points at approximately 30Hz intervals, but these are not detectable by the listener. Normal tuning of the v.f.o. is not affected as the long time constant of the correction voltage ignores such rapid frequency changes.

The connections of the ST 80 are shown in Fig. 1, this includes the control of the FRG-7 second v.f.o. Note that to minimise cabling requirements the d.c. control voltage is fed back down the coaxial cable which brings up the second v.f.o. frequency. Thus isolating components need to be included, C1 and C2 prevent the d.c. control voltage from reaching the d.f.m. input and the FRG-7 test point while RFC1 and 2 prevent r.f. from reaching the ST 80 control voltage output and the FRG-7 second v.f.o. tuned circuit. Resistors R1 and R2 isolate the two r.f. inputs, R3 is chosen if required to reduce the d.c. supply voltage to 12 volts for the ST 80.

The ST 80 as supplied requires up/down control switches to centre the d.c. control voltage in the operating range should the end of range be reached in either direction. The operating point in the control range is indicated on the meter supplied with the ST 80 kit. In the author's case these switches and meter are mounted on the front panel of the d.f.m. If internal FRG-7 mounting of the ST 80 is contemplated then it would be a justifiable risk not to fit the switches or meter. The FRG-7 v.f.o. is very stable as it stands and full control is very easily accomplished by the ST 80 stabiliser. In the author's experience the ST 80 will only run out of control range if the receiver is left on continuously, therefore under normal use the up/down switches are never used (except as very useful ultra fine tuning of the receiver). Note that powering down

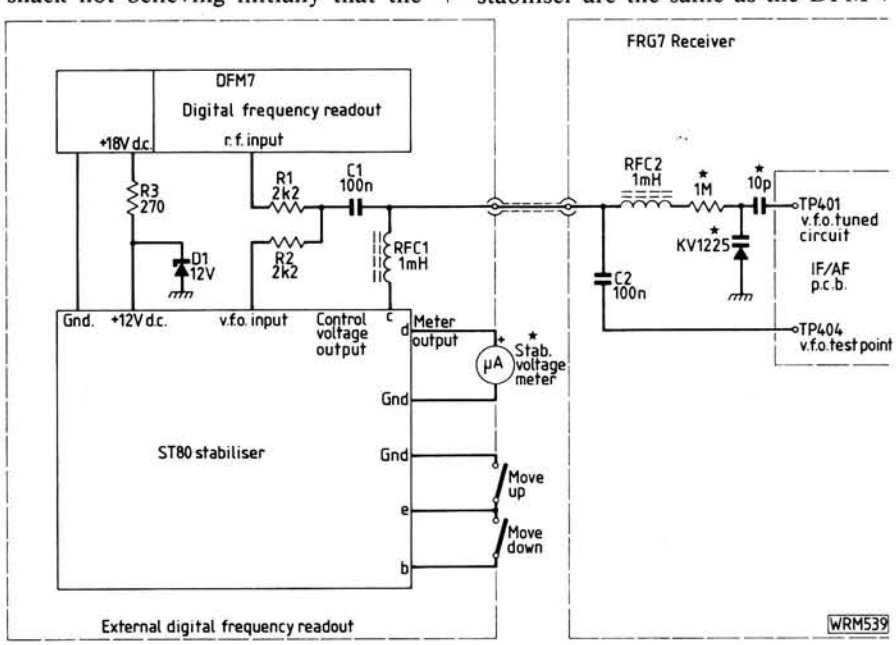


Fig. 1: The ST-80 connections. Components marked * are obtained with the ST-80 kit

the ST 80 and powering up again will recentre the operating point should the end of range be reached.

Capacitor C2 couples the v.f.o output into the coaxial cable via TP404 while a very convenient point for connection of the Varicap control circuit is available on TP401. Small tag strips were fitted, using the FRG-7 i.f./a.f. unit p.c.b. fixing screws in this area, on which the isolating choke, resistor, Varicap diode and coupling capacitor were mounted.

As mentioned previously, the best way to tackle the b.f.o. drift is to replace it completely with a crystal controlled c.i.o. (carrier insertion oscillator) for u.s.b. and l.s.b. The circuit chosen is illustrated in Fig. 2, it is straightforward and extracted from Reference 3. The output buffer is styled on the FRG-7 b.f.o. circuit to ensure as near correct matching in impedance and c.i.o. amplitude as possible.

Crystals were purchased from Quartslab (order as Spec E). It should be noted that the frequencies quoted assume that the Kokusai MF455 10AZ121 high quality mechanical filter is in use. Other filters may well require different carrier frequencies. Oscillator selection is made by grounding the appropriate source via the existing mode select switch S3c. S3c wiper is grounded. The c.i.o. is switched on in u.s.b./l.s.b. mode by S3d as before but the toggle is disconnected from the 9 volt line and connected to the 10.5V line. The p.c.b. is shown in Fig. 3, a 25mm high screen cut from p.c.b. material was used to surround the board. Feedthrough capacitors were fitted in this screen for power and u.s.b./l.s.b. selection connections. The board was mounted on short spacers in the space normally occupied by the battery pack, this facility not being of interest to the author. Coaxial cable connects the c.i.o. output to the i.f./a.f. p.c.b., (C439 10nF), which originally coupled the b.f.o. to the product detector, is removed and the new feed introduced at this point. No alignment is necessary and the only constructional point to note is that a heat sink should be used when soldering in the crystals.

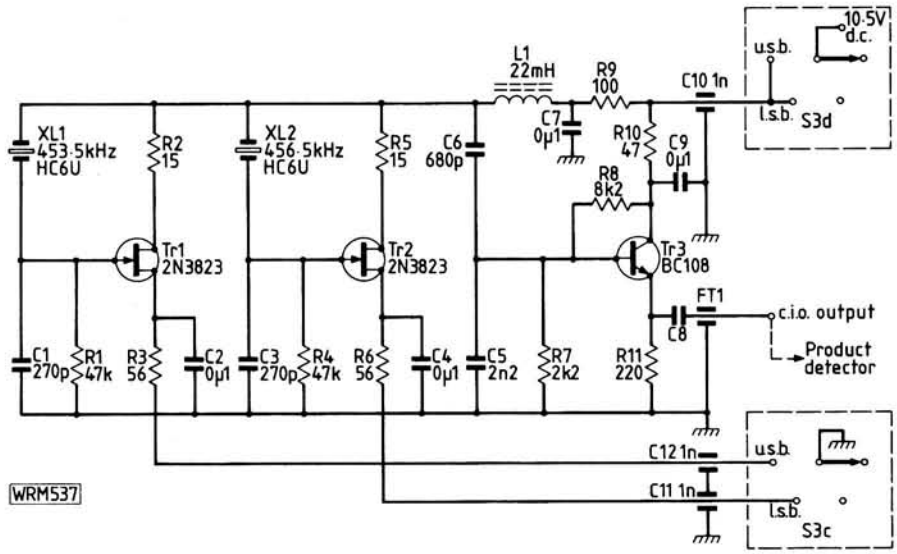


Fig. 2: The new carrier insertion oscillator

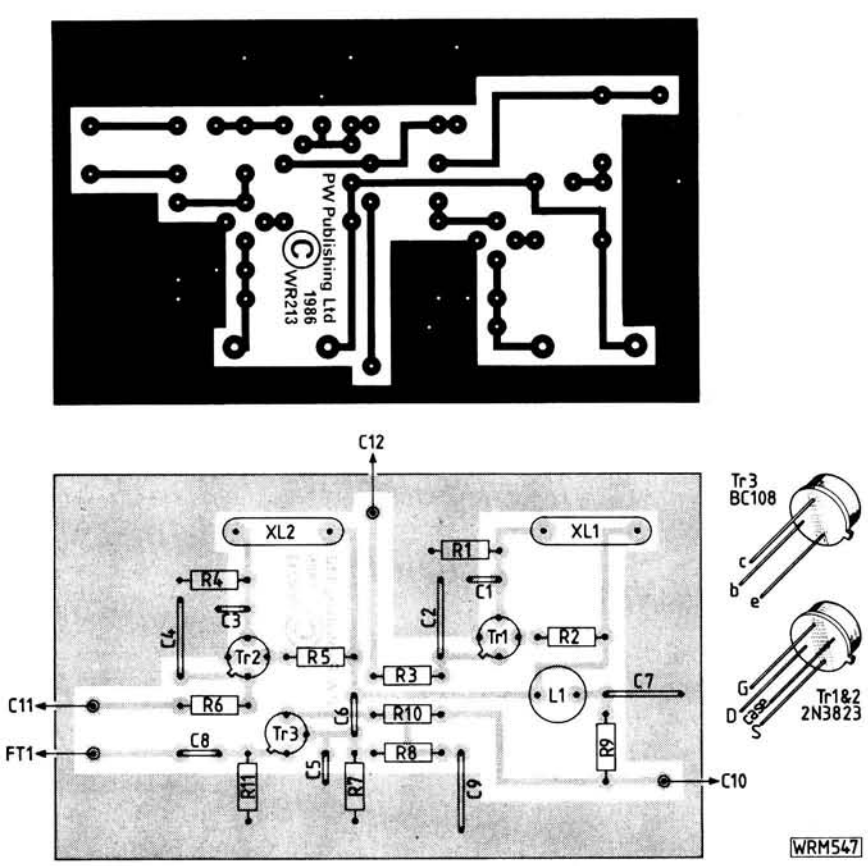


Fig. 3: The carrier insertion p.c.b. and component layout

Replacing the Audio Filters

As mentioned previously the Narrow *CR* filter is replaced by cascaded band pass active filters and the low *CR* filter replaced by cascaded low pass active filters. Both filters use standard active filter concepts, Fig. 4 demonstrates the arrangement and Fig. 5 shows the detailed circuitry.

The band pass section was designed for a *Q* of 2 producing a 3dB bandwidth of approximately 400Hz with c.w./RTTY in mind. The centre frequency is tunable so that constructors can set to individual requirements. In the author's case the potentiometers R2 and 5 were replaced with fixed resistors. Gain is slightly greater than unity at the centre frequency of the filter. In the low pass case the values chosen produce a sharp roll off at approximately 1200Hz with unity gain.

The original NARROW/NORMAL/LOW switching is used modified as shown. No p.c.b. is offered, the author made up both filters on a small piece of Veroboard which was mounted immediately alongside the audio filter select switch on the side of the v.f.o. capacitor screen box.

References

1. *Huff and Puff in CMOS—Technical Topics* by Pat Hawker G3VA. *Radio Communication* April 1978.
2. *The STBO VFO Stabiliser* by A.L. Bailey G3WPO. *Radio Communication* March 1981.

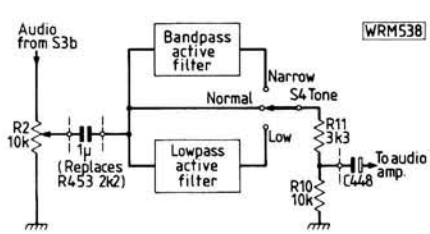


Fig. 4: The audio filter arrangement uses FRG-7 component designations

3. *The Radio Amateur Handbook 1982.* ARRL.

Further Reading

The Circuit, Operation and Alignment of the FRG-7, Part 1 and 2. By J.L. Linsley Hood, MIEE, MIMC. *Short Wave Magazine*, September and October 1981. **PW**

How Much? & How Difficult? £20 Intermediate

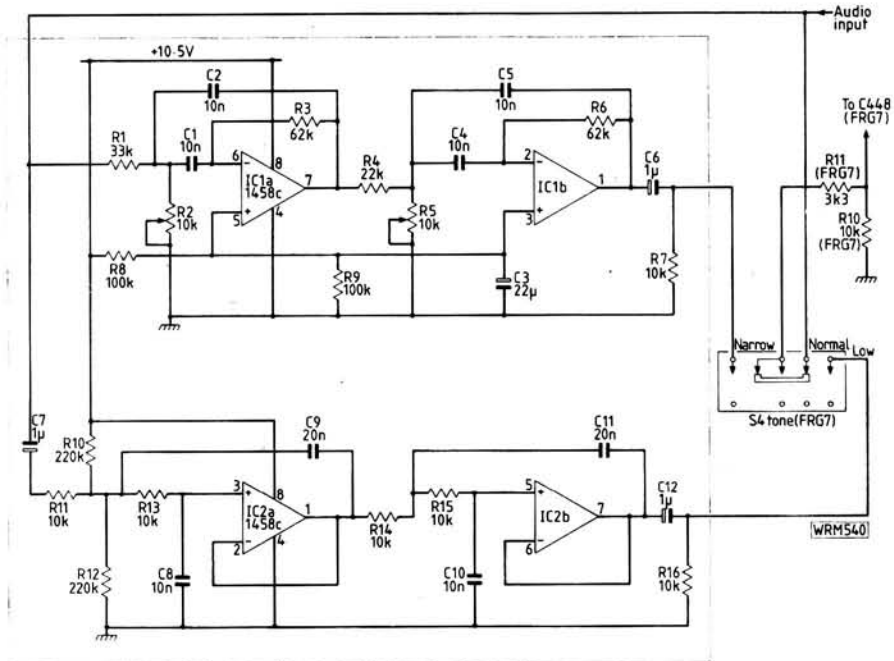


Fig. 5: The bandpass and lowpass filters

SHOPPING LIST

AUDIO FILTERS

Resistors

¼W 5% Carbon Film

10kΩ	6	R7,11,13–16
22kΩ	1	R4
33kΩ	1	R1
62kΩ	2	R3,6
100kΩ	2	R8,9
220kΩ	2	R10,12

Miniature Horizontal Preset

10kΩ	2	R2,5

Capacitors

Mylar Film

10nF	10	C1,2,4,5, 8,9*,10,11*

Sub Miniature Electrolytic

1µF	3	C6,7,12
22µF	1	C3

Semiconductors

Integrated Circuits

1458C	2	IC1,2

Miscellaneous

Veroboard; Veropins.

*20nF made up from 2 × 10nF in parallel

CARRIER INSERTION OSCILLATOR

Resistors

¼W 5% Carbon Film

15Ω	2	R2,5
47Ω	1	R10
56Ω	2	R3,6
100Ω	1	R9
220Ω	1	R11
2·2kΩ	1	R7
8·2kΩ	1	R8
47kΩ	2	R1,4

Capacitors

Low Voltage Disc Ceramic

2·2nF	1	C5
10nF	1	C8
0·1µF	4	C2,4,7,9

Ceramic Plate

270pF	2	C1,3
680pF	1	C6

Solder-in Feedthrough

1nF	3	C10–12

Inductors

22mH	1	L1 (Toko 187LY-233)

Semiconductors

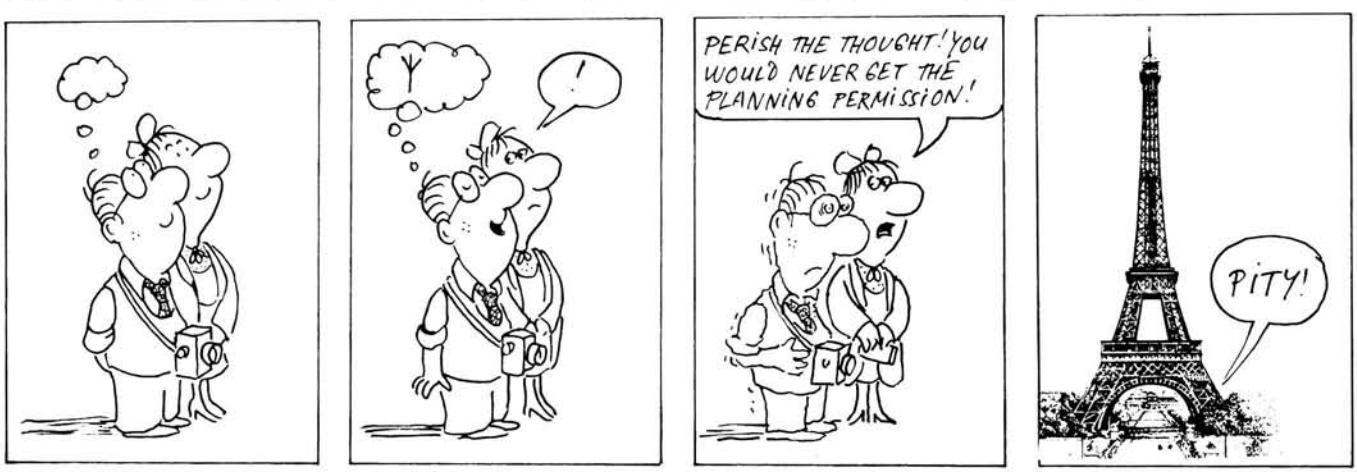
Transistors

BC108	1	Tr3
2N3823	2	Tr1,2

Miscellaneous

453·5kHz crystal (see text); 456·6kHz crystal (see text); Veropins; Feedthrough insulator; p.c.b.

BENNY



Restoration of Old Valve Receivers

Whilst not pretending that valve sets are superior Robert A. Wilson recalls the fun in valve receivers.

With the great advances in technology over the last few years, the use of the valve in radio receivers has been dropped in favour of the transistor.

For a lot of people, including myself, these advances have unfortunately taken away a lot of the pleasure of former times when dealing with radio sets.

Recently I have obtained and resurrected two ancient sets. The fault diagnosis and repair did not take a great deal of time or money, but it gave me a lot of pleasure in recalling my earlier delvings in radio.

The purpose of this article is not to pretend valves are superior to more modern sets, but to re-kindle old memories amongst senior readers and maybe give some of the younger readers a practical insight into the radio of days gone by.

The sets themselves are neither expensive, or difficult to obtain. Markets, car boot sales and jumble sales usually provide a selection of sets to choose from.

I would say that a reasonable price range would be between five and ten pounds. When looking for a suitable set a few points should be kept in mind. Valves are often difficult to obtain and quite expensive these days. Make sure that the set you choose is complete, unless you know that you can obtain any missing valve or item.

I prefer to work on the old mains sets as with battery sets the batteries would be very expensive, if indeed high voltage batteries are still produced anyway. Also the battery valve was much more delicate and susceptible to filament failure through either misuse or physical knocks.

Quite often the type of valve used in the set was printed on the back panel. This is very useful when deciding what to buy as you can always take a copy of *PW* along with you for a quick check in the valve adverts as to whether they are still available should any be gone.

Having obtained a set, a few preliminary checks should be made before plugging in. Have a good look for any obvious burn marks above or below the chassis. The inside of all the valves should have a mirror-like mark somewhere inside the glass envelope. This is normal and not an indication of a "burn out". If the inner coating of the valve is milky white, this indicates that the glass envelope has leaked air and the valve therefore rendered useless.

Check the resistance across the mains cable. If there is a dead short, there is no point in plugging in until it has been cleared. If the set is one using a mains transformer the resistance could be as low as 40 or 50Ω. Any a.c./d.c. sets use a dropping resistor which is usually quite large (several inches long) and green in colour. The mains cable resistance of an a.c./d.c. set should be considerably higher, more like 2·5kΩ. The reason for this is that all the valve heaters (filaments) are connected in series with the dropper resistor. So that if the valves took 0·1A for their heaters from a 250V supply the total resistance would be 2·5kΩ.

Next Steps

If you do not obtain the expected reading you should look for the simple things first, such as burned out fuses, faulty on/off switches. The older type of mains transformer seldom gave trouble, but fortunately replacements are still available at reasonable cost. On the a.c./d.c. sets, however, the mains dropping resistor could well be the reason for an open circuit. If it is not the resistor then it must be either fuses, switch or one of the valve heaters open circuit.

Once these preliminary checks are complete, the set may be plugged in and switched on. Be careful of course not to touch the chassis, or any other metal part of the set when plugged in to the mains.

The first thing to look for in a valve set is whether the valves are lighting up or not. If any of the valves fails to light, the set will not work.

A typical power supply unit for a set using a mains transformer is shown in Fig. 1. If you have a data sheet for your set all the better, but they are mostly very similar and it is quite possible to get by with common sense. If none of the valves light, you should first check that the mains voltage is reaching the transformer. If it is, the heater volts should then be checked on the secondary. Heater voltages vary, but are generally quite low, usually 6·3V in a set using a transformer. The heater volts can be obtained from a valve data book. Check the heater connections on the valve base. If only one valve fails to light, this would suggest heater failure, but do not jump to conclusions. It could be a broken wire, dry joint or dirty base pins. All glass valves should be removed by gently pulling them out with a slight rocking movement. Older valves with a plastics base should be removed in the same manner, but making sure that you have hold of the base and not the glass. If you try pulling them out by the glass you could well end up pulling the glass from the valve base, thus ruining the valve.

A typical power unit of an a.c./d.c. set is shown in Fig. 2. In this system, it is obvious that failure of fuse, switch, dropping resistor, any dial lamp or any valve will result in nothing lighting up.

Both types of valve heating circuits are so simple as to be self explanatory.

High tension (h.t.) faults, however, are quite common in these old sets and so I will describe the problems I had recently with the set shown in Fig. 3. When I first purchased it I knew there would be power problems as the socket for the reservoir/smoothing capacitor was empty. These capacitors are usually quite large, often standing as tall as the valves and i.f. cans. Also the rectifier valve, a 5Z4, was missing. When the set was first switched on the four remaining valves lit up as expected (heater failures are rare). On removing the set from the case I discovered that at some time the reservoir/smoothing capacitors, once contained in the single can, had been replaced by two smaller ones now housed beneath the chassis. Not wanting to go to the expense of another rectifier valve I

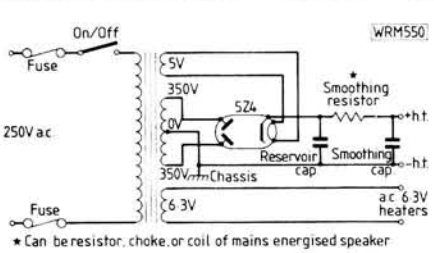


Fig. 1: A typical power supply for a set using a mains transformer

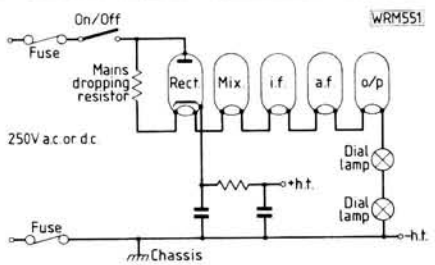


Fig. 2: Typical power supply of an a.c./d.c. set

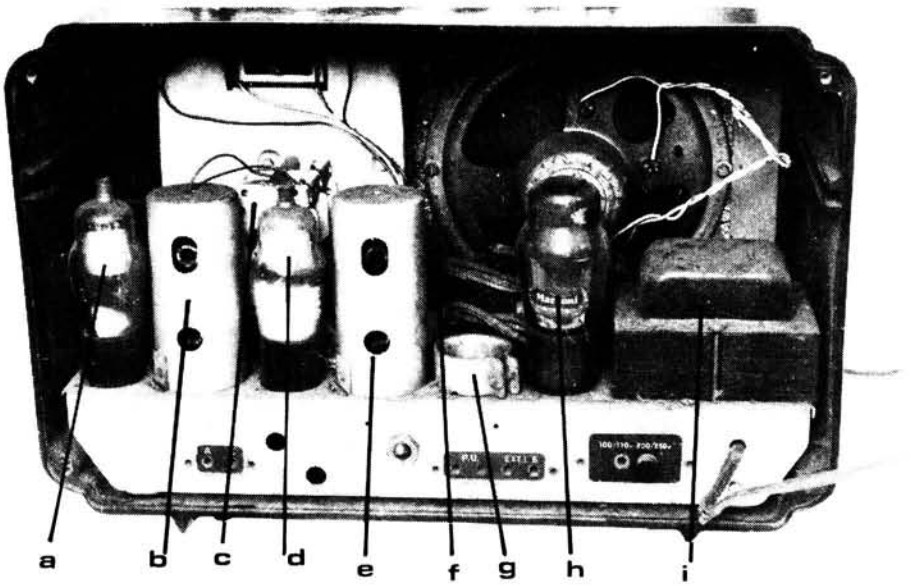


Fig. 3: A typical commercial receiver of 30 years ago. (a) Frequency changer (mixer) 6K8. (b) Intermediate frequency transformer (i.f. can). (c) Tuning capacitor. (d) Intermediate frequency (i.f.) amplifier 6K7. (e) Tuning slug of i.f. transformer. (f) Detector, a.g.c., a.f. amplifier valve 6Q7. (g) Empty socket once containing reservoir/smoothing capacitors. (h) Output valve 6V6. (i) Mains transformer, 250V primary, 350–0–350, 6·3, and 5V secondaries.

replaced the missing valve with a pair of 400V 1A silicon diodes. On plugging in and switching on the set worked after a fashion. But after a few minutes a bubbling sound was heard from the mains transformer, accompanied by a burning smell. Even with the h.t. lead disconnected from the radio it still overheated after a few minutes. Closer inspection of the bottom of the transformer showed signs of previous burning and I had to accept the fact that the transformer was faulty.

Fortunately I had a similar transformer previously salvaged from a junk set. When this was fitted the set worked at a more acceptable level of volume and more important without overheating. The new power unit circuit is shown in Fig. 4.

Had the set been of the a.c./d.c. variety and had a burned out mains dropper for which a substitute could not be found, a new power unit could have been built on these lines. The biggest problem in doing this would be to find correct heater voltages. For instance a set recently worked on had five valves with heater voltages of 14V, 12·6V, 14V, 45V and 31V. The 31V valve was the rectifier which could be easily disposed of by replacing with a silicon diode. A transformer with an output of 40V could then be used to take care of the other four valves. The 45V output valve would have to manage with just 40V. The other three would be connected in series with each other, the three requiring a total of 40·6V.

Knowhow & Sense

So it can be seen that with some common sense, plus a knowledge of power supplies in general, the problems of power requirements can be overcome without too much trouble.

The remainder of the circuitry will be very similar for either transformer sets or a.c./d.c. ones.

A typical valve-line up for a domestic receiver is: frequency changer (mixer), i.f. amplifier, detector/a.g.c./a.f. amplifier and output stage. The mixer is usally a triode-hexode, the i.f. a variable mu pentode, whilst the detector/a.g.c./a.f. are combined in one valve, a double diode triode. The output stage will be either a pentode or a beam tetrode.

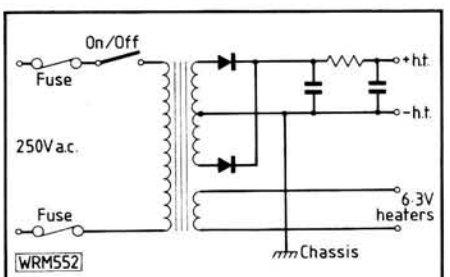


Fig. 4: The new power unit for my receiver

High Quality Sets

Occasionally in high quality sets there would be an r.f. amplifier before the mixer and an additional i.f. stage.

Identification of the valves is obtained from a radio valve data book which usually lists all the various types together. The set shown in Fig. 3 has a class of valve once in very common use and they identify as follows:

6K8	triode hexode mixer
6K7	variable mu pentode
6Q7	double diode triode
6V6	beam tetrode

These are good valves to work with as they are still available and all have 6·3V heaters.

Another common set of valves usually to be found in a.c./d.c. sets are:

UCH42	triode hexode mixer	14V heater
UF41	variable mu pentode	12·6V heater
UBC41	double diode triode	14V heater
UL41	pentode	45V heater
UY41	rectifier	31V heater

For safety reasons, and also valve/component availability, the a.c. only sets are the best to work with. They usually have an earthed chassis and are isolated from direct connection from the mains by the transformer (although dangerous voltages are still present within the set).

The a.c./d.c. types have a "live" chassis, connected direct to the mains.

Once power has been confirmed/restored, if the set still does not work we must go further.

It goes without saying that all the dust has been removed. These old sets are usually thick with it and although it doesn't often prevent them from working it can lower their general performance and also become a fire hazard.

Certain components will only very rarely give trouble, provide they are not tampered with—the tuning coils, mixer coils and i.f. transformers. The tuning and mixer coils are usually situated below the chassis in the vicinity of the tuning capacitor. The i.f. transformers are in large cans usually between the valves. In Fig. 3 the holes in the i.f. cans give access to the dust iron tuning cores. It is usually obvious if they have been tampered with, as after the initial setting up they are sealed with either wax or paint. Once set up in the factory they remain correct, so never attempt to alter them unless you have reason to believe that they have been tampered with. The same goes for the other coils—leave them alone!

Still Not Working?

The tuning capacitors in these old sets are air-spaced and as long as their vanes are not touching the only thing they are likely to suffer from is dust. If present if should be removed by gently brushing with a fine brush.

If the set is still not working, or working at reduced performance, the individual valve power supplies should be checked. The mixer should have a fairly large anode voltage on both the triode and hexode sections and on the common 2nd and 4th grids of the hexode section there should also be a good voltage, although slightly less than the anode volts.

The i.f. amplifier should also have a high anode voltage and a fairly high 2nd (or screen grid) voltage. The 3rd grid should have no voltage or very little. The double diode triode should only have a high voltage on the anode of the triode section. The output valve if it is a pentode may have the anode and screen grid strapped together, in which case a high voltage should ap-

pear on both. The 3rd grid (suppressor) should again have little or no voltage. A beam tetrode (no suppressor grid) should be similar.

Screen grid circuits can often give trouble. They are connected to the h.t. line by a resistor and also decoupled to earth by a capacitor. Should the capacitor break down and short the screen grid to earth, the resistor will overheat and burn out. Should this happen, the valve usually survives, but will not function at optimum performance until the screen grid voltage has been restored.

Should any of these voltages not be present it is a matter of common sense to find out why. The anodes are all connected to the h.t. line by either a transformer primary or a resistor, and the cathode to earth either direct or via a resistor or coil. If all the voltages are present at the anodes and screen grids, the cathode circuits should be looked at. If the cathode is joined directly to earth there is no problem. If it goes via a small resistor or choke, check them on the ohmmeter. Cathode resistors often have a small capacitor across them for decoupling. If this capacitor develops a short the set will continue to work, but not at optimum as the bias arrangements are upset.

A check can be made on the a.f. stages by injecting an audio signal to the grid of the output valve. If the amplified signal comes out of the speaker, try putting it into the grid of the triode. These two grids are the signal grids, in the case of the triode the only one, in the case of the output valve G1.

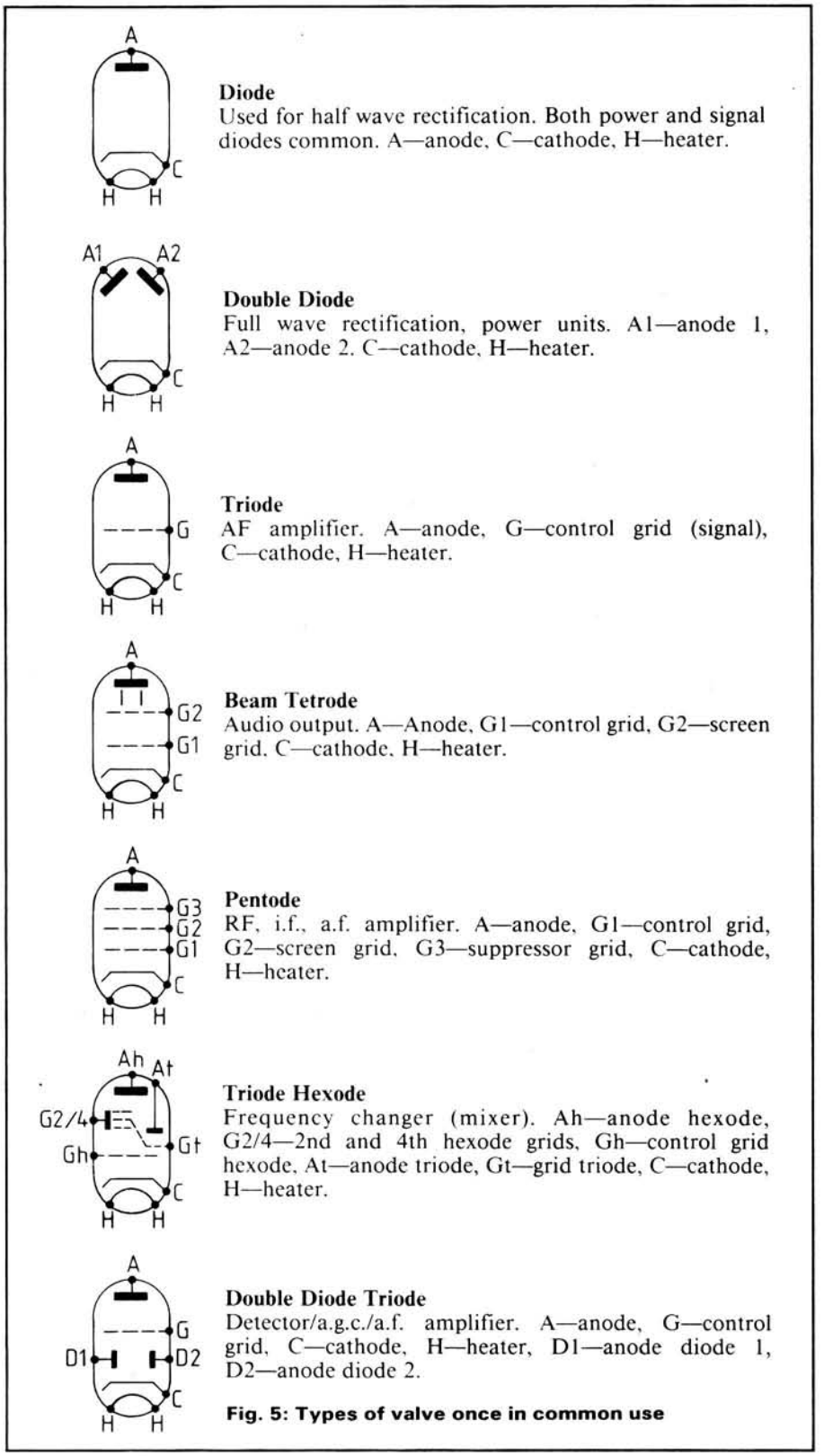
Coupling Components

Coupling components can also give trouble and prevent a set from working even when all voltages seem OK. They usually take the form of small wax covered capacitors in the region of 10nF. These waxy types often develop leaks after a number of years and can be checked on the ohmmeter in the usual manner.

Wirewound resistors should always be suspected as they often give trouble. They are usually quite heavy looking things, painted green or buff colour with the value and wattage printed on them rather than in colour code.

Older valves as shown in Fig. 3 often have a connection made to the top via a small clip. These caps are usually grid connections, one of which goes into an i.f. transformer. In this instance the connection is made by a single wire, but in some sets it is coaxial cable. Very old coaxial cable can develop short circuits and prevent the set from functioning, also with the grid caps being taken off and on sometimes the wire breaks inside the can. The cans may be opened fairly easily. Sometimes there are two nuts below chassis, or in this case two spring clips. Always built well in those days were i.f. transformers, and the windings terminated in a solder tag before changing to either coaxial cable or normal wire to the valve. As a result, repair is quite easy. But apart from connection repair, an i.f. can should be left alone. If necessary the primary and secondary and insulation may be checked from the external connections.

With the larger type of valve, the pins usually remain quite clean and poor contacts are rare. With the smaller all glass ones, however, the pins tend to get quite black and poor connections can result. These should be scraped gently with a sharp knife.



Diode
Used for half wave rectification. Both power and signal diodes common. A—anode, C—cathode, H—heater.

Double Diode
Full wave rectification, power units. A1—anode 1, A2—anode 2. C—cathode, H—heater.

Triode
AF amplifier. A—anode, G—control grid (signal), C—cathode, H—heater.

Beam Tetrode
Audio output. A—Anode, G1—control grid, G2—screen grid, C—cathode, H—heater.

Pentode
RF, i.f., a.f. amplifier. A—anode, G1—control grid, G2—screen grid, G3—suppressor grid, C—cathode, H—heater.

Triode Hexode
Frequency changer (mixer). Ah—anode hexode, G2/4—2nd and 4th hexode grids, Gh—control grid hexode, At—anode triode, Gt—grid triode, C—cathode, H—heater.

Double Diode Triode
Detector/a.g.c./a.f. amplifier. A—anode, G—control grid, C—cathode, H—heater, D1—anode diode 1, D2—anode diode 2.

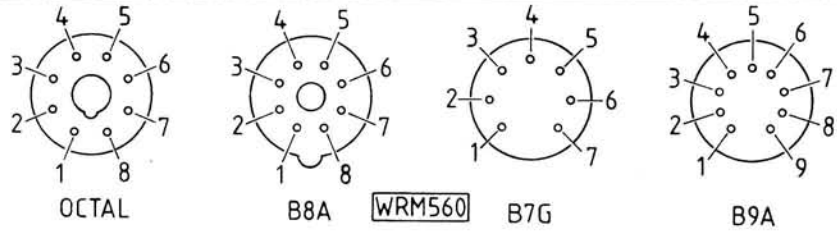
Fig. 5: Types of valve once in common use

If you do not have a circuit of the set it is a good idea to write the number of each valve on the chassis next to its socket. Also when cleaning valves take care to note the number beforehand, then in the event of rubbing it off it can be put back on again with a sticky label.

Last Point

One last point. In very old sets the speaker may be mains energised, rather than having a permanent magnet. In a mains energised speaker the

Fig. 6: General information. The four bases show the most common types of valves. The tables shows a selection of typical valves. For more information a valve data book should be consulted



magnet winding is also the smoothing choke from the power unit. This can be confusing if you have not come across it before as the speaker has four wires coming out of it, two going direct to the smoothing capacitors.

Once these ancient sets are restored to the full working order most people are surprised at their excellence of tone and general performance. They are well worth the effort of repair, as they say—a change is as good as a rest!

Typical Voltages (Valves Bases)

The following voltages were taken from the Philco set shown in Fig. 3, using a digital meter (chassis negative);

h.t. supply 335V

6K8 frequency changer (mixer)	
Cathode	3V
Screen grid	85V
Anode hexode	332V
Anode triode	135V
6K7 i.f. amplifier	
Cathode	2V
Screen grid	85V
Anode	326V
6Q7 detector/a.g.c./a.f. amplifier	
Cathode	3V
Anode	185V
Anode diode	2V
Anode diode	1V
6V6 output	
Cathode	8V
Screen grid	335V*
Anode	325V

* The screen grid of the output valve in this set is taken to the h.t. line, hence the higher voltage on the screen than the anode.

All of these voltages will vary from set to set, but do give a good idea of what to expect. ***PW***

Triode Hexodes

Number	Base	Pins	1	2	3	4	5	6	7	8	9	Heater V
UCH42	B8A		H	Ah	At	Gt	G2	G1	C	H	—	14
6K8	Octal		—	H	Ah	G2	Gt	At	H	C	—	6·3
X79	B9A		G2	G1	C	H	H	Ah	Gt	At	—	6·3
ECH81	B9A		G2	G1	C	H	H	Ah	G3	At	Gt	6·3
ECH35	Octal		—	H	A	G2	Gt	At	H	C	—	6·3
(Top cap of ECH35 is G1)												

Pentodes

6K7	Octal		—	H	A	G2	G3	—	H	C	—	6·3
(Top cap of 6K7 is G1)												
UF41	B8A		H	A	—	—	G2	G1	C	H	—	12·6
EF80	B9A		C	G1	C	H	H	—	A	G2	G3	6·3
EF39	Octal		—	H	A	G2	G3	—	H	C	—	6·3
(Top cap of EF39 is G1)												
W77/EF92	B7G		G1	C	H	H	A	G3	G2	—	—	6·3

Double Diode Triodes

6Q7	Octal		—	H	A	Ad	Ad	—	H	C	—	6·3
(Top cap of 6Q7 is G1)												
EBC33	Octal		—	H	A	Ad	Ad	—	H	C	—	6·3
(Top cap of EBC33 is G1)												
UBC41	B8A		H	A	G1	—	Ad	Ad	C	H	—	14
DH77/6AT6	B7G		G1	C	H	H	Ad	Ad	A	—	—	6·3

Output Tetrodes and Pentodes

6V6	Octal		—	H	A	G2	G1	—	H	C	—	6·3
N78	B7G		G1	C	H	H	A	—	G2	—	—	6·3
UL41	B8A		H	A	—	—	G2	G1	C	H	—	45

Power Rectifiers

5Z4	Octal		—	H	—	A	—	A	—	H/C	—	5
UY41	B8A		H	A	—	—	—	—	C	H	—	31
U78/6X4 /EZ90	B7G		A	—	H	H	—	A	C	—	—	6·3

Key

H Heater	Ah Anode hexode
At Anode triode	A Anode
G1 Control grid	G2 Screen grid
G3 Suppressor grid	C Cathode
Gt Grid triode	Ad Anode diode

Note: sometimes in pentodes the suppressor grid (G3) is connected to the cathode within the valve, hence no external connection.

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*, Enefco House, The Quay, Poole, Dorset BH15 1PP, 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 Marconi signal generator TF801D/85, 10MHz–485MHz calibrated and in good condition, instruction manual included. Would exchange for an Eddystone 770/7 v.h.f. RX or a R216 v.h.f. RX. Write: Mr C. M. Duncan, Roadside Cottage, Hoswick, Sandwick, Shetland ZE2 9HL. *B186*

Have Zenit-E 135mm Konica C35 National PE1405 flash, Beta II 35 enlarger. All item v.g.c. Also have Fidelity 3000FM CB. Would exchange for Realistic DX302 or DX200. N. Beadsworth, 34 Heron Way, Clooney Estate, Waterside, Londonderry, N. Ireland. Tel: 47871. *B206*

Have Polaroid 600 camera, Mamod steam engine (SE2) and WS1 workshop; Bremi CB p.s.u., Weller 240V soldering iron. All in v.g.c. Would exchange for Spectrum, Vic-20, TRS-80 or Maxcom TE CB. Graham. Tel: 0203 341368 (Nuneaton). *B223*

Have 1155 receivers, AR77 receiver, Taylor signal generator, meters, valves, many other items for engineering, photographic, woodworking equipment, s.a.e. for full list. Would exchange for w.h.y? Sid, 34 Crawley Down, East Grinstead, RH19 2PP. *B209*

Have Pentax Daylab colour enlarger/processor, heated water tank and print washer. Would exchange for 100W 144MHz linear (transistors). G4BTV. Tel: Fareham 235164 (Hants). *B218*

Have a valve voltmeter CT343, 12 ranges, 400 volts to 1·2 millivolts f.s.d. Would exchange for any scanner. Alan. Tel: Rotherham 814017. *B219*

County Antrim

Lagan Valley ARS: Jim Jackson G14TCS, Shantara, 21 Carnreagh, Hillsborough, Co. Down. Meets 2nd Mondays, 7.30pm in the Rathvarna Teachers Centre, Pond Park Road, Lisburn.

Avon

Bath & District ARC: L. Lear G3FIH (Bath 837539). Meets alternate Wednesdays, 7.45pm in the Englishcombe Inn, Englishcombe Lane, Bath. Next meetings—May 14 and 28.
Bristol ARC: D. Gully G4YOC (Bitton 4116). Meets Tuesdays, 7.30pm in the YMCA, 6 Park Road, Kingswood, Bristol.
City of Bristol RSGB Group: Colin Hollister G4SQQ (Bristol 508451). Meets 4th Mondays, 7.30pm in the small lecture theatre, Queens Buildings, UoB, Clifton. May 25—Mobile Picnic.
North Bristol ARC: Alan Booth G4YQQ (Bristol 690404). Meets Fridays, 7pm in the Self-Help Enterprise Centre, 7 Braemar Crescent, Northville.
Bristol (Shirehampton) ARC: Ron Ford G4GTD (Bristol 770504). Meets Fridays, 7.30pm in Twyford House, Lower High Street, Shirehampton.
Gordano ARG: John Davies G3LJD, 273 Down Road, Portishead, Bristol. Meets 4th Wednesdays, 8pm in The Ship, Redcliffe Bay, Portishead.

Bedfordshire

Bedford & District ARC: Chris Lenn G4VHF (Bedford 751763). Meets 1st and 3rd Thursdays, 8pm in Allen's Club, Hurst Grove, Queenspark. May 15—RTTY and Datacomms; June 5—Design and Construction of d.f. antennas.
Dunstable Down RC: Philip Morris G6EES (Dunstable 607623). Meets Fridays, 8pm in Room 3, Chews House, 77 High Street South, Dunstable. May 6—Visit to Intelsat Downlink Station; 23rd—"Rig Doctor" session; June 6—Wire Antennas.
Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm in the Church Hall, Ampthill Road, Shefford. May 8—Junk Sale run by G6KUK.

Berkshire

Newbury & District RS: M. J. Fereday G3VOW (Newbury 43048). Meets 2nd Tuesdays in Newbury Technical College.

Buckinghamshire

Milton Keynes & District ARS: Dave White G3ZPA (Milton Keynes 501310). Meets 2nd Mondays, 7.30pm in the Meeting Place, Hodge Lea, North Milton Keynes. May 12—TVI and BCI by G1NXH.

Cambridgeshire

Cambridge & District ARC: Brian Davy G4TRO (Cambridge 353664). Meets Fridays, 7.30pm in the Visual Aids Room, Coleridge CC, Radegund Road, Cambridge.

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. May 7—Bring and Buy.

Cheshire

South Cheshire ARS: Chris Wiseman G1PUV (Kidsgrove 73185). Meets 2nd and 4th Mondays, 8pm in the Crewe LMR Sports Club, Goddard Street, Crewe. May 12—Contest Operation by G4APA.

CLUB NEWS

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

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. May 13—Computer-Aided Design by GW8ICT; 27th—ATV by G4EZO.

Clywd

Conwy Valley ARC: Nigel Vicars-Harris (Conwy 636376). Meets 2nd and 4th Thursdays, 8pm in the Green Lawns Hotel, Bay View Road, Colwyn Bay. May 8—DF Hunt; June 12—AGM.
Rhyl & District ARC: Melfyn Allington GW1AKT (Nantglyn 469). Meets 1st and 3rd Mondays, 7.30pm in the Mona Hotel, Market Street, Rhyl. May 19—Lecture by G3SCG; June 2—DF Hunt Planning; 8th—DF Hunt.

Cornwall

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

Cumbria

Carlisle & District ARS: Tony Leach G4WOQ (Scotby 500). Meets Mondays, 7.30pm in Uppersby Parish Hall, Uppersby Road, Carlisle.
Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith. Meets 3rd Thursdays, 7.30pm in the Kings Arms, Temple Sowerby.
Solway RC: D. G. Rayner G0AFP (Cockermouth 826461). Meets Wednesdays in the Maryport Educational Settlement, High Street, Maryport.

Derbyshire

Bolsover ARS: David Fleetwood G1GNC (Chesterfield 824061). Meets Wednesdays, 7.30pm in the Black Bull, Bolsover.
Buxton ARS: Tony Briggs G8YHX (Buxton 6800). Meets alternate Wednesdays, 8pm in the Haddon Hall Hotel, London Road, Buxton. Next meetings—May 14 and 28.
Glossop & District RG: Geoff Sims G4GNQ, 85 Surrey Street, Glossop. Meets last Thursdays, 8pm in the Nags Head, Charlestown Road, Glossop. May 29—Activity Night from Dinting Railway Centre.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Fridays, 7.30pm in the Cavalier Inn, West Street, Axminster. June 6—Racal Vodafone.
Plymouth ARS: John Veale G4SCA (Plymouth 337980). Meets 1st and 3rd Mondays, 7.30pm in Plymouth Albion RFC, Beacon Park, Peverell, Plymouth. May 19—BBC Programmes.
Torbay ARS: Brian Wall G1EUA (Teignmouth 78554). Meets Fridays and last Saturdays, 7.30pm in the ECCSC, Ringslade Road, Highweek, Newton Abbot. May 31—Digital Recording.

Dorset

Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Fridays, 7.30pm in Commander House, Constitution Hill Road, Poole. May 30—HF Propagation by G3MYM.

County Down

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

Dumfries & Galloway

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

Dyfed

Carmarthen ARS: A. F. Dowling GW3GUE (Carmarthen 883460). Meets 2nd and 4th Fridays, 7.30pm in the Carmarthen Boat Club, The Quay, Carmarthen.
Pembrokeshire RS: Paul Delaney (Letterston 840249). Meets alternate Thursdays in the FE Centre, Tower Hill, Haverfordwest. Morse classes on Wednesdays.

Essex

Braintree & District ARS: Dave Willicombe G0DEC (Braintree 45058). Meets 1st and 3rd Mondays, 7.30pm in the Braintree CC, Victoria Street, Braintree. May 19—AGM.
Havering & District RC: D. St J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm in Fairkytes, Billet Lane, Hornchurch. May 14—Microwave Matters by G4RLN; 28th—DF Hunt by G4MYO.
Loughton & District ARS: John Mattison, Aylmers Farm, Sheering Lower Road, Old Harlow. Meets alternate Fridays, 7pm in Loughton Hall, Rectory Lane, Loughton.
Vange ARS: Mrs D. Thompson, 10 Feering Row, Basildon. Meets Thursdays, 8pm in the Barstable Community Centre, Basildon.

Glamorgan

Bridgend & District ARC: Trevor Morgan GW4SML, 4 Rhiw Tremaen, Brackla, Bridgend. Meets 1st and 3rd Fridays, 7.30pm in the YMCA, Angel Street, Bridgend.
Rhondda ARS: John Howells GW4BUZ (Tonypandy 432542). Meets Thursdays. 7.30pm in the NUM Club, Tonypandy. May 29—Slide Show by GW3CDH.

Gloucestershire

Cirencester & District ARC: G. R. Hayter G0AZD

(Cirencester 5015). Meets alternate Thursdays, 8pm in the Phoenix Centre, Cirencester. Next Meetings—May 22, June 5.
Stroud ARS: P. R. Gainey G1DCT, Prencott, Harley Wood, Nailsworth, Stroud. Meets Wednesdays, 8pm in Nelson School, Stratford Lodge, Stroud.

Grampian

Aberdeen RS: Don Travis GM4GXD (Pitcaple 251). Meets Fridays, 7.30pm in the clubrooms, 35 Thistle Lane, Aberdeen. May 9—TVI by GM8FFX; 16th—IBA transmitter network by GM3YMK; 23rd—d.f. hunt; 30th—Constructional Contest Judging.

Greater Manchester

South Manchester RC: Dave Holland G3WFT (061-973 1837). Meets Mondays and Fridays, 8pm in the Sale Moor CC, Norris Road, Sale.
Stockport RS: M. E. Betts G4FFW (061-224 7880). Meets 2nd and 4th Wednesdays, 8pm in the Magnet Inn, Wellington Road, Stockport.
Trafford ARC: Graham Oldfield G1IJK (Urmston 9804). Meets Thursdays, 7.30pm at TS de Trafford, Sea Cadet Corp, Bradshaw Lane, Stretford.

Hampshire

Amateur Radio & Computer Club: Trevor Tugwell (Fareham 43031 ext 2591). Meets every 4th Friday, 8pm in The Crown, Bishop's Waltham. Next meeting—May 2.
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 the Forest Rings CC, Sycamore Way, Winklebury, Basingstoke. May 5—Home Construction.
Fareham & District ARC: Alan Chester (Fareham 288139). Meets Wednesdays, 7.30pm in the Porchester CC, Westlands Grove, Porchester. May 3 to 5—GB2HAM from PCA Arts & Crafts Exhibition; 7th—24cm TV; June 4—The G6NZ Lecture.
Horndean & District ARC: Dan Barnard G4RLE, 36 Guildford Road, Fratton, Portsmouth. Meets 1st Thursdays, 8pm in Merchiston Hall, London Road, Horndean. June 5—SSTV.
Three Counties ARC: Keith Tupman G0BTU (Petersfield 66489). Meets alternate Wednesdays, 8pm in The Railway Hotel, Liphook. May 14—HM Coastguard Service Talk; 28th—Junk Sale.
Winchester ARC: Robert Stone G4FPC (Winchester 64747). Meets 3rd Saturdays, 7.30pm in The Log Cabin, Stockbridge Road, Winchester. May 16—TV Satellites by G3RDQ.

Hereford & Worcester

Bromsgrove ARS: Alan Kelly G4LVK (021-455 2088). Meets 2nd & 4th Tuesdays, 8pm in The Hundred House, Stourbridge Road, Bromsgrove. May 13—AGM.

Hertfordshire

Borehamwood & Elstree ARS: Tony G0DDJ (01-207 3809). Meets 3rd Mondays, 7.30pm in The Wellington, Theobald Street, Boreham Wood.
Cheshunt & District ARC: John Watkins G4VMR (Dane End 250). Meets Wednesdays, 8pm in the Church Room, Church Lane, Wormley.
Stevenage & District ARS: Frank Wilson G4ISO (Baldock 893736). Meets 1st and 3rd Tuesdays in Sitec Ltd, Ridgemond Park, Telford Avenue, Stevenage. May 6—HF Antennas; 20th—Radio Quiz.
Verulam ARC: Gerry Wimpenny G4OBH (St Albans 52003). Meets 2nd and 4th Tuesdays, 7.30pm in The RAFA HQ, New Kent Road, off Marlborough Road, St Albans. May 27—"Is there any life below 40?" by G3ROO.
Welwyn Hatfield ARC: Dave Fairbanks G0AII (Welwyn Garden 326138). Meets 1st and 3rd Mondays, 8pm in Knightsfield Scout HQ, Welwyn Garden City. Morse Classes on Thursdays by G4WLG and G4WVM. May 19—Construction Time.

Highland

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

Humberside

Grimsby ARS: George Smith G4EBK (Grimsby 887720). Meets Thursdays, 7pm in the Cromwell SC, Cromwell Road, Grimsby. May 8—DF Hunt; 15th—How TV Works; 22nd—DF Hunt; June 5—DF Hunt.
Hull & District RS: Cliff North G4PEP (Hull 77249). Meets Fridays, 8pm in the West Park RC, Walton Street, Hull. May 9—DF Hunt; 23rd—Microwave Antennas; 30th—Bring and Buy; June 6—Construction Contests Judging.
Scunthorpe ARC: G. Parkin-Coates G6OSA (Doncaster 873827). Meets Tuesdays, 8pm in the Hobbies Centre, Grange Farm, Franklin Crescent, Scunthorpe.

Isle of Man

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

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesdays, 8.30pm in Downe Village Hall, High Street, Downe. May 20—AR Quiz.
Cray Village RS: B. Rowe G4WYG, 19 Maderia Park, Tunbridge Wells. Meets 2nd and 3rd Thursdays in the Christchurch Hall, Eltham.
Darenth Valley RS: L. F. W. Thomas (Swanley 63368). Meets last Wednesdays, 8pm in the Crockenhill Village Hall, Swanley.
Edenbridge ARS: John Grevatt G8VCH (East Grinstead 24748). Meets 2nd Wednesdays, 8pm in the Scout Hut, High Street, Edenbridge. May 14—History of Bluebell Railway.
SE Kent YMCA ARC: John Dobson (Dover 211638). Meets Wednesdays, 7.30pm in the Dover YMCA, Godwynehurst, Leyburne Road, Dover. May 7—Crime Prevention by PC Norman; 14th—Christmas Lecture by G6AGK; 21st—Natter Nite; 28—Visit Lantern & Brewery.

Lancashire

Bury RS: Miss C. J. Ashworth G1PKO (061-764 5018). Meets Tuesdays, 8pm in the Mosses Y&CC, Cecil Street, Bury. May 13—Film Show.
Fylde ARS: H. Fenton G8GG (Lytham St Annes 725717). Meets 1st and 3rd Tuesdays, 7.30pm in the Kite Club, Blackpool Airport. May 6—Equipment Sale; 20th—Satellite TV.
Morecambe Bay ARS: W.E. Delamere G3PER (Heysham 52659). Meets Mondays, 7.30pm in the canteen, Luneside Eng. Co., Mill Lane, Halton. May 12—RSGB by G3XSN.
Oldham ARC: Kath Catlow G4ZEP (061-624 7354). Meets Thursdays, 8.30pm in the Moorside Conservative Club, Ripponden Road, Moorside, Oldham.
Preston ARS: George Earnshaw G3ZXC (Preston 718175). Meets 2nd and 4th Thursdays, 7.45pm in the Lonsdale Club, Fulwood. May 8—Stereo Broadcasting by G6UOH.
Rolls Royce ARC: L. Logan G4ILG (Barnoldswick 812288). Meets 1st Wednesdays, 8pm in the RR S&SC, Barnoldswick. May 7—DF Hunt.
Rossendale RC: Bernard Murray G4VVK (Rossendale 229026). Meets Wednesdays, 8pm in the Huntsman, Loveclough, on the A56. Club was formed when the Rossendale Valley Club closed.

Leicestershire

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

Lincolnshire

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

London

Acton, Brentford & Chiswick ARC: W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London. Meets 3rd Tuesdays, 7.30pm in the Chiswick Town Hall, High Road, Chiswick, London W4. May 20—QRO d.s.b./c.w. Rig by G4HMC.
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. May 8—Talk by Marconi Co.
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. May 9—Inter Club Quiz against Coulsdon; 30th—Summer Bazaar.

Lothian

Leith Nautical College AR&EC: Susan Beech GM4SGB, c.o. Club Address. Meets Mondays, 6pm in T2-4 Electronics Lab, Leith Nautical College, 24 Milton Road East, Edinburgh.
Lothian RS: Robin Thompson GM4YPL (Winchburgh 890177). Meets 2nd and 4th Wednesdays, 7.30pm in the Harwell Hotel, Ettrick Drive, Edinburgh. May 14—GM3OWU.

Merseyside

St Helens & District ARC: Alan Riley G6MXT (051-430 9227). Meets Thursdays, 7.30pm in St Helens ITC, Water Street, St. Helens.
Wirral ARS: R. E. Bridson G3VEB, 14 Zig Zag Road, Wallasey. Meets 1st and 3rd Wednesdays, 7.45pm in the Club HQ, Ivy Farm, Arrowe Park Road, Birkenhead.
Wirral & District ARC: Peter Morton G6CCJ (051-677 7376). Meets 2nd and 4th Wednesdays, 8pm in Irby Cricket Club, Mill Hill Road, Irby. May 14—Quiz Night; 28th—Talk by G3LEQ.

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. May 12—Satellite TV by G8CMQ; 29th—Bring and Buy.

Edgware & District RS: John Cobley G4RMD (Hatfield 64342). Meets 2nd and 4th Thursdays, 8pm in the Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. May 22—Constructors Contest.

RS of Harrow: Dave Atkins G8XBZ (Rickmansworth 779942). Meets Fridays, 8pm in the Harrow AC, High Road, Harrow Weald. May 9—Outgoing Chairman's Lecture.

Northamptonshire

Nene Valley: M. P. Bayles G6UWS (Wellingborough 71189). Meets Wednesdays, 8pm in the Prince of Wales, Well Street, Finedon. May 14—Ordnance Survey Work.

Northumberland

Borders ARS: Matty Bottomley GM1IRN, 4 Home Farm Cottages, Ladykirk, Berwick-on-Tweed. Meets 1st and 3rd Fridays, 8pm in the Tweed View Hotel, Berwick-on-Tweed. May 4—Kelso Rally.

Nottinghamshire

ARC of Nottingham: Ian Miller G4JAE (Nottingham 232604). Meets Thursdays, 7.30pm in the Sherwood CC, Woodthorpe House, Mansfield Road, Nottingham. May 15—DF Hunt and G8FWH testing rigs; June 5—DF Hunt.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets 2nd and 4th Tuesdays, 7.30pm in the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop. May 7—Visit to Bolsover Club; 20th—Clandestine radio by G3BA; June 3—Scunthorpe Club Visits.

Oxfordshire

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

Shropshire

Salop ARS: Simon Price G6MOJ (Shrewsbury 67799). Meets Thursdays, 8pm in the Olde Bucks Head, Frankwell, Shrewsbury. May 15—DF Hunt; 29th—Visit by Dewsbury Electronics.

South Shropshire RC: G. Gowan, 5 Woodrows, Woodside, Telford. Meets Thursdays, 8pm in the Brosley SC, Brosley.

Telford & District ARS: Tom Crosbie G6PZZ (Telford 597506). Meets Wednesdays, 8pm in the Dawley Bank CC, Bank Road, Dawley.

Somerset

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm in the Recreation Centre, Chilton Grove, Yeovil. May 8—Induction Coupling by G3MYM; 15th—Transmission Lines by G3MYM; 22nd—Antenna Gain by G3MYM: June 5—Sunspot Cycle by G3MYM.

Staffordshire

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

Strathclyde

Ayr ARG: R. D. Harkness (Ayr 42313). Meets Alternate Fridays, 7.30pm in the Wellington Leisure Centre, 24 Wellington Square, Ayr. May 30—Stargazing by Bill Williams.

West of Scotland ARS: Ian McGarvie GM4JDU (Brediland 2708). Meets Fridays, 7.30pm at 154 Ingram Street, Glasgow. Next Meetings—May 14 and 28.

Suffolk

Felixstowe & District ARS: Paul Whiting G4YQC (Ipswich 642595). Meets 2nd and 4th Mondays, 8pm in the Feathers, Walton High Street, Felixstowe. May 5—Fibre Optic TV; 19th—Social Evening.

Surrey

Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays (main meeting) and last Thursdays, 7.45pm in St Swithuns Church Hall, Grovelands Road, Purley, Surrey. May 12—Glider Radios by G6MFM; 29th—Help Night for RAE and Morse.

Dorking & District RS: J. Greenwell G3AEZ (Newdigate 77236). Meets 2nd and 4th Tuesdays, 8pm in the Star & Garter Hotel, Dorking.

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. May 16—AGM.

Thames Valley ARTS: John Pegler G3ENI (East Horsley 4279). Meets 1st Tuesdays, 8pm in the Thames Ditton Library, Watts Road, Giggshill, Thames Ditton. May 6—Electromagnetic Compatibility and the New Regulations.

Sussex

Brighton & District ARS: Peter Turner G4IIL (Brighton 607737). Meets 1st and 3rd Wednesdays, 8pm in the Seven Furlong Bar, Brighton Racecourse.

Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesdays, 7.30pm in the North Lodge Bar, County Hall, Chichester. June 1 to 6—GB2NM from Chalks Pits Museum.

Crawley ARC: David Hill G4IQM (Crawley 882641). Meets 2nd and 4th Wednesdays, 8pm in the United Reform Church, Ifield Drive, Ifield. May 7—Junk Sale; 9th—Annual Dinner; 28th—Quiz with Mid-Sussex ARC.

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. May 21—Antennas.

Mid-Sussex ARS: C. R. Cook G1FRF (Hassocks 2937). Meets Thursdays, 7.30pm in the Marle Place AEC, Leylands Road, Burgess Hill.

Worthing & District ARC: Roy Jones G4SWH, POB 599, Worthing. Meets Wednesdays, 7.30pm in Lancing Parish Hall, South Street, Lancing.

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. May 26—DF Hunt.

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. May 12—Electron Microscopes by G3OOQ; followed by a visit to NVRS, Wellesbourne.

West Midlands

South Birmingham RS: Matthew Twyman G6KOA (021-458 1941). Meets Mondays, 1st Wednesdays, Thursdays and Friday, 7.30pm in West Heath CC, Hamstead House, Fairfax Road, West Heath.

Coventry ARS: Robin Tew G4JDO (Coventry 73999). Meets Fridays, 8pm in Baden Powell House, 121 St Nicholas Street, Radford, Coventry. May 9—FAX and Packet Radio by G6VHI (starts 7.40pm); 23rd—Portable Station from Hartshill Hayes Country Park.

Midland ARS: Tom Brady G8GAZ (021-357 1924). Meets every week night in Unit 5, Henstead House, Henstead Street, Birmingham 5. May 11—Drayton Manor Rally; 20th—PCB Techniques by G8FTU.

Sandwell ARC: Malcolm Strong G4UMY (021-422 1554). Meets Mondays and Thursdays, 7.30pm in the Broadway, Oldbury, Warley.

Stourbridge & District ARS: Malcolm Davies G8JTL (Lye 4019). Meets 1st and 3rd Mondays, 8pm in the Robin Woods Centre, School Street, Stourbridge.

Walsall ARC: Linda Price G6HZI (Walsall 32607). Meets Wednesdays, 8pm in the Forest Comprehensive School, Hawbush Road, Bloxwich, Walsall.

Wolverhampton ARS: Keith Jenkinson G1OIA (Wolverhampton 24870). Meets Tuesdays, 8pm in the Wolverhampton Electricity S&SC, St Marks Road, Chapel Ash, Wolverhampton. May 6—Home-Brew Competition; 13th—PEP Matters; 20th—Testing of s.s.b. Rigs by G4WAS; 25th—DF Hunt, 11am at Tettenhall Rock.

Wiltshire

Blackmore Vale ARS: Bill Bailey G1GRG, 11 Brines Orchard, Templecombe. Meets 2nd and 4th Tuesdays in The Old Coachouse, Bell and Crown, Zeals.

Swindon & District ARC: Dave Ineson G4ZAZ (Swindon 37489). Meets Thursdays, 7.30pm in Oakfield School, Marlowe Avenue, Swindon.

Yorkshire

Halifax & District ARS: D. L. Moss G0DLM (Halifax 202306). Meets 3rd Tuesdays, 7.30pm in The Running Man, Pellon Lane, Halifax. May 20—Lowe dealer Demo. Keithley ARS: Mrs K. A. Conlon G1IGH (Bradford 496222). Meets last Tuesdays, 8pm in the Victoria Hotel, Keithley.

Sheffield ARC: Peter Day G3PHO (Sheffield 681216). Meets 1st and 2nd Mondays in the Firth Park Pavilion. May 5—RSGB Video; 12th—Valves by G3ANS; June 2—RSGB Video.

Spen Valley ARS: Tim Clough G4PHR (Mirfield 499397). Meets Thursdays, 8pm in the Old Bank WMC, Mirfield. June 5—Surplus Equipment Sale.

Todmorden & District ARS: Janet Gamble G6MDB (Todmorden 2494). Meets 1st and 3rd Mondays, 8pm in the Queen Hotel, Todmorden. May 5—RTTY Demo; 19th—Practical Construction Techniques.

Wakefield & District RS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. May 13—Talk and DF Practice run; 27th—Bring and Buy.

North Wakefield RC: S. Thompson G4RCH (Morley 536633). Meets Thursdays, 8pm in the Carr Gate WMC, Lawns Lane, Wakefield. May 8—Visit to Leeds Airport; 15th—Talk by G4OOC: June 5—Spen Valley Junk Sale.

White Rose ARS: Steve Clack G4YEK (Harrogate 884481). Meets Wednesdays, 8pm in the Moortown RUFC, Moss Valley, King Lane, Leeds. May 14—AGM.

PW PREVIEW

Geoff Arnold G3GSR previews the JRC NRD-525 Communications Receiver.

Very latest from Japan Radio Co. Ltd. (JRC) is a replacement for their NRD-515 receiver, the NRD-525. Other than a quick tune around on a display model, I've never had the chance to use the 515, so I'm not really in a position to compare them. The opportunity to put the new receiver through its paces was too good to resist, but this isn't one of our usual reviews, because the set arrived on the day we stripped down our test lab for the move to our new offices. So, this is more a first impressions and air-test report.

The basic NRD-525 covers the frequency range 90kHz–34MHz, with up-conversion in a push-pull, grounded-gate f.e.t. mixer stage to a first i.f. of around 70·453MHz, then via a second mixer to a 455kHz second i.f. The front-end circuits are diode-switched and double-tuned by means of varicap diodes controlled from the frequency synthesiser. An optional v.h.f./u.h.f. converter can be mounted internally, extending frequency coverage to 34–60MHz, 114–174MHz and 423–456MHz.

Modes covered as standard are c.w., s.s.b., a.m. and f.m., and an optional RTTY demodulator can also be fitted internally, giving a Centronics compatible printer output. Bandwidths set by the i.f. filters are 3, 6 and 12kHz (–6dB) as standard, with three narrow c.w. filters available as options. Passband shift (PBS), all-mode squelch, notch filter and noise blanker (with WIDE setting for dealing with the "woodpecker") are all incorporated.

A staggering 200 channels of memory are included, each channel stores data on the frequency, mode, bandwidth, a.g.c. speed and attenuator settings. Scanning of memories and sweeping of a selected frequency band are both available, each with control of speed and of the sensitivity of the auto-stop circuit. When sweeping frequency, or when stepping frequency by means of the UP/DOWN buttons, steps of 1kHz are used except on f.m., where they are 5kHz.

Rounding off the main features are a dual clock/timer, helping you keep track of local time and UTC (GMT), and controlling an associated tape recorder. The final option is an RS232C interface module for computer control of the receiver's operation.

Power supply requirements are 100/240 a.c. or 12–16V d.c.

Impressions

It is an unfortunate fact that the designers of many of the receivers and transceivers available on the enthusiast market today have gone absolutely over the top in the facilities which they build in, apparently with the sole purpose of making use of all the spare power of the microprocessor that goes hand-in-hand with modern synthesised design. Having been employed for a time as a control-system designer, I know only too well how difficult it is to produce sophisticated systems that are logical and easily understood from the operator's point of view.

Perhaps my view is somewhat distorted by the fact that I see a lot of different rigs yet seldom keep one long enough to get really familiar with it, but my first assessment of a receiver (or the receive section of a transceiver) is how many of its features can I use without having to study the handbook. Here I must report that the NRD-525 is the best and most easily understood receiver I've come across for a very long time. It's very much an operator's receiver.

For example, it seems very tolerant of the way in which you enter frequency by means of the keyboard. Say you want 14·005MHz. You could enter it just as that, or you could enter 14005kHz, or you could even enter 14MHz and then tune up 5kHz by means of the rotary tuning knob which, incidentally, is flywheel-weighted, silky-smooth and very fine in operation, tuning in 10Hz steps at approximately 2·5kHz per revolution, which is ideal for resolving an s.s.b. signal. Entering a frequency into memory, all too often a procedure that takes ages to learn, is very simple and the 525 doesn't care whether you enter frequency first and then select the desired channel or do it the other way round.

The light-blue, 7-digit, vacuum fluorescent display indicates carrier frequency or, when using r.i.t., the r.i.t. offset. I am somewhat baffled as to why r.i.t. should be fitted to a stand-alone receiver, as distinct from a transceiver, but there it is. Subsidiary displays in the same panel indicate: memory channel selected, mode, bandwidth, a.g.c. time-constant, clock/timer status, scan/sweep status, squelch, attenuator, etc., and also includes a very attractive S-meter.

Front panel layout is good, with just one moan—the panel labels for the SQUELCH, TONE and RF GAIN control knobs are hidden behind the three knobs above them when the receiver is

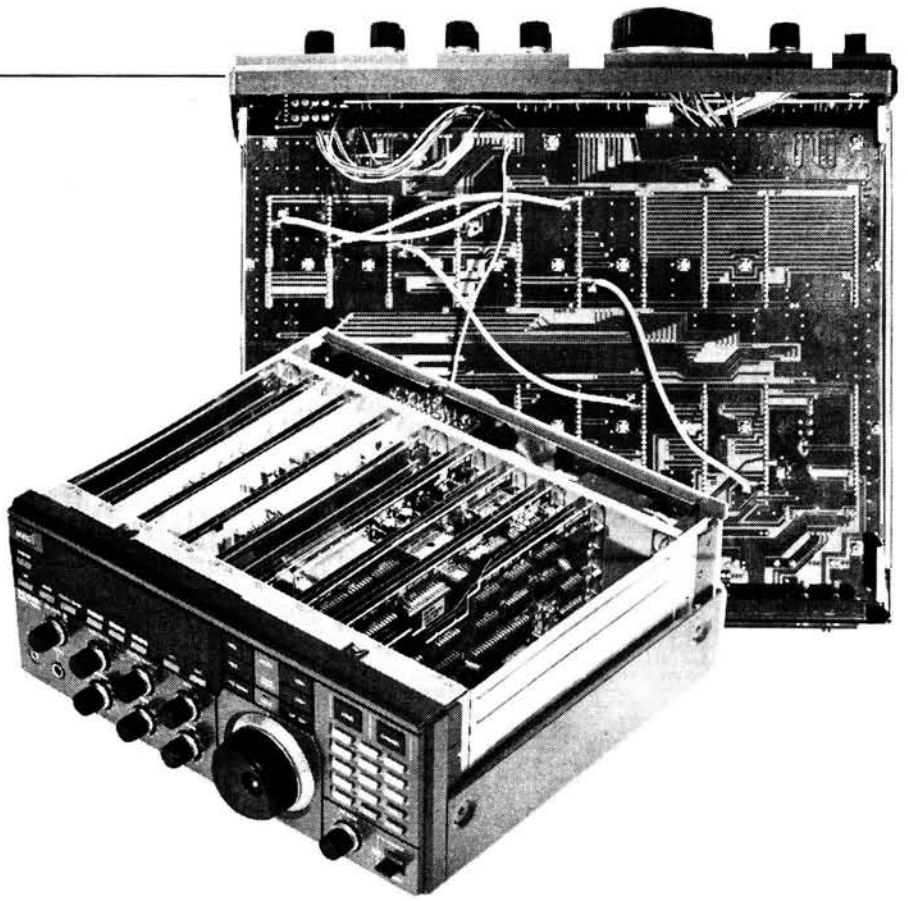
A rear view of the NRD-525, showing external facilities

sat in front of you on a table top. You will undoubtedly get to know the controls pretty quickly, but tilt-feet (not supplied) or some other means of getting the front panel nearer to right-angles with your line of sight would be nice.

From a performance point of view, the receiver seems to be clean, efficient and without vices. As always, when I have a receiver on trial the "woodpecker" seems to decide to take a rest, so I can't vouch for the efficiency of the noise blanker. Sensitivity, quoted as 0·5μV for 10dB S:N ratio on c.w./s.s.b. using the 2kHz bandwidth filter, certainly left nothing to be desired from a subjective testing point of view. I wish I could have put it through its paces on the test bench as well.

Price

The JRC NRD-525 is expected to retail at around £1000, the exact price depending upon the exchange rate of the Pound Sterling against the Japanese Yen. We are grateful to **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE, telephone 0629 2817,** for the loan of the receiver.



The NRD-525 is a very professionally engineered receiver, using modular construction with interconnections made via the "motherboard" which fills the bottom of the receiver chassis

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

The other day, on the 3·5MHz band, I listened to a G3+3 station, who ought to know better, putting out a CQ call. A station came back but our G3 friend said, "Can't quite read your callsign due to some QRM. You are 55 or 56, please try again." If you know your RST code for signal reporting you will realise that this reply was a load of rubbish! The "55" report means that the other chap's signal was perfectly readable and fairly good strength.

The RST reporting code has been in use for decades and is accepted worldwide by amateurs so it will do no harm to repeat it here.

RST CODE

Readability

R1 Unreadable
R2 Barely readable
R3 Readable with difficulty
R4 Reabable, practically no difficulty
R5 Perfectly readable

Signal strength

S1 Faint, barely perceptible
S2 Very weak signals
S3 Weak signals
S4 Fair signals
S5 Fairly good signals
S6 Good signals
S7 Moderately strong
S8 Strong signals
S9 Extremely strong signals

The third component "T" relates to the tonal quality of c.w. signals and runs from T1 "Extremely rough hissing note" to T9 "Purest d.c. note".

There is often a temptation when sending a QSL card to a DX station to overstate the report in order to boost the other station's ego so that he will reply, but this is rather pointless and does not help the other station. It will often be noticed in contests that the reports exchanged are nearly always "59" regardless of the actual signal strength and all such reports should be taken with a pinch of salt. The main idea is that if everybody is "59" then there's no need to enter it into the log at the time of the contact and this saves valuable time, especially for a DX station. Log blanks are filled in later!

This is the Vale Royal Award sponsored by the Mid-Cheshire ARS and the Vale Royal District Council

When working on c.w. a report such as "599" is frequently sent in its quite permissible short form of "5NN" which, again, saves time especially in a contest. Other than for 9 the short form for numbers is seldom used on the amateur bands.

Keep the RST code close at hand when making signal reports and be honest about it. You'll get your card just the same!

Just realised that I have been licensed for 50 years! Had my artificial aerial licence in 1936, in the name of my father as I was under-age at that time, and the call was 2ADC and we were allowed to run 10W input to a rig feeding only into a dummy antenna just to play about and learn about transmitters. The full licence G4AR came in January 1939, so I had a few months on 14MHz c.w. with 10W before WWII came along. I had great fun with 15 years in the Sudan working as ST2AR, where I managed to work some 270 countries, not too hard with a DX call like that.

Bit of a shock coming back to the UK with a mundane G4 call again! So DX is no longer the be-all and end-all of amateur radio. My best effort, I think, was working exactly 100 countries on c.w. in a weekend in one of the CQ WW multiband contests, using 100W and a tri-band beam. However, working W6 on Oscar-10 must run close when I was using just 1W c.w. input to a 18-element beam on the 430MHz band uplink. Now I'm into computers, as they say, and about to link my Beeb micro into the rig! Must keep up with the times!

General

The East Suffolk Wireless revival organised by the Ipswich Radio Club will be held on Sunday May 25 at the usual venue, the Civil Service Sports Ground, Straight Road, Bucklesham, Ipswich. Features include traders, car boot sale, antenna testing range, vintage radio display, children's play area, and a happy day out for all the family. More info from Jack Tootill G4IFF on Ipswich 44047.

The Plymouth Rally will be held at the Plymstock Comprehensive School, Plymstock, starting at 10am on Sunday May 25 with more from G0BNT on Plymouth 777777.

Sunday May 4 is the date for the BATC rally at Crick Post House, near to Junction 18 on the M1, with extra accommodation this year and facilities for all the family plus full lecture programme, and talk-in on 144MHz. Doors open at 10.30am and more details from Frank Elliott on 0533 553293.

The Dartmoor Radio Club holds its Mobile Rally on Monday May 5, starting at 10am at the Town Hall, Princetown, Devon, with many traders and an auction at the end. Contact Cliff Brown G1KKC on Tavistock 2818 for more info.

It's a pity readers cannot see the lovely four-colour design of the Binstead ARS Isle of Wight Award

The Mid-Ulster ARC has its annual Mobile Rally on Sunday May 18, starting at noon in the grounds of Parkanaur House, which is located about 10km from Dungannon on the main Ballygally road. Talk-in on S22 f.m. and there will be the usual trade stands, bring and buy and plenty for all the family.

An interesting piece on unusual antennas appeared in a recent issue of the Edgware ARC magazine *Ham News,* culled from Jane's *All the World's Aircraft.* It seemed the problem was to communicate with nuclear submarines while they are under the sea where they can trail a very long wire supported by a buoy. The "base" station was the problem so it was solved by using a Lockheed Hercules aircraft as a command station trailing a long wire 7930m long! It has a 41kg weight on the end and the aircraft flies in a tight circle so that the weight virtually stands still while the wire traces out a path rather like an ice-cream cone. A "short" 1220m wire appears to act as some kind of counterpoise! It is said that the power output of the transmitter feeding this truly long wire is around 200kW.

The Mid-Cheshire ARS announces the Vale Royal Award sponsored by the club and the Vale Royal District Council to encourage the area and encourage amateur radio in the district. The Council financed the printing of the certificates and any money over after admin costs will go to the RAIBC and the Hebden Green Special School for handicapped children, in Winsford, Cheshire.

There are two classes of award, single band, multi-mode and multi-band, multi-mode with a requirement of working stations in the area and club stations. Full details from Dr. E. J. Loader G6HXU, 13 Vale Road, Hartford, Northwich, Cheshire, or on Runcorn 513844 during the day or Northwich 75660 evenings. The charge for the certificate will be £1 or five IRCs for outside the UK.

A colourful award is being sponsored by the Binstead ARS, the Isle of Wight Award. It is in four colours and requires 10 IOW stations to be worked including the club station G0BAR. For h.f. only five stations including the club station are enough. It should be noted that there is another IOW Island award issued by the IOW RS which is quite separate. The Binstead award costs £2.50 and full de-

tails can be obtained from J. Willis G1BZC, 4 Green Street, Ryde, IOW.

DX Bands

John Kojan ex-W8NZV now living in St Cyprien, France, has acquired a Dressler active antenna and has been comparing it with his 25m-long wire in the loft. While signal strengths do go up so does the noise and he doesn't seem to be much better off! He is also a bit disappointed with the selectivity of his FRG-7700 and reckons his old pre-war Sky Challenger was much better although it did drift a bit! John comments on the hard time some of the DX stations are having these days. He specifically mentions Clive at S79GW who was taking a list from stations in numerical order. All went well until he came to "7" when, says John, everybody jumped in. Clive said "I quit" and pulled the big switch! There must be a moral there somewhere. On 21MHz c.w. John logged PP2FO, PY1ZAE, VQ9QM, plus 5T5SL and S79GW on s.s.b., QSLs to POB 4, Maha, Seychelles, with two IRCs for air-mail return QSL.

As **Shaun Jarvis** is now G1RXB I'd have thought he would have been busy on the v.h.f. bands but he has been looking around the 3·8MHz spot and found ZL1DLQ, 3D2DW, J37AD, SU1AC and OA5HL all around 22/2300Z. All with his Lafayette HA800 and matching a.t.u. fed from a 50m-long wire, in Southampton, Hants.

A new s.w.l. is **Leighton Smart** of Trelewis, Wales, who runs a Grundig Satellit 1400SL receiver and whip antenna. He says he is "one of the three million" so has plenty of time to listen on the bands. His catches on 3·5MHz have been mainly European so far although he did get K4QVK and K2PM. On 14MHz he noted 4Z4EX who claimed to be just 10 years old!

Our congratulations to regular correspondent **Marcus Walden** of Harrogate who got a credit in Part 1 and a distinction in Part 2 of the RAE. Wisely, he is now

The Panasonic receiver RF3100LBE used by George Hitchins of Frimley, Surrey, and other readers

getting the Morse speed up so as to go straight for his "A" ticket. Good luck with that OM. He can't afford any black boxes so expects to start off with QRP c.w. He is starting on the *PW* Severn now. His DX302 and 20m-long wire in the attic caught TA1D on 3791kHz plus AP2ZA, RM8MA (Kirgiz), VQ9RV and 9M2FR on 14MHz with lonely ZC4AP on 21MHz. From my own observations 21MHz seems to have perked up a bit during March.

George Hitchins BRS88435 of Frimley, Surrey, runs an RF3100LBE receiver fed from a 25m-long antenna and stuck to 14 and 7MHz bands. On 14MHz it was AP2ZA, CE0FQU, CN8EA, JW0A, LU3ABX, TZ1CP, VK7RN, and VP9CP. One catch on the 10MHz band was ZL3MW on 10·129MHz. More reports on the WARC bands would be welcomed. On to the 7MHz band and C6ANX, VK9NS on Norfolk Island, and VP2VA.

Melvyn Dunn BRS86500 living in Grimsby whetted his FRG-7700 and 40m-long antenna on most bands this month with EA8QL on 1·8MHz, then TZ2XN, 8P6GG, 4X4JO and YC6GR on 3·8MHz or thereabouts. Just 4X4JU and 9U5JB of note on 7MHz plus HC1MG, CN8EA, 9V1WK and 9K25MJ all on 14MHz. The 21MHz band came to life with A22BW, 4X4UR, SV0AC/SV9 (QSL Box 251, Rhodes, Greece, 5T5TS, ZS6BRZ and CN8EA. QSL cards received, among many, were from J87A, SU1ER, 4S7NMR, VS6DO, KH0AC, YI1BGD, J28EB, and 8R1RPN. Good going OM!

I'm sorry to report that regular writer **Andy Durrant** of Aldershot has been into hospital for a while but he did manage to take his FRG-8800 and matching a.t.u. with him and was able to fix up a temporary antenna. Anyway, he's back home now so good health OM. He stuck to 14MHz in the little time he had available but logged CU1CB, JA4FWM, JA5AUC, XE2NNZ, YB2BNJ and ZC4MR and his temporary four 5m-long wires along the ground.

Ron Pearce of Bungay, Suffolk, has a Trio R600 fed from a VFA antenna now mounted outside with a feed in to an a.t.u. He stayed with 21MHz and found 8P6QM, VP5SL, YC3CJK, OA4BCZ and YC2CJJ. Ron is busy making a one-valve receiver so hope we hear what you can receive on it. After all, that is something we old timers had to use in days gone by!

Phil Dykes G4XYX continues with his QRP ways running 10W p.e.p. with modified CB rig on 28MHz and a two-element quad while on 7MHz c.w. it's just 3W to assorted homebrew rigs feeding an 8m vertical antenna with a counterpoise. Phil has found 7MHz pretty rough with a lot of short skip stuff at night although he has heard the Pacific and the West Indies but they didn't hear him! Openings to S. America and Africa were heard on 28MHz and one VE1. Phil is very keen to look into meteor scatter on 28MHz but I fear he will want a lot more power if he is to succeed. Anyone wanting to exchange notes on MS can write to Phil Dykes, 68 Egmont Road, Poole, Dorset. So contacts on 28MHz were LU6AJ/F and CX4HS. More on 7MHz c.w. with DF0AFM, UA3ZNW, UY5MV, UZ6HO and 4U1ITU.

Don't forget that if you want to send in logs regularly I can send sample log sheets for an s.a.s.e. to me direct. Also welcomed are photos of the shack or rig, colour or black and white. Good hunting.

RTTY

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

by Ron Ham BRS15744

"One of the most rewarding aspects of Data DXing is the joy of reading a new country prefix and this month's datawatch has contributed another 8 to my catalogue, Comoros Is D68, Crete SV9, Cuba CO2, Jersey GJ, Turkey TA1, Sri-Lanka 4S7, Surinam PZ1 and Vatican City HV2, on 14MHz RTTY," writes **Len Fennelow G4ODH**, from Wisbech. Len noted in his log that good RTTY conditions existed, on 14MHz, across the Atlantic on February 22, towards Scandinavia and the Middle East on March 1, from Cuba to Crete on the 2nd and towards the USA on the 4th. While studying his detailed computerised report, covering the period February 15 to March 9, I noted that he received AMTOR signals from 4 countries on the 3·5MHz band, 3 on 7MHz, 15 on 14MHz and South Africa on 21MHz.

Another AMTOR enthusiast is **Bob Borzych G4WWD**, Liphook, who worked A4XZF (Oman) and VK2AGE (Australia) on February 12 and 23 respectively, on 14MHz. During the month prior to March 9, Bob also heard signals in this mode from 12 more countries on 14MHz, ranging from north and south America, through the Middle East to Japan and his log has been included with Len's in Fig. 1.

In Knutsford, **Dave Coggins**, copied 24 RTTY stations from 12 countries on 14MHz, including the Radio Bulletin Board Service (RBBS) of EA8WP in the Canary Is.

In Eastbourne, **Edward Swan**, is using a Tono Theta 550 communications terminal for decoding RTTY signals. In Belfast, **Tommy Dougan**, uses a Trio R2000 communications receiver for general short wave listening and plans to equip his 48K Spectrum, with suitable software, to add RTTY to his stations capability. Newcomers to RTTY often already have a good receiver and one of the popular brands of home computer, but are not quite sure how the system works. First, contact one of the software suppliers and get a RTTY program to suit your computer and then find out which port on your micro will take the ingoing audio signal from your receiver. **Before making any connections, read the instructions supplied with your computer, receiver and software.** When all is connected, load the program as instructed, switch your receiver to 14·090MHz and carefully tune through a

Country (Prefix)	Band (MHz) 3·5	7	14	21
Australia (VK5,6)			X	
Brazil (PR,PY)			X	
Canada (VE1,2,3)			X	
Canary Is (EA8)			X	
Colombia (HK4)			X	
Cyprus (5B)			X	
England (G)	X			
Germany (DF,DJ,DK,DL)	X	X	X	
Greece (SV)			X	
Indonesia (YB)			X	
Israel 4X4)			X	
Italy (I,IK,IT)		X	X	
Japan (JA,KA)			X	
Kuwait (9K2)			X	
Nigeria (5N9)			X	
Oman (A4)			X	
Portugal (CT)			X	
Sicily (IT9)			X	
South Africa (ZS6)		X	X	X
Spain (EA)			X	
Sweden (SM)	X			
Switzerland (HB9)			X	
Togo (5V)			X	
USA (A,K,N,W)			X	
Venezuela (YV)			X	
Wales (GW)	X			

Fig. 1

RTTY signal until you find the point where sensible text appears on the screen. This tuning may seem difficult at first, but once you have found the technique, it is quite easy and you should get a great deal of enjoyment from this aspect of amateur radio.

No doubt the software instructions will tell you which key on the computer is used to change between the normal and reverse styles of transmission, however, start with normal. Amateur RTTY signals will also be found around 3·6MHz, 7·090MHz and when the bands are open, 21·090 and 28·090MHz. There are also allocations for this mode of communications in the relatively new amateur bands around 10·15MHz, 18·090MHz and 24·92MHz. I would welcome reports about RTTY activity in these new bands.

During the period, I copied signals from 28 international prefixes on 14MHz ranging from both American continents, including Alaska and Canada, through Scandinavia, the Middle East and USSR, to Australia and Japan. One of my many interesting periods of operating came between 0848 and 0858, when, in a mere 10 minutes, I copied "THIS IS EA4CAI-AUTORESPONSE-SYSTEM", a QSO between LA5SAA and GM0DRU in Stornoway and a fluctuating signal from a NL7 in Alaska who I think was working a VQ5. My thanks to Bob, Dave and Len for their RTTY logs, which enabled me to compile the regular list of RTTY stations heard during the month.

Country (Prefix)	Band (MHz) 3·5	7	14	21
Alaska (NL7)			X	
Argentina (LU)			X	
Australia (VK5,6)			X	
Austria (OE)	X	X	X	
Balearic Is (EA6)			X	
Belgium (ON)	X		X	
Brazil (PY,PR)			X	X
Bulgaria (LZ)		X		X
Canada (VE1,2,3)			X	
Canary Is (EA8)			X	
Ceuta & Melilla (EA9)			X	
Comoros (D6)			X	
Crete (SV9)			X	
Cuba (CO)			X	
Czechoslovakia (OK)			X	
East Germany (Y2)	X			
England (G)	X		X	
Finland (OH)			X	
France (FE,TV)	X	X	X	
Germany (DF,DJ,DK,DL)	X	X	X	
Gozo & Comino (9H4)			X	
Greece (SV)			X	
Guyana (8R)			X	
Holland (PA)	X	X		
Hungary (HA)		X	X	
Italy (I,IK,IT)		X	X	
Japan (JA,KA)			X	
Jersey (GJ)	X			
Lebanon (OD)			X	
Malta (9H)			X	
Morocco (CN)			X	
Newfoundland (VO)			X	
Norway (LA)		X	X	
Oman (A4X)			X	
Poland (SP)		X	X	
Portugal (CT)			X	
Rhodes (SV5)			X	
Rumania (YO)			X	
Scotland (GM)		X		
South Africa (ZS6)			X	
Sicily (IT9)			X	
Spain (EA)		X	X	
Sri Lanka (4S)			X	
Suriname (PZ)			X	
Sweden (SM)		X	X	
Switzerland (HB9)		X	X	
Trinidad (9Y)			X	
Turkey (TA)			X	
Ukraine (UT)			X	
USA (A,K,N,W)		X	X	
USSR (RA,UZ)			X	
Vatican (HV)			X	
Venezuela (YV)			X	
Wales (GW)	X			
Yugoslavia (YU)			X	

Fig. 2

Reports by the 15th, please

SPACE & SATELLITES

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

by Pat Gowen G3IOR

MIR—The New USSR Space Station

The successor to Salyut-7 is "MIR", Russian for "Peace" and also meaning "World", was intended for launch on the window of Sunday 16 February at either 1300–1400 or midnight UTC, but finally went into orbit on a Proton launch at 2130UTC on Wednesday 19 February from UL7. It initially achieved a slightly lower than expected orbit of some 89 minutes, possibly to permit it to "catch-up" to Salyut-7 for an intended later docking into one of the six ports available on the new spacecraft. The initial Keplerian elements were:

Object: 86-17A
Epoch Year: 86
Epoch Day: 052·12474285
Inclination: 51·6125
RAAN: 114·4345
Eccentricity: 0·0092279
A. of Perigee: 94·7213
Mean Anomaly: 266·0304
Mean Motion: 16·15269732
Epoch Rev: 20
Drag: 0·009815

Within three days of launch the orbit had been automatically boosted from the initial 307km Apogee 285km Perigee to a circular 320km higher plane, and a new set of Keplerian data came from NORAD and NASA.

NORAD Cat. No: 16609
Object: 86-17A
Epoch Year: 86
Epoch Day: 053·36907699
Inclination: 51·6158
RAAN: 107·7321
Eccentricity: 0·0011853
A. of Perigee: 162·6966
Mean Anomaly: 197·4466
Mean Motion: 15·79459461
Epoch Rev: 40
Drag: 7E-5

As the orbit will undoubtedly be further regularly adjusted, the drag factor should not be considered as absolute. The elements will change with the compensation applied, so it is recommended that frequent updating is obtained in order to ensure accurate tracking.

From March 4 a window opened that would permit a three-man Soyuz crew to occupy and initialise the spacecraft systems of the station for a short-term stay, later to be replaced by the first long-term crew, at least one of whom may be a radio amateur, thus giving the possibility of some amateur-radio related activities.

A Progress automatic docking supply may soon be expected, which may carry the ISKRA-4 Mode "A" and "J" satellite built at UK3ABT, the Moscow Aviation Institute, as it is as yet uncertain whether this hand-launched package will emanate from the new space-station or from Salyut-7. AMSAT will be running a contest for the closest time supplied to that when the satellite re-enters the atmosphere to burn out, with a prize for the nearest "guesstimation". To qualify, your entry should be sent within the first week of ISKRA-4 operation to "Chicken Little Contest", c/o AMSAT, Post Office Box 27, Washington DC 20044, USA.

Already Cosmos-1586, an excellent signal on 19·955MHz, has left Salyut-7 and may be heading for an automatic docking with MIR. It is also more than probable that a line-up of Salyut-7 itself could have occurred since this column was written in early March, leading to a spectacular beginning of a full-scale space platform that could be used to launch the planned manned Mars mission in the next five years. Most certainly with Soyuz, Cosmos, Progress and possibly Salyut-7 linked, it will be a formidable object of high visibility on the overhead passes soon after sunset this year, and by far the brightest object in the sky. The Progress docking module may be listened for on 150MHz, the Cosmonauts on either 142·420MHz f.m., or 922·750MHz to follow the series of unfolding events. The frequencies for MIR itself are not yet to hand, but these should become evident on manning.

MIR is quite a space hotel, with individual personal quarters for each crew member,

Fig. 1: Joe Flaska WB0RLY and Jan King W3GEY inspecting Phase IIIc

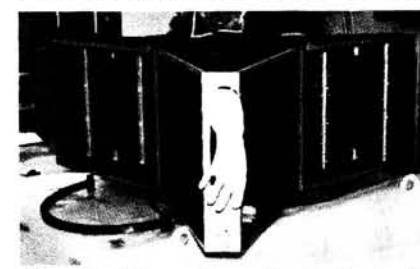


Fig. 2: It's not an April Fool—the glove protects the lens of the earth sensor

full computer control, and with twice the solar-panel area of Salyut-7.

Future Hamsats

Phase III-c: The frequencies finally selected for the Phase III-c satellite currently planned for a 21 September 1986 launch aboard the new Ariane IV rocket from FY7 (but possibly to be delayed further due to the impact of the *Challenger* loss—see May *Practical Wireless*) are as follows:

MODE "B"	
Mode "B" uplink:	435·425–435·575MHz
Mode "B" downlink:	145·975–145·825MHz inverting
Mode "B" General Beacon:	145·8125MHz
Mode "B" Engineering Beacon:	145·975MHz
MODE "JL"	
Mode "L" uplink:	1269·575–1269·325MHz
Mode "L" downlink:	437·725–437·975MHz inverting
Mode "J" uplink:	145·820–145·860MHz
Mode "J" downlink:	435·930–435·970MHz
RUDAK (Digital communications only):	
2400 Bauds p.s.k. uplink:	1269·675MHz
400 Bauds p.s.k. downlink:	435·675MHz
MODE "S"	
Mode "S" uplink:	435·625MHz
Mode "S" downlink:	2401·267MHz

(Note this is a wideband mode suitable for the inclusion of a single station on 10kHz nominal deviation f.m. or three to four separate stations if employing normal 2·7kHz wide s.s.b.)

The satellite will be undergoing final construction by the AMSAT-DL group crossing the Atlantic on 13 May to fit the frame with the transponder modules at the AMSAT Laboratory in Golden, Colorado (see photograph) from whence it will go to AMSAT-D1 at the University of Marburg in West Germany. On 23 May the functioning satellite is booked for thermal-vacuum testing and then, completed except for the final attachment of the kick-motor, will travel back to Colorado. The final terrestrial trip will be to the ESA launch site in FY7 for final integration to the powerful new Ariane IV launcher, from which to be placed into the initial parking orbit prior to kick-motor firing to send it into the planned ellipse. The only delay has been with the "S" band transponder, which is slightly behind the planned schedule, but otherwise all is well with progress. See our photographs Figs. 1 and 2 of the satellite in Colorado.

JAS-1: The planned lift-off for the JAMSAT satellite is set for 0200UTC on Friday 1 August this year, and it is confidently expected that launch postponements are unlikely. A few days are likely to elapse before the transponders are commanded on to permit full de-gassing, thermal stability and check testing, but the beacon should be activated immediately following ejection from the carrier. For details of the modes, frequencies, digital data and ground station requirements, please refer to page 53 of the March *Practical Wireless*. The orbit planned for the 50kg 400 x 400 x 470mm 26-facet polyhedron satellite is circular, non-sun-synchronous, 1500km altitude, 50° inclination, with a period of some 120 minutes.

Miki, JR1SWB will be here in the UK to deliver a command encoder so that the University of Surrey can act as back-up command station for JAS-1. JAMSAT have a p.s.k. demodulator modem using CAT (Computer Assisted Transceiver) driving Trio Kenwood equipment TS-711, TS-811, TS-940, etc. It has been tailored to NEC computers, so it will be some time before it becomes clear how we should interface to non-Japanese equipment, such as those using the Western Z-80 c.p.u. micros. NEC computers are very expensive, and likely to become more so as the yen goes up and the dollar and pound go down.

Also to be launched with JAS-1 will be a second satellite consisting of a large metal ball of some 10m diameter, covered with mirrors to enable laser geodisic measurements. Such a passive reflector may well be usable by amateurs to bounce u.h.f. and s.h.f. signals back to earth by passive reflection on the proviso that accurate tracking is maintained. The object should be quite visible when it is in sunlight and the sky is black.

UoSAT "WOD" and Research: Harold Meerza has been looking at the results obtained from the Whole Orbit Data from UoSAT-1 (OSCAR-9) that is often downlinked on Mondays. He finds that channel 03 (which normally reads a basic 2 for most of each orbit) sometimes rises to many times this value, giving rather short-term components that makes it necessary to examine all blocks of data, and to then plot the values at 5·28 second intervals in order to see just what is happening.

The Geiger-Muller tube that senses the radiation levels has a limited acceptance angle in the direction of 13° to the +Z axis of the satellite. It can be seen by the lower portion of the graph, Fig. 1, and 16 pulses are observed at regular intervals of some 71 seconds over the nineteen minute active portion of the orbit shown.

The higher graph line shows the +Z sun sensor reading, which gives a pulse each time that the rotating satellite sees maximum lighting. This is inverted and plotted to the same time scale so that frequency and phase can be easily compared, this demonstrating radiation pulses occurring at nearly (but not exactly) twice the frequency of the major sun sensor pulses. As the satellite was not in the planned attitude, definite conclusions are difficult to draw. Harold invites comments from those who are interested in this phenomena, e.g. is the radiation measured produced as a function of satellite rotation permitting the sensor to align with anisotropic lines (particles moving in the same direction) probably from a common source, perhaps the Sun, or are isotropic (movement in all directions) effects apparent, or is it both?

With the new decoder programs now available, observers now have an excellent tool to study the many parameters of both OSCAR-9 and 11, and perhaps come up with some exciting new discoveries that have eluded expensive dedicated research by the professional bodies. Remember, most major discoveries have come about in just this way, and that the University of Surrey will welcome your findings, which should be sent to Dr. Martin Sweeting G3YJO, Department of Electrical and Electronic Engineering, University of Surrey, Guildford, Surrey GU2 5XH, England.

A National Resource Centre is to be established at the University of Surrey to support the UK Co-ordinating Committee for Satellites in Education under the Chairmanship of Dr. John Gilbert. It is hoped that soon a small number of science teachers will be enrolled to develop the educational resources, as well as provide a close link between the UoSAT engineering team in planning and operations.

Shuttle: The tragic loss of *Challenger* and its crew of seven on the STS-51L mission of January 28 appears to have been traced to the rupture of the right-hand Thiokol solid fuel motor, possibly brought about by the effects of ice expansion at the junction of the two segments that are united during pre-flight assembly at the Kennedy Space Flight Centre in Florida. That such a loss of life in addition to the £1 000 000 000 cost of the orbiter could occur from natural causes is a constant reminder to us of man's vulnerability despite the technical achievements he has made.

It now appears that the 3000°C booster side jet flare melted the attach fitting, permitting the booster to ram the main tank, thus rupturing the hydrogen/oxygen container and igniting the highly explosive liquid fuel and oxidiser.

The net result is that until all investigations and cures are effected, no more shuttle launches can be expected for at least nine months, and no "ham-in-space" shuttle amateur radio experiments can be foreseen at this time. The Jupiter launches mentioned last month may now have to be postponed to May 1987, the next window. This is quite a set-back for the

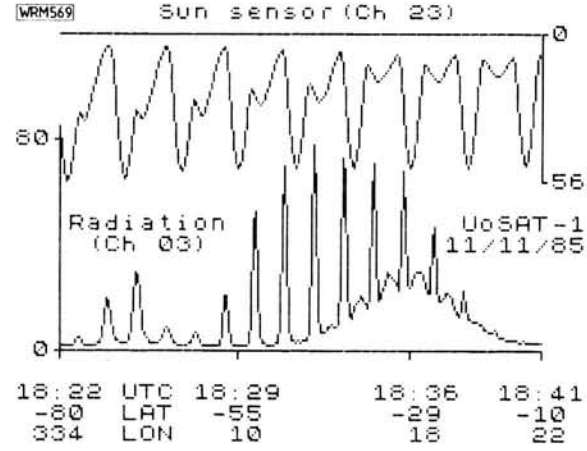


Fig. 3: The lower line of the graph shows 16 pulses at regular intervals and the top shows the +Z sun sensor reading

valuable missions.

Voyager-2: Following the highly successful swing past Uranus, Voyager-2 is now set on course for its meeting with the planet Neptune on 14 August 1989. There is, however, one little problem that astronomers would like to have cleared up before the arrival. To be assured of the safe passage around Neptune's and to permit just the right separation to obtain a good view of Neptune's big moon Triton, Voyager-2 must pass at three radii [illegible] from Neptune, but this appears to be the location of a rather odd incomplete planetary ring, for which little data currently exists.

If, like Uranus, it turns out that the belt is composed of solid chunks of rock of a metre or more across, it would clearly be wise to try to locate it precisely in order that Voyager might be navigated around this hazardous area.

One might ask why all this trouble should be taken to just see Triton, and the reason is that if an astronomer were asked "If you were to look for a stranger within our solar system, what object would you pick?" the answer would undoubtedly be "Triton".

Triton is very big, it has an atmosphere, it rotates the "wrong way" compared to other planetary moons, and, best of all, the orbit is unique in that it cannot last more than another 10 million years before it comes into "Wolfe's limit" and the tidal Neptunian forces pull it apart to form another ring. Thus, finding out more about Triton might tell us a great deal, as it is not beyond the bounds of possibility that the moon is in fact a rogue planet captured from a star system other than our own.

Japanese DBS Economics

The successful launch of the second Direct Broadcasting Satellite for TV on 12 February 1986 was followed by two months of tests to ensure that all systems operate correctly. Their plans to get well ahead of the rest of the world in this service received a severe setback when the first DBS, Yuri-1, failed soon after its launch in May 1984.

John Branegan GM4IHJ, relates that the problem with Yuri-1 was brought about by the failure of two high powered travelling wave tubes that were used to ensure 50 watts of r.f. power on each channel to ensure that the signal was strong enough to give a good signal to a small dish antenna at ground. This occurred very soon after launch, leaving the DBS with only a single working channel.

The plans to mass produce a whole range of receiving equipment was set back by nearly two years, but it is now hoped that accelerated development of the circuitry can recommence, so that Japan is well placed to capture world markets when direct broadcasting from satellites becomes commonplace.

Unfortunately, John points out, this has all cost a great deal of money, with the Japanese government having to pay much more for their satellites than it would have cost had they bought them from proven satellite builders such as British Aerospace, Hughes, and Ford. Many Japanese politicians are now questioning their government's policy of insisting that the satellites be built in Japan, particularly now that their government has had to admit that in order to get the satellites built at all they have had to break their own rules and go outside Japan for more than 30 per cent of the satellite components.

Direct Broadcasting Satellites are often confused in the media with the common carrier service satellites in the 3·7–4·2GHz band, that provide a distribution system of some forty channels of programmes to a large dish at a local terminal from whence they are distributed by cable to domestic consumers. All sorts of legislation limit the reception of these, and "scrambling" to prevent free access is common.

The DBS system is to be found between 11·7 and 12·2GHz, at relatively high power, designed to give an adequate signal to simple home equipment run from its own modest dish antenna.

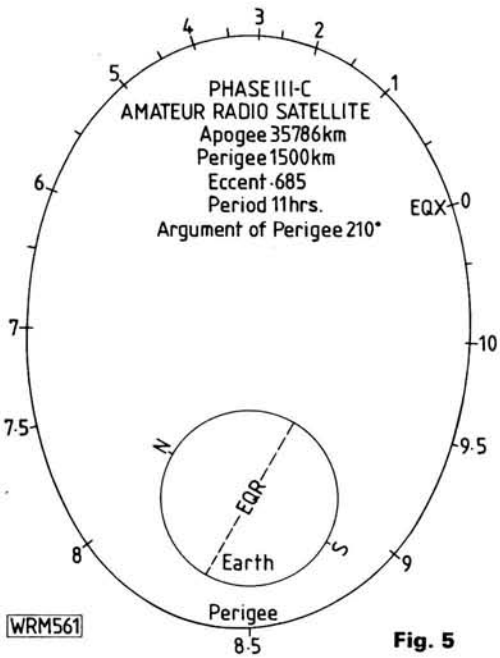
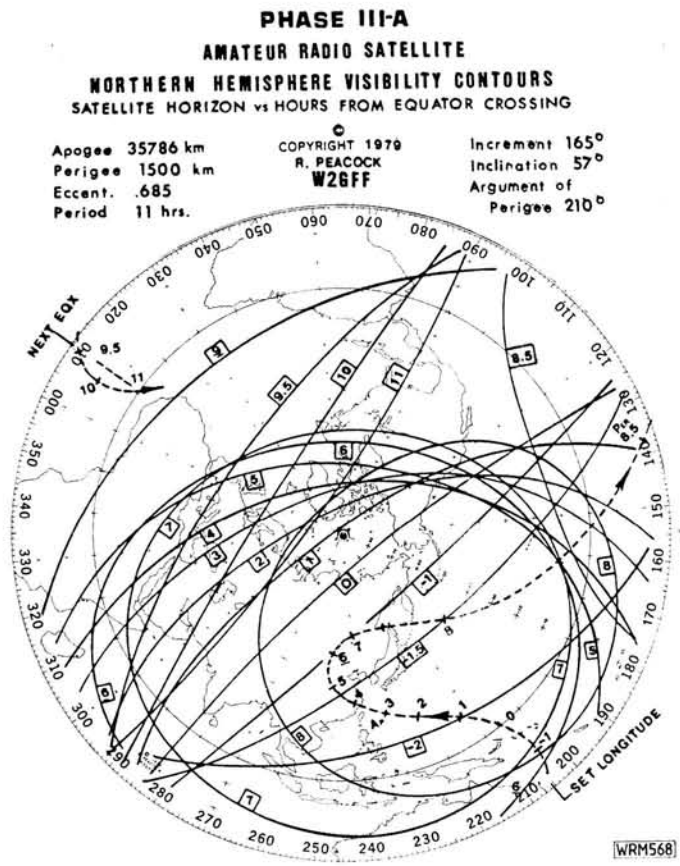


Fig. 5

Fig. 4: The chart, prepared by Richard Peacock W2GFF, showing the elliptical orbits of the satellite



Readers' Comments

Bill Kelly noted a drop in activity in the eclipse periods of the "RS" satellites, and particularly missed "RS-5" which often switched itself off whilst under heavy use in shadow when the RS3A command station cannot "see" the satellite to put it on again. Notwithstanding, Bill sends in an imposing list of some fifty stations, including W's and UA9's, and notes that RS-1 is still going strong.

Jim Miller G3RUH, says that contrary to the experiences of some of our correspondents, he has never found the Mode "L" OSCAR-10 Beacon to be weak. Jim uses a 16 turn helix (15dBi gain, r.h.c.p.) to H100 cable (loss about 0·8dB) to a receiver with a noise figure of some 4dB. He finds signals virtually noise free, and when he switches in a cheap MuTek BFQ96 preamplifier (n.f. about 1·5dB) at the masthead, he gets 6dB more of signal over noise. Jim points out that the received strength of the beacon can be a good guide as to the strength of the Mode "B" uplink signal, and the problem is likely to be low (as opposed to claimed) antenna gains.

A survey of readers' requirements show that an equal number are in favour of more scientific content, more "getting started" articles, more operational information, and more topical news, too! Within a limitation of pages available competing with other aspects of our wide ranging interests, we will try to maintain an average balance, aided by your comments, criticisms, ideas, suggestions and input.

Starting on Satellites

Elliptical Orbits: Up to now we have dealt with relatively low circular orbits and have found that it is reasonably simple to calculate the position of the satellite, and then where it is in respect of our location. Circular satellites travel at a constant velocity and are at a constant height, so the geometry is straightforward, thus allowing passes to be easily calculated, read from tables, or found from an "Oscalator" as we did in the January edition of *PW*. To perform this with satellites in elliptical orbits is possible, but much more difficult. It has been done by **Richard Peacock**

W2GFF, who is a leading expert at plotters, but the net result can be cumbersome, and the end effect, as seen on Fig. 6, may be said to be not unlike a plate of spaghetti! Even then, the satellite track forms a variety of ground tracks according to the perigee and apogee points in respect of the world, and needs to be changed with regularlity.

The reason for this is that the height of the satellite over Earth varies between a minimum, called "Perigee", and a maximum called 'Apogee", thus the angle of elevation from a point on Earth depends upon the height as well as the point in time and space at which the satellite finds itself in an orbit.

What is more, the speed of the satellite is far from constant, as it moves very rapidly through the low Perigee, and almost hangs in the sky at what may appear to be a fixed point at Apogee. This can be seen in Fig. 7, which is what the typical Phase III-c orbit should look like. At the equator crossing "EQX" and "0" hours, the satellite is rising above Earth, taking an hour or so to move 15°. Near Apogee, the same movement takes some five hours, whilst at Perigee only some eight minutes is taken. If a station were located on top of the Earth under the Apogee point, he would see the satellite from horizon to horizon for some nine and three quarter hours, but if he were located under the Perigee point he would have the satellite in view for some twenty minutes only.

A further point is that during the 11 hours of an orbit, the Earth will rotate some 11/24 × 360°, e.g. 165°, thus adding a strange curvature to the path as seen from any one operator's location. As the Apogee point moves in respect of Earth's latitude, so will the track of the sub-satellite point. All of this means that by the time you have calculated all of the now complex factors to determine the tracking requirements, the satellite may have gone anyway.

We are to be thankful that a relatively new piece of shack equipment is now available that will perform all the Boolean algebra and spherical triangle trigonometry in lightning time, and this is called the home computer. We are also indebted to mathematical genii such as Dr. Tom Clarke W3IWI, who developed the basic calculation program, and John Branegan, who has put it all into a user-friendly output with a format of tables and graphics that can be used and understood by the average radio amateur. By this means we can all find the exact whereabouts of the elusive satellite and turn our antennas to it in both azimuth (degrees horizontal in respect of true North) and elevation (degrees above horizon zero) to optimise our through-satellite communications. A reading of past issues of *PW* will give you sources of some of the many inexpensive computer programs available to you, particularly those for the popular Spectrum 48K.

All that we need to put into the program will be our station latitude, longitude, and height above sea-level, plus of course the data needed for the particular satellite in the form of the "Keplerian elements" that you have all seen in previous issues. It was in the early 17th Century that a brilliant physicist called Kepler discovered the properties of planetary motion, now called "Kepler's Laws". Later Isaac Newton took them still further. Kepler's three basic laws stated (i) that each planet moves about the Sun in an ellipse, with the Sun at one focus (motion lies in a plane); (ii) that a line from the Sun to a planet sweeps out across equal areas in equal intervals of time; and (iii) that the ratio of the square of the period to the cube of the semi-major axis is the same for all the planets of the solar system.

If we substitute Earth for the Sun, and our satellites for the planets, we can now use these basic factors for determining our satellite position for any one time, providing that we have a good starting point that can be found by radar, etc.

If we now look at a typical set of Keplerian elements, we can describe what each is in meaningful terms, so let us look at the set given earlier for "MIR", the new USSR space station.

1. The NORAD Catalogue number, 16609 is merely the reference given by the North American Radar measurement.

2. The object number, 86-17A is the NASA reference, i.e. Year '86, the seventeenth launch of this year, and "A" the first (and only) object to emanate, in case of a multi-satellite launch.

3. Epoch year, 86, is the abbreviated year of the siting taken.

4. Epoch day, 053·36907699, is the Julian day number of the year (53) and the decimal following (.36907699) is the decimal day that can be put into hours, minutes and seconds to give the time as we normally describe it. Thus the finding was taken in 1986, on Saturday 22 February, at 08 hours, 51 minutes, 28·24416 seconds. (The Epoch may be given as one long figure including the year. e.g. 86053·36907699).

5. Inclination is the angle, in degrees, between the orbital plane of the satellite and the equatorial plane of the Earth, e.g. "0" would be going round the equator, "90" exactly over the poles.

6. RAAN is the Right Ascension of the Ascending Node, the angular distance measured eastward along the celestial equator between the vernal equinox and the hour circle of the ascending node of the spacecraft. (See an almanac for these terms.)

7. Eccentricity is the parameter used to describe the shape of the ellipse of the orbit. If 0.000r then the satellite orbit is perfectly circular.

8. Argument of Perigee is the polar angle locating the Perigee satellite point in the orbital plane that is drawn between the ascending node, geocentre, and Perigee, and is measured from the ascending node in the direction of the satellite motion.

9. Mean Anomaly is an angle that increases uniformly with time, which is used to indicate the point of the satellite along its orbit when at the epoch time given.

10. Mean Motion gives the number of orbits and decimal orbits of Earth that a satellite performs in one day.

11. Epoch Revolution is the Orbit number at the time of the epoch given. (Note that some launch authorities refer to the first ascending equator crossing as "0", some as "1", and sometimes only "0" (or "1") if it forms part of the first complete orbit, so some confusion is possible here as to the precise orbit number according to source. As it is normally only used as a label, this is usually unimportant.

12. Drag or decay is the factor applied to low satellites that affect the height, hence the period, brought about by upper atmospheric friction, each lowering bringing it into denser atmosphere, hence increased drag. This can virtually be ignored on satellites above 1000km, and with very low manned orbiters, too, as the latter will jet up again to maintain an orbit. Better to take regular element updates to ensure accuracy of tracking. It will be rather important if you wish to see when ISKRA-4 burns up, as it will have no booster.

If we have lost you by now, then do not despair, as we shall update you with the figures, and your computer will do all the number crunching for you. If you have no computer, then free copies of a booklet of predictions of OSCAR-10 times of access (and "RS" and UoSAT EQX's) for the UK are sent free of charge to **AMSAT-UK members**, and this service will undoubtedly continue for the coming spacecraft. More about getting aboad the ultra-DX Phase III spacecraft will be in the next issue.

VHF BANDS

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

by Ron Ham BRS15744

The importance of the February solar disturbance and its consequent effect on the earth's atmosphere cannot be stressed too much. So, with more information to hand from readers, the subject must have pride of place again this time.

From Selsey, **Patrick Moore**, sent a drawing of the sunspot groups, Fig. 1, as he observed them around central meridian at 1020 on the 8th. From their observatory in Johannesburg, **Bob Anderson's** team counted 12, 18, 24, 31, 23, 37, 40, 33, 15, 23, 17, 14 and 7, individual spots respectively from the 1st to the 14th, but excluding the 6th when overcast skies prevented any observations, as indicated by the dotted lines in Bob's report, Fig. 3. "I have also enclosed a copy of Danie Overbeek's magnetograph trace for the 2nd to the 10th, which tells all," remarked Bob (Fig. 4). Every bit of first hand information that is published now will be of value to astronomical, radio and scientific students in the future.

The auroral co-ordinator of the British Astronomical Association, **Ron Livesey**, Glasgow, tells me that the aurora on the night of 8/9 was seen from Carlton, Leamington Spa and Worcester in the midlands, Swansea in Wales, Southampton and Winchester in Hampshire and across southern England to Edenbridge in

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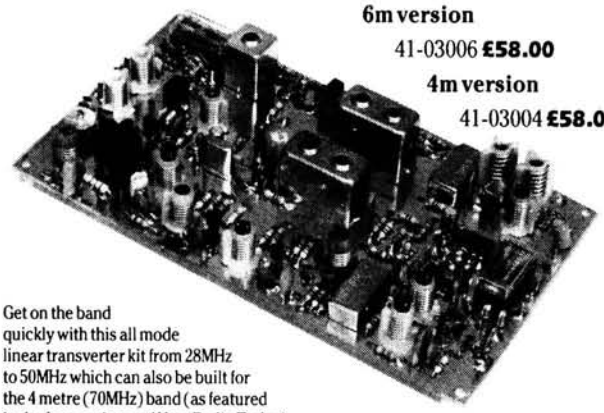

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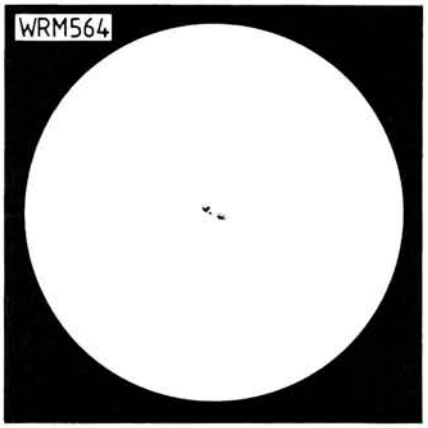

Fig. 1

Kent. Ron also received visual reports from observers at Fort McMurray, Alberta, Canada and a couple from New Zealand, in the southern hemisphere, where it was seen from all over South Island. Auroral displays were also reported on the 7th by **Paul O'Neall** at Newtown Abbot in Ulster, observers on the Ocean weathership *Cumulus* at station Lima and Peter Brown in Alberta. "Most observers reported arc bands and rayed bands and from St. Miniver, Cornwall, **Howard Miles** noted complexity and changing details of the event and at 2336 the whole sky was covered with rays, which at 2350 passed over his zenith," said Ron. He adds, "all observers talked of the whiteness of the auroral colour, although some blues, greens and reds were seen."

I agree with Ron when he said that it was an exciting time for all auroral observers and it was interesting to learn about the sudden change at 2354, because, when the display "switched-off" it correlated with an equal change in the magnetic field. "To our annoyance in central Scotland, the active period was a total cloud-out," said Ron, however, there was some compensation when he found that his, suspended magnet, magnetometer and that of **Owen Pearson** in Edinburgh, had recorded the build up of the activity. The Boulder Environmental Research station reported a major storm, due to a solar flare between the 5th and the 8th.

Radio Aurora

"My QTH is located about 170m a.s.l., with poor south/south east take off, but fine business to the north," writes **Lawrence Morgan GM0ATQ,** from Greenock. Lawrence uses 25W to a 9-element Yagi and the only beacon he can normally hear is GB3ANG at Angus on 144·975MHz. On February 7, he logged Angus at 57A while beaming at 30° and by moving his beam to 90° he heard the German beacon DL0PR at 53A on 144·910MHz and some periodic noise on 144·925MHz, the frequency of GB3VHF at Wrotham. Between 1343 and 1829 on the 7th, Lawrence worked stations in DL, EI, G, GM, ON, LA, OZ, PA, SM and UQ, mainly on the key. Then he worked DM, DJ, G, GM, GW, OK, OZ, PA and SM, from 2149 on the 8th to around 0200 on the 9th, when the event began to wane. He was justifiably delighted with his efforts because, until the 7th, his only contact outside of Scotland was in Norway. Nothing like a good opening Lawrence to pile on the score and give you a wealth of experience.

Owing to a bout of laryngitis, **Gordon Pheasant G4BPY,** Walsall, could not say much during the event, however, he did work OZ9QU and SM6PU crossband between 28 and 50MHz.

"I observed the strange situation at 0600 on the 7th when I checked the 144MHz repeater band. The Duns repeater GB3SB on R2 in Berwickshire, came booming in, it was so strong that I could hear several Scottish stations having good QSOs. This signal remained good until the 9th, it was very odd, it was as if a finger was pointing straight at me," writes **Bill Kelly,** from Belfast. Apart from a very weak signal from the Elgin repeater, GB3SS on R0, Bill did not hear any other UK repeaters during the period.

Fraser Lees, was staying in Italy with IW2BNA at the time and learnt, by landline, about the event from an Italian amateur in Monte Penice who had worked ONs and PAs via the aurora. "VHF was great during the aurora on February 7," said **Douglas Maxwell GM0ELP,** after listening to tone-A c.w. and whispering s.s.b. from a multitude of stations in Austria, France and Germany.

Solar

Patrick Moore observed another sunspot group at 1215 on March 2, Fig. 2. It seems to have been active because around 2000 on the 7th, **Dave Coggins,** Knutsford, using a 2-element beam, feeding an FRG-7700 receiver with a FRV-7700 converter, heard auroral video pulses on Chs.E2 48·25MHz, R1 49·75MHz and E3 55·25MHz. He also logged G3JHC, with a watery signal, calling CQ at 2022 on 50MHz was "14MHz very noisy with only a few stations copiable and the beacons faint on March 7," writes **Len Fennelow G4ODH,** Wisbech. He commented, "a good example of beacons indicating band conditions occurred around 1900 on the 6th when the 14MHz band conditions were extremely vague and fluttery and only a few strong European stations were audible. 4U1UN and CT3B were 599+ suggesting some form of F layer anomoly around the sub-tropical region. Minutes later, came good RTTY signals between stations in Portugal CT1 and Sri-Lanka 4S7."

"I managed to catch a band opening at 1915 on March 6 and worked OY9JD at 55A and heard GI4MOK at 53A, but could not raise him," writes Lawrence Morgan. He continued, "The aurora was very much to the north on a beam heading of 355° and the event lasted about 20 minutes."

The 50MHz (6m) Band

"Not much activity," writes Dave Coggins, who logged G4BVE on s.s.b. calling CQ at 2157 on February 27. "Rather disappointing, conditions have been very poor," commented **Norman Hyde G2AIH,** Epsom Downs. However, between February 1, when the band became available for amateur use and the time of writing, March 10, Norman had worked 83 different stations.

The 28MHz (10m) Band

"Virtually no propagation, the only stations that I heard were G4HZW and G4SVV on March 3," writes Dave Coggins. On similar lines, "Nothing to report, the only QSOs that I have had were local on 29MHz f.m.," said Norman Hyde. However, let us hope that the band opens up for HF NFD organised by the RSGB for June 7/8 and their 21/28MHz s.s.b. contest on

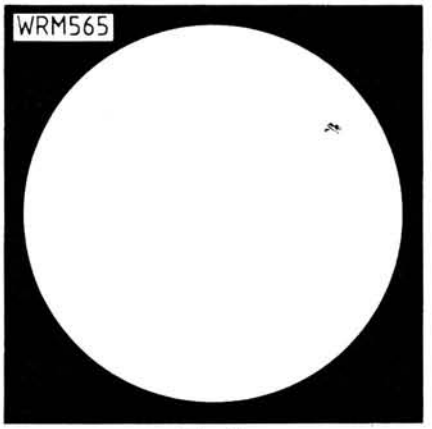

Fig. 2

October 12. I see in the February issue of *Region 1 News*, published by the International Amateur Radio Union, that the Radio Sport Federation of the USSR have organised a contest for all h.f. bands to run from 2100 on May 10 to 2100 on the 11th. The Associazione Radioamatori Italiana have a similar 24 hour event planned to start at 1600 on May 18. My thanks to Region 1 secretary, John Allaway G3FKM, for a regular copy of their News.

During the evening of February 18, **Fred Pallant G3RNM,** Storrington, heard EA5DGP for several minutes and at 1542 on March 6 he logged SV5TS calling from Rhodes and was not a bit surprised to hear plenty of G takers. Fred also logged a couple of ZS1s but could not raise them.

Propagation Beacons

"Not a lot to report this time," said Dave Coggins, although he did hear signals from the Mauritius beacon 3B8MS on March 2 and 6. "Only March 3 and 6 outstanding," writes **Ted Owen,** Maldon. "Definitely a nil return this time," remarked Norman Hyde, although like several of us he logged the Rutherford Appleton Laboratory beacon GB3RAL every day throughout this period.

"Conditions showed a sharp improvement from the beginning of March as my beacon chart indicates," writes Gordon Pheasant. He also reports hearing a new beacon, LU4XS, on 28·21MHz between 1600 and 1720 on the 5th, peaking 569 and sending GACW 54.59.S, 66,44,W.

"The Bulawayo beacon Z21ANB appeared out of the noise, like it had just been switched on, at 1101 on March 4, but it was gone by 1129," comments Fred Pallant.

In Wisbech, Len Fennelow kept up his routine watch for beacon signals on 14·100MHz. During the 14 days between February 15 and 28, he logged CT3B on 3 days, LU4AA once, OH2B on 4 days, ZS6DN/B on 9 days, 4U1UN/B on 3 days and 4X6TU/B on 4 days." The 14MHz beacons were rather sparsely received during February, but they have appeared consistently during the first 9 days of March, no doubt coinciding with the active solar region currently traversing the sun's disc," said Len and emphasised this point in his log, because he heard the aforesaid beacons on 7, 2, 3, 7, 8 and 7 days respectively, plus WX6WX/B on days 1, 3 and 9.

Len, Norman and I copied signals from the beacon at RSGB HQ, GB3NHQ on 50·050MHz, daily from February 15 to March 14 and with the exception of February 18, 21 and March 4. Norman received signals, via meteor scatter, from the

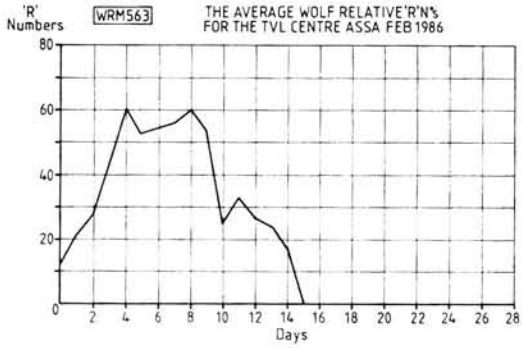

Fig. 3

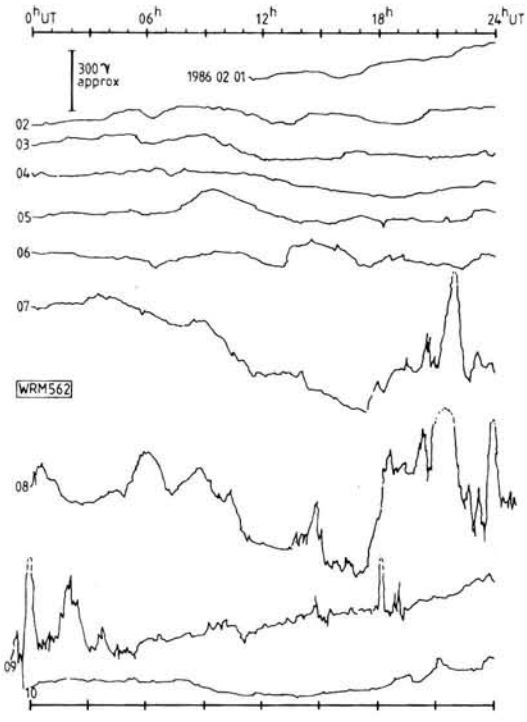

Fig. 4

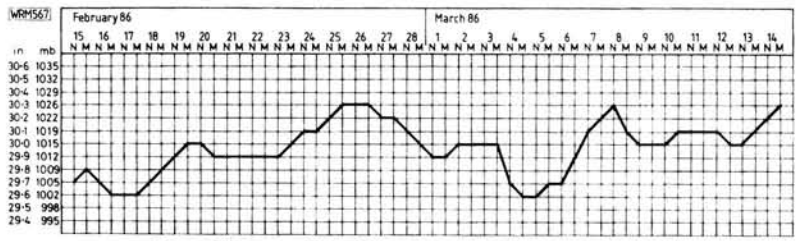

Fig. 5

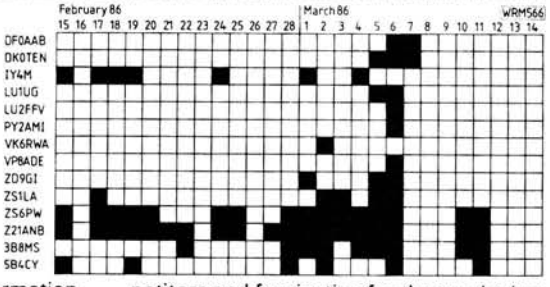

Fig. 6

50MHz beacon in Scotland GB3RMK and daily from GB3SIX in Anglesey. Apart from the last three days of February **Chris van den Berg,** The Hague, at a distance of 318km, received signals daily from GB3VHF at Wrotham, on 144·925MHz, between February 15 and March 10. He also heard the Tacolneston repeater GB3NB on R1 during the same period. My own 28MHz beacon score was nil this time despite daily checks between 28·2 and 28·3MHz so more than ever, my thanks are due to Chris van den Berg, Dave Coggins, Len Fennelow, Norman Hyde, Bill Kelly, Ted Owen, Fred Pallant and Gordon Pheasant for their logs which enabled me to compile the monthly beacon chart, Fig. 5.

Tropospheric

Every month we produce a graph showing the atmospheric pressure at noon and midnight each day, Fig. 6, planned to assist the v.h.f. enthusiasts among our readers and provide a record for posterity. The slightly rounded information originates from the Short and Mason barograph installed at my QTH. To further help, our chart makes a comparison between barometer readings measured in inches and millibars. Marked swings in pressure from high to low and visa-versa are not only an important guide to changing weather conditions but have an effect on v.h.f. and u.h.f. signals. Of course there are other factors, such as temperature inversions and humidity which contribute to a tropospheric opening but, generally speaking, v.h.f. communications are at their best for DX working when the pressure is high, around or above 30·2in (1022mb) and beginning to fall. Keep an eye on the TV weather charts or the maps in some daily newspapers.

In the past I have heard the TV weatherman say, "conditions should be good for radio amateurs tonight." Our thanks to them because this information is most helpful. The average pressure for this period, February 15 to March 14 was 29·96 and 29·97 at noon and midnight respectively, with lows of 29·6in recorded on February 16 and March 5 and a peak of 30·3 on the 26th and the 8th.

Sudden lifts can occur over relatively small areas and I think Douglas Maxwell experienced such an event when he said, "On March 1 and 2, the Duns repeater GB3SB came up to 59 + 20, it is normally about 41 with me, and I worked G1ITB in Berwick-on-Tweed and G1OXH in Southshields." At this time, Douglas, who uses 2·5W to a 5/8λ colinear antenna, also heard signals from the Berwick-on-Tweed repeater GB3BT on R4 for the first time. Let us hope that conditions are right for the RSGB 144MHz contests on May 17/18, July 26 and September 6/7 and 432MHz on May 3/4, June 1, July 27 and October 4/5. These events are good for the competitors and fascinating for those who just want a good listen around, especially during the VHF NFD on July 5/6.

Band II

"Throughout January and February, conditions were almost at a minimum with only a few French stations being heard and I thought the same would go for this month, until the tropospheric opening on March 8/9 changed the pattern," writes **Harold Brodribb,** St. Leonards-on-Sea. He continued, "February 12 was an exception, the barometer was 30·45in and falling, when stations to the east came in and signals from Belgium—Egem, and France —Lille, were logged between 100 and 103MHz." During that day Harold heard two rare ones for him, Caen Inter on 99·6MHz and Rouen Inter on 96·4MHz, plus Culture from Lille on 98MHz at exceptional strength and programmes from Boulogne and Neufchatel. While Harold's barometer was falling from 30·25 to 30·0in on March 8 and 9, he received transmissions of France Culture from Abbeville, Boulogne, Caen, Lille, Neufchatel and Rouen, Inter from Abbeville, Caen, Neufchatel and Rouen, Musique from all stations previously mentioned, Frequence Nord from Boulogne, RBL from Lille and Inter from Paris on 87·8MHz.

"The v.h.f. broadcast band has been very difficult to DX since January. The BBC have put 3 more, powerful, transmitters on the band and together with the Radio Telefis Eireann (RTE) reallocation and increase in power, they have placed a barrier which is impossible to penetrate," writes Bill Kelly. He counted 15 BBC channels for Radios 1–4 and Ulster and 6 RTE channels, in the band so it is unlikely that there will be anymore DX reports from him. Tough luck Bill, but if ever conditions come right and the DX does get through, your report will of course be welcome and received with additional interest.

Reports by the 15th, please

TELEVISION

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

by Ron Ham BRS15744

Judging by the number of photographs I receive from readers, the types of pictures most captured are test cards, closely followed by announcers, newscasters and presenters of the various programmes. As photography can be an expensive business, most DXers only record the subjects that are of particular interest to them and not everything that briefly appears on the screen.

To give both the newcomer and the experienced TVDXer alike the chance to identify the pictures that appear we publish captions, testcards and clocks etc from events that have happened at different times. Hopefully as the DX gets better and better these photographs will prove useful to readers when trying to identify your own results.

The pictures of people on TV in Poland (Fig. 1), Spain (Fig. 2) and the USSR (Fig. 3) were received by **Len Eastman G8UUE,** Bristol, during the 1984 sporadic-E season. **Major Rana Roy** in India received the

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

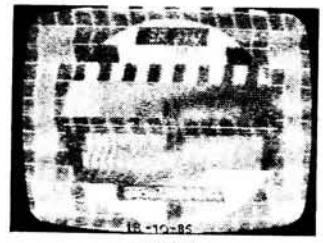

Fig. 12

photographs in Figs. 4 and 5 from Pakistan and Figs. 6 and 7 from the USSR during tropospheric and sporadic-E openings respectively in 1985. From his QTH in Aldershot **Peter Lincoln** copied pictures of amateur operators using slow scan TV from Finland Fig. 8, Italy Fig. 9 and the USA Fig. 10.

My contribution is the well dressed entertainer, Fig. 11, who I saw on German TV during a short-lived tropospheric disturbance in 1984.

Band I

"We had our first sporadic-E TVDX in 1986 when we watched Dubai TV on Ch. 2 from 1755 to 1915 on February 9," reports Major Rana Roy. He explained, "The signals were fading and coming up. When the signal started coming in, they were showing a fairy tale animated film, which finished at 1815. This was followed by an Arabic song and at 1825 another animated film, dubbed in Arabic, began."

Despite frequent checks on Band I, 40 to 68MHz, during this reporting period, 15 February to 14 March, the only sporadic-E I found was on 13 March, when weak sync pulses were frequently heard on Ch. R1. They became strong enough to produce good test cards from Poland and Czechoslovakia for short periods around 0900 and 1315 respectively. By the time you read this the 1986 sporadic-E season should be underway, just what all of you new DXers have been waiting for. After a few big events you really will be hooked. Do keep in mind that a sporadic-E disturbance can occur at any time, during daylight hours, between May and September. Obviously one cannot watch the set all day waiting for an event to begin, so I suggest that you make frequent checks on Chs. E2 and R1 because the frequencies of these channels, 48.25 and 49.75MHz, are close together, good areas for DX and vulnerable to the early stages and mildest forms of sporadic-E.

Tropospheric

"January and February exceptionally poor," writes **Harold Brodribb,** St Leonards-on-Sea. However, with some help from the troposphere he received test cards from Belgium, Liege on Ch. E3 and Wavre on E8, at 1025 on 5 March, good French pictures on Ch. F5 all day on the 6th. From 1415 on the 7th he logged strong, negative pictures from French stations on Chs. F5, 7 and 9. I observed a few bursts of car racing on Ch. E4 at 1720 on 17 February, a weak test card on Ch. E10 at 1318 on 9 March, a Dutch test card, PTT NED-1, on Ch. E4 around 0900 and an unidentified picture on Ch. E10, at midday on the 13th. Somewhat different to last 18 October, when one of our Dutch readers, **Rijn Muntjewerff,** received a test card, Fig. 12, from Poprad in Czechoslovakia on Ch. R30 and we seldom get reports like that. Rijn, a keen TVDXer, is a member of the Benelux DX Club and is hoping for confirmation that he has received pictures from Thailand during a recent F2 opening.

While travelling in Europe, **Fraser Lees,** Ringmer, learnt that TDF RES 5 and 6 are now operational from Paris on Chs. 33 and 36 and suggests that we all keep a lookout for more Italian stations in Band I during the coming sporadic-E season. Fraser uses a Thomson TF2502PI, 10in multi-standard colour set and is very pleased with its performance. I am often asked about the availability of suitable sets for DXing and I see that Aerial Techniques, in Poole, stock the Thomson sets. Don't forget to keep an eye open on the shelves of the big stores for sets fitted with a v.h.f. television tuner with its dial scribed Chs. E2 to E4 and E5 to E12 in addition to a u.h.f. tuner covering Chs. 21 to 68. I am always pleased to hear about sets, so do let me know what you find.

SSTV

In Romford, **George Ross G4IEI,** uses a Drae converter in conjunction with his TS-120S and a JVC TV receiver for operating in the slow scan television mode. George is certainly pleased with the results, because, in February, he had several good QSOs with stations in Europe and copied signals from VK2BXV in Sydney and K1DMV in New Hampshire; unfortunately he could not raise them.

To improve reception generally, **Lester Curno,** Bude, added an h.f. pre-amplifier to his FRG-7 receiver and, to reduce computer noise, he put ferrite rings on the cable which connects the output of the FRG-7 to the input of his Spectrum computer. "SSTV seemed to pick up a little in February," writes Lester. He received pictures from G0ALV, GD4HOX, GJ4YCV and a special event station GB4DBZ on 3·5MHz and logged the captions, "OP CHRIS, DIANNE, ERIC" and "QTH SHREWSBURY". The new calls that he received during the month included, HA3MQ, HA5SX, I0VMY, IK5HHE, YU2BIJ, YU5EF and ZS6AW, In 14MHz. The South African signal increased his new country score to 29 and his callsigns list to 165.

"Participation in the Fenland f.m. 144MHz SSTV net, from 1930 on Mondays, is not restricted to stations in Cambs, Norfolk and Suffolk, all are welcome," writes **Richard Thurlow G3WW,** March. He tells me that stations from Avon and Salop have already joined in. Fenland operators usually produce computer de-

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rived SSTV with Sinclair Spectrums and BBC computers; however, G3WW and G4VYG also join in and exchange 24 seconds, single frame, colour pictures. "There are now 11 stations dotted over the north-west using WCY/ENA or ROBOT equipment and have fairly regular skeds with G3CCH and G1OZH," reports **Dennis G6YBC**, from Manchester.

During a recent Open Night, held by the Huntingdon Amateur Radio Society, to show the general public what amateur radio is all about, G3RPV installed his slow scan gear at the exhibition and members of the Fenland net kept up a good supply of "over-the-air" pictures for the visitors to see. "West German SSTV stations have been active daily on the 3·5MHz band and SM5DAJ has been worked as late as 2135," writes Richard and recommends that enthusiasts tune in to the Sunday morning 3·5MHz band net, around 1000, between 3·730 and 3·735MHz.

During the month prior to March 8, Richard made many contacts with European stations and had new QSOs with I0EMU, I7BNX, HA5SX and OE3JKA and with his Robot, he exchanged 36 seconds, single frame, colour pictures with K1DMU, W0TWO, W1JKF, W4FAX, WD0FNL, ZS6AW and ZS6JCF. Richard also told me that on 9 March, John Holmes G3UEU appeared on the 3·5MHz net sending and receiving excellent 36 and 72 seconds colour pictures with his home-brewed and designed SSTV converter.

Despite some QRM, QSB and, at times, weak signals, I did manage to copy pictures from stations in Hungary, Poland and the USSR on 15 February, Yugoslavia on the 16th and 22nd and Italy and Hungary on 2 March. Among the captions that I saw were, "DE SP8ZBF PSE K", "OK DEAR GEORGE" and "G3WW DE YU1OYK", plus the often heard s.s.b. request on 14·230MHz, "Please clear frequency for amateur slow scan television".

In Bristol, **John Brown BRS87015** uses a R600 receiver, a Spectrum computer with software from the Sinclair Amateur Radio User Group and an Alphacom printer for SSTV reception.

Reports by the 15th, please

MW BROADCAST BAND DX

by Brian Oddy G3FEX

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

No doubt many of you will have noticed that some of the long wave broadcast stations have changed their operating frequency slightly. The changes, which are planned to take place over a four year period, in three stages, commenced on 1 February 1986. The first stage affects broadcasters' allocated frequencies below 200kHz and the lowest frequency of 155kHz has now become 153kHz. The new allocations in this part of the band are as follows:

153kHz, DLF W. Germany; Bucharest Roumania.
162kHz, Radio France Inter.
171kHz, Moscow, Media 1.
180kHz, Stimme der DDR; Europe 1, W. Germany.
189kHz, Stockholm, Sweden; Rome, Italy.

The second stage in the plan will occur on 1 February 1988 and this will include the BBC 200kHz Droitwich transmitter, which has for many years acted as a highly accurate frequency standard against which s.w.l.s. zero-beat their 100kHz crystal calibrators! It will move to 198kHz. The third stage is due to take place on 1 February 1990 and will affect the broadcasters using 245kHz upwards.

DX Report

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

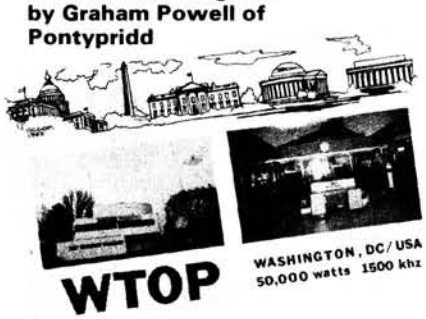
Transatlantic DX: Once again **Stuart Brooks** of Carluke, Strathclyde, has been checking the band for signals from Canada and the USA. He heard CJYQ 930 from St. John's, Newfoundland, as early as 2320 one night, but found conditions generally rather poorer than normal. However, WHN 1050 from New York, has been a very good signal on several occasions around 0120 and Stuart listened to the local weather forecast for the New York area from WINS 1010 at 0151. Also at about this time, WMRE 1510 from Boston has been received and a 'phone-in programme from another Boston station, WBZ 1030, made interesting listening!

A commentary on a ball game broadcast by WCAU 1210 in Philadelphia, came over well at 0137 one night and later, news from the Washington area was picked up by Stuart via WTOP 1500, at 0200. At about this time, Canadian CKCW 1220 has been received from Moncton, New Brunswick, at fairly good strength and later, at 0230 the News and weather reports for Newfoundland were heard via CKYQ 610 in Grand Bank. The Caribbean Beacon 1610, in Anguilla, and RCN de Tijuana, Mexico, on 1470 were also heard around 0230 by Stuart—he says "I try to stay awake for as long as possible, but fall asleep at the controls!"

Bill Kelly of Belfast has once again been searching the band for DX using his Icom R71E and JRC NRD 515 receivers, but found the conditions not good. However, those American stations which did make it across "the pond" were, in most cases, of good signal strength and Bill says that in view of this it was strange that more DX was not heard. Signals from WTOP 1500 of Washington, broadcasting a ball game, were clearly heard at 0045 and a string of adverts from "The Memory Station", WMRE 1500 in Boston were loud and clear at 0120. Bill listened to CKCM 620, located in Grand Falls, Newfoundland, for a while from 0140, but could not find any other Canadian stations on the band.

An Evangelical programme attracted Bill's attention to the Caribbean Beacon in Anguilla 1610, at 0245 and a strong signal from Radio Globo in Rio, Brazil, S. America, was noted on 1220—both of these were received by **Andy Kennedy** of Leicester, but over an hour later. Andy also logged CJYQ 930 St. John's, Newfoundland, at 0130 and WMRE 1510 Boston, Mass. at 0444, but like old timer **George Morley** of Redhill, Surrey—who took only two brief looks at the band and received CJYQ 930 around 2330—spent most of the available time on the Tropical bands!

A QSL card from WTOP Washington DC for reception of transatlantic medium wave signals by Graham Powell of Pontypridd



A car sticker from ILR Red Dragon Radio—a local radio station serving Cardiff and Newport sent in by Al Dupres of Cardiff

Other DX: Using a Sony ICF-35 receiver with ferrite rod antenna, **Keith Fernie** of Ossett, W. Yorkshire, has been making regular checks on Radio Praha, Czechoslovakia 1287 and Radio Polonia 1503. His logs show that reception of these stations is fairly consistent in the UK, during the evening.

Writing from "Down under", Old Timer **John Ratcliffe** of Southport, Queensland, says "I have been doing a little DXing on the m.w. band again, using my National DB 331 receiver. I listened to one of New Zealand's Community stations on 1550 at 1500, and later, at 1700, heard Radio Fiji, on 630. However, this is a dodgy spot, because one of New Zealand's stations comes on the air at 1730, using this frequency—a loop is of no help, as both transmitters are East-South-East from Southport".

"A very clear signal, with no interference or fading" is how **James Sneddon** of Motherwell, Lanarkshire, described Manx Radio 1368 in his log, received at 1500. James, who has only recently become interested in the more distant m.w. stations, also noted BBC Radio Ulster, 1341 at 1330 and BBC Radio Wales, 882 with some fading at 0824—so far, it has not been possible to establish whether this is the Washford, Penmon, Tywyn, or Forden transmitter, since all use 882kHz, but no doubt a good loop antenna would help to resolve this point. A QSL and other items have been received from BRT Belgium 1512, which was logged at 1000. **Wyn Mainwaring G8AWT** of Cowes, Isle of Wight, has also been listening to this station and enjoys their "Radio World" programme on Sundays.

Freq (kHz)	Station		James Sneddon, Motherwell	Alan Merritt, Abingdon	Stewart Russell, Forfar	A. Mackow, Harlesden	Andy Kennedy, Leicester	Roy Spencer, Nuneaton	Bill Kelly, Belfast
603	Invicta Sound	IBA						X	
630	Radio Bedfordshire	BBC						X	
756	Radio Cumbria	BBC	X						
756	Radio Shropshire	BBC						X	
801	Radio Devon	BBC		X					
828	Radio WM	BBC		X					
828	Chiltern Radio	IBA		X				X	
837	Radio Leicester	BBC		X					
999	Radio Red Rose	IBA			X				
1035	Radio Kent	BBC					X		
1035	Northsound Radio	IBA			X				
1107	Moray Firth Radio	IBA			X				
1152	Radio Clyde	IBA			X				
1152	Radio Metro	IBA				X			
1161	Radio Broadland	IBA			X				
1161	Radio Tay	IBA			X				

Freq (kHz)	Station		James Sneddon, Motherwell	Alan Merritt, Abingdon	Stewart Russell, Forfar	A. Mackow, Harlesden	Andy Kennedy, Leicester	Roy Spencer, Nuneaton	Bill Kelly, Belfast
1161	Viking Radio	IBA				X			
1161	GWR	IBA		X					
1170	Radio Victory	IBA		X					
1368	Radio Lincolnshire	BBC						X	
1458	Radio London	BBC	X	X	X				
1458	Radio WM	BBC		X					
1458	Radio Manchester	BBC	X		X				
1458	Radio Newcastle	BBC			X				
1458	Radio Cumbria	BBC	X						
1485	Radio Merseyside	BBC			X			X	
1530	Radio Pennine	IBA			X				
1530	Radio Wyvern	IBA					X	X	
1548	Capital Radio	IBA			X				
1548	Radio Forth	IBA			X				
1557	Radio Hereward	IBA			X				
1584	Radio Tay	IBA			X			X	

Because of an interest in touring the local beauty spots around Angus on his bicycle, **Stewart Russell** of Forfar, Scotland, has added a clip to the handle bars so that his radio can be firmly attached to enable him to be "cycle mobile"! While "out and about", he has heard BRT Brussels 1512; Radio Luxembourg 1440; BBC World Service 1296; DLF W. Germany 1269; VOA Europe 1197; Radio Sweden 1179; RTE-1 Cork 729 and RTE-2 Dublin 1278—no doubt he finds some nice interference-free places, too!

In view of the number of pirate radio stations operating in S. Ireland, **Stephen Gates** of Carrick-on-Suir, Tipperary, points out that the official stations in the Republic are operated by Radio, Television Eirean. RTE Radio 1 is radiated on m.w. from Tullamore, on 567 and Cork, on 729. RTE Radio 2 is from Athlone on 612, also Dublin and Cork, on 1278. A third service, Radio Na Gaeltachta (in Gaelic), is from transmitters at Conamara on 540, Corca Dhuibhne on 828 and Tir Chonaill on 963. A number of v.h.f. transmitters radiate all three services, too. Both RTE-1 on 729 and RTE-2 on 1278 have been received by **Roy Spencer** of Nuneaton, Warks. He uses a Realistic DX400 receiver with an indoor antenna and has also been listening to BBC Radio Ulster 1341. Other stations noted in his log include DLF W. Germany 1269 and BRT-1 which broadcasts in Dutch on 927.

John Court of Birmingham, who uses a Vega 206 receiver, has been hearing News in English from Italy, on 846 at 0300. Bill Kelly has been checking the band during the early hours, too, and heard Les Trembles, Algeria 549 at 0005 and a talk and music from Rostov on Don, USSR 945 at 0045. News and other items were received from Marseille, France 675 at 0100—a very good signal. The time signal for 0200 followed by an Anthem via Vilnius, USSR, was noted on 666. Later, at 0300, Bill heard the station ident and Anthem from Radio Vishintos, Lithuania, on 1557 and at 0510, a talk in French via Lyon-Tramoyes, France on 603.

Local Radio DX

Once again, distant stations have been received during daylight—in some cases "local"is almost a misnomer! Some idea of the local radio scene this month can be ascertained from Fig. 1. Stewart Russell says he has been busy local radio DXing with "just ordinary receivers"—a Ferguson 3R05 and a National panasonic RF1103DLBE, both of which have built-in antennas.

About two months ago, **A. Mackow** of Harlesden, London, was visiting Margate and was surprised to hear Metro Radio from Newcastle, under LBC on 1152kHz!

A new BBC local radio station is to start operations from Chelmsford in November, on a frequency of 558kHz. It will be called BBC Essex—not BBC Radio Essex, so as to avoid confusion with ILR Essex Radio, which broadcasts on 1359 and 1431kHz. This will be an interesting new station to look out for and no doubt they will be looking for reception reports, too, so let us hope they have plenty of QSL cards!

Books

A handy and informative computer generated reference book called *North American Radio-TV Station Guide* by Vane A. Jones, lists over 13 000 authorised television, f.m. and medium-wave a.m. broadcasts stations in the USA, Canada, Mexico and the West Indies. Published by Howard W. Sams & Co Inc, 4300 West 62nd Street, Indianapolis, Indiana 46268 USA, it may be available through your local bookseller under reference ISBN: 0-672-22296-5.

QSL Addresses

BBC Radio Humberside, 63 Jameson Street, Hull, HU1 3NU.

BBC Radio Solent, South Western House, Canute Road, Southampton, SO9 1JJ.

BBC Radio Manchester, New Broadcasting House, P.O. Box 90, Oxford Road, Manchester, M60 1SJ.

Reports by the 15th, please

SW BROADCAST BANDS

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

by Brian Oddy G3FEX

For the Newcomer SWL

Owing to our present position in the Solar Sunspot cycle—see March '86 *PW*, page 63—the conditions on the higher frequency s.w. bands are generally poor just now, so it is not surprising that the broadcasters are resorting to a few tricks to overcome the problems! In an attempt to ensure that a programme reaches a chosen target area, a broadcaster may often back-up a normally optimum high frequency transmission with one on a less effective lower frequency, so as to provide some measure of protection in case the m.u.f. falls—as discussed in the March article. However, this is not always effective, so what other tricks can a broadcaster employ?

In the early days of radio, commercial messages were transmitted on the low frequency l.w. bands by means of **Direct** or **Ground wave** paths. It was discovered that if the wavelength in use was increased, the ground wave attenuation become less, consequently very low frequencies were introduced. Initially, the transmitters generated low power, but higher and higher powers were gradually produced in an attempt to cover greater distances. It was difficult to effectively

radiate these low frequencies and all kinds of extensive antenna systems were evolved. A series of lower-power stations, suitably located, were used to "relay" messages to a distant destination.

Because the ground wave attenuation rapidly increases as the frequency is raised, the s.w. bands were considered, in commercial terms, to be of little interest and consequently they were given to experimenters. It was not too long, however, before those early radio amateurs discovered the virtues of the s.w. bands, for vast distances were soon being covered by means of the indirect path via the reflecting layers of the ionosphere and the rapidly attenuated direct path was of little importance! Commercial interests soon moved down onto the s.w. bands and the need for relay stations soon ceased. Even today, the very low frequencies are still used for some commercial traffic, but the majority of it is carried either on the s.w. bands, or once again by relays—via Microwave Satellite links—so history is now, to some extent, repeating itself!

As a means of providing a better s.w. service, some major broadcasters have introduced relays into their networks, too. However, it should perhaps be made clear at this point that the majority of the signals heard on the s.w. bands are reaching the listener by means of direct broadcasts from high power transmitters located in the country concerned—from the keen DXers point of view, this is just as well, for it is the thrill of being able to tune into a distant station that makes s.w.l.ing such a fascinating hobby!

"This is London . . ."—these familiar words signify the BBC World Service to millions of s.w.l.s everywhere and they originate from the BBC studios in Bush House, London. However, the main s.w. transmitters in the UK are located many kilometres away from London, at suitable sites in the countryside at Rampisham, Dorset; Woofferton, Shropshire; Daventry, Northants; Skelton, Cumbria; and Orford Ness, Suffolk. Carefully equalised land lines are used to link the studios with these transmitter sites. Because the BBC now use a number of relay stations located in several Continents, reception of their service is much improved in many areas. However, from the newcomer s.w.l.'s point of view, these relay stations can be very confusing, unless a clear understanding is grasped, for those words "This is London . . ." could in fact be coming from a relay transmitter located, for example, in Singapore!

Let us now take a closer look at the present situation, for a number of interesting questions arise. Who, for example, owns and operates these relay stations? While some relay stations may be owned and used exclusively by a broadcaster, others are operated on a shared basis.

How are these relays, scattered around the world, linked to the studio centres? Well, the programmes are sent by **Single Sideband s.s.b.** or **Independent Sideband i.s.b.** s.w. transmitters called **Feeders**—which develop high peak powers and use directional beam antennas, or, more often, via yet another relay system —Microwave Satellite Links!

How can one tell if one is tuned to a relay? To discover which station you are tuned to, a Broadcast Schedule for the station concerned may well reveal the situation. It may, however, be more useful to refer to a good guide book—e.g. *The World Radio TV Handbook* or *The International Listening Guide*—because a number of schedules will be needed to check on the other broadcasters using relays, for, as can be seen in Fig. 1, there are quite a number of them!

A UAE Radio Dubai pennant, sent in by Harry Armstrong of Co. Armagh

Although very confusing to an unwary s.w.l., many of these relay stations are located in some of the world's DX spots and make good pointers to band conditions for a keen DXer!

(My thanks to **Philip Rambaut** of Macclesfield, Cheshire, for his notes on some of the relays mentioned herein.)

Conditions on 25 and 21MHz

Note: Frequencies in MHz. Time in UTC (GMT).

Conditions on the 25MHz (11m) band have, as expected, remained poor. A weak signal from Radio Liberty 25·690, broadcasting in Russian, was heard by **Bill Kelly** of Belfast on three days around 1230. This station and Radio Free Europe 25·665, are located in Munich FRG and were the only signals received by **George Morley** of Redhill, Surrey during ten days of monitoring the band.

A number of interesting signals have been received on 21MHz (13m) during the day. **Harry Armstrong** of Co. Armagh, N. Ireland has been listening to a broadcast from Radio RSA, Johannesburg on 21·535 in Afrikaans, beamed to Europe at 0826. On two occasions, AFRTS via a relay in Tinang, Philippines 21·670 has been received by George Morley at 0945. Others in his log include Radio Cairo, Egypt 21·465, beaming to Asia at 1420 and UAE Radio Dubai 21·605. **Leslie Biss** of Knaresborough, N. Yorkshire, who has been checking out his new Trio R600 receiver plus BC bands trap dipole antenna on all bands, found the UAE Radio Dubai signal to be very strong, with only fractional fading at 1340. **Fred Pallant G3RNM** of Storrington, West Sussex says: "This band seems to be staying open later in the evening now and VOA, beaming to Africa on 21·485 from Bethany, USA is a good signal at 1830."

In Malaysia, **Ghazalie Abdullah** of Kuala Lumpur has logged UAE Radio Dubai 21·700 at 0530; RBI Berlin, GDR 21·540 with their *DX Club* programme at 0835 and Radio Nederlands 21·480, via their Madagascar relay, at 1150. **Mat Jusoh** of Selangor says: "The BBC sounds like a local station here on 21·550 and 21·660. I enjoy their *Rock Salad* and *Jolly Good Show* programmes!" Others noted in his log include Radio Nederlands 21·480 at 1130; REE Madrid, Spain 21·570 at 1600 and Radio Moscow on a number of frequencies.

At his listening post in Southport, Queensland, Australia **John Ratcliffe** says: "On the 13m band, UAE Radio Dubai at 0530 and the BBC at 0615 are pretty consistent signals most days."

The 17 and 15MHz Bands

On the 17MHz (16m) band, some interesting broadcasts may be received during the day from several continents. For example, George Morley has heard some quite good signals from Radio Australia on 17·715 around 0900 and from AIR Delhi 17·875 and Radio Pakistan 17·660 at 1000. News in English was received at 1230 by Leslie Biss from Radio Bangladesh, Dhaka on 17·645 and UAE Radio Dubai was noted on 17·830 at 1050 and 17·775 at 1340. RCI Montreal, Canada 17·820 was logged by **Robert Taylor** of Edinburgh, Scotland at 1630.

Andy Kennedy of Leicester listened to WYFR at 1641, via their Okeechobee, Florida transmitter on 17·640 and **Philip Rambaut** of Macclesfield, Cheshire heard Radio Suriname Int, Paramaribo which beams to Europe at 1703 on 17·755 via an RNB relay located over 1600km to the south in Brazil!

The 15MHz (19m) band has also been interesting and "Newcomer" s.w.l. **Sheila Hughes** of Morden, Surrey, who uses a Vega Selena B212 receiver, has been listening to a remote DX spot—KTWR(TWR) Agena, Guam on 15·115 at 0820! Radio Japan, noted in the log from **Mushtaq Ahmed** of Oslo, Norway was heard on 15·230 at 0700 and on 15·210 at 1500. SRI Berne, Switzerland, beaming to Asia at 1045, was received by **Julian Wood** of Buckie, Scotland on 15·570. **Ted Tew** of Northallerton, Yorkshire used a CR100 receiver to listen to an interesting programme about Public Health in Austria, broadcast by Radio Austria Int, Vienna 15·320 at 1230.

Using two home built valve receivers, **Neil Dove** of Lockerbie, Scotland heard many interesting 19m signals including Radio Finland, Helsinki 15·400 at 1155; Voice of Israel 15·095, beaming to Europe in Hebrew at 1455—this transmission may help those "Newcomer" s.w.l.s who are making language ident recordings (see Feb. '86 *PW*, page 64); Radio RSA, Johannesburg 15·185 at 1710 in Dutch; RHC Habana, Cuba 15·230 at 1720; WINB Red Lion, USA beaming to Europe in English on 15·295 at 1720; WRNO N. Orleans, USA on 15·420 at 1830 and RAE Buenos Aires, Argentina on 15·345 at 2150.

The signals from Radio HCJB, Quito Ecuador, noted by **Jon Snooks** of Andover, Hants are often poor in the UK at 1950, on 15·270, despite recent transmitter power increases—so try listening on 13·676 from 1900. WYFR of Oakland, California USA, which also broadcasts religious programmes, was logged at 1900 on 15·566 by Jon. For news and sports reports from the USA at 1900, he tuned to the AFRTS Greenville transmitter on 15·430. "Down under", John Ratcliffe says he receives Radio New Zealand Int, on 15.150 at 0400.

The 11, 9, 7 and 6MHz Bands

There is certainly plenty to be heard on these bands! **Alan Hollingworth** of Southsea, Hants has been putting his new Vega receiver through its paces and some of the more interesting stations noted in his log on 11MHz (25m) were Voice of Israel, Jerusalem 11·605 on 1100; UAE Radio Dubai 11·955 at 1600 and RCI Montreal, Canada 11·945 at 1900. On 9MHz (31m), TWR Monte Carlo, Monaco 9·495 at 1030; Voice of Greece, Athens 9·420 at 1915 and VOFC Taipei, Taiwan 9·510 at 2057 were received and on 7MHz (41m)

Radio Australia was logged on 7·205 at 1700.

Signals from Radio Australia are often good on the 6MHz (49m) band and **Leighton Smart** of Trelewis, S. Wales, who is now the proud owner of a Grundig Satellit 1400SL receiver, has been enjoying their country-style music on 6·035 at 1535. Radio New Zealand has been heard for the first time on 9·600 by **Len Eastman** of Bristol, Avon at 0910, using a Yaesu FRG-7000 receiver.

The broadcast beamed to the Middle East by SLBC Colombo, Sri Lanka on 11·800 from 1700 has been heard by **Ben Dias** of Bristol, Avon on his ex-Admiralty receiver. **Bill Stewart** of Lossiemouth, Scotland has been listening to Radio RSA, Johannesburg on 11·900 at 2030—often an excellent signal then—and in the "wee sma' hours" has been hearing News in English from Radio Baghdad 6·050 at 0311; Voice of Turkey, Ankara 9·560 at 0410; Radio Tirana, Albania 7·300 at 0455 and later, at 0745 HCJB Quito, Ecuador with an Evangelical programme in English, on 6·215.

John Court of King's Norton, Birmingham has a Vega 206 receiver and has been listening to Voice of Kenya, Nairobi 6·050, broadcasting in Swahili, at 0400. **Andrew Hill** of Cheslyn Hay, Staffs also used a Vega 206 with whip antenna to log VOFC Taipei, Taiwan via a relay on 11·805 in Okeechobee, Florida, USA at 2115 and Radio Cairo, Egypt 9·675 at 0200, which was also noted on 9·475 at 0230 by **Al Dupres** of Cardiff, who has a new Yaesu FRG-8800 receiver, plus temporary antenna. His logs included Voice of Vietnam, Hanoi 10·040 at 1900 and TWR Bonaire, Netherlands Antilles 9·535 at 0300.

"Newcomer" s.w.l. **Tommy Doucan** of Belfast, N. Ireland says: "This is a fascinating hobby and the scope of it is unbelievable—with this, life could never be boring!" On 49m, Tommy listened to music from Radio Austria Int, Vienna 5·945 at 1800 and to a DX programme from SRI Berne, Switzerland 6·165 at 1820—this is a regular feature for s.w.l.s. On 41m, he heard a talk about life in Albania via Radio Tirana, Albania 7·065 at 1831—still operating in the exclusive Amateur 40m band. Later, at 2110 he tuned in to the News in English from Radio Bucharest 7·195.

The Voice of Israel broadcast from Jerusalem, targeted on N. America at 0000 on 9·435, was picked up by **Roy Spencer** of Nuneaton, Warks and both he and **John Sadler** of Bishop's Stortford, Herts have DX400 receivers plus indoor antennas. Extracts from John's log included *Sweden calling DXers* from RSI, Stockholm on 9·695 at 1400; Voice of Nigeria 7·255 at 1915 and Radio Sophia, Bulgaria 6·070 at 1930.

Peter Edwards and **Alan Merritt** both of Abingdon, Oxon use Vega receivers. Peter was very pleased to hear Radio Kuwait 11·675 at 1820 and Radio Afghanistan, Kabul (via a USSR relay) on 6·020 at 1900, using just the whip antenna! Alan listens to Radio Australia on 9·655 beaming to Europe at 0920 and to *DX Party Line* from HCJB Quito, Ecuador 11·810 at 2156. Using a Sony ICF7600D receiver, **David Wright** of Telford logged HCJB on 9·860 and WYFR via Okeechobee, Florida on 7·355—both beam to Europe at 0700.

A talk on Chinese menus from VOFC Taipei, Taiwan (via Okeechobee, Florida relay on 9·852) attracted the attention of **Andrew Kirby** at 2100. An Icom ICR70 receiver plus 50m wire antenna at his listening post in Mitcham, Surrey enables him to hear other stations such as Radio Korea, Seoul 7·550 at 2200.

Fig. 1: A table of relay stations used by some of the major broadcasters

Broadcaster	Associated relays
BBC London	Ascension Island Limassol, Cyprus Maseru, Lesotho Kranji, Singapore Delano, West USA Greenville, East USA Sackville, Canada Antigua, West Indies
RCI, Canada	Monserrat, West Indies Sines, Portugal Daventry, England
Radio DW, Cologne	Sines, Portugal Cyclops, Malta Trincomalee, Sri Lanka Kigali, Rwanda Sackville, Canada Antigua, West Indies
RHC Habana, Cuba & Radio Afghanistan	Via Relay in USSR
Radio Japan	Moyabi, Gabon Sines, Portugal
Radio Moscow	Habana, Cuba Sophia, Bulgaria Nauen, Germany
Radio Nederlands	Bonaire, Caribbean Madagascar
Ree Madrid, Spain	Las Mesas, Canary Is
Radio Free Europe & Radio Liberty	Playa de Pals, Spain Gloria, Portugal
RFI Paris, France	Montsinery, Fr. Guiana Moyabi, Gabon
VOA, Washington UN Radio Marti, Voice of OAS, AFRTS	Antigua, West Indies Wooferton, England Ascension Island Tangier, Morocco Monrovia, Liberia S-Phikwe, Botswana Munich, Germany Kavala & Rhodes, Greece Colombo, Sri Lanka Bangkok, Thailand Poro & Tinang, Philippines
WYFR, California, USA	Taipei, Taiwan
VOFC, Taiwan	Okeechobee, Florida USA

Using a Vega B210 receiver plus whip antenna, Radio Bucharest, Rumania 11·940 at 1300; Radio Polonia, Warsaw 7·285 at 1200 and Radio Moscow 7·400 at 2000 are being monitored by **Keith Fernie** of Ossett, Yorkshire as part of their "Club" activity. For the last nine years, Radio New Zealand's 25 and 31m transmissions have been monitored by **A. Scholefield** of South Shields, Tyne & Wear, using a home built receiver. He would like to correspond with s.w.l.'s (via me) who have similar interests.

In Scotland, **James Sneddon** of Motherwell is a regular listener to SRI Berne, Switzerland on 9·885 at 1550 and Robert Taylor—still amazed at the number of stations he can receive with just the whip on his Toshiba RP-F11L receiver—has now found that without extending the whip, Radio Norway Int, Oslo 9·590 at 1330; Vatican Radio 11·740 at 1445; RSI Stockholm, Sweden 6·065 at 1600 and Voice of Israel, Jerusalem 9·815 at 2015 can all be heard! In the Isle of Lewis, **Calum Macleod** listened to Radio Australia at 1155 on 9·770, to KCBI Dallas, Texas USA on 11·790 at 1930 and to World Harvest Radio, USA 11·865 at 2000.

The 5, 4, 3 and 2MHz Bands

Conditions are good on these bands and **Peter Mills** of Sherborne, Dorset discovered a whole new world of interest here! He logged ELWA Monrovia Liberia, 4·760; FRCN Nigeria, 4·770; Radio Douala Cameroon, 4·795; Radio Botswana, 4·820; Radio Cotonou Benin, 4·870 and Radio Burkina, Ouagadougou 4·815—a new one for Fred Pallant, too, who heard Radio Uganda on 5·026 for another first. An extensive log from **Harold Buggins** of Witney, Oxon included LBS Liberia, 3·255; Radio Malaysia, Sarawak 4·950; Radio Singapore, 5·010 and La Voz del Upano Ecuador, 5·039.

Using a DX302 receiver **Keith Wakelin** of Hull heard Radio Atlantida 4·790, also, Africa No. 1, Gabon 4·830 which was logged, too, by **Fred Tagg** of Sherwood, Nottingham. Fred has an Icom R71 receiver and his log included Mali Bamako 4·835; Nouakchott, Mauritania 4·845 and Radio Kiev, Ukraine 4·940. **John Parry G4AKX** heard BBC Kranji, Singapore 3·915, as early as 1630 in Northwich, Cheshire.

Radio Nepal, Khumaltar 5·005 was received by **Albert Fisher G4VBH** of Heston, Hounslow. He found conditions good to S. America and logged Radio Tachira, Venezuela 4·830 and Radio Sutatenza, Colombia 5·095 around 2200. Several other S. American stations were logged by **Tim Shirley** of Bristol, including Radio Super Midellin, Colombia 4·875; Radio Relogio, Rio Brazil 4·905; and Radio Emisora Gran, Colombia 4·911.

Exploring 60m on his new Normende 2019 receiver in Harlesden, London, **A. Mackow** heard TWR Swaziland 4·760; Radio Yaounde, Cameroon 4·850; FRCN Lagos, Nigeria 4·990; and GBC Accra, Ghana 4·915. In Wales, new ones for **Graham Powell** of Pontypridd and **Simon Hamer** of New Radnor were VLM4 Brisbane, Australia 4·920; 4VEH, Haiti 4·930; and RFO Cayenne, Fr. Guiana 5·055. In Scotland, **Stuart Brooks** of Carluke, heard Bangui, Central Africa Rep. 5·035; Omdurman, Sudan 5·038 and Togolaise, Togo 5·047; and in Belgium, **Maurice Andries** of Dendermonde received RTM Bamako, Mali 4·835 and Kalinin, USSR 4·860.

Station Addresses

UAE Radio Dubai, PO Box 1695, Dubai, United Arab Emirates.

KOL Israel, External Service, PO Box 1082, 91010 Jerusalem, Israel.

Radio Praha, 12099 Prague 2, Czechoslovakia.

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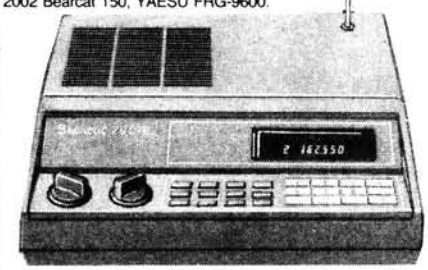

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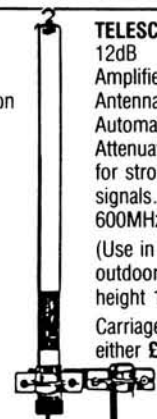

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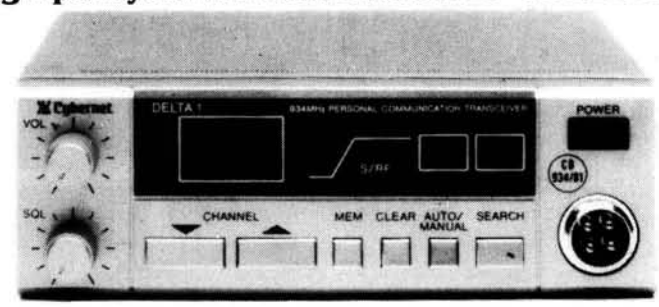

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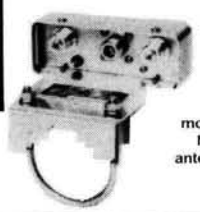

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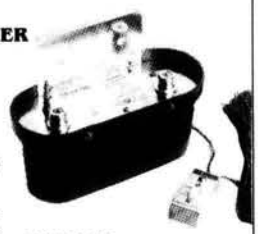

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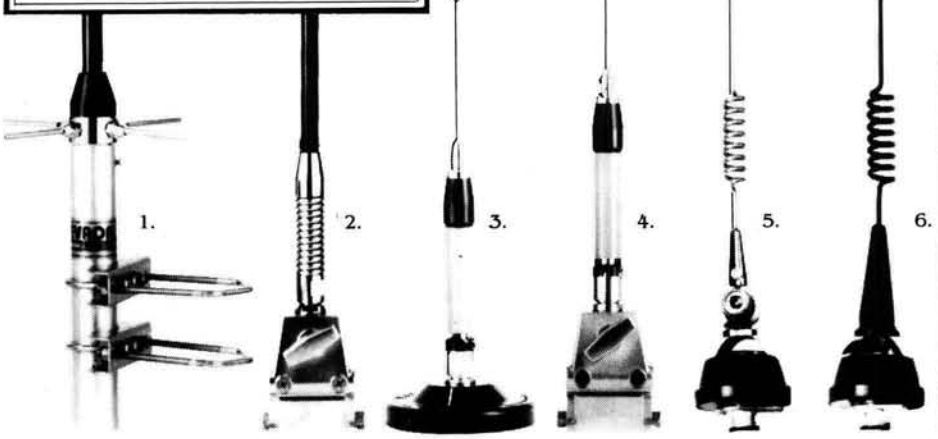

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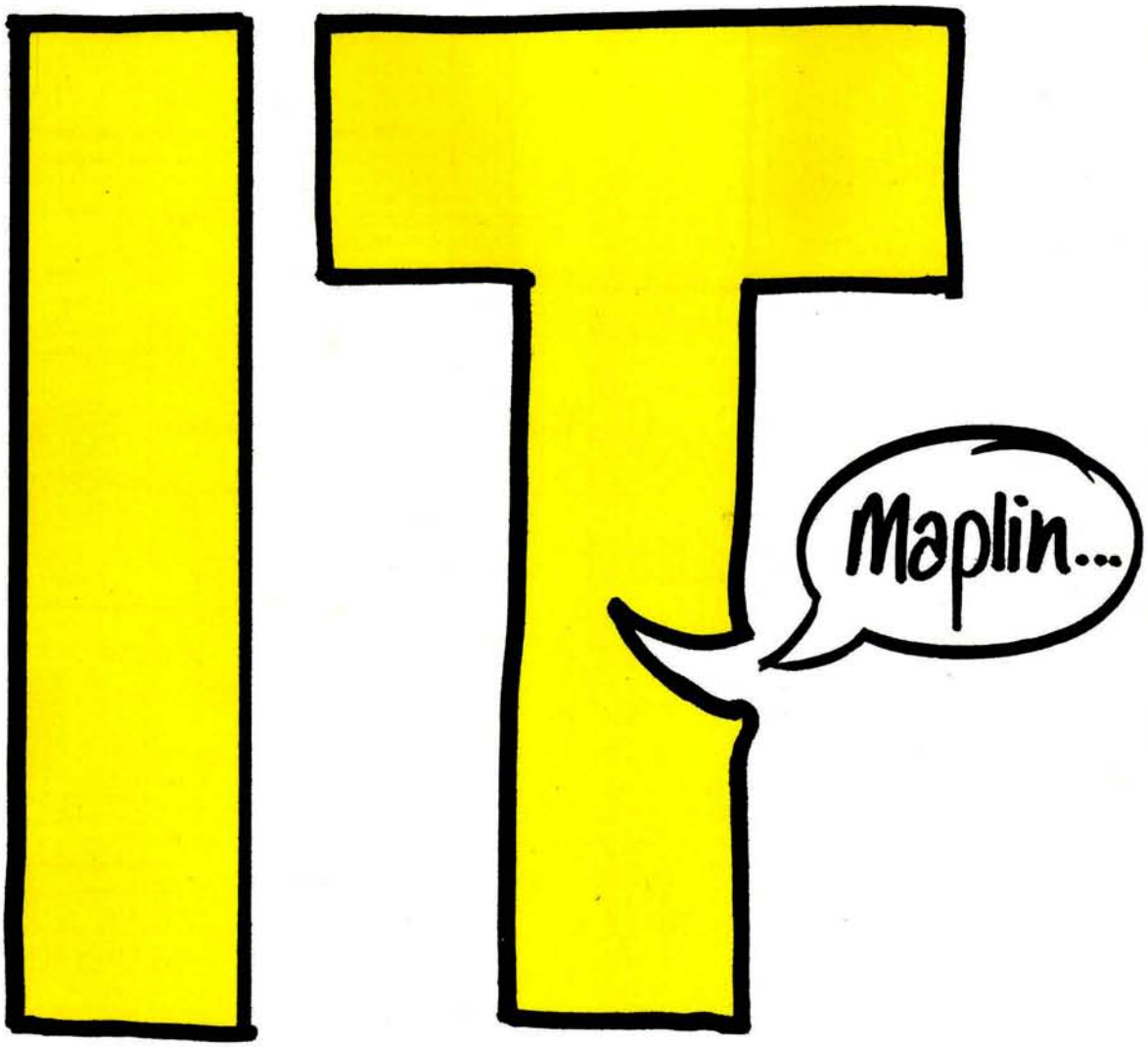

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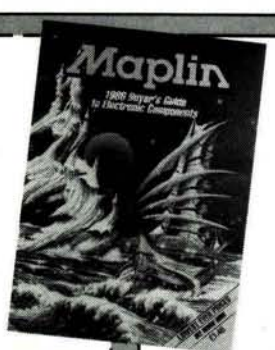

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