JULY 1986 £1·10

Practical Wireless

The Radio Magazine

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TS930S	9 Band TX General Cov RX	1395.00	(—)
TS440	**NEW** 9 Band TX General Cov RX	950.00	(—)
TS830S	160-10m Transceiver 9 Bands	898.00	(—)
AT230	All Band ATU/Power Meter	170.65	(2.00)
SP230	External Speaker Unit	51.43	(1.50)
TS530SP	160m-10m Transceiver	779.79	(—)
TS430S	160m-10m Transceiver	750.00	(—)
PS430	Matching Power Supply	139.01	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	13.56	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
SP120	Base Station External Speaker	33.33	(1.50)
MC50	Dual Impedance Desk Microphone	39.56	(1.50)
MC35S	Fist Microphone 50K ohm IMP	18.65	(1.00)
LF30A	HF Low Pass Filter 1kW	27.70	(1.00)
TR7930	2M FM Mobile	365.60	(—)
TR9130	2M Multimode	544.73	(—)
TW4000A	2M/70cm mobile	395.00	(—)
TM201A	2M 25W mobile	296.09	(—)
TM401A	7cms FM 12W	350.91	(—)
TH21E	2M Mini-Handhelds	189.30	(—)
TH41E	70cm Mini-Handhelds	220.95	(—)
TM211E	2M FM Mobiles	398.00	(—)
TM411E	70cm FM Mobiles	466.18	(—)
TS711E	2M Base Stations	770.74	(—)
TS811E	70cm Base Stations	895.00	(—)
TR3600	70cm Handheld	324.36	(—)
TR2600	New 2M FM Synthesised Handheld	299.00	(—)
ST2	Base Stand	66.11	(1.50)
SC4	Soft Case	16.95	(1.00)
SMC25	Speaker Mike	19.78	(1.00)
PB25	Spare Battery Pack	32.20	(1.00)
MS1	Mobile Stand	38.41	(1.00)
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	249.00	(2.00)
HL 35V	2m, 3W in, 30W out	76.00	(2.00)
HL 20U	70cms, 3W in, 20W out	122.50	(2.00)

MICROWAVE MODULES

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

B.N.O.S.

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

SWR/PWR Meters

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

WELZ

SP10X	1.8-150MHz PWR/SWR	36.50	(1.50)
SP122	1.8-60MHz PWR/SWR/PEP	85.00	(1.50)
SP220	1.8-200MHz PWR/SWR/PEP	59.99	(1.50)
SP225	1.8-200MHz PWR/SWR/PEP	109.95	(1.50)
SP420	140-525MHz PWR/SWR/PEP	71.00	(1.50)
SP425	140-525MHz PWR/SWR/PEP	109.95	(1.50)
SP825		165.00	(1.50)

TOYO

T430	144/432 120 W	52.50	(1.00)
T435	144/432 200 W	58.00	(1.50)

Scanning Receivers

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

Icom Products

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

Mutek Products

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

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	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 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	(2.50)	
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	KP21N2 way Switch	24.15	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.50	(1.00)
T100	100W Dummy load	38.00	(1.00)
T200	200W Dummy load	56.00	(1.50)
CT20A	20W Dummy Load PL259	14.25	(1.00)
CT20N	20W Dummy Load N. Plugs	22.50	(1.00)
CT530	300W Dummy Load	82.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)

TOKYO HI-POWER

HC200	10-80 HF Tuner	115.00	(2.00)
HC400	10-160 HF Tuner	199.00	(3.00)

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SPC300	1kW PEP	188.00	(3.00)
SPC3000	3kW PEP	275.00	(4.00)

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Practical Wireless
The Radio Magazine

JULY 1986 VOL 62 NO. 7 ISSUE 952

TWO NEW PW READERS' SERVICES

The PW Book Service
see page 48

The PW PCB Service
see page 51

THIS MONTH'S COVER

The Cirkit 50MHz Transverter Kit in course of construction

NEXT MONTH

Modifying the SRX-30D

Safety in the Shack

Portable Contest Operation

On sale July 3

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

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

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

LOWE IN NORWICH

On Sunday 22 June 1986 from 2.00 until 4.30 pm, Lowe Electronics will be at the Post House, Ipswich Road, Norwich. On display in the Harford suite will be the TRIO range of equipment. Coffee and biscuits will be free for the first fifty people to arrive. The Norfolk Amateur Radio club will operate the 2 metre talk-in station on S22, callsign G8LOW/A from 1.30 pm.

So, after the roast beef and Yorkshire pudding, put down your Sunday paper, have coffee with Lowe Electronics and see the latest amateur radio equipment from TRIO.

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, an excellent feature when receiving very weak signals. When bypassed the display indicates PASS.

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.

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send £1 for complete mail order catalogue.

Remember the TRIO TR9000 2 metre multimode that revolutionized mobile operation,

the well respected TRIO TR9130, the rig that improved the unimprovable,

now, better than ever, the NEW TRIO TR751E 2 metre multimode!

There has been a TRIO two metre multi-mode mobile transceiver for the last six years. Beginning with the successful TR9000 and continuing with the TR9130, amateurs have always found the series to be reliable and above all easy to operate, especially whilst mobile. Advances in technology have enabled TRIO to further improve on the TR9130. Additional operating features have resulted in an even easier to use and smaller transceiver. However TRIO have not discarded the valuable experience gained over the last six years. The result is the TR751E, a new generation of multi-mode mobile transceiver.

The TR751E is the first multi-mode mobile transceiver that can be set to select the correct mode whilst scanning the band. By setting the rig to vfo and selecting AUTO mode before pressing the SCAN button, the TR751E will move up or down the band changing both mode and step rate according to the band plan (5kHz/SSB, 12.5kHz/FM or 1kHz/SSB, 5kHz/FM depending on the selected frequency step).

The transceiver has two VFO's and 10 memory channels. Memory information is easily transferred to either vfo. Each memory holds information on frequency, mode and also the step rate to be set when transferring the memory information to vfo. Memory channel one is also the ALERT frequency, memories 7 and 8 relate to DCL and memory 0 programs the user defined limits of frequency scan.

The TR751E can be set to scan between user programmed limits or around them depending on the frequency set when the scan is started. When AUTO mode is set the transceiver will select the correct mode as it scans. In addition to scanning each memory, the TR751E can be set to scan those memories programmed with the same mode. Pause on an occupied channel is time operated but can be changed to carrier hold by an internal modification.

Operating on 13.8 volts DC, power output from the transceiver is 25 watts (high) and approximately 5 watts (low). The low power setting applies to all modes. When compared with the TR9130, the TR751E is smaller and lighter, TR751E (TR9130) 180mm (175mm) wide, 60mm (68mm) high, 213mm (253mm) deep, 2.1 Kgs (2.4 Kgs).

The TR751E is perfect for base station use. When operating on SSB, signals can easily be found using the frequency step set to 5 kHz, fine tuning quickly achieved by switching to the 50 Hz rate. Operation is also ideal on FM, the rig stepping in either 12.5 or 5 kHz steps. Full repeater facilities are also available including reverse repeater. Receiver performance is excellent, our first sample amazed us, FM, 0.14uV for 12dB SINAD and SSB, 0.09uV for 10dB S+N/N.

As an option, the TR751E can be fitted with DCL. Compatible with the DCS system, DCL (Digital Channel Link) enables your rig to automatically QSY to an open channel. The DCL system searches for an open channel (checks the next eleven 25 kHz spaced frequencies above the one stored in memory 7), remembers it, returns to the original frequency and transmits control information to the other DCL equipped station that switches BOTH rigs to the clear channel.

For the blind operator the TRIO TR751E is perfect. As each mode is selected a tone gives the appropriate morse letter (F for FM, U for USB, etc) and when fitted with the optional VS1 board, a digitally encoded girl's voice will announce on request the operating frequency.

In addition, the TR751E has an illuminated analogue S/RF meter, all mode squelch, MHz select keys, a noise blanker, semi break-in CW with side tone, RIT, memory channel up/down keys and a frequency lock. TRIO's attention to detail can be seen in the design of the included mobile mount, a clamp system with rubber pads protecting the rig as it is slid in and out for security, the clamp can be easily locked in the closed position.

Better than the TR9130 and at the same price, there is so much more to say about the TR751E, so why not ring us and let's talk about it.

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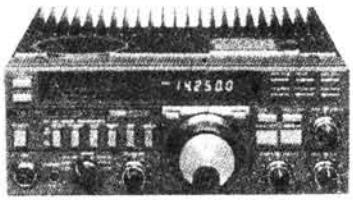

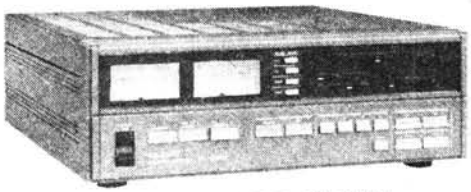

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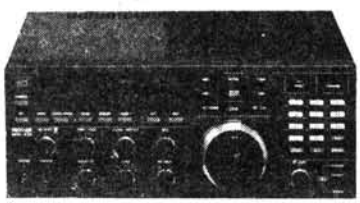

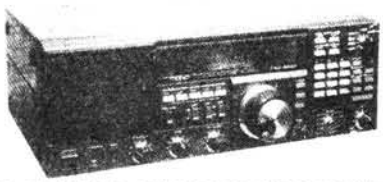

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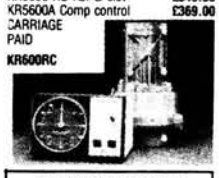

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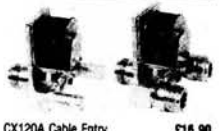

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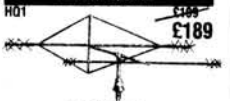

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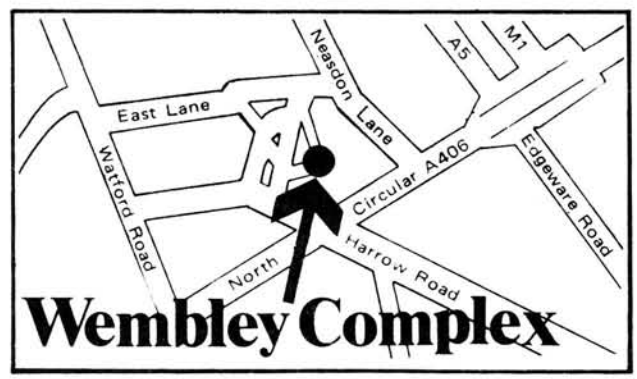

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LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00	(2.50)
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NS660P	1.8-150MHz PEP Cross Needle Meter up to 1.5KW	99.50	(2.50)
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SW200A	SWR/power/PEP meter 1.8-150MHz	92.70	(2.50)
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SW2000	SWR/power/PEP meter 1.8-54MHz up to 2KW	99.00	(2.50)
SWC1	Optional coupler for SW200 1.8-150MHz	25.50	(1.50)
SWC2	Optional coupler for SW200 140-450MHz	25.50	(1.50)
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FRG9600	60-905MHz scanning receiver	465.00	(3.00)
HX2000E	Handheld VHF/UHF scanner	269.00	(3.00)
R537S	Handheld Airband receiver	64.90	(2.50)
R532	Mobile/Base/Portable Airband receiver	209.80	(3.00)

Icom Products

IC751A	HF Transceiver	1399.00	(—)
IC745	HF Transceiver	989.00	(—)
IC735	New HF Transceiver	899.00	(—)
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)
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	(—)
SPECIAL OFFER			
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Mutek Products

SLNA 50	50MHz Switched preamp		(1.50)
SNLA 144s	144MHz Low noise switched preamp		(1.50)
SLNA 145sb	Preamp intended for 290		(1.50)
GLNA 432e	70cm Mast head preamp		(2.50)
RPCB 144ub	Front end FT221/225		(1.50)
RPCB 251ub	Front end IC251/211		(1.50)
BBBA 500u	20-500MHz Preamp		(1.50)
RPCB 271ub	Front end for IC271		(1.50)
TUHF 230c	2M-FM Transverter		(5.00)
LBPF 144u	Bandpass Filter		(1.50)
LBPF 432u	Bandpass Filter		(1.50)
TVVF 50c	6M Transverter		(2.50)
GLNA 433e	70cm Pre-amp		(2.50)
TVVF 144a	2M Transverter		(2.50)
GMFA 144e	2M Mast Head Preamp	119.95	(2.50)
TVVF 50a	6M Transverter	249.90	(2.50)

CW/RTTY Equipment

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BY2	Squeeze Key, Chrome base	76.97	(2.00)
HI-MOUND MORSE KEYS			
HK708	Straight key	18.10	(2.50)
HK702	Deluxe version of above on Marble Base	34.50	(3.00)
HK706	Straight key	19.50	(2.50)
HK707	Straight key	18.50	(2.50)
MK704	Squeeze paddle	17.50	(2.50)
MK705	Squeeze paddle on Marble Base	27.90	(3.00)
RTTY-EQUIPMENT			
AMT-2	Terminal Unit RTTY/AMTOR/ASCII/ CW	245.00	(3.00)
AMT-2/CBM64	Software for the above for the Commodore 64	51.75	(2.50)
AMT-2/VIC20	Software for the above for the Commodore VIC 20	51.75	(2.50)
AMT-2/BBC B	Software for the above for the BBC B	44.85	(2.50)
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TRX3	Morse Oscillator	11.70	(1.50)
Drae	Morse Tutor	52.00	(3.00)

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)
CSC1A	Carrying Case	6.50	(1.00)
YHA15	2m Helical	7.50	(1.00)
YHA44D	70cm ¼wave	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)
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430/726	70cm Module for above	255.00	(2.50)
FRG8800	HF Receiver	575.00	(—)
FRV8800	Converter 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)
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YH77	Lightweight phones	17.50	(1.00)
YH55	Padded phones	17.50	(1.00)
YH1	L/weight Mobile H/set-Boom mic	17.00	(1.00)
SB1	PTT Switch Box 208/708	18.50	(1.00)
SB2	PTT Switch Box 290/790	16.00	(1.00)
SB10	PTT Switch Box 270/2700	18.50	(1.00)
QTR24D	World Time Clock	39.00	(1.00)
FF501DX	Low Pass Filter	33.00	(1.00)

Power Supplies

DRAE			BNOS		
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12 amp	86.50	(3.00)	25 amp	169.00	(4.00)
24 amp	125.00	(4.00)	40 amp	345.00	(4.00)

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KR500	6 core Elevation	139.95	(2.50)
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Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	23.95	(1.00)
Welz	2 way 'n' Skts	43.95	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)

Aerials

JAYBEAM			
Jaybeam	TB3 Mk3 HF 3 element Tribander Beam	287.50	(10.00)
Jaybeam	TB2 Mk3 HF 2 element Tribander Beam	195.50	(10.00)
Jaybeam	TB1 Mk3 HF Tribander Rotary Dipole	97.75	(10.00)
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(Full range of Jaybeam VHF and UHF aerials available, please ring for details)

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Tonna	9 element portable 144MHz	21.05	(5.00)
Tonna	13 element portable 144MHz	32.67	(5.00)
Tonna	17 element 'N' socket 144MHz	47.85	(5.00)
Tonna	9 element 435MHz 'N' socket	22.35	(5.00)
Tonna	19 element 435MHz 'N' socket	28.75	(5.00)
Tonna	2×19 element 435MHz	36.00	(5.00)
Tonna	21 element 432MHz 'N' socket	38.15	(5.00)
Tonna	21 element 438MHz ATV	38.15	(5.00)
Tonna	23 element 1250MHz	27.75	(3.00)
Tonna	23 element 1296/1269MHz	27.75	(3.00)
Tonna	55 element 19 1296/1269MHz	44.75	(5.00)
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HB9CV	2 metres	3.95	(2.50)
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	The scanner guide to the VHF/UHF spectrum	3.95	(0.75)
	The International VHF FM guide	2.00	(0.75)
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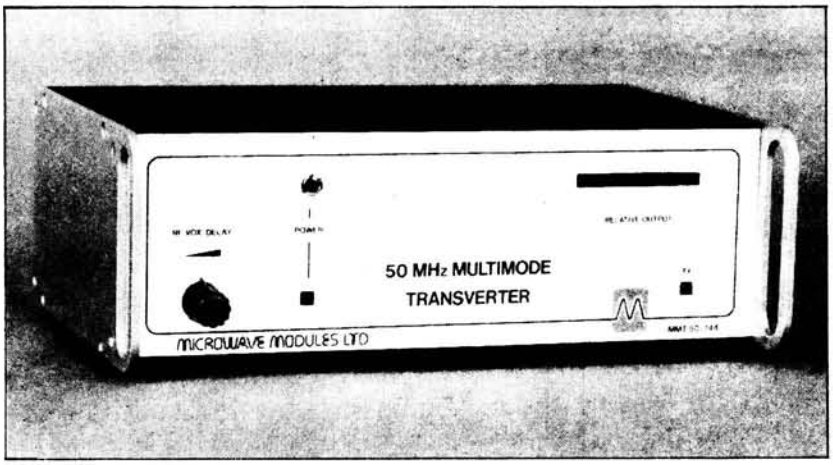
MICROWAVE MODULES LTD

THE NEW 50MHZ TRANSVERTER



General:
Input Frequency Range: 144-148MHz
Output Frequency Range: 50-54MHz
Modes of Operation: SSB, FM, CW, FSK, AM
Input/Output Impedance: 50 ohm
RF Connectors: SO239
Power Connector: 5 pin DIN 240 degree
DC Power Requirements: 13.8 volts at 4 Amps peak

Transmit Section
Output power: 20 watts at −23dB 3rd order IM
15 watts at −28dB 3rd order IM
10 watts at −32dB 3rd order IM
Input level range: 150 milliwatts to 15 watts
ALC range: 20dB
Level of spurious output: better than −65dB

Receive Section
Conversion gain: 10dB ± 1dB
Noise figure: better than 3.8dB
Input 3rd order intermod intercept point: better than +10dB
Spurious response rejection: better than −80dB

PRICE £245.00 inc VAT

Transit power output of 20 Watts
This power level of 20 watts, when used in conjunction with a typical antenna of 7dB gain, gives an ERP of 100 watts (the maximum permissible in UK). This power level is also ideal for driving a grounded-grid amplifier.

Purity of transmission
The MMT50/144 transverter has been optimally designed to ensure that spurious radiation falling with the 88-108MHz broadcast band are typically better than 90dB below full output. This has been achieved by the use of 16 poles of filtering, well-balanced mixing and push-pull amplification.

Exceptional large signal receiver performance
The 50MHz transverter enjoys a uniquely high overload characteristic of typically +12dBm (third order intercept point at transverter input). This has been achieved by the use of parallel FET's in the front end driving a balanced pair of FET's in the mixer. Given that the background sky noise at this frequency represents an equivalent noise figure of greater than 8dB, the low noise figure achieved in the transverter ensures that external noise is the limiting factor. The conversion gain of 10dB is provided to ensure that the 144MHz transceiver in use will detect the weakest of signals, while not being subjected to overload in the presence of strong signals on the 50MHz band. In other words, a system of impressive dynamic range is guaranteed.

Further features
The transverter will accept a drive level at 144MHz of between 150 milliwatts and 15 watts. The automatic level control (ALC) ensures that the 20 watt output signal is of consistently high quality. An LED bargraph display indicates the relative transmit output power, and the RF VOX control allows the operator to select the "hang" time to anything from 20 milliseconds to 1.5 seconds.

		Total inc VAT	Post Rate
MML28/100-S	10m 100W Linear, 10W input	129.95	C
MML144/30-LS	2m 30W Linear, 1 or 3W input	94.30	B
MML144/50-S	2m 50W Linear, 10W input	106.95	B
MLL144/100-S	2m 100W Linear, 10W input	149.95	C
MML144/100-HS	2m 100W Linear, 25W input	159.85	C
MML144/100-LS	2m 100W Linear, 1 or 3W input	169.95	C
MML144/200-S	2m 200W Linear, 3, 10, 25W input	334.65	D
MML432/30-L	70cm 30W Linear, 1 or 3W input	169.05	C
MML432/50	70cm 50W Linear, 10W input	149.50	C
MML432/100	70cm 100W Linear, 10W input	334.65	D
MMC435/600	70cm ATV Converter, UHF output	35.65	A
MTV435	70cm ATV 20W Transmitter	197.80	B
MM2001	RTTY to TV Converter	189.00	B
MM4001-KB	RTTY Transceiver with keyboard	299.00	D
MMS1	The Morsetalker	115.00	B
MMS2	Advanced Morse Trainer	169.00	B
MMT50/144	6m Linear Transverter, 20W o/p	245.00	B
MMT144/28	2m Linear Transverter, 10W o/p	129.95	B
MMT144/28-R	2m Linear Transverter, 25W o/p	236.90	B
MMT432/28-S	70cm Linear Transverter	195.50	B
MMT1296/144-G	23cm Linear Transverter	258.75	D
MMX1286/144	1268MHz Transmit Up-Converter	195.50	D
MMC50/28	6m down to 10m Converter	35.65	A
MMC144/28	2m down to 10m Converter	35.65	A
MMC144/28-HP	2m High Performance Converter	47.90	A
MMC432/28-S	70cm down to 10m Converter	39.90	A
MMC432/144-S	70cm down to 2m Converter	39.90	A
MMK1296/144	23cm down to 2m Converter	129.95	B
MMK1691/137·5	1690MHz WX Satellite Converter	145.00	B
MMG144V	2m RF Switched GaAsFET Preamp	37.90	A
MMG1296	23cm GaAsFET Preamplifier	75.00	A
MMG1691	1690MHz GaAsFET Preamp	129.95	B
MMD1500P	1500MHz Divide by Ten Prescaler	119.60	A
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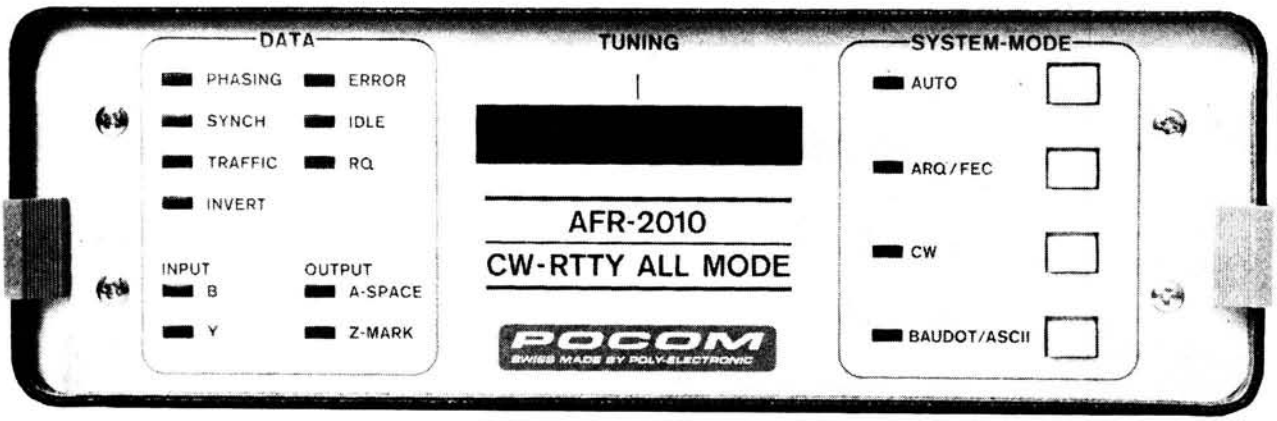

To be able to answer that question it is necessary to appreciate the different parameters that have to be determined when attempting to decode an RTTY signal. Valuable time can be wasted setting the speed, shift and phase but the AFR series of decoders determines all of these automatically – within 5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

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

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

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

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

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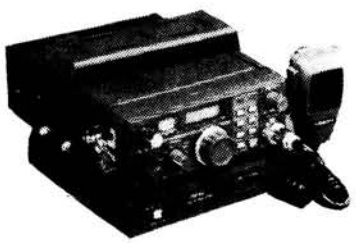
This month we have selected 3 items which, we consider, offer top value but, remember, at Earlestown we hold massive stocks of all types and models of amateur radio equipment which can be purchased by telephone through our mail order system.



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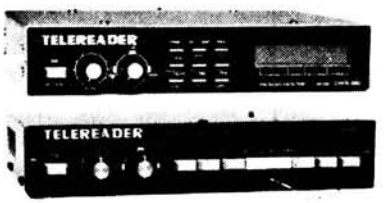

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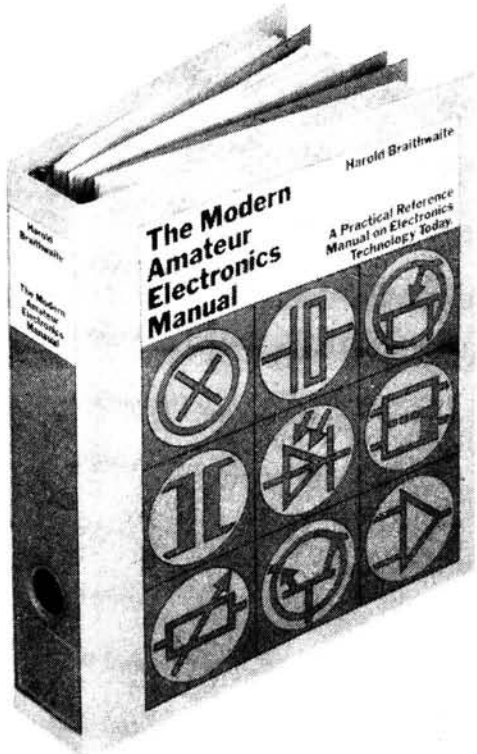

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Twin VFO's plus keyboard/computer interface control — all mode SSB, CW, AM & FM. Memories, scanning, filters. Includes 2-dimensional LCD, graphical SIMPO.

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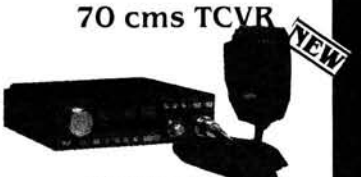

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Send your letters to our Editorial Office in Poole, the address is on our contents page. We will pay £10 for the Star Letter each month, £5 for any others published. letters must be original and not duplicated to other magazines. The Editor reserves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

STAR £10 LETTER

Morse Tests

Sir: The RSGB took over responsibility for administering the amateur Morse test from 1 April 1986. The RSGB have known for two years that they were almost certain to get the franchise because they tendered at a very low price which was far below that which a commercial organisation would consider economic. Despite this they appear to have done little or no effective preparation until the franchise was in the bag, with the net result that no testing facilities will be available for several months.

Contrast this with the situation in the USA where the amateur community, led by the ARRL, took over the running of all Morse tests and the technical exams at fairly short notice from the FCC. Whilst there have been some minor hiccups, the volunteer examiner programme has generally gone very smoothly. Also note that all the exams are free and the candidate has to pay a maximum of $4.25 in out-of-pocket expenses regardless of how many exam elements he takes! Why can't our national society get it right for once?

Peter L Crosland G6JNS
Worcester

Unbeatable Bargain?

My daughter was moaning because her hi-fi had developed a fault—but since she also possesses two transistorised radios, plus remote control TV and video recorder, I couldn't find much sympathy!

In the 1950s when my husband and I were married, we bought a second-hand wireless for ten shillings (50p in today's money) and this old set gave us the first episode of *The Archers* and thousands of other old favourites for twenty-one years—before we finally retired it. How many sets today could equal such a feat for ten shillings.

B. L. Cuthbertson
Hull

This reminds me of my first TV, a 14 inch 405-line Bush, which cost £20 second-hand. It worked perfectly for about eight years, apart from having one faulty a.f. coupling capacitor replaced. Finally the tube got so dim that the picture could only be watched in a darkened room, and as a new one would have cost more than the original purchase of the set, an old friend was pensioned off. Editor.

PW COMMENT

Amateur Radio in Decline?

It is fashionable nowadays to "knock" the establishment, authority in general, the old brigade, call it what you will. It is also very easy to do so—easy to be destructive in your criticism—far, far more difficult to be constructive, to put forward plans for changes which will not simply create as many problems as they will solve.

For the UK amateur radio fraternity, the DTI as licensing authority and the RSGB as national society are the twin whipping boys, subject to an ever-increasing barrage of abuse. This month's letter from G6JNS is one of the few on the state of amateur radio arriving in my mailbag which is actually printable, surely a sad comment in itself.

As an observer of happenings and feelings in the hobby, it distresses me greatly to see how the DTI, the RSGB, and the agitators for change have developed such an unhappy knack of scoring "own goals" in their actions and pronouncements.

Take, for example, the DTI, who after the fiasco of the revised Amateur Licence Schedule of 12 February 1982, promised that steps would be taken to ensure that nothing like it could ever happen again. So what have they just done? Without consulting or even telling the RSGB, they produced a new policy document on dealing with complaints of interference to domestic radio and TV reception, and circulated it to Radio Investigation Service district offices throughout the UK. That document seems to consider the radio amateur's transmitter is the villain of the piece, and puts forward the delightfully simple solutions: 1. limit his power output; 2. limit his hours of operation; 3. if all else fails close him down. See also *Comment* in last month's *PW*.

Now why did the DTI do this? Despite what many people think, the technical and legal branches of the DTI are not fools, yet somehow they managed to produce this draconian yet totally ineffective solution to a real and growing problem. Did some underling at the DTI devise, print and circulate the document while his bosses were away at some international conference?

Why did the RSGB not know about the new document, when they have regular monthly meetings with the DTI's Radio Regulatory Department and, we are told, are in touch with them also on a day-to-day basis? Was it, as has been suggested to me by a number of radio amateurs, simply the DTI reminding the RSGB: "We're in charge round here—you count for little in the scheme of things". If this were true, it would be an insult not only to the membership but to the UK amateur radio movement in general.

The DTI have no monopoly of foolishness and poor public relations, however. Towards the end of January 1986, news emerged that Mrs Joan Heathershaw G4CHH was to be RSGB President again in 1987. There is nothing in the Society's rules to prevent a member serving more than one term as President, and indeed it has happened before. However, it is an event sufficiently unusual that, in my opinion at least, it warranted a clear explanation of the reasons being given to the membership at the earliest possible opportunity. In the event, *RadCom* was silent on the matter until the April issue, and then carried only a bland statement that RSGB Council had been unanimous in their selection, and that "This clearly reflects Mrs Heathershaw's great achievements during her earlier term of office in 1985".

Now I have the greatest respect for Joan Heathershaw, having had the pleasure of meeting her at several events during 1985, but surely if Council truly felt that there was no other possible candidate who was qualified, willing and able to assume the office, they could at least have the common courtesy (and the common sense, in view of the volume of recent criticism of their functioning) to say why. Not to do so is to miss a golden opportunity to improve their image, beside being an insult to every RSGB member. One can only hope that this was not their intention.

Lastly, those "agitators for change". Whilst I can appreciate their frustration in trying to achieve change in what they see as a seemingly immovable establishment, there is little point in resorting to mudslinging. Nor is an argument strengthened by obstinately refusing to acknowledge that there is a single good point about the existing system or even one snag to be overcome in putting the new ideas into effect. Constructive criticism and reasoned argument are far more likely to persuade a majority of radio enthusiasts of the need for change, and this is what must be done if the "agitators" are to progress their case.

Geoff Arnold

Note—Morse tests are now available at major rallies.

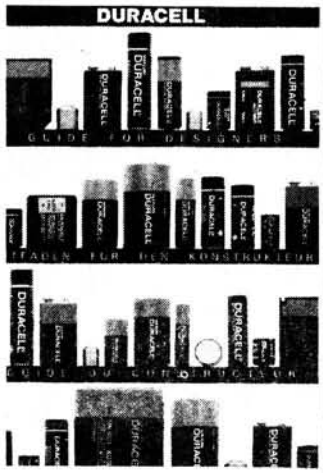
Designers Guide from Duracell

Duracell have published the latest edition of their *Guide for Designers* handbook. It contains all the key information that a designer requires when deciding on the type and size of battery needed for a project.

The Guide covers the full range of Duracell's products (mercury, alkaline manganese, zinc air, silver oxide batteries, etc) with detailed information on each product's external dimensions, nominal voltage and capacity, weight, life and typical discharge characteristics.

There is information on the relative benefits of each chemical system, its voltage range, current capability, temperature performance and storage life so the best system can be selected for a given application. Other important factors that should be considered in the design of the battery compartment, e.g. recommended contact materials to prevent galvanic corrosion occurring, and polarised battery contacts, etc. is also given.

Several new designs of cells are included for the first



time in the guide such as the DL223A lithium manganese dioxide battery designed for high rate, long storage applications and the new range of eleven zinc air cells. Details are also given of the improved capacities of Duracell's alkaline range of batteries.

The Guide is written with an English, French, German and Italian section and for a free copy please contact: ***John Bellamy, Duracell Technical Division, Duracell House, Church Road, Lowfield Heath, Crawley, West Sussex RH11 0QP.***

ON4CLM Award

This award has been going now four years, and is sent to amateurs who have worked the ON4CLM special event station in the week of November 1 each year and have sent their contribution to the welfare fund.

This year the station will be on air again to commemorate the liberation of Knokke and to pay tribute to ON4UM (silent key on February 4) who has run the station in past years.

The story behind the award is, in the autumn of 1944, Canadian troops fought in the Belgian coast area. On November 1 the town of Knokke was finally liberated and each year the Canadians are remembered with ceremonies, festivities and a Canadian Liberation March.

The special event station ON4CLM will once again be on the air from October 27 until November 2. The award is a five colour printed certificate and is available for all contacts with ON4CLM.

The cost of the award is £2, $5 or 10 IRCs or equivalent, with all proceeds going towards a welfare fund.

The frequencies to be used are:

3·685, 7·045, 14·145, 21·245, 28·545 and 144·250MHz s.s.b. and 3·515, 7·012, 14·020, 21·020, 28·020 and 144·020MHz c.w. They will also be on 145·475 MHz f.m.

For QSLs, s.w.l.s or additional information contact: ***Radio ON4CLM, PO Box 140, 8300 Knokke, Belgium.***

International Conference

Plenty of warning for this event! The conference will be held between 7 and 10 April 1987, at the University of Surrey, Guildford. It is being organised by The Institute of Electronic and Radio Engineers. The subject for the conference will be "Frequency Control and Synthesis".

If you would like a copy of the programme/registration form when it becomes available you should write to: ***Conference Secretariat, IERE, 99 Gower Street, London WC1E 6AZ. Tel: 01-388 3071.***

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, KITS AND PCB'S

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for some of our more recent projects are available from **CPL Electronics,** 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE. Tel: 0642 591157. The **printed circuit boards** are available from our new **PCB SERVICE**. For details see p. 51.

CONSTRUCTION RATING

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

Beginner

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

Intermediate

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

Advanced

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

INSURANCE

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

BACK NUMBERS AND BINDERS

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

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

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

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

SUBSCRIPTIONS

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

Special Event Stations

GB4LAD: Dunstable Portable ARG and Dunstable Down RC are joining to operate this station on June 7. It is being staged for the Luton and Dunstable Hospital Fete, and they are being sponsored for the number of contacts made.

All money is going towards a much needed extension unit for the hospital's Surgical Laser.

The station will be operational on four bands, the frequencies being 144·375, 14·3, 3·740 and 1·93MHz ±QRM.

More details can be obtained from ***Tony G0COQ, Tel: 0582 508259.***

GB4WPS: This station will be active on June 21 from 0330 until 1730 at the Westbury Park School Fair. Operation is planned on all bands on a rotational basis, as well as 144MHz and 430MHz RTTY and SSTV.

Westbury Park School is in Bayswater Road, Westbury Park, North Bristol, with talk-in on S22.

All contacts will receive a QSL via the bureau, and the group is hoping for plenty of contacts as the school children are looking forward to the event.

GB0RAF: The station will be operational from the Royal Air Force Hendon Museum on July 12 only, using 144, 14 and 3·5MHz bands, f.m., s.s.b. and c.w., from 0900 to 1600GMT. Hopefully they will be able to operate on the following frequencies, depending on propagation and QRM, 3·74MHz s.s.b., 14·015MHz c.w. and 144·17MHz s.s.b.

RAFARS members are needed to man the station, if anyone is interested they should contact ***Terry G4PSH, QTHR. Tel: 01-446 0266.***

All contacts will be sent QSL cards via the bureau or direct.

St Dunstan's ARS

Back in March I was fortunate enough to be invited to the 10th Anniversary Luncheon of the St Dunstan's ARS.

It is a radio society for Forces men and women blinded either in war service or active service. The society have the objective, "To create and encourage interest in, and further the knowledge of, amateur radio amongst St Dunstaners, their contacts and friends."

The photograph shows Frances Woolley G3LWY, representing the RAIBC, receiving a cheque from Ted John G3SEJ, the newly elected chairman.

The society were very fortunate as many guests came to join their celebrations. The Guest of Honour was Sir John Anderson KBE, Executive Director, Armed Forces Communications and Electronics Association Europe, and Lady Anderson.

Morse Testing

Scarborough ARS are holding their annual rally on July 27 at The Spa, Scarborough, opening at 11.00am, with talk-in available on S22 and SU8, and on RB0 via GB3NY. Scarborough is a large seaside resort with many attractions so why not take the family along for a day out. The organisers tell me they have arranged for fine weather on the day!

An RSGB Morse Testing Station will be in operation at the rally, and early application for bookings is advised. For further details, contact Ian Hunter G4UQP on 0723 376847.

Help!

"I am restoring an Icom IC-202E 144MHz s.s.b. transceiver, and would be pleased to hear from any reader or dealer who has the correct NiCads and internal charger for this unit available."

Anyone able to help should write to: ***Bob Sayers, 120 Birmingham Road, Redditch, Worcs B97 6EP.***

Lowe in Norwich

On Sunday, June 22, from 2.00 until 4.30pm, Lowe Electronics will be displaying the Trio range of equipment in the Harford Suite in the Post House, Ipswich Road, Norwich. Coffee and biscuits will be free for the first 50 people to arrive. Talk-in will be provided from 1.30pm on S22 by the Norwich Amateur Radio Club, using the callsign G8LOW/P.

Magazines Merge

Two well-known US radio magazines, *Monitoring Times* and *International Radio* are to combine into a single operation beginning with the July, 1986 issue.

The expanded 60-page tabloid will be the largest periodical in the monitoring industry. Annual subscription rates for addresses outside the United States will be $27 for surface mail despatch or $49 for airmail. For further details contact *MT* headquarters at 140 Dog Branch Road, PO Box 98, Brasstown, NC 28902.

Chalk Pits Museum

"Now that wireless communication is accepted as a matter of course, and as many as 50 000 words are transmitted to and from a single ship during a transatlantic voyage—in many cases over the whole width of the ocean—it seems strange to think that it is only 30 years since the first wireless signal was received across the Atlantic."

So wrote the author of an illustrated booklet, issued by the Marconi International Marine Communication Company Limited to commemorate the 30th anniversary of the reception at St John's, Newfoundland, on 12 December 1901, by Guglielmo Marconi and his colleagues G. S. Kemp and P. W. Paget, of the letter "S"—three dots in Morse code—transmitted from Poldhu in Cornwall.

Now, almost 85 years later, a surviving booklet signed by Kemp, and a signed photograph of Marconi dated 1898, believed to have been a gift from Marconi to Kemp, have been donated to the radio archives of the Chalk Pits Museum, Amberley, Sussex. An enlarged copy of the photograph, bearing the words "Yours very truly, G. Marconi" now adorns the entrance area of the museum's radio exhibition building.

Visitors wishing to see these and other early wireless documents should ask to see Ron or Joan Ham, who are usually to be found at the museum on Sundays and bank holidays during the season.

NEWS ... compiled by G4LFM

Young Electronic Designer Awards Scheme

The photograph shows the assortment of electronic components supplied by Cirkit and Texas Instruments to each educational establishment whose students' projects have been accepted as entries in the 1986 Young Electronic Designer Awards Scheme.

Mobile Rally

The 17th Elvaston Castle Mobile Radio Rally is being held on June 8. The Country Park is situated 8km south-east of Derby on the B5010, and is well signposted.

There should be plenty to do for all the family, including a free-fall parachute jump by members of the Skydivers Parachute Display Team—weather permitting!

There will be over 90 trade stands for the radio and electronics enthusiast and admission is free. For more details contact: ***John Robson G4PZY. Tel: 0332 767994.***

DXpedition

A group of around 25 members of the Stroud Amateur Radio Society, led by G4MOH, G4SJK and G4VZR, will be taking to the waters of the Bristol Channel on Saturday, June 7. They will sail from Weston-super-Mare to the 50 acre uninhabited island of Steep Holme, scene of early experiments by Marconi, where from around noon on that day until 4.00pm on Sunday, June 8, they will be operating G4SRS/P on h.f. s.s.b., mainly in the 1·8, 3·5 and 7MHz bands, and on 144MHz s.s.b. and f.m. A special QSL card will be available for stations contacting this rare location.

Southern 10m FM Group

Enthusiasts in the south have formed this group to keep the 28MHz (10m) band active during sunspot minimum.

A regular newsletter aims to give information covering propagation, technical tips, availability of equipment, members ads and news.

One year's subs costs £1 to cover postage costs and membership is open to anyone interested in 10m. This includes listeners and Class B operators, who can work cross band to 10m.

Subs and written contributions are welcomed by: ***Jim Hicks G4XRU, 33 Hayling Rise, Worthing BN13 3AL.***

A New Company

Qubik Consultants are a new company, who aim to set up a definitive database of Test and Measurement equipment. Once established they will provide a free consultancy service for people who are looking to purchase new equipment.

A list of services they can provide can be obtained by contacting ***Qubik Consultants, 7 The Bourne, Albury, Near Ware, Herts SG11 2JR.***

Frequency Changes

BBC Radio Northampton has changed the frequency used at the Moulton Park and Geddington v.h.f. f.m. stereo radio transmitting stations.

The Moulton Park transmitter moves to 104·2MHz and the Geddington transmitter moves to 103·6MHz. The Moulton Park transmitter covers an area from Desborough in the north to Brackley in the south, and from Daventry in the west to Rushden in the east, while the Geddington transmitter provides additional coverage for Corby and Kettering, in the far north of the county.

At these transmitters, a specially designed antenna system is used to provide a signal suitable for car radios and portable receivers, as well as for fixed receiving installations in the home.

Radio Northampton's medium-wave broadcasts from King's Heath transmitters on 1107kHz (271m) will stay the same.

Availability

Recent increase in demand for *Practical Wireless* has caught some newsagents unawares, with the result that we have been selling out in several parts of the UK only a few days after going on sale each month. We are taking steps to overcome the problem, but to make sure you don't miss **your** copy of *PW*, why not place a firm order with your newsagent, or take out a subscription—at £13 for one year to UK addresses, you can actually save money!

G4V Series Award

The requirements for this award are:

To work or hear 30 G4V series callsigns (this reduces to 15 for people outside the UK). A maximum of half the total claimed must be made within the G4V-Net. To claim the award you send in your log extracts, countersigned by two others, complete with 75p (£1 outside UK) to the G4V Series Award Manager, ***Mr N. J. Ludlow G4VJM, 5 Laburnum Avenue, Laffak, St. Helens, Merseyside WA11 9DZ.***

Instrumentation '87

Two exhibitions are due to be staged in 1987, one in Harrogate and the other in Bristol.

25/26 February 1987: Harrogate Exhibition Centre.

25/26 March 1987: Bristol Crest Hotel.

The first instrumentation show held in Bristol proved a success attracting visitors from Wales, the South West and the South East. Therefore, holding another show in Harrogate in 1987 it is hoped to attract visitors from the Midlands, the North and Scotland.

New TV Relays

Cumbria: A new TV relay station should shortly bring much better reception to people in Crosby Ravensworth, Cumbria.

The relay, built by the BBC and IBA, is at Crosby Hall—just north-west of the village. Viewers will need group C/D antennas, mounted vertically and set-top antennas are not recommended.

The new channels are:
Channel 53—Channel 4
Channel 57—BBC1 NE
Channel 60—Border TV
Channel 63—BBC2

North Yorkshire: Another new TV relay is due on air to bring better reception to people in parts of Rosedale Abbey, 22km south-west of Whitby.

This relay has been built at Heygate Farm and should be on the air by the time you read this.

The new channels are:
Channel 40—BBC1
Channel 43—Tyne Tees TV
Channel 46—BBC2
Channel 50—Channel 4

Viewers will need group B antennas, mounted outside and with the rods vertical, again set-top antennas are not recommended.

Catalogues and Brochures

I have received some interesting catalogues and leaflets recently which should be of interest to readers.

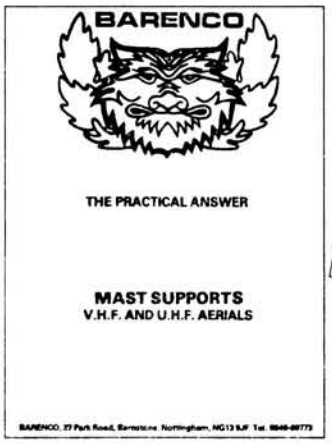
The Vintage Wireless Company Ltd. have just published their first new catalogue for four years.

Containing 166 pages, liberally laced with half-tones and vintage drawings, this is a mine of information on all aspects of vintage wireless—components, valves, product information, service data and manuals as well as books. They can even supply your needs for steel gramophone needles—still in production apparently at 99p for a pack of 100 in three grades!

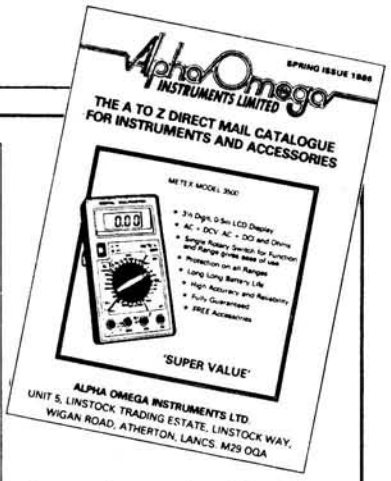
You can get a copy direct from ***The Vintage Wireless Company Ltd., Tudor House, Cossham Street, Mangotsfield, Bristol BS17 3EN. Tel: (0272) 565472*** for the princely sum of £2 (post paid) if you live in the UK or £3 (via surface mail) if you live overseas.

Alpha Omega Instruments Ltd. are a new company specialising in lower cost instrumentation via a free direct mail order catalogue. The first issue consists of 16 pages covering 80 items which should appeal to users in industry, education research and development as well as the hobbyist and d.i.y. enthusiast.

All prices are shown and orders can be placed by post or telephone using credit cards if you wish. For your free copy write to ***Alpha Omega Instruments Ltd., Unit 5, Linstock Trading Estate, Linstock Way, Wigan Road, Atherton, Lancs M29 0QA. Tel: (0942) 873558.***



Looking for some form of support for your v.h.f. and u.h.f. antennas? Unless you insist on using a sky-hook then Barenco have the answers in their new catalogue. Get in touch with them for your copy. ***Barenco, 27 Park Road, Barnstone, Nottingham NG13 9JF. Tel: (0949) 60773.***



Eraser International Ltd. have a new eight-page brochure which describes their complete range of Model DCF wire strippers and twisters.

The brochure includes technical and application data for four different models which are used to strip magnet and enamel coated wires—round or rectangular in section. Application data is also given on two tools used to make twisted pairs or for twisting stranded wires.

The brochure is available free on request from ***Eraser International Ltd., Unit M, Portway Industrial Estate, Andover, Hants. SP10 3LU. Tel: (0264) 51347.***

Hamtel RTTY

The GW4WRD RTTY program is written for the BBC-B computer, which seems to be one of the most popular computers with radio amateurs.

Some of the features included in the program are well worth mentioning. It is fully menu driven so you can select various parts of the program quickly and easily. Mode 7 teletext graphics are used and the program is displayed in full colour, using a 40 column display so that you don't need a high resolution monitor—an ordinary colour television can be used. The type-ahead buffer holds over a thousand characters—ideal for those who can't type very quickly and like to start preparing their answers in advance.

The program has four standard baud rates pre-programmed, although you can directly enter anything between 16 to 999 baud using the keyboard. You can use a printer during both RX and TX so hard copy can be kept. Pre-edited text can also be sent from any one of nine pages, and these pages can be stored on tape or disc and re-loaded later.

A tuning facility is provided on-screen permitting simple designs of t.u. to be used. Also on-screen is a 24 hour clock with hourly time signals and current time may be sent during a QSO.

The GW4WRD RTTY program costs £12 on tape and £14.50 on disc (40 or 80 track) inclusive of postage and VAT from ***HAMTELecommunications, "Rock Hill", Llanarthne, Carmarthen, Dyfed SA32 8LJ.***

Your callsign must be given when ordering otherwise you will get a program with a dummy callsign.

Other programs claimed to be "coming soon" are a Mark II RTTY, AMTOR, and a Morse Tutor.

Toroidal Transformer Kits

Toroidal transformers have many advantages over conventional laminated core types, including smaller physical size, lower weight and the virtual elimination of stray magnetic fields.

Now Electronic & Computer Workshop have introduced a series of toroidal transformer kits to enable enthusiasts to make transformers to suit their own particular needs.

The kits come in five power ratings—50, 120, 225, 500 and 1000VA and all have pre-wound 240V a.c. primary windings.

The user can easily wind the secondary to give any fixed voltage and full instructions are provided with each kit.

The 50VA kit (KT050) costs £12.46 with the 1000VA version (KT1000) costing £48.76 including VAT and postage, from ***Electronic & Computer Workshop Ltd., 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.***

Magnetic Clip

I was intrigued by a small, colourful plastics clip sent to me by Pelltech Ltd.

The Combicoclip is a magnetised plastics clip which, it is claimed, can often be used instead of paper clips, drawing pins, adhesive tape, etc.

The clips can be used to hang papers or cloth, up to a total thickness of almost 0·5mm and a weight of 200gm, by sticking the clip to any dry surface using the self-adhesive backing. Just what you can hang up is limited only by your imagination.

Combicoclips come in six standard colours—white, red, blue, green, yellow and brown, and can be obtained from graphic arts dealers or commercial stationers.

If you are interested in using these clips for promotional purposes then ***Pelltech Ltd., FREEPOST, Witney, Oxon OX8 6BR. Tel: (0993) 76451*** will be pleased to give you a quote.

Desk PSU for Icom Hand-helds

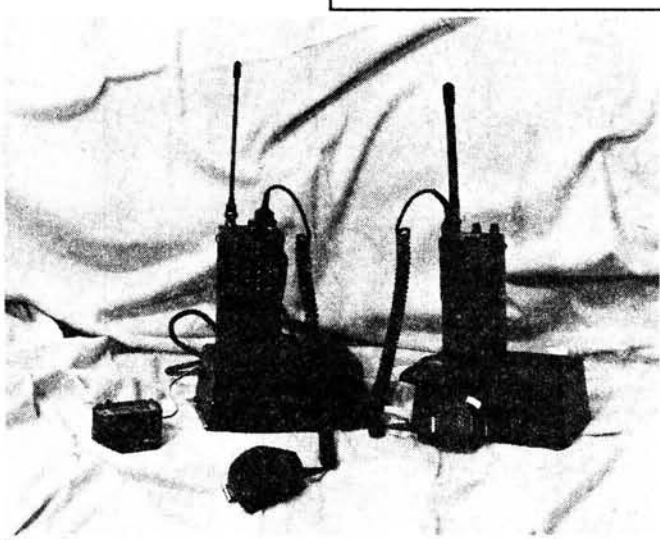
The MRZ desk top power supply has been designed for use in conjunction with the Icom range of hand-held portable rigs.

In one quick operation any of Icom's portable battery packs can be easily removed allowing the body of the radio to slide firmly onto the mounting on the MRZ unit.

With an external microphone plugged into the miniature jack socket the radio is ready for base station operation.

The unit incorporates over-voltage and over-current protection and the output voltage is regulated. Two models are available—the BPU which is a desk d.c. supply for base station operating and the BPU/BC which also has a built-in charging system to recharge the BP.3 battery packs.

Further details from ***MRZ Communications Ltd., Newton House, 248 Uttoxeter Road, Longton, Stoke-on-Trent ST3 5QL. Tel: (0782) 619658.***



144MHz Mobile Rig

The Alinco ALR-206E 144MHz mobile transceiver is a compact 25/5 watt unit recently introduced into the UK by ***ICS Electronics Ltd., PO Box 2, Arundel, W. Sussex BN18 0NX. Tel: (024 365) 590.***

A back-lit liquid crystal display gives frequency and S-meter read-outs and all programmable features are accessed by the key-pad on the rear of the microphone. These are band scan; 10 memory channels and memory scan. Frequency selection is by means of a large front panel knob or from the UP/DOWN buttons on the microphone.

The price of the rig, complete with mobile mounting bracket, is £295 incl. VAT with postage and insurance an extra £3.

Also from ICS Electronics is a complete 30 watt 144MHz hand-held system selling at £249.95 incl. VAT.

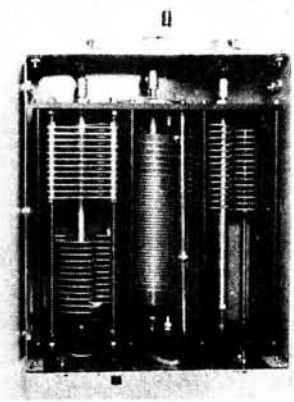
The system is based on the Alinco ALM-203E hand-held with a separate 30 watt f.m. amplifier and 10dB gain GaAs f.e.t. pre-amp. The amplifier can be left permanently fitted in the car while the hand-held can be removed and used on its own when required.

Antenna Couplers

News has just come through that Amcomm/ARE have been appointed sole world-wide distributors for the British made range of Cap.Co Electronics antenna couplers.

Alec Allan G5VS tells me that the company is taking every opportunity to promote some of the finest and most promising new products, and he reckons that the SPC300 antenna coupler fits the bill.

The current model is built into a steel cabinet 305 x 76 x 324mm and the stator and rotor blades of the capacitors are made of high grade NS4 alloy with all other parts from solid brass. Control is by two slow-motion drives for the two capacitors, with calibrated scales over 100 degrees, while for the inductor there is a digital turns counter.



The inductor is of the "roller coaster" type with a maximum inductance of 28μH and a high *Q*.

The unit can be connected in seven different configurations by altering a series of links.

Four models are available catering for 1kW and 3kW r.f. power either in a cabinet or "naked" and they all cover 1·8 to 29·7MHz.

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

Kit Construction—It's Easy

Frightened by the idea of building something for yourself? Elaine Richards G4LFM seeks to dispel your fears.

Building kits is easy. Well it can be easy. A great deal depends on the quality of the kit you intend to build. There is nothing worse than opening up the package and finding that some of the parts are missing, or worse, the instructions are not there.

Obviously the well known kit manufacturers have quality control departments and this type of mistake is unlikely to happen. So if you are building your first kit my advice would be to buy a simple kit from a well known manufacturer. If you have never built anything before and this is your first home construction project you can always ask advice from the companies as to which kits they feel are suitable for you to attempt. If, when the kit arrives you don't feel capable of completing the project you can usually return the kit and for an extra fee they will send you a ready assembled p.c.b.

Direct Conversion Receiver

The DcRx Direct Conversion Receiver from C.M. Howes Communications was the kit chosen as a suitable beginners project. So a few details about the receiver would not go amiss. It is available in four versions, 14MHz (20m), 7MHz (40m), 3·5MHz (80m) and 1·8MHz (160m) and if you are well versed in project building you could always modify it for just about any other band.

The receiver can be run from a 12V d.c. supply and will drive a loudspeaker or headphones. Obviously you will need an external antenna, but instructions for a suitable antenna are provided with the kit.

The instructions with this kit assume that you have never built an electronic kit and so take up five pages. This includes a complete parts list and circuit diagram—very useful if you make a mistake.

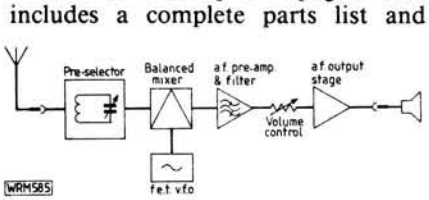


Fig. 1: The DcRx block diagram

There are certain steps that should be followed in kit building, if you want to increase the chances of success. To give a pictorial guide the kit was built during a photography session, in about a tenth of the time I would normally take. So there was some anxiety when I connected the receiver up—but it worked first time. I was pleasantly surprised with how well the assembled kit worked. Even if you are used to building projects it's really nice when they work first time.

Easy as ABC?

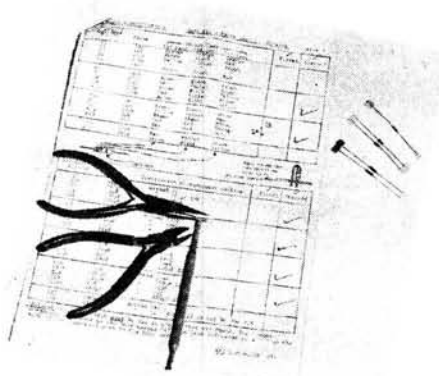
The first step is always to collect all the tools you will need together; a small soldering iron (maximum 30 watts), side cutters, long-nosed pliers and a trimming tool. It doesn't do any harm to have one or two extras available, like de-soldering braid (well, mistakes can happen) and tweezers.

Next, read the instructions right through before starting. It doesn't matter how many projects and kits you have built this step should never be missed out. It can save so much time, trouble and hair tearing later on—I can vouch for this from experience. Next check the kit to see if it is complete. C.M. Howes provide a check list so you can mark each component before and after you have fitted it into the kit. In the instructions each resistor and capacitor is identified by its colour code or markings, so there should be no doubt about which component is which.

Construction

If you have not used a soldering iron before then read up on the best techniques, and practice on a piece of Veroboard with some junk components. It's always a shame to see a project ruined with bad soldering, just through lack of practice.

The resistors should be the first components soldered onto the board, making careful checks that the right resistor goes in the right place. On the receiver kit some resistors are mounted on end as there is not enough room on the board to mount them horizontally. It's really easy to tell which ones are, as the p.c.b. is marked with short lines between the holes for end-on resistors and long lines for horizontal ones. After each resistor is soldered in place as close to the p.c.b. as possible,



Check you have all the components in the kit

cut off the excess leads close to the solder joint (Photo 1).

Next it's the turn of the capacitors. The most important point here is take care with the electrolytics. Check before you solder each one that you have the polarity correct (Photo 2).

The semiconductors (diodes, integrated circuits and transistors) are fitted next. Again, care should be taken with polarity of these components. Any mistake now could take a long time to find later. As you can see it's just a methodical process of soldering components onto the p.c.b. in a logical order, small components first followed by the larger ones. It's also a process that I follow when building other electronic projects (Photo 3).

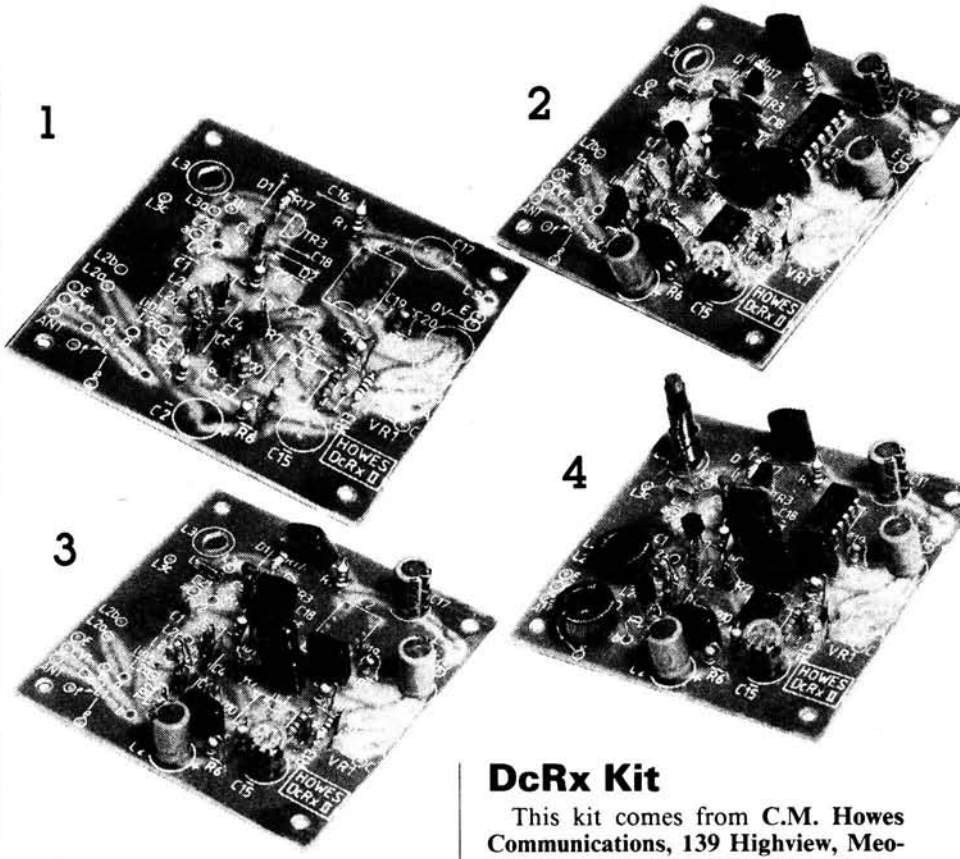
Any links that are on the board should be fitted next, and you don't usually need to buy wire for these as you can use the discarded leg of a component. With this project the last components to be fitted onto the board were the coils, and great care was taken making sure the right wires went into the right holes! (Photo 4).

Once all the components are fitted onto the board, it's time to connect the external components to the project. The instructions with the kit show very clearly how this is done.

The last thing to do before switching on and testing is a final good look over all the solder joints. Are they all good and shiny? Now check the polarity of the components once more.

Then, if this is your first project, it's hold your breath, cross fingers and switch on. Any setting up details will be included with the kit, and if they are anything like the ones provided here you'll have no difficulties setting things up correctly.

Since finishing the kit, I have boxed it—just for neatness—and so it doesn't look too untidy in the shack.



DcRx Kit

This kit comes from **C.M. Howes Communications, 139 Highview, Meopham, Kent DA13 0UT** and is priced at £14.80 (inclusive of VAT), plus £3.00 for the two air-spaced capacitors and 80p post and packing.

If you would like details of the kits that C.M. Howes produce then an s.a.e. will bring a two page catalogue. They also can provide information on any one of their kits, again for an s.a.e.

Digital Voltmeter Kit

In Part 1 of this article Brian Dance shows how a very sensitive high performance digital meter can be made using a kit of parts from Ferranti Electronics Ltd.

Inexperienced constructors are often deterred from building their own digital voltmeters not only because of the relatively complex principles involved in the operation of the circuitry, but also because of the vitally important component layout and grounding problems encountered in the low-level circuitry.

The ZN451 evaluation kit, marketed by Ferranti Electronics Ltd, contains all of the components required to construct a basic digital voltmeter—including the complex ZN451E Ferranti d.v.m. i.c., the liquid crystal display (l.c.d.) and p.c.b. This basic circuit provides a single range of ±1999μV using a 3½ digit display. In a 3½ digit display, the last three positions can show any digit, but the first position can be only a blank or the digit "1" (the so-called half-digit), thus effectively doubling the range. Each range of an instrument using such a display has a full scale reading of 1999 (or nominally 2000) with a negative sign available, and also a choice of three positions for a decimal point—if used.

The number of possible variations in the circuitry of the instrument is almost unlimited. This project has therefore been made an open-ended one; after making the basic d.v.m. circuit, the constructor can add whatever ranges and other facilities he wishes and can easily modify them or add other ranges.

Although the kit has been prepared mainly to enable manufacturers to quickly evaluate the capabilities of the ZN451, it is equally suitable for the home constructor.

Basic Range

The basic ±1999μV circuit provided by the completed kit may be compared with the single range of a simple moving coil analogue meter. Just as one can convert the simple moving coil meter into a multi-range analogue meter, one can add additional circuitry to the digital meter (not normally on the p.c.b. provided in the kit) so as to provide other voltage, current and resistance ranges, circuits for measuring alternating input signals, etc. Indeed, one can use the kit as a basis for a digital temperature meter, a weighing machine, a pressure meter or anything within the limits of the constructor's ingenuity and the 3½ digit display.

Naturally, the kit does not contain the components required for any range other than the basic ±1999μV display, neither does it contain a box for the finished instrument. Additional facilities which can be provided with extra components include a decimal point in a fixed or variable position, a display hold facility (using an extra switch on the kit p.c.b.), low battery voltage indication, a provision for adjusting the internal oscillator frequency and circuitry for the automatic selection of the instrument range according to the magnitude of the applied input signal to be measured.

Digital or Analogue?

A digital voltmeter measures the input voltage and takes a short time (known as the conversion time) to make the measurement before the voltage can be displayed. The instrument repeatedly measures the input signal. Thus any change in the input voltage may not be displayed until perhaps a second after the change has occurred. Some early types of digital voltmeter could not display a measured voltage whilst making the succeeding measurement, so such instruments showed no reading for a substantial part of the measurement cycle. This does not apply to the ZN451 circuit which displays the last measured value until the display is updated as soon as the next measurement has been made.

The constructor may well ask: "Do I need a digital meter anyway?" If one is adjusting a trimmer for a peak signal display, the movement of the needle of an analogue meter normally provides a far more satisfactory indication than the periodic changes of the display of a digital meter. In other words, if one wishes to have an immediate indication of the trend of changes of an input so as to obtain the "feel" for the direction and rate of variations in the monitored signal value, an analogue meter is normally ideal. Similarly analogue meters are normally best for measuring fluctuating or oscillating signals. They also have the minor advantage that they usually do not require any power source other than the signal being measured.

On the other hand, the accuracy provided by an analogue meter is normally very limited and reading an analogue meter for optimum accuracy requires some care. If one considers a high quality analogue meter with a large scale and an anti-parallax mirror (such as a Model 8 Avometer), the optimum accuracy is seldom better than ±1 per cent of the full scale deflection of the range in use. The accuracy of a small, cheap analogue meter is more likely to be about ±5 per cent—or worse.

The figures may be compared with the accuracy of digital meters (which

depends on the number of displayed digits and other factors). In the case of the digital meter under discussion with a range of ±1999μV, the resolution provided by the least significant digit represents 1 part in 2000 or 0·05 per cent of the full scale value. Furthermore, a meter with a digital display can be unambiguously and easily read from almost any angle and often from a considerable distance even in poor lighting.

Digital meters can have extremely low input current requirements, but so can analogue meters if appropriate electronic circuitry is employed.

Thus it is clear that there is a definite place for both analogue and digital meters. They are different tools and the most appropriate meter should be selected for various applications. An analogue meter is the most essential instrument for the experimenter; however, as he becomes accustomed to the use of such a meter and appreciates its limitations, he will begin to understand that the inclusion of a digital meter in his equipment will add a new dimension to his work for the less frequent cases where such a meter is required.

The ZN451E

Apart from the availability of the ZN451E in a kit of parts which enables the basic circuit to be constructed very easily, are there any other reasons why one should choose this particular device? It is certainly desirable to employ a complex purpose-dedicated d.v.m. i.c. rather than to employ large numbers of components or even discrete devices, the use of which would result in a highly complex circuit.

The ZN451E employs the fairly new charge balancing technique which provides some advantages over the more conventional dual-slope integration circuitry, including excellent linearity of the displayed voltage with respect to the input signal and a well-defined conversion time which is independent of the input level. The ZN451E includes a very stable "on-chip" precision band-gap voltage reference circuit, an internal oscillator clock circuit and provides direct drive for an l.c.d. It is claimed to be free from the layout-dependent stray capacitance problems sometimes found in "dual-slope" d.v.m. designs.

In some digital voltmeters the zero of the scale tends to drift and may require frequent re-setting by a potentiometer, especially if the temperature changes. This does not apply in the case of the ZN451 circuits, since the input voltage and the zero error are measured alternately and the difference between these two measurements is displayed. Such "auto-zero" circuitry is now common and is very desirable for convenience of operation.

However, the ZN451E is the first d.v.m. i.c. to be marketed which not only provides for auto-zero circuitry, but which also allows for external

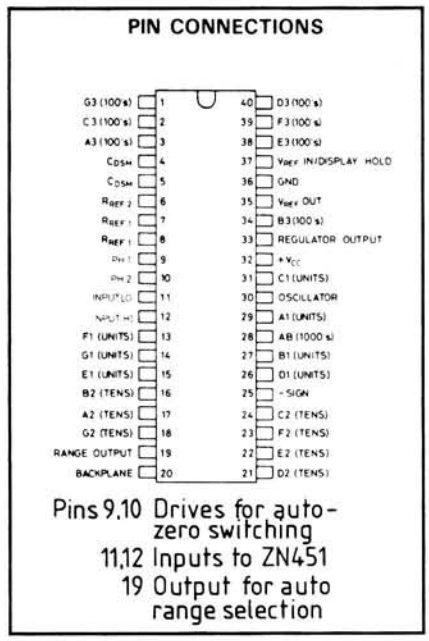


Fig. 1.1: ZN451E pin-outs

circuit components to be included in the auto-zero circuit loop. Thus operational amplifiers can be included in the input circuit and in the auto-zero loop, so that any drift of the voltage offset of these amplifiers is automatically compensated by the operation of the auto-zero circuit. Such amplifiers may be used to raise the sensitivity of the circuit.

In the basic circuit for use with the p.c.b. supplied with the kit, an operational amplifier circuit with a standard gain of fifty is employed to increase the input sensitivity from the ±100mV range provided by the ZN451E alone to ±1·999mV (1999μV) with a guarantee that a zero reading will be obtained when the applied input voltage is zero. When one is dealing with signal inputs down to a level of a microvolt, the auto-zero circuit is extremely useful. This ability to measure small voltages will often make the basic ZN451E circuit ideal for use with strain gauges, thermocouples, pressure transducers, etc. which have low-voltage outputs.

The ZN451E Kit

The kit contains a 40-pin ZN451E dual-in-line (d.i.l.) device, two TL091 Texas Instruments 8-pin d.i.l. operational amplifiers together with a CD4066 c.m.o.s. 14-pin d.i.l. quad-bilateral switch to perform the auto-zero switching function. Sockets are included for all of these i.c.s and also for the two sides of the "lucid" type 108F111 l.c.d. A 24-page detailed data sheet on the ZN451E d.v.m. i.c. and an 8-page booklet on the kit itself are provided. The constructor must obtain a 9V battery.

The dimensions of the p.c.b. in the kit obtained by the author are 137 × 91mm. It is a high quality board with connections on both sides and plated through holes. A screen is incorporated into the input section of the board. The position of every component is clearly marked on this board, so the construction could not be easier.

The pin connections of the ZN451E are shown in Fig. 1.1 and its internal circuit in block form in Fig. 1.2. The basic circuit used to provide the 1999μV range is given in Fig. 1.3, but the components shown dotted are optional extras not provided in the kit. The ZTX108 transistor forms part of a voltage regulator circuit used to pro-

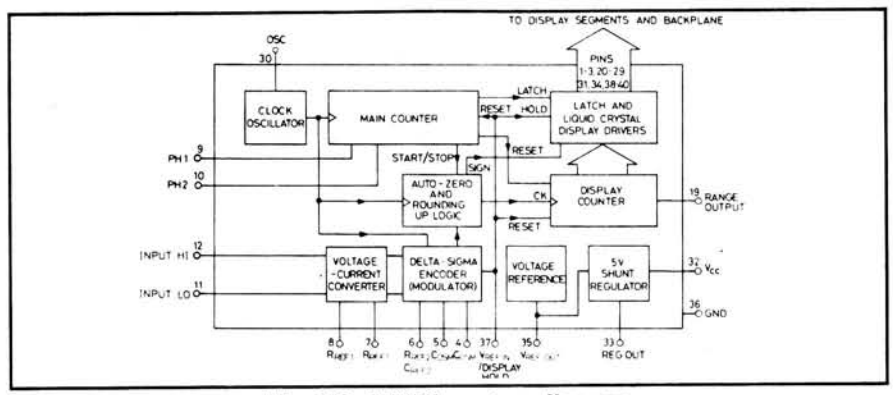


Fig. 1.2: ZN451 system diagram

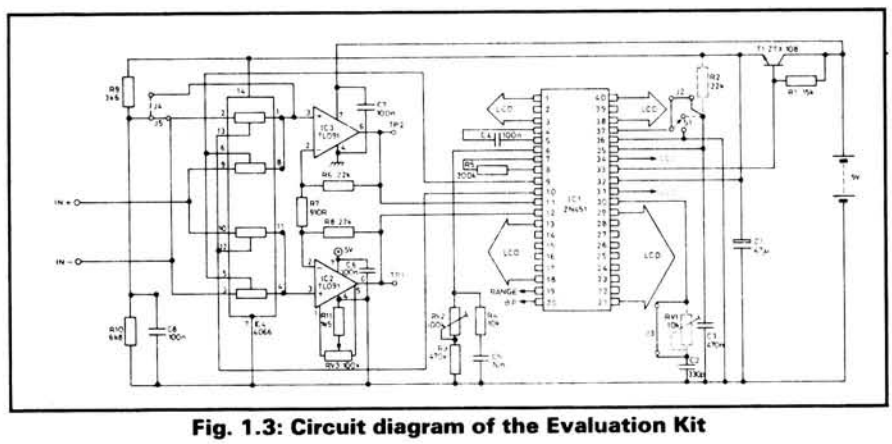


Fig. 1.3: Circuit diagram of the Evaluation Kit

vide the required +5V at pin 32, in conjunction with the internal voltage regulator in the i.c.

Unless it is desired to include a facility for holding a displayed value, the resistor R2 and the switch S1 of Fig. 1.3 can be omitted and the link J2 used to join pins 35 and 37.

Construction

A fine pointed soldering iron, solder, pliers/forceps, sidecutters and perhaps a magnifying glass are all of the tools required for the construction of the kit. As with any kit, it is wise to carefully check the component list before starting the work. Resistors may be fitted first, attention being paid to the additional band marked to provide the third significant figure of the value of 2 per cent or 1 per cent components supplied in the kit. The negative side of the 47µF capacitor is marked by a dark violet line; it is convenient to adjust the wiring of this capacitor so that the component can be folded over onto its side in front of the display.

The two multi-turn potentiometers RV2 and RV3 (each about 15 turns) are fitted so that their adjusting screws are at the outer edges of the board. The red and the black 4mm input sockets are each fitted with a single nut and the connection from the bottom of each of these terminals must be made to the nearby points on the board.

The "lucid" display is sandwiched between two pieces of glass and has a conducting backplate. It is 51mm long by 31mm wide, but the upper glass plate does not extend over the full width. The exposed edges of the lower glass plate carry the transparent electrode connections. A connector is fitted to the edge of each display as shown in Fig. 1.4. First the edge of the display is inserted gently into the connector at an angle of about 30 degrees, the display is then pivoted so as to open the connector jaws and very gentle pressure will then cause the display to go fully home. The other connector is fitted along the opposite edge in the same way. Both connectors can now be soldered into the p.c.b. taking care to ensure that the decimal points are at the bottom of the display.

Before the display was fitted, it was noted that merely wiping a finger across the upper surface of the glass generated enough electrostatic charge to cause some of the segments to be displayed. When the display had been fitted into its circuit, this effect was no longer found, as the connections could remove the electrostatic charge.

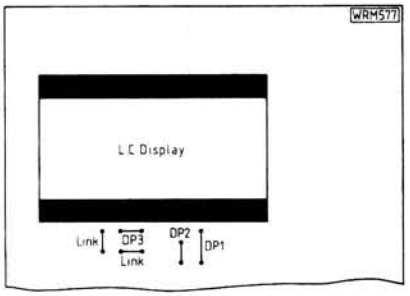


Fig. 1.5: Link positions

Constructors should ensure that the wire jumper links J1, J2, J3 and J5 are not omitted. (J4 is not used unless the circuit is modified for a single ended input). The kit sheet states that if any of the decimal point displays (marked DP1, DP2 and DP3 on the board) are not to be used, then they should be linked to the display backplane (marked BP on the board). The author found that no functional problem occurred if the decimal point electrodes were left unconnected. However, they should be linked to the backplane as shown in Fig. 1.5 when first constructing the circuit, since the extra decimal point circuitry is best added later if needed.

The battery clip may now be fitted—the round headed bolts supplied in the kit prevented the battery from lying flat in its clip and countersunk screws are much better.

The four integrated circuits were plugged into their sockets last of all so that they were not subjected to any potentials which may have existed on the soldering iron.

Note, all c.m.o.s. devices have an inherently high input impedance and are very susceptible to damage by static discharge. Under no circumstances must you remove the device from its protective conductive foil or foam packaging until ready to insert into circuit. This operation should be done on a metallic surface that is at earth potential or with you using a charge-guard wrist strap or similar. When soldering components on the board ensure the iron tip is earthed and if this is not so, allow it to reach working temperature and remove the mains plug.

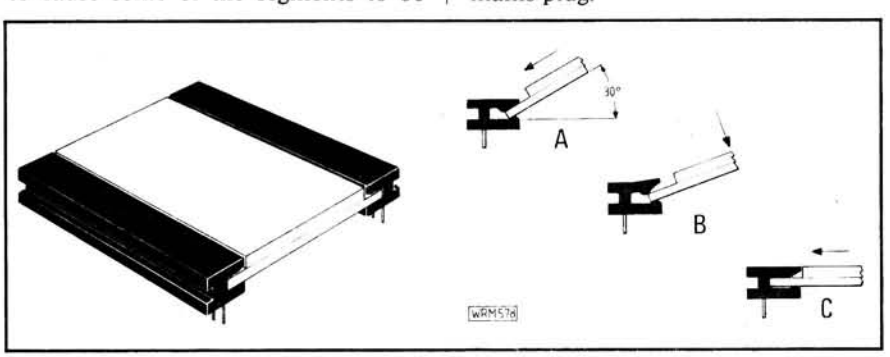


Fig. 1.4: Display preparation

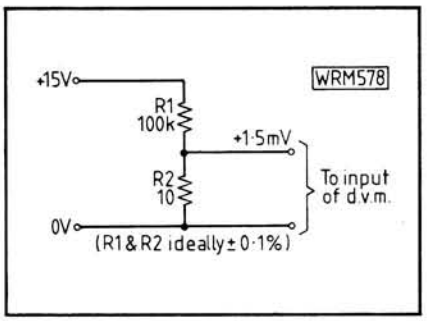


Fig. 1.6: Calibration circuit

Testing and Adjustments

The battery connector may now be fitted onto the battery to apply power. The author found the total current consumption was 7·8mA, but this value can vary somewhat. One should not expect to obtain any display if the input terminals are unconnected, since stray pick-up from 50Hz mains fields will produce input potentials far above the ± 1·999mV full scale reading.

A sensitive meter (with a full scale deflection of about 1V) may be connected between the test points TP1 and TP2 marked on the board which are connected to the outputs of the two TL091 devices shown in Fig. 1.3. The input terminals are now shorted, power is applied from the 9V battery and the multi-turn potentiometer RV3 is adjusted for a zero voltage reading on the external meter. It is easy to make the adjustments for less than 10mV between TP1 and TP2. The external meter can now be removed and the display should indicate zero with the input shorted.

This adjustment of RV3 is required, since the auto-zero circuit can null out zero errors of up to ± 150 per cent of the full scale reading, namely ± 3mV. The TL091 offset can be greater than this, but once trimmed in this way, the auto-zero circuit will compensate for any long-term drift or temperature drift of the TL091 offset voltage; thus no further trimming will be required. Adjustment of RV3 produced a variation of the potential between TP1 and TP2 from over 8V in one direction to over 8V in the other over the full range of RV3.

The sensitivity control, RV2, is used to calibrate the instrument. This calibration can be a problem unless one has access to an instrument of known accuracy or to an accurate reference voltage, but a local society or college may be able to help. For most purposes only relative measurements are required, so very accurate calibration is often unnecessary.

The author used the circuit of Fig. 1.6 in which a stabilised 15V ± 0·1 per cent supply was divided by a resistive circuit by a factor of 10 000 to prove an accurately known input of 1·5mV to the digital voltmeter. Potentiometer RV2 was adjusted until a display of 1500µV was obtained. It was found

RV2 provided a total adjustment of almost ±10 per cent. If the input leads are reversed, the "roll over" error should result in a display within ±2 digits of the previous value together with a minus sign. It should be noted that an input of over 1·999mV will produce a display of the left hand "1" or "−1" according to the polarity, while a blank display can be obtained with higher input potentials.

For many purposes adequate accuracy may be obtained using a calibrating voltage known only to about 1 per cent.

The meter is now ready for use on its basic ±1·999mV scale. The high sensitivity of the instrument inevitably leads to it being susceptible to effects from thermal voltages at the junctions of different metals. Such junctions should therefore be avoided and the signal paths to each input should be as nearly identical as possible. Sudden changes in the temperature of the circuit board components during a measurement can result in zero errors due to thermal drift in the short time between the input signal measurement and the zero error determination. It may be noted that the high input impedance of the meter falls dramatically if its power supply battery is disconnected.

Circuit Options

A few variations can be made on the board supplied in the kit.

(1) The omission of the jumper J2 between pins 35 and 37 of the ZN451 and the inclusion of R2 and S1 of Fig. 1.3 enables a displayed value to be held indefinitely. When S1 connects pin 37 to ground (pin 36), the display will continue to show the last valid measurement until S1 is operated to re-connect pin 37 to pin 35.

(2) The gain of the differential input/differential output amplifier comprising IC2 and IC3 is:

$$A = 1 + \frac{(R6 + R8)}{R7}$$

or nearly 50 with the values shown. Other resistor values may be employed to alter the gain and hence the full scale of the basic range. This full scale is equal to ±(100/A)mV. Good quality metal film or metal oxide resistors should be employed to obtain good gain stability.

(3) If the link J3 of Fig. 1.3 is replaced by a 10kΩ variable resistor RV1 (for which the circuit board has been prepared), the internal oscillator clock frequency may be adjusted from the value of about 50kHz when this resistor is at its minimum value up to about 95kHz. This changes the ZN451 conversion rate. Alternatively the value of C2 in Fig. 1.3 may be changed.

The total conversion time of the circuit is the sum of the initial settling period of 4000 clock cycles, the auto-zero measurement time of 20 000 clock cycles, a further settling period of 4000 clock cycles and signal voltage measurement period (the integration time) of 20 000 clock cycles; thus the conversion time totals 48 000 clock cycles. The value of C2 (330pF) shown in Fig. 1.3 is used to provide a clock frequency of about 50kHz and hence a conversion time of approximately 1 second. The author measured the rate of updating of the display using the components supplied in the kit and found it was almost exactly once per second.

When an 820pF capacitor was added in parallel with the existing 330pF capacitor C2, the total conversion time was increased to about 3·3 seconds. It was noted that the display now flickered rapidly when viewed from one corner with a frequency of about 5Hz, but remained without flicker when viewed directly from above.

Changing the clock frequency does not change the sensitivity of the instrument, but it alters the integration time over which the signal measurement is averaged. If this integration time is equal to a whole number of cycles of the mains frequency, the effect of any mains hum voltages on the input signal will be minimised, since an equal number of positive and negative half-cycles will be included in the measurement period and these half-cycles will tend to mutually cancel one another. However, it is important that any mains frequency or other interference on the input should have a peak amplitude no greater than 25 per cent of the full scale so that saturation of the circuit is avoided.

The clock frequency can be set very accurately if C2 is replaced by a crystal in series with its recommended value of load capacitance or by a ceramic resonator. For example, a 100Hz crystal will provide an integration time of 200ms, since the integration time is 20 000 clock cycles. This time is equal to ten cycles of the 50Hz mains frequency. The 100kHz clock frequency will provide a total conversion time of 480ms and there will be just over two display updatings per second.

The data sheet quotes the maximum oscillator frequency as 300kHz, but the conversion time has a minimum value of 0·25s and the latter corresponds to a 192kHz frequency.

(4) The circuit of Fig. 1.3 has a differential input. It may be converted into a single input circuit by: (a) removing the jumper link J5 and inserting J4; (b) replacing R6 with a jumper link; (c) changing R8 to 47kΩ if the sensitivity is to be unchanged; and (d) removing IC3 and linking pins 3 and 6 of its socket.

(5) In Fig. 1.3 the ZTX108 forms an external series regulator circuit. This transistor can be omitted and its base and emitter terminals linked if the value of R1 is changed to (Vsupply −5)/6·5kΩ. Alternatively the circuit may be fed from a regulated supply of +5V if R1 and the ZTX108 are omitted and the +5V supply is connected to the point on the p.c.b. which was previously the transistor emitter.

TABLE 1.1
FIVE-BAND RESISTOR CODES

Colour	Band 1 1st Figure	Band 2 2nd Figure	Band 3 Multiplier	Band 4 Tolerance	Band 5 Temperature Coefficient
Black	0	0	×1		200ppm/°C
Brown	1	1	×10	1%	100ppm/°C
Red	2	2	×100	2%	50ppm/°C
Orange	3	3	×1000		15ppm/°C
Yellow	4	4	×10 000		25ppm/°C
Green	5	5	×100 000	0·5%	
Blue	6	6	×1 000 000	0·25%	10ppm/°C
Violet	7	7	×10 000 000	0·1%	5ppm/°C
Grey	8	8			1ppm/°C
White	9	9			
Gold			×0·1	5%	
Silver			×0·01	10%	
None				20%	

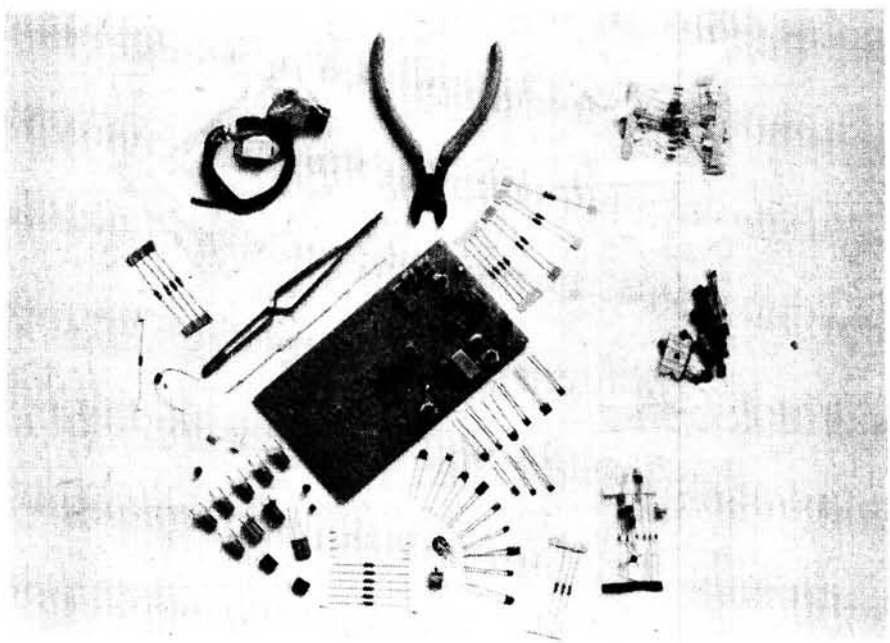
NEXT MONTH: In Part 2, extra ranges for Voltage Current and Resistance, plus display options.

AVAILABILITY

Kits are available by mail order from Midwitch Computer Company Ltd, Gilray Road, Diss, Norfolk IP22 3EU. Cost £32.09 including VAT plus post and packing.

PW REVIEW

Now radio amateurs have access to the 50MHz band, home construction again is becoming popular. G4LFM builds the Cirkit 6m kit.



The Cirkit 6m transverter is not a kit for beginners. For a start it is a double-sided p.c.b., needing earth connections to be made directly to the top side of the board. So a little experience in soldering and project building would be more than helpful.

As soon as the transverter kit arrived it was carefully checked through and found to be complete, even the coaxial cable and enamelled copper wire was included. All the components supplied were of good quality with none being damaged in transit—the kit was packed in a sturdy box. Although this sounds a trivial matter, it's not funny if the project you have been patiently waiting for arrives damaged and has to be returned.

The *Cirkit Catalogue* gives fairly comprehensive details of the kit, but a few points worth noting should be mentioned. Both the receiver and transmitter use Schottky diode ring mixers, the popular SBL-1 device used in so many projects these days.

The output level from the transverter is 0·5W p.e.p. s.s.b. or 1W c.w./f.m., and this is for drive levels of between 1mW and 1W. The transverter incorporates a *pin* diode and resistor attenuator network allowing drive levels of up to 1W.

Other features include r.f. sensing with adjustable delay for p.t.t. switching or automatic operation using the on-board VOX.

The specifications mentioned are: harmonics better than −45dB and intermodulation distortion better than −35dB at 0·5W p.e.p. The receiver has 0·08μV sensitivity at 10dB S/N + N (s.s.b.), and the system noise figure is around 4dB when used with a modern transceiver.

The kit builds into an all-mode transverter working from 28 to 50MHz, and a 70MHz version is also available. The kit comes complete with a photocopy of the original magazine article describing the project fully. A word of warning here—read it through very carefully as the article, especially the components list, was written for both the 50 and 70MHz versions. Some components are only necessary for one or other version, and if you don't notice that straightaway you could spend a long time looking for a component that's not there!

The kit comes with the double sided p.c.b., the various components separately packed by type and the instructions.

Listening to the stations using 50MHz, home-construction seems to be very popular on the new band. There are a few kits on the market at the moment, mainly resulting from magazine articles, such as the *PW* Meon and the Cirkit 6m transverter. These projects are not only useful for Class A licence holders but also those Class B operators wishing to work cross-band.

In these days of "the black box" it is refreshing to hear of so much home construction being successfully completed and used.

Although normally I follow the logical method of building kits, or the instructions provided, this kit was needed for photography so had to be built in the wrong order for the most part. Anyone else building this kit would be well advised to follow the instructions. Soldering connections to the earth plane can be tricky if you don't notice the marks on the component layout as you are working. Trying to go back over the p.c.b. and find the missing earth connections is not always easy—not to mention a great time waster. If you are impatient about getting the transverter "on air" there is nothing more frustrating than chasing round in circles looking for a fault, so care taken in construction is worth it.

All the usual rules for construction need to be followed, i.e. mounting components close to the board unless otherwise instructed and always following the component layout.

Unlike most kits, which start with the smallest components first, this kit is built stage by stage—to make testing and setting up easier.

The instructions suggest that the crystal oscillator stages are the first to be tackled. Once the stage has been assembled according to the instructions, a frequency counter is used to set the oscillator correctly.

Next is the receiver section, both building and alignment. It is much easier to set up if you have a suitable signal generator, but instructions are provided for those without this type of equipment.

The final section to be built is the transmitter, again by following the instruction the job is quick and easy. An s.w.r. bridge and dummy load need to be used to set up the transmitter. Assuming no mistakes the unit will work correctly (it's not impossible assuming you have taken care and checked the board as each stage was finished). Don't forget the kit needs a metal box before you put it on the air.

Unfortunately there wasn't enough time to really give the kit an airing on the band, but it did perform well with the limited tests possible. Once time permits there is likely to be another callsign on 50MHz as it is a band worth exploring. There is only one thing, if I ever build another kit like this I shall definitely follow the instructions, as the way I had to work was not the easiest and I'm sure I've acquired a few extra grey hairs in the process.

The kit is available from **Cirkit, Park Lane, Broxbourne, Herts. Tel: (0992) 444111.** It costs £50.43 plus VAT and 60p post and packing. Many thanks to Cirkit for supplying the review kit.

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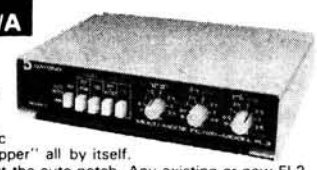

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AA	0.50	1.23	1.17	1.11
AA (Super)	0.60	1.35	1.28	1.22
AA*	0.50	1.25	1.19	1.13
½A*	0.45	1.40	1.33	1.26
RR	1.20	2.38	2.26	2.15
C	2.20	3.10	2.95	2.80
D (SUB)	1.20	3.25	3.09	2.93
D	4.0	5.75	5.46	5.19
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Getting Started... The Practical Way

In the first part of this new series Rob Mannion GM3XFD shows you how to get over the problems associated with starting off in radio construction, where to do it, and how to go about obtaining those elusive but all-important parts.

There is certainly no doubt in my mind, that getting started in our hobby today is far more difficult than it ever was, and rather more expensive! A glance at what is on offer from the average "High Street" shop selling components may make you feel that the preceding statement is absurd, until you try and buy the parts to make the simplest radio receiver, and count the cost! You will quickly realise that it is very much cheaper to get a ready-made "oriental" receiver!

Even if you can afford it, and eventually do buy a multi-waveband receiver, nothing can beat the thrill of hearing the world on your own home-made equipment. The knowledge that is acquired from constructing it is never wasted either! Easily said perhaps, but how do you go about home construction, with the ever decreasing space in modern homes, coupled with even more limited funds for the younger enthusiast (often paired with parental opposition to "wires and things" about the house).

The Shack

Certainly, for most people the biggest single problem to be solved is where can they work? The work demands a relatively quiet situation, to help develop the concentration which is required. Don't despair! Although many modern homes lack cellars, attics or even built-in sheds which can be used, the enthusiast is nothing, if not versatile! He, or she, can improvise. In this situation that is what our hobby is all about!

If you are forced to use a small space indoors, the kitchen table is perhaps not the best place! Even though the amount of "metal bashing" in our hobby today is limited, it would be extremely easy for you to scratch a table or burn it with the soldering iron. You can make a trolley that can be wheeled under the stairs or into the conservatory, but an old fashioned stout wooden tea trolley will save you the job! One young friend of mine put piano castors under an old laundry table which was small enough to be wheeled about.

Another option is an ironing board, the asbestos pad at the end is more than useful. The metal-based boards can take a small vice which will make it even more useful. The advantage of the ironing board is that you will have a very wide spread, although with a limited depth. Taking a tip from many housewives, one can use a stool to work from, and you will find that the height of the stool will be just about right, unless you are over 2m or below 1·5m tall! Seriously though, you will find a stool far better than a chair especially when you are "up and down" looking for parts.

Storage Problems

Unfortunately you then have a storage problem, but that can be overcome by making a portable shelving unit to hold your tools and parts. For many years GM3XFD used wooden trays measuring approximately 305 × 230mm. These trays started off as fish cake boxes which came from the local chip shop. However, with plastics and other materials around nowadays, this method is mentioned only to give you ideas. An extremely useful and readily available storage box, is one of the "multi-tray" tool/fishing boxes. With their multiple small storage spaces, and room for tools, they are ideal . . . at a price.

Find yourself a quiet place in the house if you can but almost certainly you will finish up in the kitchen, dining room or conservatory. The loft, if you have one, is not recommended unless it is properly lined and floored. It will be useful for antennas later on though! Having, hopefully, found somewhere you can now come up against the next problem . . . power and lighting.

Power

Today, fortunately, power to the "shack" need not be a problem with the use of semiconductors. The soldering iron need not be a problem either, there are excellent 12 volt types available. In fact many people prefer to use a low voltage iron at all times, as they are versatile and give added protection against static damage to f.e.t.s.

The advantages in only needing a 12 volt power supply are many, not the least being the cost! Safety is yet another advantage, with the most pessimistic protective parent being at ease with 12 volts in the vicinity rather than mains.

New batteries are not cheap, the cheapest usually being around £12 or so. However, a trip to the local garage may be useful. A car battery that has failed the "3 minute shunt test" may be available for a small sum. These batteries have been given a brutal test by having 300 amps drawn from them, whilst the volt drop is measured. One that fails will not perhaps be good enough to start a car on a cold morning, but will suffice to run a 24 watt 2 amp iron and your electronics.

It should be possible to buy the battery from the garage for about £2, which is the figure that the battery reclaim company allows them. It may be a surprise, but the vast majority of old batteries do go for "rebuilding"! My experience has taught me that it is not worth approaching the specialist "quick fit" depots where batteries, tyres etc are fitted "while-you-wait". Their whole operation is geared up to recycle as much as they can, and you will be fortunate to obtain a battery this way.

Once you have the battery, and with the help of the garage have chosen one that is not too bad, charging it will be a priority. It may not be necessary for you to buy a charger though, you may have one in the house, or have a model railway or you can use the family car! The latter way however, can be expensive and dangerous. Charging the battery via "jump leads" **should only be undertaken outside, well away from enclosed areas.** Carbon monoxide present in car exhausts is extremely deadly and strikes quickly. Even in the open, in still air it is very hazardous. And unfortunately I am speaking with first hand, nearly fatal experience.

An efficient low current charger can be utilised from a model railway transformer-rectifier unit. The main problem is that they can only normally supply 1 amp or so, but this can be overcome by "trickle charging". Safety-wise, the transformer units have a big advantage in that they are "double wound" (the mains winding and the low voltage winding are totally

isolated from each other) and are robust indeed.

You must limit the current drawn by the battery on charge with a suitable resistance. A 12 volt car sidelight bulb, in series with the positive terminal (marked +), will keep the current to a safe limit. You may be able to buy a cheap car ammeter from an accessory shop, but unfortunately they are not reliable at low current levels, and for accuracy, a multimeter is required.

Warning!

The use of car batteries to provide a 12 volt supply has certain dangers. The batteries contain dilute sulphuric acid, and will produce explosive hydrogen gas and possibly sulphuric acid spray whilst being charged. They should be kept well clear of furnishings, and should not be charged in an inventilated room. They must be kept upright.

You should also be aware that dropping metal objects, such as tools or bare wires, across the battery terminals, will cause arcing with a risk of fire or possible explosion.

Car batteries are a useful power source, but they must be treated with care and respect.

Lighting

Almost certainly you will find that the lighting, even in the house, will be inadequate when you start work, and to avoid undue eye strain some extra lighting is recommended. A desk lamp is ideal, some cheaper imported types are really small, with flexible "goose neck" adjustable stands, although they do not have the "reach" of the better lamps.

Suitable desk lamps are often to be found at a local "sale", and it cannot be stressed enough, what a useful source of "difficult to find bits" they are! Attend every jumble sale you can, and it's often possible to buy the once popular bedside spotlamps for a few pence. These were in vogue in the 60s, and have an integral 12 volt transformer in the base, running a 24 watt or so car bulb. However, whether running on mains or 12 volts, they are most useful.

A visit to your local caravan accessory shop can be very profitable, for of course caravan equipment is designed for those who are away from the mains. For around £10 or so, it will be possible to buy a 12 volt invertor powered fluorescent light. These useful lights give "glare free" illumination, but watch out for possible interference from the invertor unit. Each lamp is equipped with a small oscillator unit which electronically switches the 12 volt d.c. via a transformer, to around 240 volts. Good quality lights will be adequately protected, but in close proximity, the radiated signal from the oscillator could prove a problem on long and medium waves.

Collecting Junk

Once you have started to collect broken down radio and other electronic items from "jumble sales" you will quickly be able to break up items for spares. This is the best thing to do with modern "oriental" items. Currently a favourite source of spares seems to be from the once popular "8-track" cartridge player/radio receivers.

Other radio receivers you should look out for when attending the next "jumble", are the older and cheaper type of car radio, and the very common "attache case" dry battery valve radio. Most UK manufacturers produced these excellent little radios in the 50s, with valves that would operate with as little as 36 volts on the anode! Each radio, in a substantial wooden case, came with frame antenna in the lid, for only latterly did the now universal "ferrite rod" antenna make an appearance in these portable sets.

Many are still in daily use with "mains adaptors", and they are well worth collecting for spares. The cases are most useful for storing parts, the speakers are nearly always of good quality, as are the variable capacitors and other components. Mostly they will be in very good condition, having been stored since the introduction of 9 volt powered transistor portables, which killed them off virtually overnight. The 90 volt and 1·5 volt battery prices saw to that!

Occasionally, it is possible to buy an older type "positive earth" car radio at a sale. Don't hesitate! The low price will usually be because of the polarity of the chassis. That will not work against us at all. A 12 volt car radio, such as this, with its screened coaxial antenna input, will make an ideal "foundation" for your first "communications receiver".

Using the radio as a "tuneable i.f.", and utilising the most useful "screened input", which greatly reduces "breakthrough", you will later on in the series be able to build and add a "converter" so that the car radio will become a versatile short wave receiver able to tune into the "short wave" band of your choice.

With other little "add-on" units, made up from very simple circuits, Morse and s.s.b. (single sideband) speech from amateur stations will be available. The cheap car radio will then have the facilities to equal much more expensive equipment. It will be, in fact, a "double conversion" receiver, and you'll have made most of it yourself!

Economical Approach

This approach must surely be the most economical, and enjoyable introduction to Amateur Radio and construction, but you must "put yourself out" quite a bit, and should make friends in the hobby too. It is all too easy to be a "loner" in our hobby, to great disadvantage at times! An enquiry at the Town Hall, or at the local Technical College will perhaps bring you into contact with a local enthusiast or licensed amateur station.

Useful Introduction

CB Radio, often sneered at, and derided by many, can prove a most useful introduction to Amateur Radio. Now that it has lost most of the media promoted "cowboy image" and the anarchists it attracted have gone on to other things . . . it can be used with great effect.

Many amateurs, including GM3XFD use CB, and you may meet one on 27MHz. If not, you will undoubtedly be told where you can contact an amateur. Whatever happens, you can be certain that you will make friends who share the same interests. This, coupled with the fact that CB radio prices have fallen so much now, that a rig can be bought extremely cheaply indeed, makes CB a real bargain. Unfortunately this is unlikely to happen with amateur radio prices, but this series is aimed at avoiding those costs . . . wherever possible!

So, start collecting, hunt your local amateur out, even if he cannot spare the time to get involved, many delight in passing on "junk", the often unfair name for the valuable "bits" that are the foundation of our hobby. Surely, it's the practical way to get started!

Next month . . . Your library, getting a test-meter, antennas and first projects and methods.

Stop Press News . . . Stop Press News . . . Stop Press News . . .

Morse for Class B Licensees

A DTI Press Notice states that . . . "Following the successful completion of the experiment allowing Class B Amateur Radio licensees to practice the use of Morse code, the DTI has confirmed, following consultations with the RSGB, that the concession is now a permanent feature of the licence. The experiment restricted Morse operation to the station address but this condition no longer applies . . ."

The DTI has revised the definition of the amateur licences and has removed Footnote A (which restricts the use of Morse).

Remember, the use of Morse must be restricted to the bands for which you are licensed.

The Sooper Loop

David Mayhew's simple but effective m.w. DX Loop

This medium wave "Sooper Loop" is a highly sensitive loop antenna with a powerful output stage. It will enable your radio to receive medium wave stations which are normally unattainable by any other means. Because the loop is highly directional it will be possible to separate stations using the same frequency or to "null" out an unwanted signal close to a wanted one. This loop has been in use for several years and is by far the best design yet evolved by the author for receiving m.w. DX stations. Some idea of its potential can be obtained by referring to *PW* "On the Air" September 1985. Naturally, good conditions and patience play an important part in obtaining such results, too!

Circuit Description

The heart of the "Sooper Loop" is a high *Q* loop tuned by a small variable capacitor (see Fig. 1). To maintain this high *Q*, both of these components are totally insulated from all other parts of the circuit to avoid unnecessary loading. A single turn of wire around the loop provides sufficient coupling into a single transistor amplifier to ensure adequate signal output. The amplifier gain may be varied to allow for different signal levels by means of a simple variable resistor in series with the PP3 9 volt battery supply to the transistor (battery life is approximately 150 hours).

The amplifier output may either be connected directly to the antenna/earth terminals of the receiver or coupled via a specially designed ferrite injector to an internal ferrite antenna in the set.

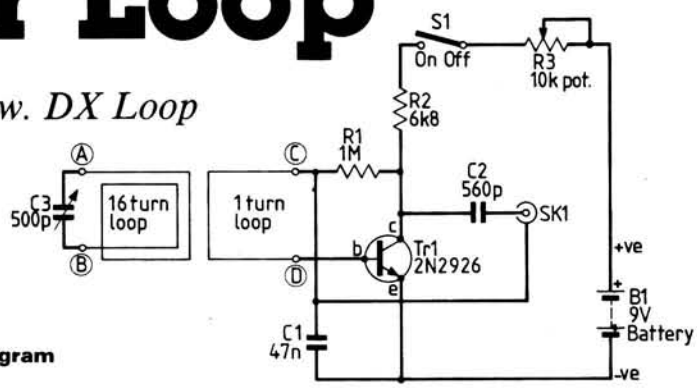

Fig. 1: Circuit diagram

Construction

Making the powerful "Sooper Loop" is a simple job and is easily undertaken by a beginner. A kit is available for £20 including post from the author at 29 Downview Close, Yapton, W. Sussex.

1. The former for the loop winding is a 45mm wide slice of 315mm diameter plastic pipe—about 3mm thick.

2. Drill four holes (AB) (CD) in the pipe to accept 8BA bolts. Fit four 8BA bolts, solder tags, washers and nuts as wire anchors and tighten them.

3. Close-wind on the former 16 turns of 24 s.w.g. enamel-covered wire to form the main loop. Clean the wire ends and solder to the external solder tags at bolts (AB). Fix the turns in place with polystyrene cement or use three bands of plastic insulating tape around the coil. Note: the winding direction is unimportant.

4. Wind on one turn of the same wire over the centre of the loop turns. Clean the wire ends and solder them to the external solder tags at bolts (CD). Do not twist the wires together at the end of the turn but bend the ends out to the solder tags. Cement this single turn in place.

5. Cut three panels, 173 × 78mm (rear), 173 × 58mm (front) and 173 × 45mm (bottom) respectively, from 18mm blockboard. See Fig. 2.

Drill three holes in the front panel to clear the shanks of No. 8 woodscrews, and countersink the holes on the outside of the panel.

Drill two further clearance holes near the bottom of the back panel, again countersinking them on the outside face. Drill a small pilot hole partway through the rear panel from the inside face, in line with the upper hole in the front panel, to accept the tip of the 3 inch woodscrew which will clamp the loop former. Screw the rear panel to the bottom panel as shown in Fig. 2.

6. Take the plastics electric double socket surface box (MK List No. 2025) which forms the control box.

Knock out the woodscrew fixing

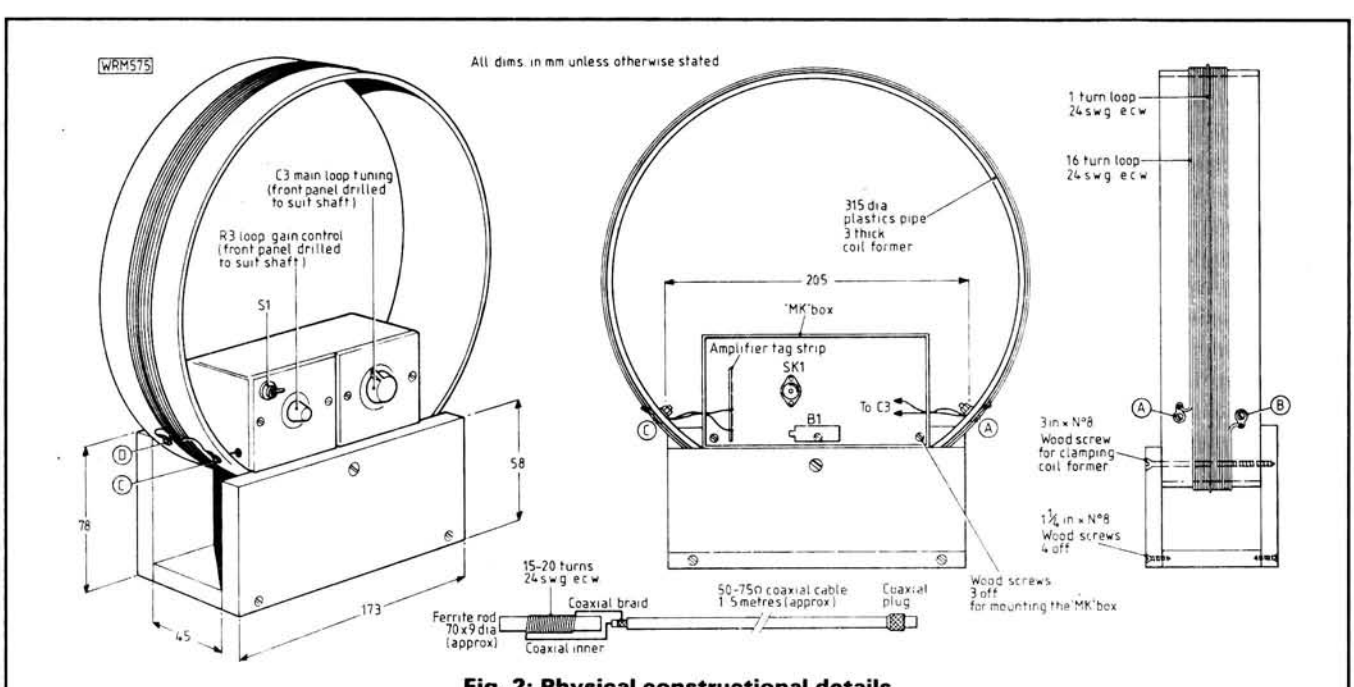

Fig. 2: Physical constructional details

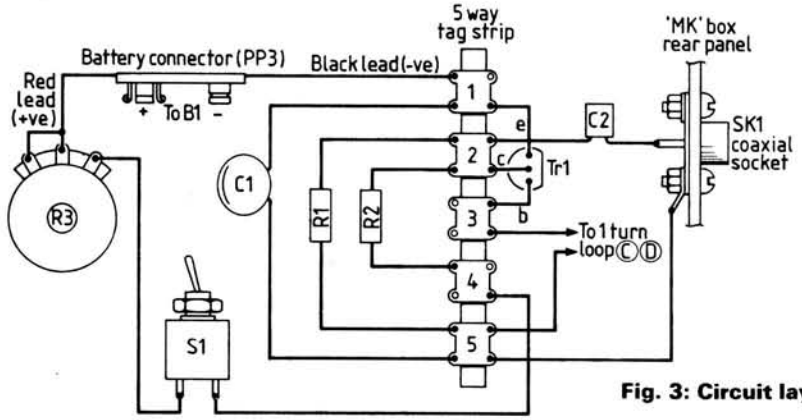

Fig. 3: Circuit layout

hole blanks at the bottom left, bottom centre and bottom right of the box rear wall, and attach the box to the rear wooden panel using three ¾in No. 6 woodscrews, so that the bottom of the box is 20mm below the top edge of the rear wooden panel.

7. Knock out the blanking plug in the centre hole in one of the plastics blanking plates (MK List No. 3827), and enlarge the hole with a file to accept a small 500pF variable capacitor, C3. This is the main loop tuning capacitor, which should now be attached to the plate using one nut each side of the panel. Note: this capacitor fits inside the right-hand half of the box and must not foul the box at any setting.

8. Connect two lengths of thin single-conductor plastics covered wire, each about 120mm long, to the variable capacitor connections.

9. Drill four 3mm holes in the plastics box, two through the lower right-hand side and two through the lower left-hand side, to take the wires to the loop windings. See Fig. 2.

10. Using a file, knock out and enlarge the centre hole in the second blanking plate to accept a small 10kΩ wire wound variable resistor (R3). Drill a hole for a miniature toggle switch (S1) 25mm down and 10mm in from the top left-hand corner of the panel. Mount these parts on the panel and fit a small knob to the shaft of the variable resistor.

11. Join together one outer tag and the centre tag of the variable resistor R3, and connect them to one of the toggle switch connections using a short length of plastics covered, red coloured, wire.

12. Attach the red flexible lead from a PP3 battery connector to the unused outer connection on R3.

13. Construct the amplifier on a 5-tag strip, see Fig. 3. Attach thin plastics covered wires 100mm long to tags 3 and 5 of the amplifier.

Attach the black flexible lead from the PP3 battery connector to tag 1 and a red plastics covered flexible lead, 130mm long, to tag 4 of the amplifier.

14. Using a file, enlarge the slot-shaped woodscrew hole just to the left of the centre pillar in the box, so that a Belling Lee chassis-mounting coaxial socket may be bolted in position from the inside, with the socket facing out through the back of the box. Drill two 6BA holes to fix it to the rear wall of the box. Use 6BA bolts, washers and nuts, and fit a solder tag to the lower bolt when fixing it.

15. Drill a 6BA hole through the rear wall of the box, 55mm down from the top rear edge and 15mm in from the side (on the right-hand side when viewed from the back). This hole is used to mount the amplifier tag strip.

16. Pass the wires from tags 3 and 5 of the amplifier out through the holes in the left-hand end of the box (see Step 9) and bolt the amplifier into position, inside the box and parallel to the left-hand side, using a 6BA bolt, washer, spring-washer and nut.

17. Offer up the completed variable capacitor panel to the right-hand side of the box, passing the attached wires out through the adjacent holes. Fix the panel to the box. Fit a large knob to the capacitor shaft.

18. Join a short flexible lead from tag 5 of the amplifier to the earthing solder tag on the Belling Lee socket (SK1). Connect a 560pF capacitor (C2) between the centre connector on this socket and tag 2 of the amplifier (transistor Tr1 collector).

19. Connect the red lead from tag 4 of the amplifier (step 13) to the unused connection on S1 and check that the switch is off.

20. Temporarily attach the panel containing the toggle switch, etc., to the left-hand half of the box.

21. Place the loop in position immediately below the control box. Fix the front wooden panel to the bottom panel using two 1¼in No. 8 woodscrews. Insert the 3in No. 8 woodscrew through the hole just below the control box, feeding it into the pilot hole in the

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47nF	1	C1

Variable Capacitors
Jackson miniature

500pF	1	C3

Semiconductors
Transistors

2N2926	1	Tr1

Miscellaneous
Plastics pipe 315 x 45 x 3mm wall, 1 off; blockboard panels, see text; plastics electric double socket surface box (MK 2025), 1 off; plastics blanking plates (MK 3827), 2 off; 3in x No. 8 countersunk woodscrews, 1 off; 1¼in x No. 8 countersunk woodscrews, 4 off; ¾in x No. 6 countersunk woodscrews, 3 off; Belling Lee chassis mounted coaxial socket, 1 off; Belling Lee coaxial plug, 1 off; 45mm dia front panel knob, 1 off; 22mm dia front panel knob with scale, 1 off; s.p.s.t. miniature toggle switch, 1 off; 5-way tag strip, 1 off; red and black plastics covered wire, 1m of each; PP3 battery connector with leads, 1 off; PP3 battery, 1 off; 10mm 8BA bolts, 4 off; 8BA nuts, 8 off; 8BA solder tags, 4 off; 8BA spring washers, 4 off; 8BA plain washers, 8 off; 10mm 6BA bolts, 3 off; 6BA nuts, 3 off; 6BA solder tag, 1 off; 6BA spring washer, 1 off; 6BA plain washers, 3 off; 50 or 75Ω coaxial cable, 1·5m; 24 s.w.g. enamelled covered wire, 20m; 70 x 9mm ferrite rod, 1 off*; plastics insulating tape, 1 m; polystyrene cement.

* Required for ferrite signal injector only.

How Much? & How Difficult?
£20
Beginner

The Sooper Loop (cont)

rear panel, and tighten it gently, so as to grip the loop between the panels.

22. Connect the wires projecting through the holes in the right-hand end of the control box to the anchor bolts (AB) on the inside on the loop, using solder tags, washers and nuts, cutting off the excess wire.

23. Connect the wires projecting through the holes in the left-hand end of the control box to the anchor bolts (CD) in similar fashion.

24. Remove the left-hand panel and fit a PP3 battery by sliding it in on its back (after connecting the press stud fastener/connector to it) on the floor of the box between the two panels. Replace the panel.

25. Prepare a 50Ω or 75Ω coaxial cable lead, about 1·5 metres long, with a Belling Lee plug on one end and a suitable coaxial connector to mate up with the receiver input at the other end.

If the receiver has A and E sockets, connect the inner of the coaxial cable to (A) and the outer braiding to (E).

If the set has an internal ferrite antenna, construct the special ferrite injector and lead shown in Fig. 2.

Congratulations! You are now ready to test your "Sooper Loop".

Operating Notes

Place the loop about 1 metre from the receiver and connect them together using the coaxial cable prepared in step 25. Note: if the special ferrite injector is being used, place this close to the receiver's internal antenna.

Set the loop gain control to its mid-position and switch on the loop amplifier. Tune the receiver to the desired station/frequency. Adjust the loop tuning (this is very sharp) and rotate the loop for maximum signal.

Adjust the loop gain control for best reception without overload. "Null" out any unwanted signals by rotating the loop. ***PW***

NEWS EXTRA

Band III

The licence applications for Band III have been announced. Mr G. Pattie, Minister of State for Industry and Information Technology, named the successful applicants who want to operate p.m.r. systems. He said there would now be discussions with the DTI to further define technical aspects of their systems before licences will be granted.

Band III (174–225MHz) became available when 405-line TV finished on the band. Licences will only be granted if the Department is satisfied that the licence conditions will be properly observed.

National p.m.r.:
(a) A consortium of Pye Telecommunications; Digital Paging Systems (UK); Investors in Industry; Racal Telecommunications Group & Securicor Communications.
(b) GEC Telecommunications.

London p.m.r.:
(a) London Car Telephones
(b) Air Call
(c) Relcom Communications
(d) Sinclair Communications
(e) National Radiofone

Provincial p.m.r.
Birmingham–National Radiofone
Manchester/Merseyside–National Radiofone
Nottingham–Zycomm Electronics
Leeds/Bradford–RT Radiophones
Glasgow/Edinburgh/Aberdeen–Tactico/National Radiofone (joint venture).

The DTI notice announced that licences will not be awarded at this stage in four of the other areas outside London for which applications were invited, as insufficient suitable applications were received.

As regard National Wide-Area Radiopaging for the 153MHz band, three groups were announced.
(a) A consortium of Air Call, Digital Paging Systems (UK), Inter-City Paging and Pageboy Services (UK).
(b) A consortium of Mercury Communications and Motorola
(c) Racal

For 454MHz there were two companies,
(a) Infowave
(b) Millicom (UK).

As there may be the need to make allowances for future expansion, some operators may be allocated frequencies in the 138–141MHz band rather than 153MHz.

Project Omega

Mr M. Jarvis has written to us regarding all Project Omega constructors. He would like to hear from others with a view to creating a pool of ideas and information regarding any problems which may have been encountered—with solutions arrived at, or not—as the case might be.

All correspondence will be treated as confidential, so if you would like to write, the address is: ***Mr M. Jarvis, 11 Bushey House, Charles Field, Grove Park, London SE9.***

AMSAT-UK

For those amongst you who find satellites a growing part of amateur radio, there is an organisation you should know about. AMSAT–UK (The Radio Amateur Satellite Organisation of the UK) can provide you with a vast amount of information.

Each year it costs £8.50 to provide each member with all the information, so a suitable donation is required from members and prospective members.

Anyone interested should send a 9 × 4½in s.a.e. to: ***Ron Broadbent G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ.***

SWL Pen Pals?

We have a reader in the USA who would like pen pals. Kenn Wilson says that he is interested in reading magazines on auto racing, soaring and radio controlled airplanes. Any s.w.l. interested in writing to him should address their letters: ***Kenn Wilson W9JLA/5, 14902 Preston Road, Suite 212-218, Dallas, TX 75240, USA.***

Can You Help?

Has anyone a circuit or handbook on the Cossor double beam oscilloscope type 3398? If so, ***Kirk Wilson, 35 Connaught Road, Margate, Kent CT9 5TW,*** would like to hear from you.

Another "Can You Help" here, from Mr D. Jenks. He would like to find a circuit diagram for a Safgan Oscilloscope DT420. If you can help, please write to ***Mr D. Jenks, 36 West Dene, Gaddesden Row, Hemel Hempstead, Herts HP2 6HU.***

TV Plans on DBS

The IBA is proceeding with plans to advertise for contractors to provide up to three British television services by Direct Broadcasting by Satellite—following the announcement by the Home Secretary that sections 37–41 of the Cable and Broadcasting Act are being brought into operation.

If suitable contractors are found, the DBS services—receivable throughout the UK with the necessary equipment, of course—could be on the air before 1990.

The nature of these additional services—which could be funded either by advertising or subscription or by a combination of both—will be discussed with the applicants. The IBA will be looking for a variety of programming supplementary to the comprehensive output of ITV and Channel 4.

IBA's Director General, John Whitney, says, "We shall be proceeding with all speed while aiming to ensure that the firmest possible basis is laid."

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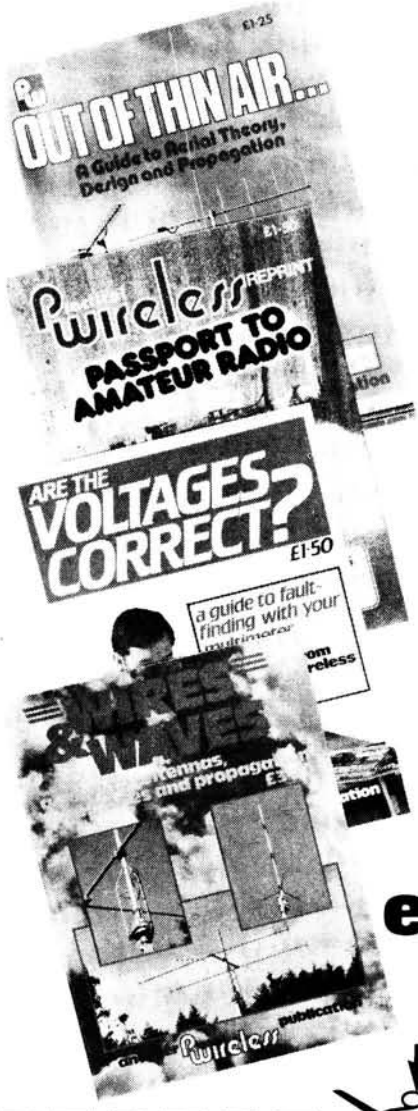
SPECIALIST REPRINTS



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With the IC-R7000 you have normal tuning capability with the front panel tuning knob or for quick tuning of a desired frequency by using the front panel key-pad. A total of 99 memory channels are available for storage of received frequencies and operating mode. Memory channels can be called up by pressing the memory switch then rotating the memory channel knob or by direct keyboard entry.

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

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There are two ways of using this advertisement, one is to cut out the life-size photograph of the R7000 and paste it to the side of an old shoe box, who knows if your shack is dimly lit visiting Amateurs will be impressed by your excellent choice. The alternative (and one we strongly recommend) is if you are an Amateur or SWL call us on free HELPLINE 0800-521145 for the location of your local ICOM dealer where you can see and actually buy the competitively priced R7000, you have the choice.

Computer Control The IC-R7000 can be easily connected to a computer terminal via a very simple interface. Receiver control is performed serially in the IC-R7000 by ICOM's C1-V communication interface system. Operation is possible with a personal computer that has an RS-232c serial port.

	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

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By making simple modifications, you can track the VFO's of the Rx and Tx either normally or reverse. This is unique to these ICOM rigs and therefore very useful for OSCAR 10 communications. Digital A.F.C. can also be provided for UOSAT etc. This will give automatic tracking of the receiver with digital readout of the doppler shift. The easy modifications needed to give you this unique communications opportunity are published in the December '84 issue of OSCAR NEWS. Back issues of OSCAR NEWS can be obtained from AMSAT (UK), LONDON E12 5EQ.
This range includes the IC-271E-10W, IC-271E-25W, 271H-100W and the 70cm versions IC-471E-25W and 471H-75W r.f. output. The 271E has an optional switchable front-end pre-amp. The 271H can use the pre-amp AG-25, with the 471E and 471H using the AG35 mast-head pre-amp. Other options include internal switch-mode PSU's: the 271E and 471E use the PS25 and the 271H and 471H use the PS35.

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IC-02E/04E Handportables

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

HS10

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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.

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

Weather Watch–3

Jeff Maynard G4EJA completes his survey of weather information available by radio.

After all the detailed figure work and decoding of Part 2, you may well be relieved to know that some weather information is available on h.f. and v.h.f. telephony. This includes the so-called VOLMET transmissions of airport weather details aimed at civil and military aircraft in flight. At the end of 1983 the West Drayton transmissions were taken over by the Royal Air Force.

On h.f., RAF VOLMET can be heard on 4·722MHz and 11·200MHz. On v.h.f. it can be found on 126·6MHz and 128·6MHz in the London area. In each case the transmissions are fully automatic, using computer-controlled voice synthesisers.

The transmissions give visibility, wind speed and direction, and cloud height and cover information for a number of civil and military airfields in the UK. Similar information for major European airports is available from Shannon VOLMET on 5·641MHz. When propagation is favourable New York Aeradio can be heard with further VOLMET transmissions on 13·271MHz. There are many, many other VOLMET transmissions around the world and the interested listener may care to concentrate on DXing in this area. I have never tried to QSL any of these stations and rather doubt that any cards would be returned!

Facsimile (FAX)

There are a great many meteorological stations broadcasting weather maps using facsimile transmission in the h.f. bands. I have copied traffic from Moscow, Madrid, New York, Copenhagen, Halifax (Canada) and Rome Meteo stations as well as Bracknell. Before looking at the schedules and transmission frequencies for meteo facsimile broadcasts, it will be helpful for many readers to review the principles of this method of transmission.

Facsimile is used for transmitting weather charts. Whilst the principles are the same for picture transmission, the resolution available from h.f. meteo links is not generally adequate for anything better than outline maps of the type shown in the accompanying illustrations.

A picture or map to be transmitted is scanned from left to right and top to bottom in rather the same way as a television raster is built up. As each line is scanned so the composition of the line is resolved between white and black. Most weather transmissions use a minimal grey-scale having only four or eight different shades. This is more than adequate for line drawings.

The grey scale is transmitted by frequency modulating an audio frequency sub-carrier at 1900Hz. Full white produces a shift of +400Hz, and full black produces –400Hz. The frequency modulated audio signal is used to generate an s.s.b. signal for final transmission. The emission code for this type of signal is F3C.

Printing of the received facsimile picture requires that the grey scale be recognised (achieved by recovering the f.m. component of the signal from the demodulator) and that synchronisation be achieved. Synchronisation is maintained by a sync pulse at the beginning of each scan line. Meteo facsimile broadcasts are also preceded by tones to identify the transmission characteristics.

The characteristics that determine between transmitter and receiver are drum speed and index of co-operation (IOC). Drum speed (the original picture is wrapped around a drum for scanning) is usually 60, 90 or 120 r.p.m., with the last-mentioned being the most popular.

The index of co-operation is the product of the total length of one scan line and the number of scan lines per unit length. IOC determines the resolution of the received picture, and is normally either 576 (for a minimum pixel size of 0·44mm) or 288 (for a minimum pixel size of 0·7mm).

Meteo fascimile transmission schedules always list the appropriate drum speed/IOC combination in the form 120/576. Some stations change the combination during their daily schedule. Receiving and transmitting equipment can be set to different speeds or IOCs and some communication achieved, but the resulting picture will be distorted although recognisable. For example, with the IOC set for 288 when receiving a transmission based on an IOC of 576, the received picture will be expanded in scale.

FAX Equipment

Currently there is no amateur facsimile equipment available on the UK market, although a kit is available from the US company Alden Electronics. For about $1200 this provides a drum speed of 120 and an IOC of 576.

Meteo fascimile broadcasts use similar transmission characteristics to commercial facsimile machines designed for use over the public switched telephone network (PSTN). Such machines using the meteo-style analogue decoding are rapidly being replaced by digital machines. It is likely, therefore, that surplus equipment may be avail-

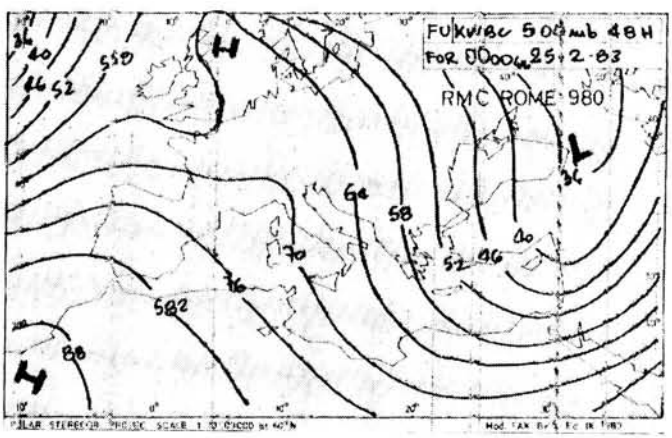


Fig. 3.1

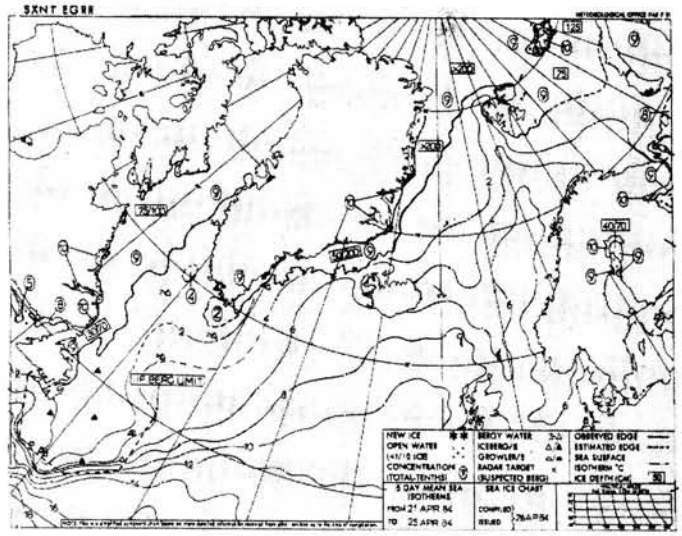


Fig. 3.2

able if you can but find it. The likes of Infotec, Interscan, Plessey or Xerox may be sitting on warehouses full of old FAX machines!

FAX Broadcasts

The main source of facsimile traffic in the UK, and the place to become familiar with the rhythmic sound of FAX, is Bracknell. There are two main groups of transmitters as shown in the Table. Each station of a group transmits the same information. All transmissions use F3C modulation as described previously and are from 10kW transmitters.

Group 1 stations transmit about fifty different maps every 24 hours and Group 2 stations originate about a hundred. A transmission schedule, available to licence-holders from the Meteorological Office, lists the full set and shows for each transmission the time, drum speed and IOC, chart identification, observation time, map area, and a description of the map contents.

For example, at 0952UTC, Group 1 transmitters are scheduled to transmit at 120/288, chart FXNT EGRR (report identification and originating station) observed at 0000UTC for map area G and showing the North Atlantic wave prognosis for the following 48 hours. The schedule lists also the relevant map areas used for these transmissions.

The print-out in Fig. 3.1 shows a facsimile transmission received from the Italian Air Force meteo station in Rome on 8·146MHz of data received from the National Meteorological Centre, New York (KWBC). The chart Fig. 3.2 is a transmission from Bracknell (identified as station EGRR) of a sea-ice chart (data identifier AXNT) received on 4·782MHz at a drum speed of 120 r.p.m. and an IOC of 576.

The latter map was received fully automatically since the tones preceding the transmission (and indicating drum speed and IOC) will start the Muirhead FAX receiver in use at the author's shack. This does require that all the equipment is very stable, since the filters on the Muirhead are quite narrow. The slightest drift as equipment warms up will take signals out of the filter passbands and the tones will not be recognised. It is usually necessary to have both receiver and FAX machine switched on for at least an hour before automatic operation can be relied upon. Receiver drift during reception of a chart will show up as reduced definition or clarity.

	Callsign	Frequency	Hours (UTC)
GROUP 1	GFA21	3·289MHz	0000–2400
	GFA22	4·610MHz	1800–1600
	GFA23	8·040MHz	0000–2400
	GFA24	11·086MHz	0000–2400
	GFA25	14·582MHz	0600–1800
GROUP 2	GFE25	2·618MHz	1800–0600
	GFE21	4·782MHz	0000–2400
	GFE22	9·203MHz	0000–2400
	GFE23	14·436MHz	0000–2400
	GFE24	28·261MHz	0600–1800

Table 1

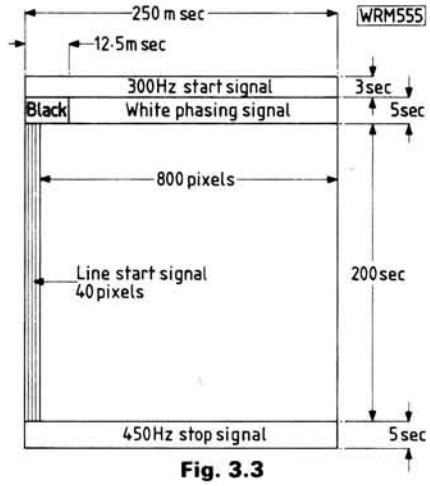


Fig. 3.3

Weather Satellites

The preceding may seem rather prosaic next to the possibility of receiving weather data from satellites. However, the experience gained as a short wave meteo listener is never wasted and the facsimile receiving equipment can be used as the basis for receiving pictures from satellites.

The NOAA (US) and Meteor (USSR) groups of weather satellites broadcast APT (automatic picture transmission) signals compatible with equipment previously used for h.f. picture reception. Note, however, that the APT pictures use 16 levels of grey scale for higher resolution of sub-orbital land masses.

The modulation mode is F3C, as on h.f., but using a 2·4kHz sub-carrier on NOAA and a 2·5kHz sub-carrier on Meteor. The resolution obtainable on a NOAA picture is 4km. The transmission is on 137·5MHz (NOAA 8) using right-hand circular polarisation and a transmission power of 5 watts. Drum speed is 120 and IOC is 576.

The reader should note that the carrier deviation of these signals is ±17kHz, and this requires a receiver of correspondingly high bandwidth. The current spate of scanning receivers covering the satellite sub-band at v.h.f. (136–138MHz) are not therefore suitable for APT reception purposes. Suitable receivers are available but tend to be expensive.

NOAA 8 has also a high-resolution picture transmitter (HRPT) transmitting 5W on 1698MHz right-hand circular. The data on this channel gives sub-orbital ground pictures with a resolution of 1·1km. The APT data is derived from the HRPT data by way of an averaging algorithm.

A beacon is also transmitting from NOAA 8 on 136·77MHz. The digital beacon data contains multiplexed satellite housekeeping and low-rate instrument data transmitted at 8320 bits per second in a series of frames repeated every 32 seconds. Detailed information for the beacon data together with a wealth of information describing the collection and subsequent transmission of HRPT and APT data is contained in the Annex to World Meteorological Publication No. 411.

Meteosat

A system for receiving NOAA and Meteor APT pictures is a major step towards receiving whole-Earth pictures from Meteosat. This is because a converter can be obtained to translate the Meteosat frequency of 1694MHz to the v.h.f. satellite sub-band. Thus a v.h.f. system can receive Meteosat with the addition only of an antenna and converter. Meteosat is in geostationary orbit some 35 000km above the Earth's surface and signals from its 18dBW transmitter are therefore quite weak for terrestrial reception. Hence the use of a dish antenna with the conversion to v.h.f. at the antenna feed, to obviate the need for high-grade, low-loss s.h.f. feeder cable.

Meteosat data is transmitted in digital form to primary data user stations (PDUS) where extensive computing facilities are required for data evaluation. The Meteosat Ground Computer System in the European Space Operations Centre at Darmstadt in West Germany receives PDUS data and processes it to a form compatible with APT systems. The data is sent back to Meteosat for retransmission to suitable equipped APT stations.

In addition to sending back reprocessed APT-compatible Meteosat pictures, Darmstadt also sends APT-compatible pictures received via the US weather satellite GEOS. Thus Meteosat users can receive pictures for areas not directly visible from that satellite.

The print-out Fig. 3.3 shows the Meteosat APT picture format complete with 300Hz start signal, phasing signal, data and 450Hz stop signal. This format is the same as NOAA APT pictures. The start phasing and stop signals are the same as those used on h.f. transmissions. These allow the use of unattended receiving stations—a particularly useful facility for the polar orbiting satellites (NOAA and Meteor series) which overfly any fixed ground station for only about 14 minutes of each 100-minute orbit. ***PW***

More Information

In addition to the Meteorological Office, intending weather forecasters will find the following sources useful:

Decoding details:
News sheet: M. W. Stubbs, Meteorological Broadcasts, Royal Meteorological Society, James Glaisher House, Grenville Place, Bracknell RG12 1BX.
Weather **(monthly):** Royal Meteorological Society, address as above.
Various: World Meteorological Organisation, Geneva, Switzerland.
NOAA orbital data: Bracknell RTTY broadcast daily about 2000UTC (data—TBUS KWBC).
Meteosat data: ESA Operations Centre, MDMD/OPS, Robert Bosch Str 5, 6100 Darmstadt, West Germany.

50MHz from Day 1

Following an initial experimental period of amateur activity on the 50MHz band by 100 UK special permit holders the DTI opened the band to UK Class A licensees on 1 February 1986. This report, compiled by John M. Fell G0API provides an initial insight into activity during the first week of 24 hour operation.

It's not too often that an all new amateur band allocation is made available and so the long awaited *London Gazette* announcement of 20 December 1985, regarding UK amateur access to spectrum at 50MHz, was received with more than average enthusiasm.

With Day 1 set at Saturday, February 1 it appeared that there would be plenty of time to prepare all the necessary equipment—January seemed to pass very quickly and was notable only for the lack of any real DX on most of the v.h.f. bands. Even the stalwart activities of the 50MHz special permit holders dwindled away—not surprising really when you consider the many hours of effort put in chasing contacts after TV hours and before 0830. Having managed to log 56 of their number during the last 6 months of the experiment, I for one would like to publicly thank them all for all their efforts which have now resulted in the present allocation.

At five minutes to midnight the headphones went on and a check was made on the band to make sure everyone was holding back. How wrong can you be? Far from the deserted wastes, the band was jumping with signals, yes the permit holders were having a last fling! Having added several new callsigns to the list, the time arrived and 30 seconds into Day 1 G3RJL in Weymouth, some 40km distant, was called and 5/9 reports passed both ways.

Equipment

Several more local contacts ensued before a rather bemused but less enthusuastic XYL demanded QRT. Reports received afterwards suggested that the band was well and truly christened with activity going on well into the early hours and contacts over ranges of up to 250km being available. The RSGB HQ staff were active from Potters Bar—GB3NHQ (for a few hours) was not!

So much for the start: what sort of equipment is being used, and to what effect? Well here at G0API the 50MHz set-up comprises a Shimizu SS-105S transceiver driving, at 28MHz, a *PW* Meon Transverter (what else!). A Spectrum Communications p.a. provides further gain and has been set for 10W p.e.p. thus ensuring that when used in conjunction with a 5-element NBS Yagi and 35m of UR-67 feeder the system stays within the 20dBW e.r.p. limits.

Transverters seem to be popular, with home-brew and commercial designs all providing good results—28MHz i.f.s predominate. As with all bands populated with multiple high level signals the use of high dynamic range, selective receivers becomes more of a necessity—50MHz is no exception in terms of signal levels.

From observations and contacts made during the subsequent days of the first week it became obvious that antenna installations varied between the h.f. operator "running here a link-coupled G5RV", to the v.h.f. orientated station with his 3, 4, 5 or even 7-

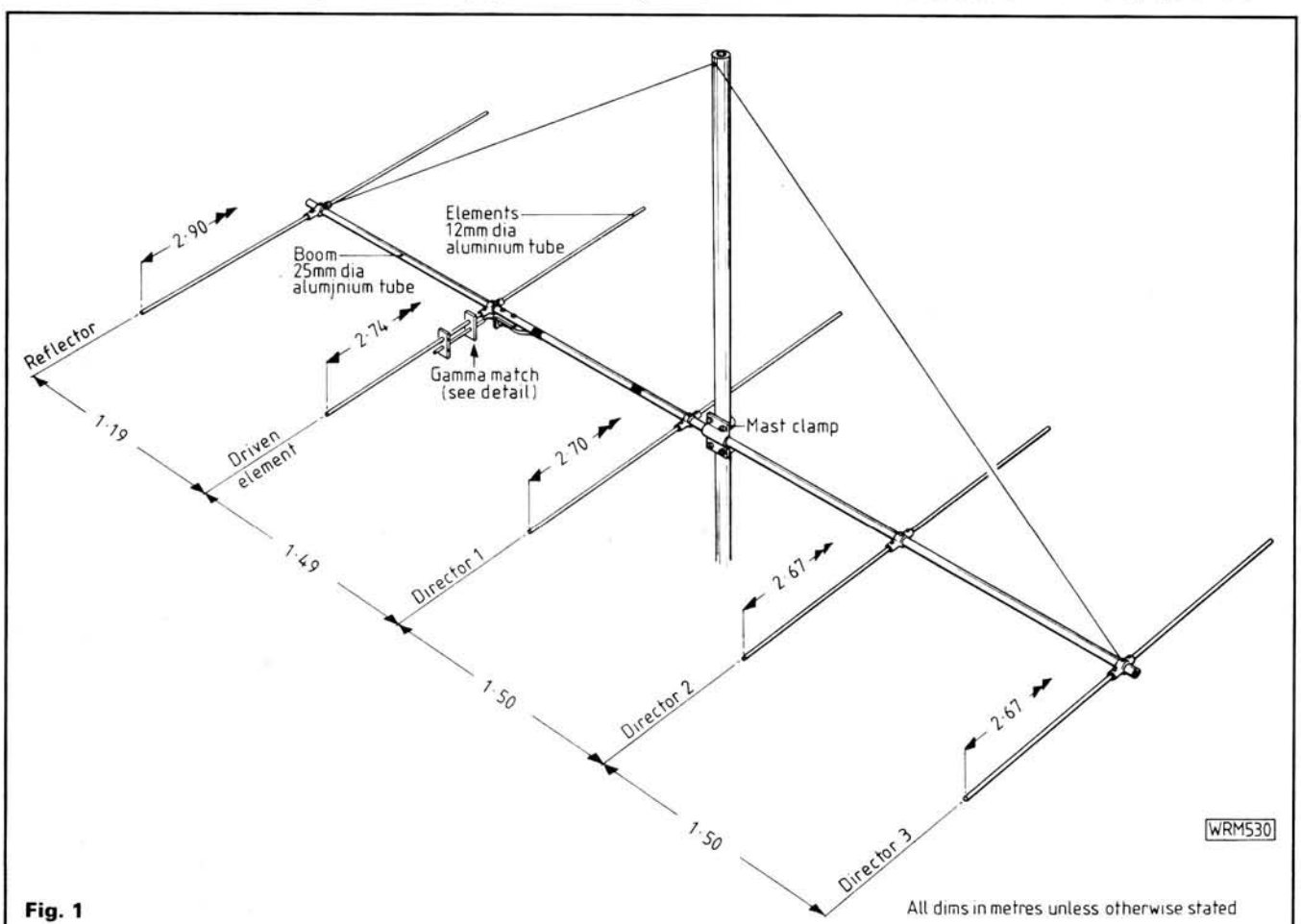


Fig. 1

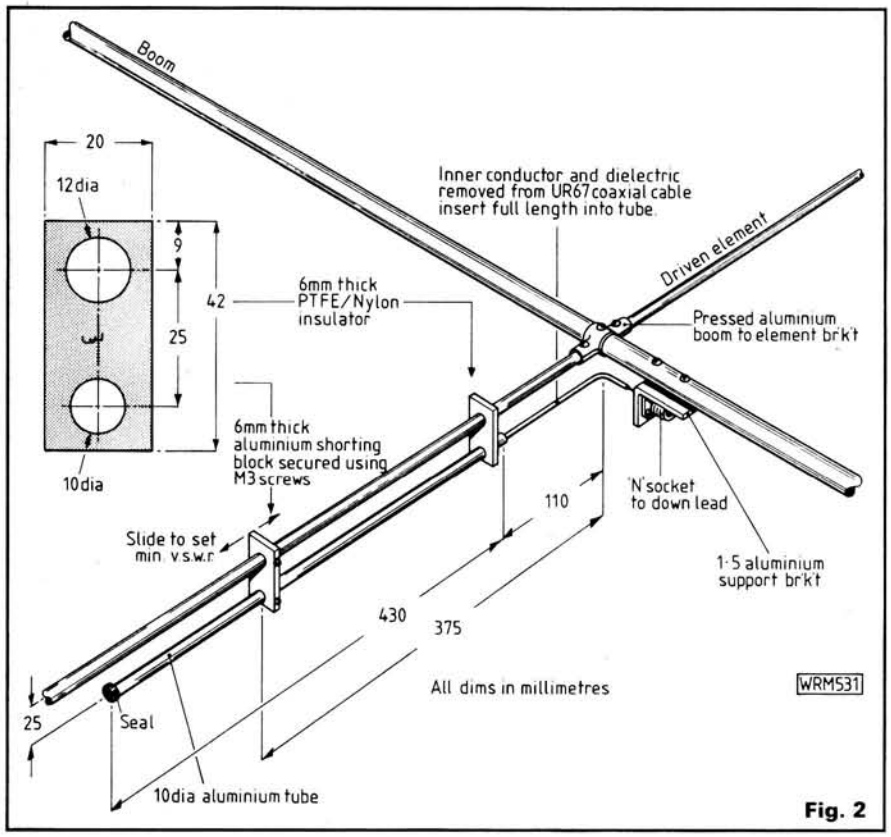


Fig. 2

element Yagi beam. The largest system yet encountered consisted of two phased 5-element Tonna Yagis—no mean feat when you consider that for optimum aperture the stacking distance should be near to 1·5λ.

I personally would advocate the use of a rotatable beam, with its antenna directional selectivity advantages and passive system gain. For those who just cannot find the extra space, the single and double size G5RV does work well but, as theory dictates, with predominant fixed lobes favouring its main axis. My half-sized version of this antenna, which is only some 6m a.g.l. at its highest point and fed via 75Ω coaxial cable, provides an absolutely flat load and can be directly connected to the p.a. output.

Operating

Turning next to operating practice the RSGB band plan has been largely adopted, but with *de facto* calling frequencies established at 50·100MHz for c.w. and 50·200MHz for s.s.b. during "normal" conditions. Some n.b.f.m. activity has been observed above 50·400MHz and this follows the narrow deviation format established on 28MHz. For those monitoring in conjunction with a 144MHz i.f. the recovered audio will be perfectly readable but noticeably low level.

From my QTH here in Dorset (IO80) the GB3NHQ beacon at Potters Bar normally averages a 5/3 signal but is often subject to slow QSB which is a characteristic of 50MHz. Tropospherically related enhancement has been noted but appears less pronounced than at 144MHz. If meteor scatter propagation has never appealed to you before, the far greater incidence of this phenomenon at 50MHz (caused by signal reflection from briefly ionised patches of the upper atmosphere) may well be an eye/ear opener. Setting your receiver to a known beacon frequency will produce many different effects, ranging from the brief "ping" or rapidly cut-off metallic sounding "clunk" to occasional bursts of high level signal, sometimes for up to 30 seconds or more. All UK beacons are receivable by this mechanism and the likely intensity can be predicted by reference to known meteor showers.

The coming Summer months from May onwards should see other propagation effects becoming more obvious, and amongst these sporadic-E will no doubt provide the potential for long range contacts. With the Sunspot minima yet to be reached, International F2 layer propagation is still a long way off. The limitation will be on the availability of suitably equipped stations outside the UK. It is believed that Portugal will soon have some 50MHz activity. Certainly during previous years both the Gibraltar beacon ZB2VHF, 50·035MHz, and the Cyprus beacon 5B4CY, 50·499MHz, have provided many hours of S9+ signals throughout the UK. Within Europe it is probable that other in-band contacts will occur with stations in EI, LA and PA—albeit subject to TV hours operation restrictions.

Returning from the probable, Day 7 of 50MHz operations will probably go down in history as marking the onset of an extremely large auroral event. At 1630 on February 7, I once again tuned across the full 0·5MHz bandwidth and was amazed to find steady signals from the GB3RMK beacon, 50·060MHz, in Northern GM. Whilst steady however, the c.w. was far from pure and had the characteristic rasp of auroral propagation. Continuing to tune the band further c.w. activity was evident from Scotland with at least four separate GM stations calling CQ. The adrenalin started to flow from then on as the first s.s.b. signals arrived. At 1701 I called Dave GM3WIL at Prestwick (IO75QL) who exchanged 5/9 aurora reports. My beam heading for peak signals at this time was some 40° to the east of north. Even more surprising was the description of the equipment used by GM3WIL—a home-brew 3-element beam, at modest height, fed by a 6W p.a. stage driven from . . . yes, you've guessed it, a *PW* Meon!

Activity on 50MHz picked up very rapidly from then on and in Southern England the event lasted until at least 1830. The Anglesey beacon GB3SIX was heard but, unlike the more northerly GM stations, had to be beamed at directly for peak signals. This device on 50·020MHz has an e.r.p. of 100W and beams due west. Before the band lapsed into a more normal mode, contacts were made with GM4YPZ at Montrose (approximately 60km south of Aberdeen) and GM3WOJ, 10km north of Inverness (IO77WO).

There was a strong temptation to QSY upwards when GM4YPZ mentioned having contacted stations in DL that afternoon on 430MHz! Subsequent information has revealed that 144MHz s.s.b. and c.w. contacts were made between Northern G and Russia, Poland, Yugoslavia and Scandinavia —clear evidence of a very extensive opening.

Best DX

It is known that auroral events often exhibit several distinct active periods or phases, in this case the second phase, certainly in the Southern part of the UK, started during the following afternoon at approximately 1330. Once again the appearance of strong auroral note c.w. heralded the start of the fun, which continued throughout the afternoon until at least 1900. Even after this time GB3SIX continued to be audible, with regular QSB, but unlike the previous day's emergence, signal peaks occurred at beam headings of up to 300°—some 60° west of true. Conversely, the northern stations were peaked more closely to true heading. Many stations throughout the UK took part in this second phase with many working squares never before contacted on v.h.f.

When conditions are so good it is only human nature to go for the best available DX and inevitably this produced some enormous pile-ups for all the GM, GI and EI stations. However, the "true" best DX probably occurred when Southern G stations exchanged full auroral reports. Dave G3PBV at Hennock near Exeter worked Brian G4WEY in Wimborne with 5/7A reports—both stations being nearly at the same latitude along the South

Coast and a very long way from the auroral curtain. Even GJ stations were heavily into the event—did it reach CT?

During such conditions the use of a directional antenna allows the best reflection point to be tracked but it was equally obvious that very modest power levels, some in the milliwatt range, and even indoor dipoles produced mouthwatering DX. Tony G3PFM (IO80) exchanged 5/9A reports with GM3JIJ at Stornoway (WS69C) on the Outer Hebrides, remarkable to think that the GM station was using a barefoot FT-690 and a 4-element beam that was actually sat flat on his garage roof. Some London stations apparently worked 140 contacts during this event, taking full advantage of the much reduced auroral "scrambling" at 50MHz to use s.s.b. with "contest style" report exchanges. Towards the close of the auroral opening in the early hours of February 9 several contacts occurred by a mechanism labelled as auroral-E which can produce equivalent DX but without the tell-tale auroral rasp. Certainly the month of February had produced similar auroral events in years past so perhaps the start up date was indeed well planned.

Clearly the first few days on 50MHz produced far more than most ever expected, and has left many wondering about future propagation effects.

Les G4XMX in Manchester was one who anticipated the aurora. He had been warned by the Rutherford-Appleton Laboratory that a large X-ray flare had occurred on the visible disc on the sun at 0400 on February 4, following a progressive build up of solar noise during the previous two days. This noise is still clearly evident up to 144MHz as I write this on February 10, together with the attendant suppression of h.f. band propagation below 28MHz.

Those who took part or monitored this event are urged to send reports to Charlie Newton G2FKZ, the IARU co-ordinator, and also our own v.h.f. correspondent, Ron Ham.

50MHz NBS Yagi

As mentioned previously, the Yagi beam antenna used at G0API is based on NBS data. Constructional details are shown in Fig. 1 and should be easy to duplicate. The use of ready-made pressed aluminium boom-to-element clamps allows rigid construction and economy of materials as the element tubes are split at the clamp points.

The use of a 25mm diameter boom may be considered to be tempting fate but if formed from seamless tube of the type used for TV antenna masts and supported by guy ropes the structure is quite durable. The prototype has survived without mishap for nearly six months and remains straight.

Gamma matching techniques have proved to be a ready means of feeding from 50Ω unbalanced (coaxial) sources and the arrangement shown is simple, but effective. To avoid drilling and tapping the long lengths of ptfe which normally form the dielectric of the tubular matching section capacitor, this arrangement uses the centre conductor and dielectric from normal UR-67 coaxial cable. If you have an old Jaybeam 144MHz antenna element it will be found that the tube bore is a reasonably close fit on the cable. With the antenna elements clear of the ground, v.s.w.r. adjustments are made by sliding the aluminium shorting block along the capacitor tube/driven element. It should be possible to obtain a v.s.w.r. of below 1·3:1 over the bandwidth. Forward gain will be approximately 7dBd, with reasonable front to back ratio and a 3dB beamwidth of some 40°.

The boom-to-element clamps and suitable plastics element plugs, essential to prevent "organ pipe" resonance, can be obtained from Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset. Tel: (0202) 738232. ***PW***

ERRORS & UPDATES

PW Radio Programs—7 BBC-B "SATRACK"

Some users of this program have experienced problems concerning the year input routine, caused by the year being input as 1986 instead of 86 in the DATA part of the "S1" program.

The author, Norman Dilley G8YBT, has sent us the following modifications to the program to overcome the problem and also to extend the *Sidereal Time Table* to 1990. Follow the instructions exactly.

LOAD "S1" (Do not RUN)

Substitute LINE 54Ø with the following:

```
54Ø IF N=8 REPEAT PRINTAB
(0,1Ø); STRING$(38," "): PRINTAB
(3,1Ø); CHR$134; X$; CHR$131;
TAB(17);: INPUT Y3: PROCyrchk:
UNTIL Y3>8Ø AND Y3<91
```

LOAD "S2" (Do not RUN)

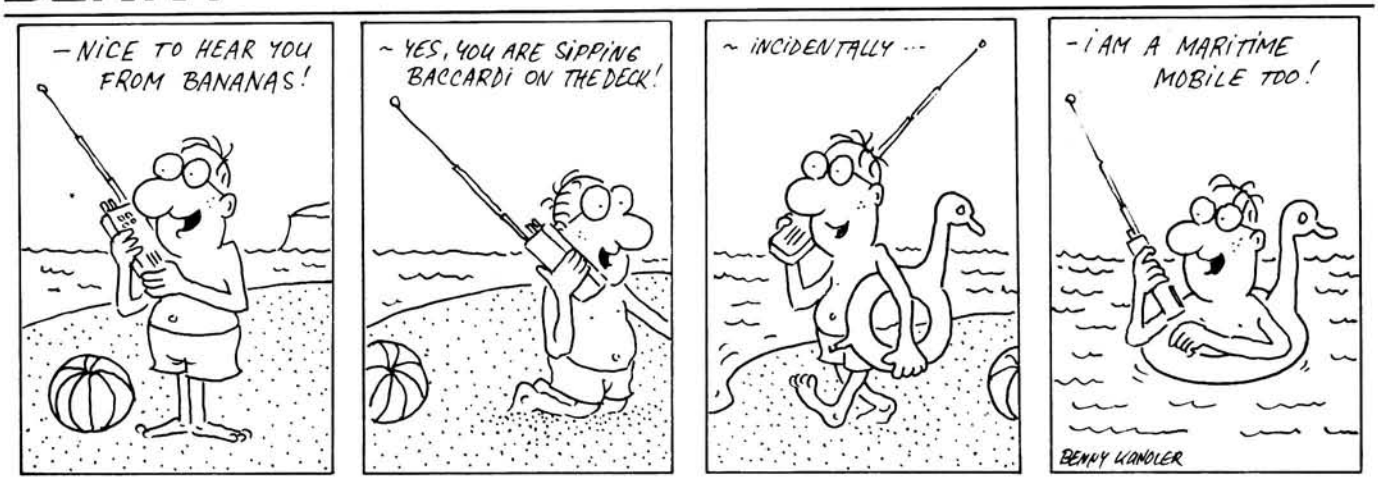
Add the following LINES:

```
1161 DATA 86,Ø-276Ø1916
1162 DATA 87,Ø-27535606
1163 DATA 88,Ø-27469296
1164 DATA 89,Ø-27676777
1165 DATA 90,Ø-2761Ø467
```

SAVE "S2"

"SATRACK" is recorded on the cassette in three parts, each part CHAINED to the next. To make a new copy of the program it is necessary to LOAD "SATRACK" and then SAVE "SATRACK" onto a clean tape. Next LOAD "S1" from the original tape, carry out the amendments and SAVE "S1" onto the new tape immediately following "SATRACK". Repeat this process for "S2". Note that you must LOAD, not CHAIN and that you must not RUN any of the programs after loading. If desired you can LIST any of the programs after LOADing them.

BENNY



Michael Faraday

NAMES from the PAST

by Tony Smith G4FAI

Sometimes referred to as the "father of electricity", Faraday's career as a scientist did not begin until he was 21. Born in 1791, he came from a poor family, and had very little formal education. At 14, he was apprenticed as a bookbinder, stationer and bookseller, and in this trade developed the manual dexterity and practical approach which distinguished his research in later years.

He read scientific books passing through his hands, and undertook such simple experiments as he could afford with a limited income. He attended four lectures by Sir Humphry Davy at the Royal Institution, using tickets given to him by a customer. He took careful notes which, using the skills of his trade, he bound and sent to Davy, asking his advice and assistance in commencing a scientific career.

In 1813, with Davy's support, he was appointed as a laboratory assistant at the Royal Institution. He accompanied Davy on a tour of Europe during the next two years, meeting some of the most famous scientists of the time, including Ampere and Volta. Returning home, he enthusiastically took up chemistry and by 1820 had acquired a reputation as an expert analyst.

That year, he was persuaded to review the electrical experiments and theories of others, following Oersted's recent discovery of electromagnetism. He was reluctant to turn from chemistry, but changed his attitude when he discovered that a magnetic pole would rotate around a wire, so long as a current flowed in the wire—in effect, the first primitive electric motor.

Director of the RI Lab

In 1825, he was appointed Director of the RI laboratory. He instituted the Friday evening discourses which helped popularise science amongst influential Victorians, and, in 1833, was made the Institution's first Fullerian professor of chemistry.

In 1831, both he and Joseph Henry (in the USA), working independently of each other, discovered the effects of electrical induction. Faraday wound an electromagnet on a thick iron ring, with two separate windings, one on each side of the ring. When a current was switched through the primary winding, a galvanometer, wired to the secondary coil, moved. Faraday published his findings first. The discovery of mutual inductance was credited to him, and that of self-inductance to Henry.

Faraday subsequently invented the

Photo courtesy of the Science Museum

dynamo, and this led to another field of research. There was much confusion at the time about the production of electricity from different sources, e.g. electrical machines (static electricity), voltaic cells, thermocouples, electric fishes, and now, the dynamo. It was generally believed that each had its own characteristics, resulting in different types of electricity. Faraday thought otherwise, and his work to prove this led to his laws of electrolysis, and the foundations of electrochemistry.

In 1839, after eight years of intense experimentation and intellectual effort, in which he had probed and expanded the known frontiers of electrical science, he suffered a nervous breakdown. For the next five years he concentrated on the affairs of the RI, and on less demanding scientific work. In 1845, he discovered the effect of a magnetic field on polarised light, known as the Faraday effect, and in 1846 published an early approach to the electromagnetic theory of light, later developed by Maxwell.

Illustrated Lectures

After 1850, he concentrated on teaching, and his lectures, illustrated by experiments, became famous. He resigned from the RI in 1862, and retired to a "grace and favour" house at Hampton Court, provided by Queen Victoria at the suggestion of Prince Albert, and there he died in August 1867.

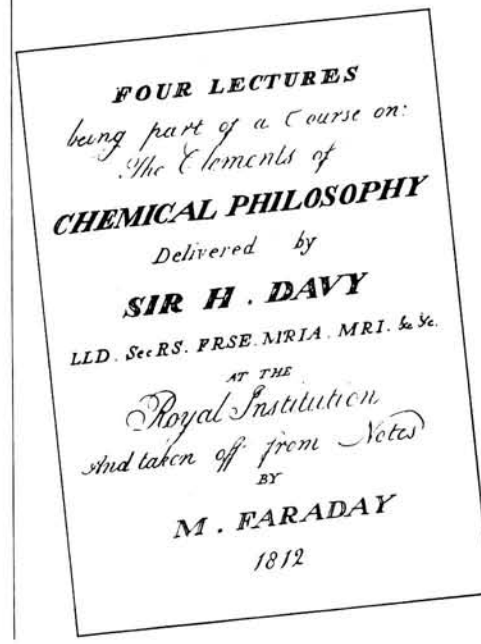
Noted above all else for his work on electromagnetism, his other scientific work was incredibly varied, and included the discovery of benzene, the experimental production of superior steel alloys, on which the later work of Bessemer and others was based, experiments on optical glass, and the condensation of gases.

With Sir Charles Lyell, a geologist, he investigated the cause of an explosion in a Durham coal-mine. He served on a committee set up to consider the preservation of paintings in the National Gallery, and studied the varnishes used to cover them.

He was consulted about preserving the Elgin Marbles in the British Museum and for many years lectured on chemistry at the Royal Military Academy, Woolwich. He was scientific adviser to Trinity House, and suggested new visual and aural warning systems for their lighthouses. He was one of the first Senators of London University, and declined the Presidency of the RI in 1864.

He was a deeply religious man, a member of a sect known as the Sandemanians, but he kept his work and his religion apart all his life. He is remembered today through the unit of electrical capacitance, named "farad" in his honour; by the Faraday medal, the highest award of the IEE; and by the various scientific laws named after him. He was one of the truly great pioneers of modern science.

From Michael Faraday of the Royal Institution *by Ronald King. Courtesy of The Royal Institution of GB, London.*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Royal Institution
And taken off from Notes
BY
M. FARADAY
1812

MODS No. 36 Roger Hall G4TNT (Sam)

What can the FT-2700RH do? Roger takes a look at some ideas.

FT-2700RH

The Yaesu FT-2700RH is a very versatile radio that has obviously been designed for worldwide use. Kris G8AUU, has been playing with one that was loaned to him by Bernie at A.R.E. Communications. He has discovered that it is possible to programme it to cover virtually every band that is available to amateurs anywhere. If you are anticipating taking yours abroad, Kris's mods will show you how to set the appropriate band edges and channel spacing.

To take the rig apart follow the instructions in the operating manual for fitting the optional FVS-1 voice synthesiser unit except for the front panel. This should be pivoted upwards on the upper pair of countersunk side mounting screws. This will hinge the front panel away from the wiring harness.

Unscrew and lay back the small switch panel and this will reveal the control unit p.c.b. on which the two v.l.s.i.c.s (Q4001 and Q4002) are located.

UHF Options

Just below the lefthand chip (Q4002—HD44750FM) there are three diode positions—D4013, D4014 and D4015. These are marked BJU0, BJU1 and BJU2 on the circuit diagram but only the two diodes, D4013 and D4014, are fitted. By using all three positions, eight options are available —see Table 1.

MODE 0
This is the u.h.f. inhibit mode.

MODE 1
This is for standard North American 440MHz operation.

MODE 2
This 430–450MHz version of Mode 1 is needed in the metropolitan areas of North America where 440MHz is overcrowded.

MODE 3
This is the standard IARU Region 1 version as supplied to the UK.

MODE 4
This is the same as Mode 3 apart from the repeater shift which is changed to ±7·6MHz, making it suitable for use on the extensive West German, Austrian and Swiss repeater network.

MODE 5
This is the version that is supplied to Australia and New Zealand.

MODE 6
This is the Japanese domestic version.

MODE 7
Mode 7 is the same as Mode 6 except for the channel spacing which is 5/10kHz instead of 10/20kHz.

VHF Options

Immediately below and just underneath the two i.c.s. (Q4001 and Q4002) are the fitting holes for diodes D4009, D4010, D4011 and D4012 and again only two (D4009 and D4012) are fitted. These diodes are marked BSV0, BSV1, BSV2 and BSV3 on the circuit diagram and Table 2 shows the sixteen options that are available by inserting the appropriate diodes.

MODE 0
In this mode v.h.f. is inhibited.

MODES 1, 2, 3 and 4
In these modes the frequency is locked to 151·600MHz and none of the v.h.f. controls are active.

MODE 5
This is probably for the Asian (India, Singapore and PR of China) market where the 144MHz band is only 2MHz wide instead of the usual 4MHz.

MODE 6
144–154MHz coverage as in Mode 7.

MODE 7
This is for both the North and South American markets. The only difference between type A and type E is the frequency of the tone burst (A = 1800Hz and B = 1750Hz).

MODE 8
140–150MHz coverage otherwise as Mode 7.

MODE 9
This version is the one that is supplied to the UK for standard Region 1 operation.

MODE 10
This mode gives standard New Zealand and Australian operation.

MODE 11
140–150MHz coverage otherwise as Mode 10.

MODE 12
144–154MHz coverage otherwise as Mode 10.

MODE 13
144–154MHz coverage otherwise as Mode 14.

MODE 14
This is the standard Japanese home market version but as there are no 144MHz band repeaters in Japan, the offset switch would be inhibited giving ▶

Table 1 ▼

Mode	BSV			Call 2 (MHz)				Rpt. (kHz)			Step			Band (MHz)		
	D4015	D4014	D4013	433·0	433·4	435·0	435·0	±1·6	±5·0	±7·6	10/5	20/10	25/12·5	430–440	430–450	440–450
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1
2	0	1	0	0	0	0	1	0	1	0	0	0	1	0	1	0
3	0	1	1	0	1	0	0	1	0	0	0	0	1	1	0	0
4	1	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0
5	1	0	1	0	0	1	0	0	1	0	0	0	1	1	0	0
6	1	1	0	1	0	0	0	0	1	0	0	1	0	1	0	0
7	1	1	1	1	0	0	0	0	1	0	1	0	0	0	1	0

Table 2 ▶

Mode	BSV				Call 1			Rpt. (kHz)	Step (kHz)			Band (MHz)			
	D4012	D4011	D4010	D4009	145·0	147·0	151·6	±600	10/5	20/10	25/12·5	144–146	144–148	140–150	144–154
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
3	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0
4	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
5	0	1	0	1	1	0	0	1	1	0	0	1	0	0	0
6	0	1	1	0	0	1	0	1	1	0	0	0	0	0	1
7	0	1	1	1	0	1	0	1	1	0	0	0	1	0	0
8	1	0	0	0	0	1	0	1	1	0	0	0	0	1	0
9	1	0	0	1	1	0	0	1	0	0	1	1	0	0	0
10	1	0	1	0	0	1	0	1	0	0	1	0	1	0	0
11	1	0	1	1	0	1	0	1	0	0	1	0	0	1	0
12	1	1	0	0	0	1	0	1	0	0	1	0	0	0	1
13	1	1	0	1	1	0	0	1	0	1	0	0	0	0	1
14	1	1	1	0	1	0	0	1	0	1	0	1	0	0	0
15	1	1	1	1	1	0	0	1	0	1	0	0	0	0	1

only single frequency operation.

MODE 15

144–154MHz coverage otherwise as Mode 14.

As you can see, putting the right diodes into the FT-2700RH will make it work almost anywhere! Thanks for passing on the information Kris.

Wanted

I have had several enquiries from readers who want to know more about interfacing their radios—usually scanners, with their computers. With modern scanners such as the AOR AR2002 or the Icom R7000 this is very easy to do because the manufacturers have not only provided sockets on the back of these sets, they have also recently brought out interfaces that will allow almost any computer that has RS232 to be used to control the radio. This seems to be the way that amateur radio is going to go and nearly all of the new h.f. radios will have facilities for interfacing, as have some of the new 2m base stations that I have seen. We will be telling you more about the AOR and Icom interface units and the ingenious software that is already available as soon as possible—hopefully in the next issue, but in the meantime I would be interested in hearing from anyone who has managed to link up one of the older style scanners (Bearcat, SX-200, Saiko and so on) to any form of external controller. I will then gladly pass on the information through these pages to those of you who have expressed an interest.

Till next time—73's de G4TNT.

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

If you have a mod that you would like to pass on or if you have a request for a mod that you would like to carry out, please write to me at this address: R. S. Hall, Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP.

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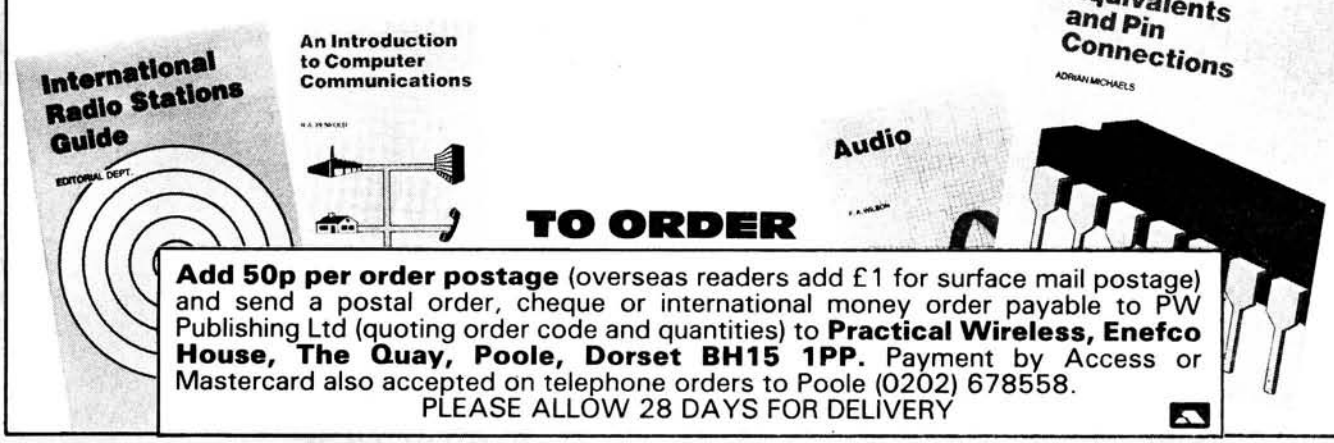

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Compiled by Eric Dowdeswell G4AR
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PLEASE MARK "CLUB NEWS"

Avon

South Bristol ARC: Len Baker G4RZY (Whitcurch 834282). Meets Wednesdays, 7.30pm in Whitchurch Folkhouse, East Dundry Road, Whitchurch.

Bedfordshire

Bedford & District ARC: Chris Lenn G4VHF (Bedford 751763). Meets 1st and 3rd Thursdays, 8pm in Allen's Club, Hurst Grove, Queens Park, Bedford. June 19—Propagation and the weather by Jim Bacon.
Dunstable Down RC: Philip Morris G6EES (Dunstable 607623). Meets Fridays, 8pm in Room 3, Chews House, 77 High Street South, Dunstable. June 6—Wire Antennas by G3WLM; 20th—"The Scene of the Crime".

Berkshire

Maidenhead & District ARC: Bob Fowler G3IQF (Marlow 6421). Meets 1st and 3rd Tuesdays, 7.30pm in the Red Cross Hall, The Crescent, Maidenhead.
Newbury & District RS: M. J. Fereday G3VOW (Newbury 43048). Meets 2nd Tuesdays in Newbury Technical College. June 10—Intermodulation, Phase Noise and Dynamic Range by G3RZP.

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. June 9—Long Range Aircraft by USAF.

Cambridgeshire

Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848). Meets 4th Thursdays, 7.30pm in Southfields Junior School, Stanground, Peterborough.

Cheshire

Chester & District ARS: Dave Hicks G6IFA (Chester 336639). Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm in the Chester RUFC, Hare Lane, Vicars Cross, Chester. June 10—Surplus Equipment Sale; 17th—Barbecue, bring your own steaks; 24th—Cellular Radio by GW1ATZ.

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. 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. June 8—DF Hunt.

Cumbria

Solway RC: D. G. Rayner G0AFP (Cockermouth 826461). Meets Wednesdays in the Maryport Educational Settlement, High Street, Maryport.
South Lakeland ARS: Dave Warburton G6LKB (Barrow-in-Furness 54982). Meets 1st and 3rd Thursdays, 8pm in the Norweb S&SC, Ormsgill Hotel, Barrow-in-Furness.
Westmorland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal. Meets 2nd Tuesdays, 8pm in the Strickland Arms, Sizergh, nr Kendal.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Fridays, 7.30pm in the Cavalier Inn, West Street, Axminster. August 1st—Family Picnic.
Plymouth Polytechnic ARS: Darren Salter G1ERM, 92 Alma Road, Pennycomequick, Plymouth. Meets Wednesday afternoons in the Science Block, top floor.
Tiverton (SW) RC: G. Draper G4ZNV (Crediton 235). Meets Tuesdays, 7.30pm in the Half Moon Inn, Fore Street, Tiverton.
Torbay ARS: Brian Wall G1EUA (Teignmouth 78554). Meets Fridays and last Saturdays, 7.30pm in the ECCSC, Ringslade Road, Highweek, Newton Abbot. June 27—Wine-making by G0BAJ: 28th—Special Event Station GB4PP.

Dorset

Flight Refuelling ARS: Ashley Hulme (Bournemouth 872503). Meets Sundays, 7.30pm at the FR S&SC, Merley, Wimborne. June 22—Lecture by G4WHO; July 6—RSGB Video; 20th—ATUs by G3RZP.
Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Fridays, 7.30pm in Commander House, Constitution Hill Road, Poole. June 27—Antenna Rigging Time for G4PRS.

County Down

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

Dumfries & Galloway

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

Dyfed

Aberporth RAC: Frank Thomas GW6RDR (Cardigan 87274). Meets Thursdays, 7pm in Building 17, Royal Aircraft Establishment, Aberporth.
Pembrokeshire RS: Paul Delaney (Letterston 840249). Meets alternate Thursdays in the FE Centre, Tower Hill, Haverfordwest.

Essex

Havering & District RC: D. S. J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm in Fairkytes, Billet Lane, Hornchurch. June 11—Best Crystal Set Competition; 18th—Talk by G5RV; 25th—Meteor Scatter Operation by G8VR.
Southend & District RS: Brian Wood G4RDS (South Benfleet 50494). Meets Fridays, 7.30pm in The Rocheway Centre, Rocheway, Rochford.

Fife

Dunfermline RS: Donald Ingram GM1OIN (Inverkeithing 414283). Meets Thursdays, 8pm in the Outh Wireless Station. Transport from Dunfermline arranged if required.
Glenrothes & District ARC: Anne Edmondson GM4TCW (Glentrothes 744449). Meets Wednesdays and 3rd Sundays, 7.30pm in Provosts Land, Leslie. Mondays—GM3YBQ gives theory lessons; Tuesdays—GM3AFQ gives code classes.

Glamorgan

Rhondda ARS: John Howells GW4BUZ (Tonypandy 432542). Meets Thursdays. 7.30pm in the NUM Club, Tonypandy. June 26—Tape Slide Lecture.

Gloucestershire

Cirencester & District ARC: G. R. Hayter G0AZD (Cirencester 5015). Meets alternate Thursdays, 8pm in the Phoenix Centre, Cirencester.

Grampian

Aberdeen RS: Don Travis GM4GXD (Pitcapple 251). Meets Fridays, 7.30pm at 35 Thistle Lane, Aberdeen. June 13—Super Sale of Good Equipment; 20th—Talks by Winners of Home-brew Competition; July 4—Junk Sale.

Greater Manchester

West Manchester RC: Dave Comac G1IOO (Bolton 24104). Meets Wednesdays, 8pm in the Astley and Tyldesley MW, Meanley Road, Gin Pit Village, Astley.
Stockport RS: Mel Betts G4FFW (061-224 7880). Meets 2nd and 4th Wednesdays, 8pm in the Magnet Inn, Wellington Road, Stockport. Informal gathering on 3rd Wednesdays.
Trafford ARC: Graham Oldfield G1IJK (Urmston 9804). Meets Thursdays, 7.30pm in the TS de Trafford, Sea Cadet Corp, Bradshaw Lane, Stretford.

Gwent

Abergavenny & Nevill Hall ARC: J. B. Davies GW4XQH (Abergavenny 4655). Meets Thursdays, 7.30pm in Pen-Y-Fal Hospital above Male Ward 2. 1st Thursdays—Video Matters. Club is a registered RAE centre.
Pontypool ARS: Ivor Wilkinson GW4RJA (Cwmbran 72110). Meets Tuesdays, 7pm in The Settlement, Rockhill Road, Pontypool.

Gwynedd

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

Hampshire

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

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

Fareham & District ARC: Alan Chester (Fareham 288139). Meets Wednesdays, 7.30pm in the Porchester CC, Westlands Grove, Porchester. June 18—Basic Digital Techniques by G4ITF; July 2—Weather Satellites by G8VOI.

Farnborough & District RS: Peter Taylor G4MBZ, 12 Dunbar Road, Paddock Hill, Frimley, Camberley. Meets 2nd and 4th Wednesdays, 7.30pm in the Railway Enthusiasts Club, Access Road, Hawley Lane, Farnborough.

Horndean & District ARC: Dan Barnard G4RLE, 36 Guildford Road, Fratton, Portsmouth. Meets 1st Thursdays, 8pm in Marchiston Hall, London Road, Horndean. July 3—Special talk by G6NZ.

Three Counties ARC: Keith Tupman G0BTU (Petersfield 66489). Meets alternate Wednesdays, 8pm in The Railway Hotel, Liphook. June 7—Lurgashall Fete Station; 11th—Cellular Radio by G0TDW; 25th—Computer Time; 28th—Summer Barbeque.

Hereford & Worcester

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

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

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

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

Hertfordshire

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.

Humberside

Grimsby ARS: George Smith G4EBK (Grimsby 887720). Meets Thursdays, 7pm in the Cromwell SC, Cromwell Road, Grimsby. June 12—RTTY Demo; 19th—Treasure Hunt; July 3—DF Hunt.

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

Scunthorpe ARC: G. Parkin-Coates G6OSA (Doncaster 873827). Meets Tuesdays, 8pm in the Hobbies Centre, Grange Farm, Franklin Crescent, Scunthorpe.

Kent

Biggin Hill ARC: Bob Senft G0AMP (Farnborough 57848). Meets 3rd Tuesdays, 8.30pm in Downe Village Hall, High Street, Downe. June 17—Moonbounce Operation.

Bredhurst R&TS: J. Scott G4ZTF (Medway 374670). Meets Thursdays, 8.15pm in Parkwood CC, Parkwood Green, Rainham.

Dartford Heath DF Club: Peter B. Sharman G8DYF (Greenhithe 844467). Meets at the Horse & Groom, Leyton Cross, Nr Dartford Heath prior to the hunt, next pre-hunt meeting July 1. June 8—Club Hunt; 15th and 29th—RSGB Hunts.

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

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

SE Kent YMCA ARC: John Dobson (Dover 211638). Meets Wednesdays, 7.45pm in the Dover YMCA, Godwynehurst, Leyburne Road, Dover. June 11—Top Band Fox Hunt starting at 1930; 18th—Natter Nite; 25th—Setting up Portable Equipment for Outdoors Operations; July 2—Natter Nite.

West Kent ARS: Nigel Peacock G4KIU (Tunbridge Wells 33586). Meets Fridays, 8pm in the AEC Annex, Quarry Road, Tunbridge Wells.

Lancashire

Morecambe Bay ARS: W.E. Delamere G3PER (Heysham 52659). Meets Mondays, 7.30pm in the canteen, Luneside Eng. Co., Mill Lane, Halton. June 9—SSTV by G0AUF; 23rd—RAYNET.

Preston ARS: George Earnshaw G3ZXC (Preston 718175). Meets 2nd and 4th Thursdays, 7.45pm in the Lonsdale Club, Fulwood. June 19—Analysis by G3ZXC.

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

Rossendale Valley RC: Bernard Murray G4VVK (Rossendale 229026). Meets Thursdays 8pm in the Bishops Blaize Hotel, Rawtenstall, on the A56.

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

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

Lincolnshire

Bourne ARS: A. T. Johnson G4RQK (078-087 326). Meets 1st and 3rd Tuesdays in Edenham Village Hall, Edenham, Bourne.

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. June 17—Receiver Design.

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

Grafton RS: John Kaine G4RPK, 74 Camden Mews, London NW1. Meets 2nd and 4th Fridays, 8pm in the Haringey Sea Cadet Corp, Training Ship Wizard, White Hart Lane, Wood Lane, London N22.

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. June 13—Judging the Construction Contest; 27th—Space Exploration of the Solar System by Dr Gary Hunt.

Lothian

Lothian RS: Robin Thompson GM4YPL (Winchburgh 890177). Meets 2nd and 4th Wednesdays, 7.30pm in the Harwell House Hotel, Ettrick Drive, Edinburgh. June 11—AGM.

Merseyside

Wirral & District ARC: Peter Morton G6CGJ (051-677 7376). Meets 2nd and 4th Wednesdays, 8pm in Irby Cricket Club, Mill Hill Road, Irby. June 11—Practice DF Hunt; Troposcatter Comms in the Oil Industry and in Amateur Operations Film.

Northamptonshire

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

Nottinghamshire

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

ARC of Nottingham: Ian Miller G4JAE (Nottingham 232604). Meets Thursdays, 7.30pm in the Sherwood CC, Woodthorpe House, Mansfield Road, Nottingham. June 12—QRP Construction and Operation by G4JAE and G4DVW; 19th—430MHz DF Hunt; 26th—Summer Junk Sale.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets 2nd and 4th Tuesdays, 7.30pm in the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop. June 17—Mystery Lecture Night; July 3—Visit to Newark RC.

Shropshire

Salop ARS: Simon Price G0EIY (Shrewsbury 67799). Meets Thursdays, 8pm in the Olde Bucks Head, Frankwell, Shrewsbury. June 12—Receiver Techniques by G3EWZ; 26th—Operation via Satellites by G3MWQ.

Somerset

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm in the Recreation Centre, Chilton Grove, Yeovil. June 12—Phase by G3MYM; 19th—Anonalous HF Propagation; July 3—Daytime Propagation on 80m.

Staffordshire

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

Suffolk

Felixstowe & District ARS: Paul Whiting G4YQC (Ipswich 642595). Meets 2nd and 4th Mondays, 8pm in the Feathers, Walton High Street, Felixstowe. June 16—Social Evening; 30th—Talk.

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

Surrey

Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays and last Thursdays, 7.45pm in St Swithuns Church Hall, Grovelands Road, Purley, Surrey. June 9—Open Evening with v.h.f., h.f., RTTY and ATV.

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. June 20—Quiz with Coulsdon ATS; 29th—Visit to Longleat Rally.

Sussex

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

Hall, Chichester. Next meetings—June 5 and 19th. No meetings in July and August.
Crawley ARC: David Hill G4IQM (Crawley 882641). Meets 2nd and 4th Wednesdays, 8pm in the United Reform Church, Ifield Drive, Ifield. June 25—Weather satellites by G4TVC.
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. June 18—Medical Electronics.
Horsham ARC: Paul Drawmer G4YFY, Treforest, Dragon Green, Shipley. Meets 1st Thursdays, 8pm in the Girl Guides HQ, Denne Road, Horsham. July 3—HF Antennas and Feed Systems.
Southdown ARS: R. Evans G4VOS (Heathfield 3168). Meets 1st Monday, 7.30pm in Chaseley Home, Southcliff, Eastbourne and Tuesdays and Fridays in the Wealdon Council Offices, Vicarage Field, Hailsham.

Tyneside

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

Warwickshire

Rugby ATS: Kevin Marriott G8TWH, 41 Foxon's Barn Road, Brownsover, Rugby. Meets Tuesdays, 7.30pm in the Cricket Pavilion, BTI Radio Station, "B" Entrance, Hillmorton, Rugby.
Stratford-upon-Avon & District ARC: David Boocock G8OVC (S-u-A 750584). Meets 2nd and 4th Mondays, 7.30pm in the Baptist Church, Payton Street, S-u-A. June 9—Talk on Royal Signals & Radar Establishment; 23rd—CAD PCBs by G0CHO.
Mid-Warwickshire ARS: Stan Hobbs G6XRI (Kenilworth 53099). Meets 2nd and 4th Tuesdays, 8pm at 61 Emscote Road. June 10—DF Hunt and Barbeque; 24th—Chassis Bashing.

West Midlands

Dudley ARC: John Tisdale G4NRA (Kingswinford 278300). Meets 1st, 2nd and 4th Mondays, 7.45pm in the Allied Centre, Greenman Alley, off Tower Street, Dudley. June 23—Halley's Comet by Dave Harris.
Mirfield RC: C. Marks G4ZPJ, 63 Alvis Walk, Chelmsley Wood, Birmingham. Meets Mondays, Tuesdays, Wednesdays and Thursdays, 7pm in the Mirfield CC, Yockleton Road, Lea Village, Birmingham.
Sandwell ARC: Malcolm Strong G4UMY (021-422 1554). Meets Mondays and Thursdays, 7.30pm in the Club Rooms, Broadway, Oldbury, Warley. June 30—Amateur Radio on the Burma Railway by G3BA.
Willenhall & District ARS: John Phillips G4UPF (Wombourne 782076). Meets Wednesdays, 8pm in the Cross Keys, Prouds Lane, Willenhall.
Wolverhampton ARS: Keith Jenkinson G1OIA (Wolverhampton 24870). Meets Tuesdays, 8pm in the Wolverhampton Electricity S&SC, St Marks Road, Chapel Ash, Wolverhampton. June 7/8—Demo Station at 21st Tipton Carnival & Show; 17th—Lightning Protection; 22nd—DF Hunt from Tettenhall Rock at 11am; 24th Problems Solved Time.

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

Wiltshire

Devizes & District ARS: Peter Greed G3MQD, 18 Nursteed Park, Devizes. Meets Fridays, 8pm in the Devizes Football SC, Devizes.
Salisbury R&ES: Neil Underwood G4LDR (Salisbury 22809). Meets Tuesdays, 7.30pm in Grosvenor House, Churchfield Road, Salisbury.
Trowbridge & District ARS: Gerry Callaghan G4SPE (Westbury 4532). Meets 4th Tuesdays, 8pm in Southwick Village Hall, Nr Trowbridge.

Yorkshire

Halifax & District ARS: D. L. Moss G0DLM (Halifax 202306). Meets 3rd Tuesdays, 7.30pm in The Running Man, Pellon Lane, Halifax. June 17—RTTY Working Demo by G4KGS & G4MLW.
Pontefract & District ARS: Colin Mills G0AAO (Pontefract 43101). Meets Thursdays, 8pm in the Carleton CC, Pontefract.
Sheffield ARS: Peter Day G3PHO (Sheffield 681216). Meets 1st and 2nd Mondays, Firth Park Pavilion.
Spen Valley ARS: Tim Clough G4PHR (Mirfield 499397). Meets Thursdays, 8pm in the Old Bank WMC, Mirfield. June 19—DF Hunt against N. Wakefield ARS.
Wakefield & District RS: Walter Parkin G8PBE (Wakefield 378727). Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. June 10—DF Hunt.
North Wakefield RC: S. Thompson G4RCH (Morley 536633). Meets Thursdays, 8pm in the Carr Gate WMC, Lawns Lane, Wakefield. June 19—DF Hunt and Barbeque.

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

Readers can hardly have failed to notice the recent hullabaloo over the introduction of the new amateur band allocation at 50MHz. Some may wonder why so much fuss is being made over the maximum power that may be transmitted and the seemingly complicated way in which it has to be calculated.

In the earlier days of amateur radio the d.c. power input to the valve delivering power to the antenna was a very simple means of stating transmitter power. Knowing the p.a. anode current and the anode voltage enabled the power to be calculated. For example, an 813 p.a. valve with 1000V on the anode and passing an anode current of 150mA had an input of 150W, the maximum allowed on the h.f. bands then, with a limit of 10W on the 1·8MHz band.

Now, the requirement is based on r.f. power output described in decibels, relative to a watt or dBW. On the new 50MHz band not only must the transmitter power output be known but also the loss in the feeder between the p.a. and the antenna, and the gain of the antenna system. The reason for this is that UK 50MHz stations must not be allowed to interfere with certain Continental TV broadcast stations in the same band. If interference does occur with any regularity our 50MHz allocation might well be withdrawn.

Reference to dB tables will show for example, that 9dBW, the maximum carrier output on the 1·8MHz (160m) band, corresponds to 8W. On the h.f. bands (except the WARC bands) it is 20dBW or 100W output. The corresponding maximum output power on s.s.b. would be 400W (26dBW) peak envelope power or p.e.p. as it is commonly called.

Reverting to the requirements on 50MHz the transmitter output can be measured with a power meter suitable for use at that frequency, while coaxial feeder loss may be calculated by reference to tables to be found in AR handbooks or obtained from the cable retailer. This loss is usually expressed in dB per 100m and must be deducted from the transmitter output power to obtain the power at the feedpoint of the antenna.

The antenna for 50MHz will almost certainly be a Yagi beam, the gain in dB being found in the manufacturer's literature and added to the power at the antenna feedpoint. Note that the antenna gain must be expressed in dBd meaning decibels relative to a half-wave dipole. The resulting power is known as the effective radiated power (e.r.p.) in a given direction.

On the 50MHz band the maximum e.r.p. is 14dBW carrier power, or 20dBW p.e.p., corresponding to 25W carrier or 100W p.e.p. The antenna must be horizontally polarised, and not exceed a height of 20 metres above ground level. All rather complicated but if the conditions are adhered to it will ensure that we keep our new 50MHz allocation.

General

During the Greenwich Festival on Sat/Sun, June 14/15, the Cray Valley Radio Society will be running the special event station GB2GF on behalf of the Festival. Operation is being arranged for both the h.f. and v.h.f. bands and special QSL cards will be available for all contacts and reports. Further details from Owen Cross G4DFI, 28 Garden Avenue, Bexleyheath, Kent.

An interesting letter from J. T. Joyce G4JTJ, chairman of the Bedford & District Radio Club on how to run a club properly. He comments that over the last few years his club "sank into the doldrums of a beer-swilling club, mainly as a result of not offering a programme". The club supports three repeater stations which tended to act as a meeting spot instead of the club. Now the club is on its feet again with the target set to provide a more formal atmosphere and to ensure that there is always a talk or demonstration organised for meeting nights.

He goes on to say that this policy is proving successful so far. His final point is that in order to sustain a variety of talks and demos the club has co-ordinated its programme with other clubs with a view to providing a "library" of events which can be drawn upon as necessary. Club committees, read, learn and inwardly digest!

During Fri/Sat/Sun, June 20/22, the 200-year anniversary of the Methodist Missionary Society will be celebrated at Trentham Gardens, Trentham, North Staffs, by the World Association of Christian Radio Amateurs and Listeners with special event station GB8MM on the h.f. and v.h.f. bands plus a special commemorative QSL for all contacts. Full details of the event and of WACRAL activities from Brian Hancock G4NPM on 0795 873147 or drop a line to him at "Leahurst", Augustine Road, Minster, Sheerness, Kent.

DX Bands

Phil Dykes G4XYX of Poole, Dorset, comments on some good openings heard on the 28MHz band of late, mainly to South America and Africa and wonders if this is a sign of things looking up. Personally speaking I don't think it is, as north/south propagation tends to come good on the band from time to time during sunspot minimum. The sunspot count is still hovering around the zero mark and the 1·8 and 3·5MHz bands are still producing excellent DX. Phil has been away from home a lot recently so his log consists of c.w. QRP contacts on 7MHz, like EI4DZ, KB1DA, LX1DA, UC2SLX, WA1GAG and W4XJ, all with 3W input and a vertical antenna.

"Oh! the pain!" comments **Marcus Walden** of Harrogate, on his efforts to copy c.w. on the amateur bands, where callsigns are often repeated several times which is most helpful for the beginner. However, back to s.s.b. where Marcus caught VO1FG around 3·8MHz, with EA9FU on 7MHz. The 14MHz band produced just HH7PV for a good one, and on to 21MHz and NP4CC, TR0A, TU2PX and ZS6CAN, all on a DX302 and 20m-long antenna in the attic.

Arthur Greenwood BRS86966 of Rochdale has been busy on most of the h.f. bands with his R600 receiver and 20m-long wire, finding 9L3MW, a Reformed Church missionary, on 21MHz. On 14MHz the log starts with TA1I, TY5EG, T52KEZ and V3VEL, and on to 7MHz and TI2WW and TK5BF. More on and around 3·8MHz with J6LMY, KH6F, OJ4CK, TI2CCC, V3GJ, VE3MV, ZL2AGV and ZL4AP all about 0630Z. Arthur will have had a go at the RAE by now so let's hope he has made it. He is very active learning the code at his local club.

Andy Durrant (Aldershot, Hants) has now added a Jaybeam VR3 for 7/14/21MHz on the receiving side with his FRG-8800/FRT-7700 combination and did well around 3·8MHz with EA8BLO, I2JSB/EA5, OE5JTL/YK, OY5NS, VK2ABN, 6W1CK, VK2AVN, VK7AE, 3A2AH and 4X4JO mostly between 2100Z and midnight. Up to 7MHz and NP4A with cards to W3HNK, OD5AS and YV5DPO. The popular 14MHz band produced AI2C/4, EA8BBP, KP2AH, OD5AO, TA1D, VE8RKS of the Polar radio club at Alert, NWT with cards to MPO 310, Belleville KOK 350, VP2EZ, VP2MCG and 5Z4MR all evening catches. CT3AF and EA8BED were all of any note on the 21MHz band.

For those readers interested in low-power operation the G-QRP Club is running a "Summer Ramble" activity event on June 14 to 22 this year, hopefully to become an annual event, so watch all the QRP spot frequencies.

Snippets of news say DL2YAG/SV5 is on 14MHz around 2300Z and that BY0AA is on c.w. on 14·029MHz around 1130Z with a YL operator.

Using a Panasonic DR49 and an AD370 antenna in Bolton, Lancs, **Michael Sargeant** did well to capture CR8CDC, N6MCD/OX, VE7RVT, V44KAC, ZL3MF, 3D6VU and 5H3HM all on 14MHz s.s.b. The 21MHz area produced A22BK, A4XZF, CP6NU, EL3AA, HZ1HZ, J28DN, TA2G, VU2ZAP, ZS6NK, 8R1RPN and finally 9J2BO.

Robert Watters of St Austell, Cornwall, runs a Yaesu FRG-7700 and FRT-7700 a.t.u. fed from a 20m-long L-shaped antenna and feels that the 21MHz band has improved of late with entries such as LU8DWR, SV5TS, YC0BW, YV5AGM and 4X6KJ. Bob looks forward to the time when he can hear all the activity promised on the 21 and 28MHz bands when the solar cycle starts rising again. Don't we all! On 14MHz Bob logged VK6WC, VK5MS, JA1CIA and JH1IED and PY1BJ.

With 94 countries now confirmed **M. Dunn BRS86500** of Grimsby is busy

sending off for various awards, helped by the arrival of cards from SV5TS, A22BW, A4XJZ, 9H1ED and 9U5JB. Melvyn has an FRG-7700 and 40m of antenna wire to capture such as T77C on Top Band, plus PY0FG (QSL POB 10, Fernando da Noronha), 4X6TT, and TA1E with QSLs to POB 294 Istanbul on 3·8MHz. The noisy 7MHz band came good with HC5EA (QSL K8LJG), YV3AA, VP2EC (QSL N5AU), and D44BC QSLs to POB 36, Mindelo, Cape Verde Islands. Good catches on 14MHz included such as PJ7ARI (QSL POB 142, Saint Maarten), HV3SJ, (QSL I0DUD), VP9KK, and 5N0HFW with cards to WB2LCH. Finally, on 21MHz, YB3CDL, TR0A, 5N8AFE (QSL POB 12635, Kano) and HZ1HZ with reports to N7RO.

George Hitchins BRS88435 (Frimley, Surrey) comments on the VK/G Net on 10·128MHz s.s.b., mentioning VK7AK in particular. George has a Panasonic RF3100LBE receiver and a loft wire 20m long. Outstanding on 7MHz were DU6UA and NP4A while CM0CQV, KL7X, TU2JU (QSL POB 120, Abidjan), V85GI, 6T2BA (Sudan), 9L1IS, 5V7QL very strong indeed (and wondering if he is legitimate), all on 14MHz. Outstanding on 21MHz were LU1DDS, PT7CB, YC8GH, YV2CCT, ZS1AAJ, 5N4RTF and 5X5GK.

Fred Tagg up in Nottingham bought a trapped dipole, twin feeder and a dipole/Marconi switched balun from the G2DYM organisation and was delighted to note that as a dipole it greatly reduced electrical QRM and improved signal strengths. The principle expounded by G2DYM of keeping everything symmetrical has certainly proved effective in many similar situations. Fred has an Icom R71 receiver and logged KW0A, VO1PK, XT2BR and ZB2HG (QSLs POB 292, Gibraltar) on the 3·8MHz spot. On 7MHz c.w. it was CO7HC, PU7IAL and WT4K/MM in position 31°N, 41°W. Stuff found on 14MHz s.s.b. included HH7PV, JH1LPF, KA9TWZ/AG, PY2BD, VP2MJ (QSL to VE3XZO), VU2BEJ, 5T5SL (QSL DL8DF), 5Z4EO (QSL DJ5JRT) and KP2AH (QSL WA2YMX) who said he hopes to be active on 1·8MHz with a 15 metre-tall vertical antenna. On 14MHz c.w. it was ZD8KM who wants cards via G3IFB. Catches on 21MHz s.s.b. were FM5BX (QSL POB 152, Fort de France), YC3DSJ (QSL POB 490, Surubaya), YC1FR (QSL POB 54, Jakarta) and 4X4HT.

Mention was made a while ago of an idea to form an association of people for the exchange of information and ideas between s.w.l.s, and as a result the International Listeners' Association has been formed with a membership of over 60 at the start. A register of members will be built up and, at present, there are no membership fees. It is intended to issue a quarterly newsletter with updates of members' equipment, etc.

Intending members should send full name and address and details of equipment to Trevor Morgan GW4OXB, 1 Jersey Street, Hafod, Swansea, SA1 2HF, and it is pointed out that addresses will not be published or released outside the club. All inter-member mail will be sent via the above address.

Trevor has originated a number of awards for s.w.l.s including the Amateur Radio Prefix awards with certificates for logging 250 and 500 prefixes and engraved plaques for 1000 and 2000 prefixes. There are also the Lifeboat Award, the QRP Awards, and the Jamboree Awards in connection with the annual JOTA event. Full details of these awards from the above address of GW4OXB.

Readers are invited to send in regular logs of DX stations heard on the h.f. bands and they should reach me direct by the 15th of the month. A sample log sheet is available from me for an s.a.s.e. Good listening!

RTTY

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

by Ron Ham BRS15744

"Although there is no sign yet of a general upturn in solar activity, the h.f. bands have been lively enough to bring in a rich harvest of data mode loggings this month," writes **Len Fennelow G4ODH** in Wisbech. During the month prior to April 8 Len had a record haul of stations from over 60 countries on RTTY. He heard 27 stations on AMTOR including 12 new ones for him, Botswana, Cayman Is, Central African Republic, Ecuador, Equatorial Guinea, Kenya, Moldavia, Montserrat, Panama, Peru, St. Pierre and Uruguay. However, although the majority of these countries were logged around 14·090MHz, I am pleased to see that signals from Brazil, Canada, Canary Is, Chile, Equatorial Guinea, France, Italy and Spain were copied on 21MHz. "This lot, at a time of depressed solar conditions augurs well for future months when an increasing sun angle, with its attendant enhancement of F layer ionisation, should bring many an evening's pleasure to this fascinating hobby of Data DXing," said Len.

Between March 10 and April 7, **Bob Borzych G4WWD**, Liphook, exchanged AMTOR signals with KA9EDX, K0EPK, WB2TTC and VE3RX on 14MHz and A4XFW on 21MHz. At 1121 on April 5, he was the second QSO for SP9VU who was enjoying his first day using AMTOR. Bob also heard AMTOR signals from 11 other countries, ranging from Alaska to Australia on 14MHz and at midday on the 5th, he copied HB9BDM and both sides of a QSO between G4ZKJ and ZS6AAK on 21MHz.

I too had a good RTTY haul during the period, including signals from the Pacific area and several new prefixes. At 0849 on March 16, on 3·5 and 7MHz I copied, "This is the voice of the German Amateur Radio Teleprinter Group Inc.", announcing that their station was active on 3·585, 7·035 and 14·085MHz using 75 baud Baudot at 0900, 110 baud ASCII at 0930 and 45 baud Baudot at 1000. A few minutes later, on 14MHz, SP9HWN told an EA, "I am a member of the SPDX Club and Scouts Group of Tarnow."

During the evening of the 28th, I read, "End of RTTY Bulletin of PI4AA, Dutch National Amateur Radio Station PA0AA of the Society for Experimental Radio Research in the Netherlands." RTTY signals on 14MHz pounded into my QTH from JA4CMW, Fukuyama City, working a 4X4, at 0932 on March 21 and less strong, but very clear, came VK2BQS at 1436 on April 3.

"I have not heard the band in such good condition for a long time," commented HP1XAW to an IT9 on 14MHz, at 1947 on March 30, and he was absolutely correct because at 0839 on the 31st I logged, for the first time, ZK2JB on Niue Is. I saw his RTTY signal again at 1015 on April 5, saying "Good evening to you" to a station on Sardinia. I glanced at my world clock and realised that, as far as the ZK was concerned, the time was around 2200 on the 4th. Shortly after I noted that OH6MW

Country (Prefix)	Band (MHz) 3·5	7	14	21
Alaska (KL7)			X	
Argentina (LU)			X	
Australia (VK)			X	
Austria (OE)		X	X	
Balearic Is (EA6)			X	
Belgium (ON)			X	
Botswana (A2)			X	
Brazil (PP,PT,PU,PY)			X	X
Bulgaria (LZ)			X	
Canada (VE)			X	X
Canary Is (EA8)			X	X
Cayman Is (ZF)			X	
Central African Rep (TL)			X	
Ceuta & Melilla (EA9)			X	
Chile (CE)				X
Comoros (D6)			X	
Cuba (CO)			X	
Czechoslovakia (OK)		X	X	
Denmark (OZ)		X	X	
East Germany (DM, Y2-9)		X		
Ecuador (HC)			X	
Eire (EI)			X	
England (G)	X		X	
Equatorial Guinea (3C)				X
Estonia (UR2)			X	
Finland (OH)		X	X	
France (F)	X	X	X	X
Germany (DF,DJ,DK,DL)	X	X	X	
Gozo & Comino (9H4)			X	
Greece (SV)			X	
Greenland (HH)			X	
Haiti (HH)			X	
Israel (4X, 4Z)			X	
Italy (I)		X	X	X

Country (Prefix)	Band (MHz) 3·5	7	14	21
Japan (JA,JF,JR)			X	
Kenya (5Z)			X	
Lebanon (OD)			X	
Malta (9H)			X	X
Martinique (FM)			X	
Moldavia (UO5)			X	
Montserrat (VP2M)			X	
Netherlands (PA)	X		X	
Nigeria (5N)			X	
Norway (LA)	X		X	
Oman (A4)			X	
Panama (HP)			X	
Peru (OA)			X	
Poland (SP)			X	
Portugal (CT)			X	
Rhodes (SV)			X	
Rumania (YO)			X	
Sardinia (IS)			X	
Scotland (GM)			X	
Sicily (IT9)			X	
South Africa (ZS4-6)			X	
Spain (EA)	X	X	X	X
St Pierre (FP)			X	
Sweden (SM)	X	X	X	
Switzerland (HB)	X	X	X	
Turkey (TA)			X	
Ukraine (UT)			X	
Uruguay (CX)			X	
USA (N,K,W)			X	
USSR (UA,UB,UZ,RA)			X	
Venezuela (YV5)			X	
Wales (GW)			X	
Yugoslavia (YU)			X	

Fig. 1

was printing "CQ DX PACIFIC" and at 1029, I read both sides of a real northern QSO between stations in Greenland OX3CO and Sweden SM0KCR.

During the evening there was an opening to South America, because around 2000, I copied CO2BB in Cuba working into EI, DF and HB9 and heard several stations calling him. Within a few minutes I had logged signals from Brazil, Haiti, Suriname and Venezuela and a W4 saying he was, "From the Blugrass station of Kentucky". These reports should be good news for people like Andrew Salt G1SAC, in Sheffield, who is planning to use a BBC B computer for data communications.

I made a few sample checks on 14MHz during the BARTG RTTY contest in March and soon after 1113 on the 22nd, I had 5 countries, Austria, Finland, Italy, Japan and the USSR in the log. If one has the time, these events are fascinating and well worth entering. BARTG events usually cater for single or multi-operators and s.w.l.s. On several days during this period I copied signals from the EA8WP-Radio Bulletin Board Service and VK5BB, in Whyalla, working G at 0759 on April 6.

My thanks to Bob and Len for their detailed logs, which, coupled with my own RTTY efforts, enabled me to compile our monthly charts. Reference to Fig. 1, RTTY, shows that 8 countries were logged on 3·5MHz, 11 on 7MHz, 64 on 14MHz and 9 on 21MHz and, Fig. 2, AMTOR, indicates 3, 2, 27 and 6 countries respectively.

Country (Prefix)	Band (MHz) 3·5	7	14	21
Alaska (KL7)			X	
Australia (VK)			X	
Austria (OE)			X	
Brazil (PP,PT,PU,PY)			X	
Canada (VE)			X	
Canary Is (EA8)			X	X
Crete (SV9)			X	
Eire (EI)	X			
England (G)	X		X	X
Finland (OH)			X	
Germany (DF,DJ,DK,DL)	X	X		
Greenland (OX)			X	
Italy (I)		X	X	X
Japan (JA,JF,JR)			X	
Kuwait (9K)			X	
Mauritius (3B8)			X	
Netherlands (PA)			X	
Norway (LA)			X	
Poland (SP)			X	
Portugal (CT)			X	
Sicily (IT9)			X	
Singapore (9V)			X	
South Africa (ZS4-6)			X	X
Spain (EA)			X	X
Sudan (ST)			X	
Sweden (SM)			X	
Switzerland (HB)			X	X
USA (K,N,W)			X	
West Malaysia (9M2)			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

Gateway to Space

Readers may recall having read about the "Gateway" stations operating in the USA in the February 1985 *PW* (page 64) and of the experiments conducted in the UK by G4CUO and G4ZHG on page 55 of the March 1986 issue.

Although mobile to mobile operation through OSCAR-10 has been successfully demonstrated by the first QSO between G3PXT/M and G4CUO/M, it is normally only really feasible when the satellite is close to perigee, and when the modest powers and antennas of a mobile installation are not competing with the demands of fixed stations with high e.i.r.p. levels. Local ignition QRN can critically affect the readability, and it is no mean feat to finely tune Doppler shifting s.s.b. and match ones uplinks and downlinks whilst driving a car on our busy roads of today.

This is where the "Gateway" comes in, as a repeater with a difference, which can use a remote station to get the mobiles signal as an uplink to the satellite, and also retrieve the satellite downlink and pass it to the mobile as a good strong noise-free transmission requiring minimum driver adjustment. The problems that might evolve by closely linked harmonically related signals, and powerful adjacent transmitted signals in the same band as the weak satellite downlink have been overcome in an experimental station at Newark, by Dave G4CUO and John G4ZHG, who have demonstrated a feasible basic project that may lead to a number of permanent stations allowing worldwide inter-mobile v.h.f./u.h.f. contacts independent of propagational variables.

The Gateway station consists of three interdependent sections, as (1) The input from the local f.m. stations and the interface unit, (2) The uplink, and (3) The downlink.

(1) The Local Input: The input from local f.m. amateurs requires a fully quieting input on 144·575MHz, this choice of frequency showing no de-sensitisation by proximate mobiles of the satellite downlink 1·375MHz higher in the band. An FDK Q16 crystal controlled transceiver was used with a ground plane at 9m, giving coverage to Lincoln, Grantham and Doncaster all around 48km distant. (It was calculated that if the input was changed to the Lincoln repeater or "R5" (145·125 RX/145·725MHz TX) and a separation of 825kHz established, then coverage of some 96km would be possible. This has yet to be discussed with the Lincoln Repeater Group).

(2) The Uplink: The incoming f.m. signal from mobiles on the Q16 is audio coupled to the IC-451E set to 435·050MHz l.s.b. VOX controlled, and a 430MHz linear amplifier added to give the e.i.r.p. needed to produce a good downlink from the satellite. The signal was fed to a 430MHz 12-element XY RHCP array, with manual control of antenna position and r.f. level determined by a Spectrum computer using the OSCAR-10 program of GM4IHJ to give pointing, distance, DX in range, satellite position, Doppler, and all needed parameters.

(3) The Downlink: The signals from the satellite are received on an 8-element 144MHz XY RHCP array and fed via a MM144 pre-amplifier to an IC-211E. Both RX and TX have microprocessor frequency controls which can be remote controlled for frequency adjustments, Doppler shift, QRM, etc. The resultant audio from the downlink is fed to the Q16 and monitored by the operator, who also controls the TX switching, aligns the RX and TX frequencies, steers the antennas, announces the Gateway open, and explains the procedure to stations using the system.

This is the basis for the functional station, which by our licence requirements could be said to need licensed operator presence while in use, although technically could be fully computer controlled. By the use of even a small micro and suitable modems, frequency selection, uplink and downlink matching with Doppler correction adjustment, amplitude levels to match a given downlink strength, az-el auto antenna tracking, callsign indication, and a host of control commands could all be executed and put into effect by a group effort.

If any groups are interested in experimenting with their own local system, it is strongly recommended that they liaise with G4CUO, G4ZHG, and the RSGB Repeater Management Group who could in turn consult with the DTI with a view to establishing such facilities on a permanent basis.

As future satellites emigrate through u.h.f. toward s.h.f., and the cost and technical requirements of a single station escalate, the Gateway concept could be the means of large numbers of users sharing a common facility and installation costs to provide worldwide communications to small mobile and hand-held f.m. users.

Shuttle Scene

NASA has tentatively arranged a schedule of STS flights commencing on 5 February 1987, on the proviso that these are permitted following adequate correction of the problem that brought about the tragic *Challenger* disaster. May 1 is to be a highly secret military mission for which no details are obviously available, but June 25 is set for *Atlantis* to carry either a solar probe and/or the Galileo mission to Jupiter and its moons. July 23 is planned for the first launch of *Discovery* from the Vandenburg Air-Force base (from whence came the early OSCAR series) giving us high inclination, very visible passes in Northern Europe. *Atlantis* is planned to fly again on 17 September to carry the Hubble space telescope into space, and around 18 November to take up the "G-STAR" and the Indonesian "Palapa B-3" satellite. Finally, on 17 December, *Atlantis* flies again to take up the long awaited "TDRS", the Tracking Data and Relay Satellite that is used by the shuttles themselves for communications.

Sadly, but rather as expected, NASA listed no "ham-in-space" or "SAREX" (Shuttle Amateur-Radio Experiment) missions, as they seem to prefer to call them. Given time, it is to be hoped that these will resume, as the public relations aspect of these do much to make the enormous budget costs of the STS missions acceptable to many of the taxpayers who also happen to be radio amateurs. As even the major missions listed can be said to be no more than that which it is hoped to accomplish if all goes according to plan, it would be premature to assume any further ham activity within a year.

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the late October/early November DP0SL mission operated by DD6CF, DG2KM and PE1LFO has had its first audience. Stations uplinking on 437MHz f.m. to DP0SL were numerous on the tape, and resulted in a list containing mainly stations from the USA and Germany, plus some quite exotic call areas.

From the British Isles, the following stations were identified on the first playing of the tape recording:

EI6AS, G3AHX, G3IOR, G3RUH, G4FCD, G4RKV/A, G4VRC, G6HMS, G8SBF, GM6FPX, GM6JVC and GU4YMV.

The tape will be gone through very carefully in time, with good filters and sharp ears, at which time a further group of stations in the area will be identified and listed. These will be placed in a later issue, and if copy space permits, a complete listing will be given.

OSCAR-10

A number of our readers have asked why we have not been keeping them informed of the operating schedule times of A-O-10. The lack of information, we openly admit, is quite intentional, as with the rapid change of schedule mode "on" times every week or so, by the time the information is published it would be well outdated, and thus no longer true when seen. Until we come to a long zero-eclipse period, coupled with good behaviour of all of those stations currently louder than the beacon that has meant an additional "off" period close to apogee to conserve battery charge, there is no way in which a long advance plan can be given. Watch the 145·810MHz beacon and the numerous AMSAT nets, try the UoS bulletin telephone number given later in this issue, and these will give you the schedule changes on a topical basis.

Gradually the spacecraft is getting above our Northern European roof levels, and also coming into more sociable hours, at which times signals have been found to be quite good. New stations continued to be heard using the transponder, with VS5JA, TR8JLD, 7P8CM/3D8 and 7P8CF/3D8 adding to the one hundred and twenty DXCC countries now known to be active via OSCAR-10.

QSL's for 7P8DM and DF/3D6 go to Martin and John either via the 7P8 QSL Bureau or direct to Martin Broadway, P.O. Box 949, Maseru 100, Lesotho. CX2GB's QTH is Paul Rivero, Grito de Asencio 1581, Dolores, Soriano, Uruguay. CE8ABF, Alex, is operating from Tierra del Fuego, and can be QSL'd via LU8DPM, P.O. Box 7150, Ayacucho, Argentina. TZ6FE has DL4BC as a QSL Manager.

Orbital Elements

In this issue we shall additionally publish the Keplerian data for most of the Weather Satellites, as this seems to be becoming popular with many correspondents. These have been kindly supplied by keen satellite s.w.l. Birger Lindholm of Dalsbruk, Finland, from his NASA source. We shall attempt updates regularly enough to literally keep you in track.

Comments have arisen that the data supplied for MIR and Salyut-7 have resulted in those satellites being up to thirty minutes out from that predicted, although the other spacecraft elements gave passes which were found to be "spot-on". Rather as expected, and probably to avoid an unscheduled coupling, just before the Keplerian data was published in our last issue, MIR was jetted first up, and then later down by some 7km, and Salyut-7 was lifted by some 3km. This change meant an incremental additive that gave earlier and later pass times respectively. As these satellites are constantly being adjusted in their orbits, the parameter changes cannot be normally kept true for more than a week or so at the best, and if no topical update is to hand, then it is best to listen for the crew of MIR on 143·625MHz f.m. (no h.f. frequency yet) and to Salyut-7 when crewed on 142·420MHz. One can easily copy the strong 19·955MHz telemetry of Cosmos 1686 currently attached to Salyut-7, but beware sub-horizon and antipodal reception, particularly during the hours of daylight and high m.u.f. if you intend to use these passes to modify the elements to match.

As mentioned before, it is best to ignore the decay or drag factor as being useful for long term predictions, as if sustained the large manned orbiters would soon get into an even lower orbit, and merely provide short lived but excellent meteor-scatter communication.

The latest data, including the drag, will be published with this column, but please remember that by the time you read and apply it, quite a few changes could have occurred to the orbit height and hence the period, and considerable leeway of up to forty minutes either side of the evolved pass times should be allowed for.

MIR, SALYUT and SOYUZ

It is now known that the new USSR space station MIR has, in addition to the facilities listed last month, a sports hall, a recreation room, a restaurant, and a normal earth atmosphere. It also has a large extending arm, undoubtedly to be used for the manipulation, launch and recovery of satellites.

John Branegan GM4IHJ, who watched the TV broadcast by Cosmonauts Commander Leonid Kizim and Engineer Vladimir Solovyov who went aloft on the first Soyuz T-15 mission to prepare the station for the later full time crewing, said that MIR was ". . . out of this world . . ."!

Nevertheless, even this success does not come without its problems, the prime one being concerns over experiments that require a stable platform for success. ROENTGEN/HEXE is a high energy X-ray experiment designed by teams from Utrecht, Birmingham, Tubingen and ESA, and made by the German Max Planck Institute. It has to have extremely good stability to permit accurate pointing as it looks at old super-novae and galactic nuclei, and this state is unlikely to be achieved with lots of cosmonauts moving about in a station at 315km altitude causing movement of the ultra-stable platform needed for all work of this nature.

HEXE was originally designed to fly in Salyut-7 when it was unmanned, so some very special and careful scheduling will now be necessary if it is to fly in MIR, as the Russians have stated that MIR is to be manned continuously.

Ideally, MIR could be taken up to 500km altitude, where it could be gravity stabilised, and there is nothing to prevent MIR from achieving such an orbit but the same is not true for the Salyut-T transport craft that ferry the crews back and forth from earth. Even Salyut-7 had to be lowered in altitude whenever a three-man crew went up via Soyuz, which was then pushed up another 50km or so to avoid the drag and

Satellite	NOAA-6	NOAA-9	METEOR 2/13	METEOR 2/8	METEOR 2/9	METEOR 2/10	METEOR 2/11	METEOR 2/12	METEOR 3/1	SALYUT-7	MIR
Int designation	79–57A	84–123A	85–119A	85–25A	82–116A	83–109A	84–72A	85–13A	85–100A	82–033A	86–17A
Object Number	11416	15427	16408	13113	13718	14452	15099	15516	16191	13138	16609
Epoch Year	86	86	86	86	86	86	86	86	86	86	86
Epoch Day	067·69900681	074·38336797	068·09289574	068·62056161	068·85475081	068·90052181	068·86193294	069·89479899	069·79603860	077·75326929	078·93895735
Inclination	98·5106°	98·9873°	82·5322°	82·5402°	81·2487°	81·1613°	82·5272°	82·5393°	82·5555°	51·6270°	51·6256°
RAAN	86·2151°	32·8489°	90·8336°	288·7530°	10·4042°	50·6203°	236·7717°	174·4257°	0·1630°	341·7852°	335·4476°
Eccentricity	0·0012364	0·0016606	0·0017589	0·0015042	0·0056695	0·0094516	0·0013169	0·0015841	0·0019378	0·0003458	0·0005297
Arg of Perigee	14·7031°	58·9149°	62·1550°	171·0172°	156·8791°	298·5326°	353·9839°	221·7209°	58·7122°	299·5628°	184·7287°
Mean Anomaly	345·4505°	301·3643°	298·1373°	189·1259°	203·4977°	60·6366°	6·1203°	138·2732°	301·5118°	60·5187	175·3822°
Mean Motion (r.p.d.)	14·24901938	14·11412799	13·83795559	13·83806026	14·12883687	14·21641385	13·83472109	13·83909631	13·15903974	15·75656110	15·78307655
Decay Rate (r/d^2)	$7{\cdot}7e^{-7}$	$-8{\cdot}5e^{-07}$	$6e^{-08}$	$6e^{-08}$	$6e^{-08}$	$6e^{-08}$	$6e^{-08}$	$1{\cdot}47e^{-06}$	$1{\cdot}39e^{-06}$	$2{\cdot}5786e^{-04}$	$1{\cdot}531e^{-04}$
Orbit Number	34945	6460	1010	19988	16675	12269	8483	5586	1807	22549	444
SMA (km)		7229·861									6713·889
Period (min)		102·025432									91·236965
Apogee (km)		879·024									339·390
Perigee (km)		855·012									332·277
Frequencies (MHz)	APT 137·5 DSB 136·77	APT 137·62 DSB 137·77	WEFAX 137·3	APT 137·85	APT 137·3				WEFAX 137·4	COSMOS 1686 19·955	SOYUZ 143·625

other problems after Soyuz had docked with the station.

John points out that if MIR is to be used at maximum potential, then clearly an advanced Soyuz taxi needs to be evolved, so our readers are alerted to the probability that they may soon be hearing signals from a new Soyuz type of craft on test at orbits greater than the present 92 minute period. Listeners should watch 922·750 and 926·060MHz as well as the more familiar 121·750MHz on f.m., and for the beacon on 20·008MHz.

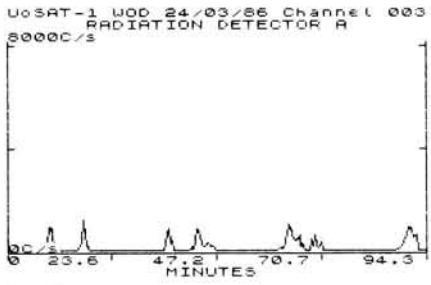

Fig. 7

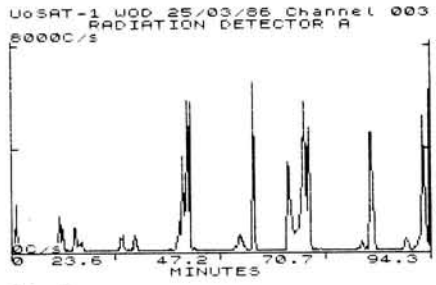

Fig. 8

Space Launches

Now that the Soviet launch agencies are giving advance notice of their space launches, *Practical Wireless* space watchers will have a far better chance of being able to monitor the communications used on these one or two day trips. Since the early advice on the launch of MIR and of the Soyuz launch to take the first crew, John Branegan has been carefully listening, and has given us some informative and interesting details made from his observations.

Manned Soyuz "T" flights use 121·75MHz f.m. voice transmissions, which can easily be at first confused with the a.m. aircraft ground control signals present in many places, e.g. Edinburgh, etc. Even when the listener is close to an air-control station, mutual interference rarely affects the f.m. reception of Soyuz, and the Russian language can clearly be identified. At times Soyuz cosmonauts switch on a beacon on 20·008MHz which often can be heard sub horizon. The beacon sends a succession of two tone dots and ripples, but it is not always switched on whilst the spacecraft is over Europe. Manned Soyuz flights usually take 25 hours from launch to docking, and after docking they still have tests to perform that can take up to a further three hours before they finally enter the space station itself. Thus, a 28 hour period of productive listening results following a launch when signals from Soyuz can be heard.

If a Soyuz flight is extended beyond one day, then this is a sure sign that the slower, safer, more economical, two day approach is being employed. This occurred during the Salyut-7 rescue mission in 1985 and again when the first cosmonauts went up to man the new MIR station. In the MIR case the safe orbit was dictated not because of equipment failure but because it had then yet to be switched on.

When returning to earth the procedure is often much faster, with the landing occurring only six or seven hours after undocking. Landings are usually timed to occur a little before local sunset, corresponding to about 1300UTC in summer, and an hour or so earlier in the winter. Before landing, final orbit checks are sometimes made with communications ships off the North-West coast of Africa, and near the Straits of Gibraltar, so communications may be heard some time before the spacecraft is within range of the USSR.

The unmanned automatic supply craft of the Progress type invariably use the more economical two day approach from launch to docking, averaging some forty-nine hours of overall flight time in the majority of cases. Progress control channels use 166·00MHz and 922·750MHz. Unlike Soyuz, Progress craft are frequently undocked, but are not commanded to destructive re-entry for several days, when they normally re-enter and burn out over the Pacific Ocean.

MIR Communications

The frequency of 143·625MHz f.m. voice now appears to be the regular v.h.f. downlink for MIR. This channel is regularly left on mark when not in use, and it rebroadcasts not only uplink traffic picked up from loudspeakers inside MIR, including music, but also broadcasts station running noise such as air conditioning, pen recorders, pipe noise, and that generally resulting from the cosmonauts at work. Recently some MIR transmissions over UK have ended with a burst of two tone RTTY, but it is not clear whether this is an actual transmission on the downlink, if it is aural pick up, or even produced by cross modulation. It was very noticeable that in November 1985, when the CHEGETS team were closing down SALYUT-7, much of the machinery noise was absent from transmissions made on the last two days of occupation of the station, so this is a clue to be watched for in the future.

The following frequencies reported by WA2LQQ have been found to carry Soyuz/MIR communications around the world: 121·750, 142·400, 142·417, 142·600, 143·144, 143·625, 143·825, 166·000 and 192·040MHz. These are thought to be specific channels for various ships, and the main one for the USSR base heard in Europe is 143·625MHz.

The USSR has now launched a satellite called "LUCH" which is very similar to the USA "TDRS" satellite that handles the tracking data and communications relay for MIR. It is thus now unlikely that we shall hear much in the way of h.f. communications from the new space station, unless another Cosmos like 1686 is attached later in the programme.

ARIANE Launches

A keen observer reports signals on 136·610MHz emanating from the ARIANE rocket as it takes the satellites up from the ESA launch site in French Guiana. Our space watchers might wish to observe this frequency when the next launch is scheduled.

Satellite List Additions

Graham Smith G1JVZ, adds to our frequency lists with the information that 166·000MHz is occupied by the following group of satellites: Cosmos-1167, ELINT; Cosmos-1220, Ocean RADAR; Cosmos-1249, RADAR; Cosmos-1260, Ocean Recon; Cosmos-1299, RADAR; Cosmos-1337, RADAR; Cosmos-1461, ELINT Ocean Recon.

DIY "WOD"

Readers who have expressed interest in the Whole Orbit Data graphs made by Harold Meerza in past issues will be happy to know that they now have the means of doing their own. As an add-on the G4IDE/G4INP Spectrum "SHORT1" and "SHORT2" UoSAT decoder programs that comes with the "UO1-EAR" and "UO2-EAR" programs detailed in the March *PW*, they have now, with the aid of G4JJ and G3ENY, put together a program called "WOD".

Satellite	OSCAR-9	OSCAR-10	OSCAR-11	RS-1	RS-5	RS-7
Int designation	81-100B	83-58B	84-21B	78-100A	81-120C	81-120E
Object Number	12888	14129	14781	11084	12999	13001
Epoch Year	86	86	86	86	86	86
Epoch Day	071·47672713	069·68155227	066·75676743	062·01122382	069·26460025	059·66057011
Element Set	856	233	124		306	242
Inclination	97·6514°	26·3847°	98·1610°	82·5423°	82·9531°	82·9628°
RAAN	70·7946°	90·8961°	135·0944°	87·4729°	160·3712°	159·6531°
Eccentricity	0·0003900	0·6004856	0·0014126	0·0011456	0·0008339	0·0022375
Arg of Perigee	61·5034°	92·8224°	115·9196°	223·3938°	245·0573°	183·8165°
Mean Anomaly	298·6523°	333·2649°	244·3470°	136·6212°	114·9604°	176·2727°
Mean Motion (r.p.d.)	15·28185141	2·05856192	14·62032819	11·96696866	12·05051219	12·08695650
Decay Rate (r/d²)	$2{\cdot}735e^{-05}$	$-8e^{-08}$	$9e^{-07}$	$8e^{-08}$	$4e^{-08}$	$4e^{-08}$
Orbit Number	24619	2063	10754	32113	18595	18535
SMA (km)	6856·340	26105·467	7061·831		8033·850	8017·682
Period (min)	94·229420	699·517457	98·493001		119·496995	119·136691
Apogee (km)	497·093	35407·492	710·612		1679·722	1657·570
Perigee (km)	491·746	4055·578	690·661		1666·323	1621·691
Frequencies (MHz)	145·826	145·810	145·826	29·401	29·330	29·340
	21·002	436·048	435·025		29·452	29·501
	435·025		2401·5			
	2401·0					

This program takes the data stored in the UoSAT computer over the course of an orbit saved in the original program, and draws graphs of the data dumps in amazingly fast time. It takes the raw data, checksums, etc. for any channel, irrespective of length, decimal or converted figures, uses selected max/min figures for the "Y" axis, and did 700 lines in only 2 seconds!

Graphs of channel 3, the radiation detector, made on two consecutive days, using the "WOD" program, are shown in Figs. 7 and 8. The difference in the level is very marked and, as Harold Meerza points out, it is vital to know just where the radiation detector is pointing in order to deduce any really meaningful conclusions from the evidence. For details on the new program send a s.a.s.e. to SARUG, the Sinclair Amateur Radio Group, c/o G4INP QTHR.

"SUDD"

The Spectrum UoSAT Data demodulator program of G4HLX covered in the last issue has been used to give the copy in Fig. 9 to show its word-perfect capabilities and give some of the latest information that is available on reading the UoSAT-OSCAR-9 weekly bulletin transmitted each Saturday and Sunday. This copy was obtained directly by feeding the audio output of a hand-held TR-2400 on the office windowledge to the Spectrum ear socket, having carefully oriented the handy-talkie to avoid the chorus of two metre noise that the computer generates.

Fig. 9

```
**** UoSAT-OSCAR-9      Bulletin 171b  26 March 1986 ****

UoSAT Spacecraft Control Centre, University of Surrey, England

** SIGHTING AND MONITORING MIR **

Those who have fed Keplerian elements for MIR into their
tracking programs and then turned their scanners or their eyes
to the sky have been well rewarded.  There are now many reports
of amateur radio operators and satellite spotters catching a
glimpse of the giant Soviet space station.  Harold Price (NK6K)
reports that "at 60 degrees elevation, MIR was the brightest
object aside from the Moon, and was visible from ground level in
Los Angeles, on a major street, under a street light.  The moon
was 89% full.  When MIR disappeared at 21 degrees, it was still
as bright as the stars in Orion's belt." From this and other
reports, Ron Dunbar (W0PN) concludes that MIR is around first
magnitude.  The best viewing times are on orbits about an hour
before sunrise or after sunset.  Narrowband FM VHF radio
transmissions from MIR have been monitored on several channels
between 142 and 144 MHz.

** AMSAT-USA REQUEST FOR PAPERS **

You may recall that in the spring of 1985 AMSAT-USA announced
that it would publish a collection of technical papers as the
first issue of the AMSAT Technical Journal.  Though the Journal
has not been published, it is being revived by Robert Diersing,
N5AHD.  It will be dedicated to TECHNICAL articles, not to the
kind of "how to" and construction articles that are already
familiar and frequently published.  There is no upper limit on
the technical content.  Judging from some of the reports that we
get from stations monitoring the UoSATs, many of you have made
detailed, long-term observations of amateur satellites and may
have something to add to this technical publication.  If you think
that you have the makings of an article for the AMSAT Technical
Journal, quickly contact R.J.  Diersing, Computer Science
Department, Corpus Christi State University, 6300 Ocean Drive,
Corpus Christi, TX 78411.

** PHASE 3-C PROGRESS REPORT **

The Helium bottle bracket problem is solved.  Last week, a
weldment, or additional support, was added to the bottom ring of
the assembly, and it now fits perfectly.  Other work centered on
the Liquid Ignition Unit, with the prototype board wired and
custom transformers wound.  Once the circuit has been tested, it
is expected to take a week to finish the flight model.  Steady
work on the delayed Mode-S transponder continues.  The
oscillator, multiplier and mixer chain prototype has been
completed, and the IF board and the RF amplifier board are under
test.  Enclosures for the module are being built for AMSAT by a
member of the L-5 Society.  (de WB0RLY)
```

Useful Numbers

Graham Smith G1JVZ, sends us the Mansfield Amateur-Radio Society list of some handy telephone numbers by which to keep in real-time contact with the many space happenings. Most of these have a short tape recording giving the latest details of any particular on-going mission, and are a valuable source of topical data.

Guildford (0483) 61707 gives the UoSAT-1 alias OSCAR-9 bulletin, and includes most of the latest Keplerian satellite elements.

Guildford (0483) 61202 is the UoSAT-2 (OSCAR-11) counterpart.

01-246 8055 is the British Telecom "Spaceline", and whilst little is given on amateur-radio satellites, is a valuable source of general space information updated regularly.

025 683 448 is the Lasham Ground Station, with a tape recorded bulletin giving the latest news and data on the NOAA and Meteosat weather satellites.

010 1 900 410 6272 will produce the American "Dial a shuttle" service which is kept going during missions with update.

010 1 202 653 0258 is the Washington US Naval Observatory Hotline carrying useful input for your needs.

Finally, the RSGB Newsletter on Potters Bar (0707) 59312 always carries the latest information available when any amateur radio related space activity is imminent or current, as well as the other amateur radio news.

Russian Satellites

Little new news is to hand on ISKRA-4 which in early April was not ready for transport to either MIR or Salyut-7 for launch. RS-9 has been having a few problems under test, but RS-10 is all ready for the lift-off still set for late May this year.

Both RS-5 and RS-7 survived the long March eclipse, and despite the ailing batteries, could be with us for some time to come with careful handling from RS3A and modest use by amateurs.

VHF BANDS

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

by Ron Ham BRS15744

By connecting a straightforward v.h.f. converter, fed with a suitable antenna, to the front end of an h.f. communications receiver you can transform the receiving section of your station into a useful scientific observatory. I am often asked by newcomers, how this conversion business works and is it really worth while. Of course I am biased, but in my view, the addition of equipment for the 144MHz band gives the operator another challenge on the DX front and a chance to learn more about the behaviour of radio signals. You can tell when they are influenced by such natural phenomena as aurora, decaying meteor trails, sporadic-E and tropospheric ducting.

First the 144MHz converter has 3 basic sections, a radio frequency amplifier tuned to cover the range 144 to 146MHz, a crystal oscillator chain giving a steady signal at 116MHz and a mixer stage which combines the incoming v.h.f. signal, say 145MHz, with the oscillator at 116MHz and produces an output at the difference frequency, in this case 29MHz. Therefore, if this difference, or intermediate frequency (i.f.) is fed to the antenna socket of a good communications receiver, already tuned to 29MHz, the wanted signal at 145MHz will be heard through the receiver's loudspeaker. By the same token, 28, 29 and 30MHz are converted to 144, 145 and 146MHz, respectively, with all the advantages, such as slow motion tuning, variable stage gains, independent selection of a.m., c.w., f.m., and s.s.b. modes, a signal strength meter and in some cases, a bank of memories, usually built in to an h.f. receiver.

A good tuning test is one of the v.h.f. beacons, for example, the Wrotham beacon GB3VHF on 144·925MHz should appear at 28·925MHz on the h.f. receiver's dial. A good rotatable Yagi is an ideal antenna for the 144MHz band and there is a good selection to choose from among *PW* advertisers. When aurora is present the antenna should be beamed toward the north, so that signals reflected by the display can be received. Maximum signal strength beam headings should be carefully noted, because they are important in your report, especially if it is going to the RSGB's auroral co-ordinator. Remember that the tone of auroral c.w. is very rough, thus a typical report would be 55A and s.s.b. signals sound like a ghostly whisper.

During the mid-summer months sudden outbreaks of sporadic-E, which normally affects signals between 28 and 80MHz, can extend rapidly up to 150MHz and while such conditions last the beam should be directed toward eastern European and the Mediterranean countries for some super DX. It will soon become obvious what

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stations are about and do keep in mind that each event is different and a new experience, so I can only provide a few guidelines from my own observations.

When the atmospheric pressure is high and beginning to fall it is likely that a tropospheric opening will take place, in which case, point the antenna at Scandinavia, then at the Dutch/German border and see what is about before making further alterations to the antenna direction. Very often 144MHz signals are so strong during an opening that it is possible to leave the antenna in one direction. However, don't forget to look around the UK when tropo conditions are good because EI, G, GI, GJ, GM, GU and GW all count as countries and, depending on your own location, a signal from any one of them can be good.

VHF DX

Lists of Continental and Scandinavian 144MHz beacons are available from the RSGB. However, if you are new to DXing, when conditions are right look for the beacons in Angus GB3ANG, Cornwall GB3CTC, Lerwick GB3LER and Northern Ireland GB3EGI on 144·975MHz, 144·915MHz, 144·965MHz and 144·945MHz respectively.

During the earth's orbit around the sun it encounters millions of tiny particles, known as meteors, which on a clear dark night become visible as streaks of bright light as they burn up in the Earth's atmosphere. Each burn represents a decaying trail of ionised gas which, during its brief life, can reflect radio and television signals. A radio signal, bouncing off a meteor trail, sounds like and is referred to as a "ping" of the intelligence being transmitted at the time. Very little station information can be identified from these random meteors. However, try pointing your antenna toward a really distant beacon, tune your receiver to its precise frequency and listen for "pings" of the beacon's transmissions jumping above your receiver's background noise. Periodically every year the earth passes through great swarms of these particles, called meteor showers, which produce enough temporary ionisation for amateurs to attempt long distance communications using the meteor scatter technique. Normally both sides of a prearranged QSO transmit their station information, on the key, at 5 minute intervals until the contact is confirmed.

When sunspots are present, direct your beam (unless you can tilt it) at the rising or setting sun, then find a clear spot in the 144MHz band and select the a.m. mode and listen for the "whooOOooshing" of solar activity above your receiver noise. Take this a step further and connect a d.c. amplifier and a pen recorder to your receiver's detector circuit and you have a simple solar radio telescope. However, be warned, recording chart is expensive. Finally, make sure that the feeder between your 144MHz antenna and converter is of good quality and use a screened cable between the output of the converter and the antenna socket of your receiver, to prevent unwanted signals breaking through at the intermediate frequency.

Meteor Scatter

To encourage more interest in random meteor work, special activity periods have been arranged. The dates and times are in Table 1.

A reminder to all enthusiasts, amateurs, s.w.l.s, broadcast bands and TVDXers, to exercise their skills and equipment during the predicted peaks of the Perseids, August 12, Orionids, October 21, Leonids, November 17, Geminids, December 14 and the Ursids on December 23. All of these annual meteor showers are named after the constellation of stars from which the radiant of the meteors appears to come.

Month	2200-2400	0600-0800
June	7th	22nd
July	12th	27th
August	9th	24th
September	6th	21st
October	11th	26th
November	8th	23rd
December	6th	21st

Table 1

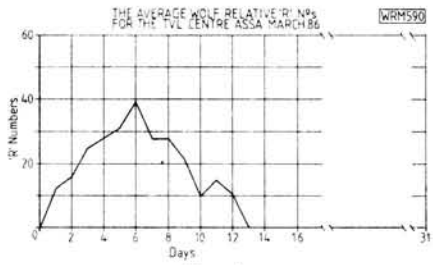


Fig. 1

Solar

Apart from a single group of 3 sunspots, observed by **Bob Anderson's** team in Johannesburg at 0745 on March 28, the sun was generally quiet throughout this reporting period, March 15 to April 14.

"I have made careful magnetic measurements in April, but so far there has been no apparent recurrence of the February/March activity as I have not detected any magnetic disturbances neither have I received any reports of aurorae and other events," writes **Ron Livesey**, Glasgow. Ron is the auroral co-ordinator for the British Astronomical Assocation and like Bob, has sent more information about the solar happenings during the first half of March. Bob's team observed 3 sunspots on March 1 and watched the number grow to 29 on the 6th and decline to one on the 12th. This can be seen by following the graph in Fig. 1, which is a copy of the relative report they prepared for the solar section of the Astronomical Society of South Africa. The sunspots which they located on the 1st appeared exactly 14 days after the last February group disappeared and Bob thinks that this could be a reappearance, due to the rotation of the sun, which grew into a sizeable group.

"The aurora of March 6/7 was well seen in Edinburgh, late at night, when the display was referred to as brilliant, and photographed," said Ron. He also received reports of "quiet glows" and "quiet ray structures", from the weathership *Cumulus*, at station Lima, for the nights of 5/6 and 6/7 respectively. Rays, rayed arcs and bands were among the descriptions received from observers in Edinburgh, The Wirral, St. Andrews and Ulster about the 6/7 aurora, and active bands, homogeneous arcs, patches, quiet arcs and ray bundles were seen from the same areas, plus Kirkwall, on the night of March 7/8. The Boulder, Colorado, Space Environmental Centre, reported a minor magnetic storm from 6th to 8th and Ron's own magnetometer registered a small magnetic storm during the 7/8 event. Boulder also reported, "a major storm in high latitudes. Source unknown," on the 13th. On the same day, **Len Fennelow G4ODH**, Wisbech, entered in his log, "Conditions very bad on 14MHz, blacked out at 21MHz." As you will see every snippet of information about unusual conditions, however insignificant it may seem at the time, may well become very important in a collective report.

My thanks to Bob Anderson for the April issue of *Canopus*, the newsletter of the Transvaal branch of the ASSA, in which he says, "The violence of a magnetic storm is in no way related to the sunspot number but to the magnitude and location of the solar flare which causes it. Hence our interest in observing all those factors which lead to a better understanding of solar-terrestrial influence on our daily existence and in maintaining this interest."

The 50MHz (6m) Band

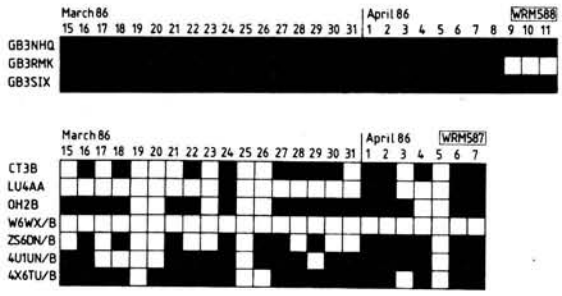
On March 22, **Norman Hyde G2AIH**, Epsom Downs, worked GW3XJQ in South Wales and gave him a report of RS55, fine, but, "what was remarkable," said Norman, "he was only running 0·5W! Admittedly, he was using a 5-element Yagi, but, if my sums are right, his e.r.p. was only 2·5W and I think conditions were about average at the time."

Newcomers may wonder why broadcast stations often appear within the 28MHz band during the summer months. This annoying factor is mainly dûe to sporadic-E and these, sometimes very strong, signals are harmonics of lower frequency transmissions. It is a useful excercise to tune around the lower broadcast bands, find the original signals and add this information to your reports. 28MHz is a fascinating band, especially when conditions are changing between sporadic-E and F layer propagation and at sunrise and sunset, so it is worth keeping a special watch on all sections of this band during the coming months and let me know your findings.

"Nothing to report on 28MHz, this time," writes Norman Hyde, however, he kept an ear on the 50MHz beacons and between March 15 and April 11, he received signals from GB3NHQ, in Potters Bar and GB3SIX, in Anglesey, every day and GB3RMK in Scotland, daily until April 8 (Fig. 2).

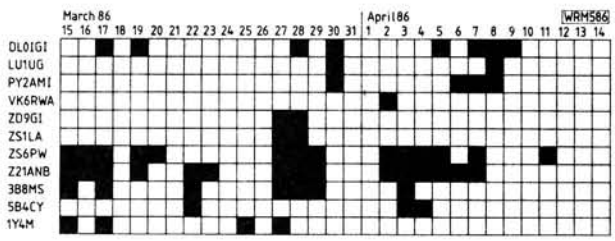
Propagation Beacons

"Herewith the worst ever beacon report, only GB3RAL heard," writes **Ted Owen**, Maldon, for the month prior to April 10. Apart from logging the Rutherford Appleton Laboratory beacon (RAL) around 0800 every day during this period, my 28MHz log is also blank. In Belfast, **Bill Kelly**, heard the Marconi beacon IY4M, on March 15 and 17 but nothing else. Len Fennelow and **Fred Pallant G3RNM**, Storrington, logged the Mauritius beacon 3B8MS early in this period, but in Walsall, **Gordon Pheasant G4BPY**, did much better; he copied signals from the German and South African beacons on several days and his prize was the appearance of VK6RWA, peaking 429, between 0759 and 0808 on April 2. "Propagation to South America is beginning to creep in again and as usual, when the band opens up that way, there is some backscatter on DL0IGI. Backscatter seems to result from reflections from the sea, which makes a better reflector than land and must produce a lot of scatter in odd directions,



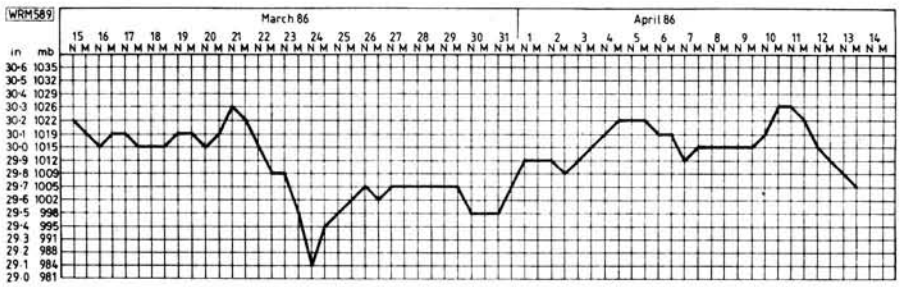
◀Fig. 2

Fig. 4▶



◀Fig. 3

▼Fig. 5



especially if the sea is rough!" said Gordon. An interesting thought, I said earlier that 28MHz is a fascinating band.

"The 14MHz beacons were regularly received here during the past month, showing a fairly consistent level of propagation, although their strength varied widely during the evenings," writes Len Fennelow. Both he and I received signals daily from the RSGB v.h.f. beacons at their Headquarters in Potters Bar GB3NHQ, on 50·050MHz and Wrotham GB3VHF. My thanks to Len for his 14MHz beacon log, Fig. 3, and to Bill, Fred, Gordon, Len, Norman and Ted for their detailed reports which enabled me to compile our monthly chart (Fig. 4) of beacon signals received on 28MHz.

During a brief sporadic-E opening during the afternoon of March 14, Norman Hyde exchanged signals from GM4ELV, Glasgow and GM4UQO, nr. Edinburgh on 29MHz fm. "The Glasgow station was only running 5W," said Norman.

In The Hague, **Chris van den Berg** logged signals from the South African beacons, ZS6PW and Z21ANB on March 15, 16 and 19, and then a force 10 gale, gusting to 12, severely damaged his h.f. antenna system. Tough luck Chris, this is something we all dread happening during high winds and heavy, driving rain when the wet can creep into insulators and joints previously cracked by dry hot weather. However, Chris also received signals from the Wrotham v.h.f. beacon while the pressure was falling on March 15 and 16, rising on 18 and 19, falling on 22, 23 and 24 and then on several days, when it hovered around 30·0 in (1015mb), between April 2 and 10.

Tropospheric

Although v.h.f. conditions were generally below par for the period, there was a small lift between March 17 and 23 and a few very minor ones which ebbed and flowed with the changes in atmospheric pressure. I noted this by comparing the daily signal strength of the Wrotham beacon, received on a vertical dipole, with the reading on my barometer and the general weather situation. Early on March 22, Bill Kelly heard traffic working through the 144MHz repeaters in Buxton GB3HH on R4, Caernarfon GB3AR R4, Moel-Y-Parc GB3MP R6 and Waterford EI2WRC R2. The atmospheric pressure remained at 30·0in (1015mb), or above from March 15 to 22, kept mainly between 29·5 (996) and 30·0 from the 22nd to April 3 and then back above 30·0 until the 12th, when a fall set in for the end of this period. 29·4 (995) on March 24 was the lowest pressure that I recorded this time and 30·3 (1026), on April 10, was the highest. The slightly rounded figures on our monthly pressure chart, Fig. 4, were taken daily, at noon and midnight, from the Short and Mason Barograph installed at my QTH.

Band II

Although Band II DX is a big problem for Bill Kelly because of strong BBC and RTE signals, he did hear ILR stations from Clyde and Sheffield, Red Rose in Preston, Radio City, Liverpool, and BBC Cymru, Lancashire and Merseyside, during the lift, early on March 22. Bill identified the stations by their adverts, news bulletins and or announcements.

"For most of the month there was only the bare minimum of French stations about," writes **Harold Brodribb**, from St. Leonards-on-Sea. However, he did hear signals, occasionally, from the stations in Abbeville, Boulogne, Lille and Neufchatel, transmitting programmes from Cultur, Frequence Nord, Inter and Musique. On March 13, he added Caen and Rouen to the list, noted extra good reception from Dieppe, Lille and Neufchatel on the 17th and similar on the 18th, except that Caen, Paris and Rouen were inaudible." Daily variations were obviously directional," said Harold, who also reported that Abbeville was "unusually strong" on the 20th.

Reports by the 15th, please

TELEVISION

Reports: as for VHF Bands, but please keep separate

by Ron Hem BRS15744

"I have a high quality scanning v.h.f./u.h.f. receiver and if I put the television sound frequencies into the receiver's memory and set it for limited scan, it could possibly surface as an early warning indicator for sporadic-E," writes **Ian Mason**, from Ayrshire. Quite true, Ian, and as we are now in the sporadic-E season, you have raised a point that affects us all and needs further discussion. Most TVDXers are well aware of the fact that a sporadic-E disturbance can manifest suddenly, at anytime during daylight hours, during the mid-summer months and obviously, it is not possible to watch a screen all day just waiting for an opening to occur. However, with this in mind, a more practical way must be found of knowing when an event is beginning, or is, in fact, in progress, if every opportunity is to be taken to witness that extraordinary style of DX which is peculiar to sporadic-E.

It is already well known that signals around 50MHz are most vulnerable, even to the mildest E-layer disturbance, therefore, if the vision frequencies of Ch.E2, 48·25MHz and Ch.R1, 49·75MHz, are put in a scanner's memory and left with the receiver's squelch control active, a strong buzzing sound will be emitted from the loudspeaker when vision signals are present on these channels. Although the sound frequencies for Chs. E2 and R1, 53·75 and 56·25MHz respectively, are above the critical frequency they, too, warrant memory space in the scanner, because when there is a hint of a signal on either of these channels, sound or vision, the time is right to switch on the television receiver and carefully tune through Band I. A simple horizontally mounted dipole, cut for 50MHz, is ideal for the scanner or both sets can be fed from a wide-band distribution amplifier installed at the receiver end of an outdoor antenna specifically designed for Band I. I have found the latter a most satisfactory arrangement.

By the time you read this, new DXers may well have seen their first major sporadic-E opening and realised that pictures from some countries are predominant for a while and others appear for short periods only, or sometimes just briefly. Conditions like this and the source of the signals being received, at any given time, depends entirely upon the movements and fluctuations of the sporadic reflecting

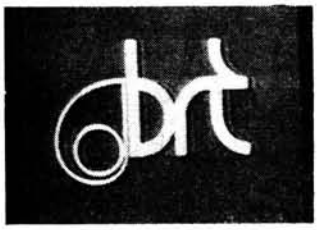


Fig. 1

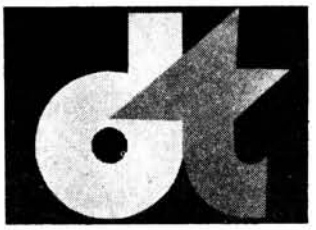


Fig. 2

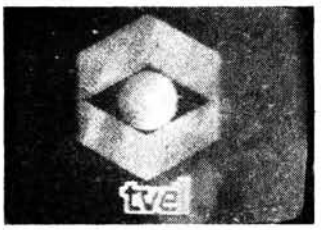


Fig. 3

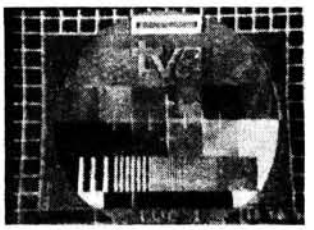


Fig. 4

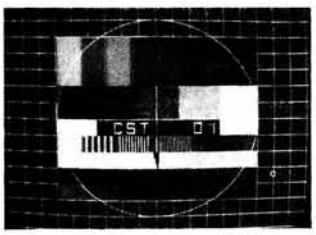


Fig. 5


Fig. 6

Fig. 7

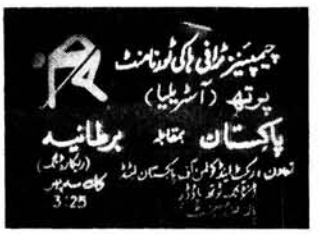


Fig. 8

Fig. 9

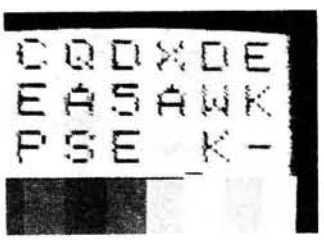


Fig. 10

Fig. 11

Fig. 12

regions within the E-layer of the earth's ionosphere. We have all experienced the problem of identifying a signal from a glimpse at the peak of a QSB, so I suggest that you keep a look-out for insignias, like those from Belgium BRT, Fig. 1, and Poland's news, dt, Fig. 2, sent in by **Keith Hamer** and **Garry Smith**, both TVDXers and authors of the book, *Guide to World-Wide Television Test Cards*. In my opinion, this book, available from HS Publications, 7 Epping Close, Derby DE3 4HR, and the *World Radio TV Handbook*, distributed in the UK by Pitman Publishing Ltd, 129 Long Acre, London WC2E 9AN, are a must for the enthusiast's bookshelf. Signals from Spain with station captions, Fig. 3 and test-cards, Fig. 4, received by **Steve Green**, Malvern, and **Len Eastman G8UUE**, Bristol, respectively, often appear on Chs. E2, 3 and 4 during a disturbance and the letters TVE or RTVE are the idents to look for. At times signals on Ch. E2 will mix with and overpower, pictures from the USSR on Ch. R1, so in this case, watch for clocks with the inscription CCCP, the news captions BPEMR and HOBOCTN and TACC COObWAET (Tass Report) under a presenter's name and such titles as CNOPT and NPORPAMMA. The time on a clock is another important clue to the origin of the signal; try counting the time zones on a map by the number of hours that the clock is ahead of GMT and when there is a rapidly changing mixture of pictures, keep an eye open for regional names, frequently seen on test cards, from Norway and Spain on Ch. E2 and Yugoslavia on Ch. R1. Finally, do watch for CST, RS-KH and PRAHA from Czechoslovakia, MTV Hungary, TVP Poland, TVR Rumania and JRT Yugoslavia on Ch. R1 and ORF-FS1 from Austria, NORGE, NRK and TELEVERKET Norway, RTP, Portugal and TV1 SVERIGE, Sweden, on Ch E2 and please include any captions, etc. that you see with your reports because these can be of great assistance to other readers.

Band I

Husband and wife team, **Tony** and **Edwina Mancini**, Belper, kept a routine watch on Band I between March 8 and April 6 and received test cards, for short periods or sometimes just bursts, with something on most days, from Czechoslovakia, scribed RS-KH and CST.01 and Poland TVP on Ch. R1, Austria ORF-FS1, Spain RTVEI and II, Sweden TV1 and Switzerland +PTT SRG1 on Ch. E2, Belgium BRT1, Portugal RTP1 and Spain, on Ch. E3 and East and West Germany DDR F1 and Ard, Holland PTT NED 1, Italy RAI (IB) and Norway NRK on Ch. E4. The Italian Ch. B and Ch. E4 have the same vision and sound frequencies, 62·25 and 67·75MHz respectively, which adds to the fun during an intense sporadic-E disturbance. Among the programmes received at the Mancini QTH were skiing from Spain on March 23, the Pope from Italy on the 28th, a clock showing 1200 from RAI PROGRAMME 1 at 1100 our time on the 29th, a geometry lesson from Portugal at midday on April 4 and cartoons from Spain during the afternoon of the 5th. This is an impressive log by any standards for this time of year, which proves once more, that there are rewards for tuning through Band I as often as possible. Last September, Tony received pictures from Czechoslovakian Television and sent them a report and among the items of information in their reply package, was a coloured photograph of their CST.01 test card, Fig. 5.

I received a weak test card from Holland on Ch. E4, at 0805 on March 15 and 0857 on April 7 and, around 0800 on April 1 and 5, I heard many bursts of television sync, on Ch. R1, appearing on the ex-Army R216 communications receiver which I use with a dipole antenna to monitor 49·75MHz and for general tuning through Band I.

Tropospheric

At 2235 on January 22, **Major Rana Roy**, India, received pictures from Pakistan Television and writes, "We saw an interview and then, at 2255, a commercial, followed by a programme of classical Indian music. Signals improved considerably at 2325 and we watched clear coloured pictures from Rawalpindi on Ch. 8, Fig. 6 and Bahawalpur on Ch. 10. The programmes finished at 2340 and then Radio Pakistan's Lahore programmes were announced, followed at 2342 by the next day's television schedule, Figs. 7, 8 and 9."

While on a trip some 200km north of Bikaner, between January 27 and February 15, Rana regularly received pictures from Lahore on Ch. 5, in good colour, using a friend's ITT German colour receiver and his own 24-element Band III antenna and pre-amplifier. "We usually have a few very good tropo openings in March, but none this year," says Rana and explains, "The weather became very warm here at the end of February and beginning of March and suddenly on March 12, we had heavy rain all over north and eastern India and heavy snowfalls in the Himalayas. The plains of Punjab and Haryana had hail storms which destroyed the wheat crop. This brought the temperatures down and we have taken to our sweaters again." Sounds like Easter in the UK Rana, hi. Rana has added a Hitachi VT330E video recorder to his station so that he can keep his DX records on cassette.

Weather conditions in the UK during March and early April did little to enhance v.h.f. signals. However, Tony and Edwina Mancini, received spasmodic bursts of

pictures from Radio Telefis Eireann (RTE1), on Ch. H, 207·25MHz, in Band III, daily, from March 10 to 16 and good pictures and sound on the 17th. They also logged bursts of test card from Belgium RTBF on Ch. E8 on the 12th and similar from France, CANAL PLUS, mainly on Ch. F9, on days 8, 11, 12, 16 and poor to excellent pictures from the 17th to 22nd, and poor to good from the 23rd to 29th.

In St. Leonards-on-Sea, **Harold Brodribb** received a test card from Belgium, scribed RTBF1, on Ch. E8 from Wavre, on March 14, and strong negative pictures from France on Chs. F5, 7 and 9 in Band III and from Lille, at 1715 on the 20th, on u.h.f. Ch. 21. I noticed co-channel interference on some stations on the u.h.f. band during the evening of March 22.

In Bombay, **J. A. Kharas** often receives intermittent pictures from Gulf stations between 1030 and 1830 u.t.c. and from distant Indian stations, re-broadcasting Delhi programmes which they receive via satellite. "I am interested in satellite television, I can watch two satellites from here, Intelsat V, with programmes like Premiere, The Children's Channel and Screen Sport and ECS-1, which includes such programmes as RAI 1, Olympus, New World Channel, Music Box and the Sky Channel," writes **Carlos Gonzalez**, from Gijon. I must confess that I know very little about these television systems and would be pleased to hear more on the subject from my readers.

SSTV

"There seems to be a lot more activity on SSTV this year with many stations coming up and the Sinclair Spectrum computer appears to be very popular among operators," writes **Lester Curno** from Bude, adding, "March was a very interesting month for me on SSTV," after receiving pictures, mainly on 14MHz, from 25 stations in Czechoslovakia, Eire, Finland, Germany, Hungary, Italy, Switzerland, USA and Yugoslavia. During a 3·5MHz SSTV net on the 29th, Lester copied pictures from EI3CZ, G4GOZ, GD4HOX and GJ4YCR and among the captions he logged, within the period, were "I0UMV for GB4DBZ", "QRX OTHER STATION", "QTH LATINA", "CQ SP7FUZ PSE K", "GM3WIL DE W4FAX 36 SEC", "GJ4YCR DE DL3NAE", "NAME IS WALT QTH KENMORE NEW JERSEY", "CQ DE F3RT", "QRZ YU4EZC", "G4RVC DE I3XQW", "DF3PU DE YU4EZC", "CQ DE HB9BIN", "HOW COPY DE OH4BB", "MIKE ENDICOTT NEW YORK" and "CQ CQ DE W2UOX". By adding Cyprus, 5B4MD, to his log on April 1, he increased his score to 192 different stations logged in 31 countries and told me that he is really looking forward to the improved band conditions as time goes on. Reports like this should really encourage readers like **David Spry** who is planning to use his Spectrum computer to add the SSTV mode to his station in Thurso.

Around 14·230MHz I logged the SSTV captions, 'CQ SSTV DE IC8POF", at 1651 on March 16, "MY NAME IS PETER", at 0939 on the 22nd, I think "G4TZI DE HA8EI", at 1530 on the 24th, and "HOW COPY PSE K", possibly from the USA, at 2025 on April 9. Last year, **Peter Lincoln**, Aldershot, an experienced SSTVer, received CQ captions from Spain, EA5AWK, Fig. 10, Switzerland, HB9AXG, Fig. 11, and an interesting picture from KP4YD in Puerto Rico, Fig. 12.

During the month prior to April 11, **Richard Thurlow G3WW**, March, added HA0DG, HG6VV, LZ1OW, OZ1DOZ, YU5FU and ZS6BOU on 14MHz to his new station list on SSTV and tells me that G0BNR, Ramsey St. Mary, G4WJB, Stanground and G6SCD, Chatteris, have joined the Fenland 144·5MHz f.m. Net, which operates at 1930 on Monday evenings.

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

Back in March, keen s.w.l. **Al Dupres**, of Cardiff, informed me that he was considering the possibility of introducing a DX programme into the *Al Dupres Show* which he presents on Red Dragon Radio, from Monday to Friday between 2100 and 0100UTC, also on Saturdays between 1300 and 1700UTC. Naturally, I gave him every encouragement to make this idea a reality, for this series, I felt, would bring the exciting world of s.w. radio to the ears of the m.w. listener and do much for this truly **great** hobby of ours.

I am delighted to be able to tell you that Al has now introduced this feature, called *Red Dragon DX* into his Show on the first and third Friday of the month at 0015UTC—so Local Radio DXers should turn their loops to Cardiff at this time!

Red Dragon Radio took over CBC and GB Radio and can be heard on 1305kHz & 1359kHz m.w.—also on v.h.f.—and serves the Cardiff and Newport area of S. Wales, but as every DXer knows it can be heard over a wide area! If you would like a QSL or have a report for Al, see QSL Addresses later.

DX Report

(Note: All frequencies in kHz: Times in UTC = GMT).

Transatlantic DX: A very impressive list of transatlantic m.w. DX has been sent along by **Andy Kennedy**, who listens at all hours of the night! Between 0230 and 0515, he received from the USA WTOP of Washington 1500; WINS 1010 and WHN 1050—both from New York—and from Boston he heard WMRE 1510. Newfoundland, Canada, came in well, too—CJYQ of St. John's 930, was the first to be heard, followed by CHYQ of Musgravetown 670, VOCM of St. John's 590 and CKYQ from Grand Bank 610.

Andy reports that several Caribbean and S. American stations have been well received at his location between 0115 and 0500, namely Radio Rebelde from Cuba 600 and Caribbean Beacon, Anguilla 1610; also Radio Globo from Rio, Brazil 1220 and from Venezuela, Radio Vibracion of Carupano 1470 and Radio Vision from Caracas 950.

Another listener who enjoys m.w. DXing, is **Calum MacLeod** of the Isle of Lewis, Scotland. His log includes WBAL of Baltimore 1090 and WMRE 1510 heard at 0100. Much later, at 0655, he listened to WNEW of New York 1130. During most nights, CJYQ 930 has been received, although CJCH of Halifax 920 was only audible around 0330. Radio Paradise of St. Kitts 825 and the VOA Antigua relay 1580, have been good signals around 0130 from the Caribbean area.

Paul Logan of Co. Fermanagh, N. Ireland, also logged many of the stations detailed above and says, "As a matter of interest to *PW* readers using simple gear, I have heard about twenty N. American stations on a receiver which has a ferrite rod antenna!" Another listener in N. Ireland, **Bill Kelly** of Belfast, has been hearing WQXR in New York on 1560 at 0245 and the "Memory" station in Boston, WMRE 1510.

At his listening post in Randburg, S. Africa, **Leo Gieske** has been busy checking the band on his Drake SPR4 receiver and heard CJRS in Sherbrooke, Quebec 1510 for the first time. Also in Quebec, CKLM of Lavel 1570 was a good signal, but CBJ of Chicoutimi 1580 was much weaker—all were received around 0350. Other stations logged were WTOP; WMRE; WQXR; WKBW from Buffalo, NY 1520; WCKY of Cincinnati, Ohio 1530 and WPTR of Albany, NY 1540.

Using a Trio R2000 receiver, **Graham Powell** of Pontypridd, S. Wales, logged several stations from Newfoundland, including CJYQ; VOCM; CJFX of Antigonish 580 and CKVO of Clarenville 710. WMAQ of Chicago, 670 has now sent along a QSL to Graham—it seems that this station has not been heard in the UK for some years. Another Trio R2000 owner, **George Morley** of Redhill, Surrey, noted WCAU of Philadelphia 1210, WHN; WINS; WNEW and WBZ of Boston 1030, in his log.

In an interesting letter, **Maurice Andries** of Dendermonde, Belgium, described how the signals from CJYQ "improved by the minute" when his local 300kW station BRT 1 closed down at 0405—local stations are creating an increasing problem for DXers, with more and more of them now operating 24 hours a day.

Other DX: Once again, Leo Gieske has been hearing ILR Capital Radio on 1548kHz, in Randburg, S. Africa! Other m.w. European stations received include DLF Mainflingen, W. Germany, with 700kW on 1539kHz and WDR Langenberg, W. Germany, which runs 800kW on 1593kHz. Leo uses a Box Loop antenna in conjunction with his Drake SPR4 receiver to hear these signals around 0400UTC.

Alan Jarvis of Cardiff, Wales, has been monitoring the band using a very unusual receiver—a Tandy MW/FM Headphone Radio, which has the complete receiver built into the headphones, including a very effective ferrite rod antenna! During one night, he received AFN Stuttgart, Germany 1143 at 0230! Alan says that good "nulls" of unwanted signals can be obtained with them, so they may well be of interest to m.w. Local Radio DXers.

Manx Radio 1368, was received by **Alan Merrit** of Abingdon, Oxon, for the first time on his Pye music centre, which has a built-in antenna. **Steven Woods** of Bramcote Moor, Nottingham, has also been listening to this station at night. RTE Radio 2 from Athlone 612 was also noted in his log. Belgium's Beltem transmitter, which

Freq (kHz)	Station		Simon Hamer, New Radnor	Paul Logan, Co. Fermanagh	Alan Merritt, Abingdon	Stewart Russell, Forfar	Roy Spencer, Nuneaton	Steven Woods, Nottingham	Calum MacLeod, Isle of Lewis	Andy Kennedy, Leicester	Alan Jarvis, Cardiff	Graham Johnson, Nuneaton
603	Invicta Sound	ILR	X									X
630	Radio Cornwall	BBC	X									
630	Radio Bedfordshire	BBC	X							X		X
657	Radio Cornwall	BBC		X								
666	Devonair Radio	ILR	X	X						X		
666	Radio York	BBC	X	X						X		
756	Radio Cumbria	BBC	X	X								
756	Radio Shropshire	BBC	X							X	X	
774	Radio Kent	BBC	X							X		
774	Radio Leeds	BBC	X					X		X		
774	Severn Sound	ILR	X	X				X		X	X	X
792	Chiltern Radio	ILR	X							X		X
801	Radio Devon	BBC	X	X						X		
828	2CR	ILR	X								X	
828	Radio WM	BBC	X					X		X		X
828	Radio Aire	ILR	X					X				
828	Chilton Radio	ILR	X					X		X		
837	Radio Leicester	BBC	X	X						X		X
855	Radio Devon	BBC		X							X	
855	Radio Norfolk	BBC	X	X						X		
855	Radio Lancashire	BBC	X	X								
873	Radio Norfolk	BBC	X							X		
963	GWR	ILR	X	X						X		
954	Devonair Radio	ILR	X	X								
954	Radio Wyvern	ILR	X	X						X		X
990	Radio Devon	BBC		X								
990	Beacon Radio	ILR	X					X		X		X
990	Hallam Radio	ILR	X							X		
999	Radio Solent	BBC	X	X								
999	Red Rose Radio	ILR	X	X		X						
999	Radio Trent	ILR	X							X		X
1026	Radio Cambridgeshire	BBC	X							X		X
1035	Radio Sheffield	BBC	X							X		
1035	Radio Kent	BBC	X							X		
1035	Northsound Radio	ILR	X									
1035	West Sound	ILR	X	X								
1107	Moray Firth Radio	ILR		X								
1107	Radio Northampton	BBC	X		X					X		X
1116	Radio Derby	BBC	X	X						X		
1152	LBC	ILR	X		X							
1152	Radio Clyde	ILR		X						X		
1152	Metro Radio	ILR	X	X								
1152	BRMB	ILR	X							X		X
1152	Piccadilly Radio	ILR	X	X								
1152	Radio Broadland	ILR	X	X								
1161	Radio Sussex	BBC	X									
1161	Radio Tay	ILR		X						X		
1161	Viking Radio	IBA	X							X		
1161	GWR	ILR	X									

Freq (kHz)	Station		Simon Hamer, New Radnor	Paul Logan, Co. Fermanagh	Alan Merritt, Abingdon	Stewart Russell, Forfar	Roy Spencer, Nuneaton	Steven Woods, Nottingham	Calum MacLeod, Isle of Lewis	Andy Kennedy, Leicester	Alan Jarvis, Cardiff	Graham Johnson, Nuneaton
1161	Radio Bedfordshire	BBC								X		
1170	Swansea Sound	ILR	X	X								
1170	Radio Tees	ILR	X									
1170	Radio Orwell	ILR	X							X		
1170	Signal Radio	ILR	X							X		
1242	Invicta Sound	ILR	X							X	X	
1251	Saxon Radio	ILR	X									X
1260	GWR	ILR	X	X	X							
1260	Marcher Sound	ILR	X									
1260	Leicester Sound	ILR	X									X
1278	Pennine Radio	ILR	X									
1305	Red Dragon	ILR	X		X							
1305	Radio Hallam	ILR	X									
1323	Radio Bristol	BBC	X	X								
1323	Southern Sound	ILR	X	X								
1332	Hereward Radio	ILR	X		X	X						X
1359	Essex Radio	ILR	X									
1359	Radio Solent	BBC	X									
1359	Red Dragon	ILR	X	X								
1359	Mercia Sound	ILR	X	X	X							
1368	Radio Lincolnshire	BBC	X									
1431	Essex Radio	ILR	X									
1431	Radio 210	ILR	X	X								
1449	Radio Cambridgeshire	BBC	X	X								
1458	Radio London	BBC	X	X						X		
1458	Radio WM	BBC	X							X	X	
1458	Radio Manchester	BBC	X	X					X			
1458	Radio Newcastle	BBC		X					X			
1458	Radio Devon	BBC		X								
1458	Radio Cumbria	BBC		X								
1476	County Sound	ILR	X	X	X							
1485	Radio Merseyside	BBC		X								
1485	Radio Humberside	BBC	X	X								
1485	Radio Oxford	BBC	X									
1503	Radio Stoke-on-Trent	BBC	X	X								
1521	Radio Mercury	ILR	X	X	X			X		X		
1521	Radio Nottingham	BBC	X	X						X		X
1530	Pennine Radio	ILR	X	X		X						
1530	Radio Wyvern	ILR	X	X	X							X
1548	Capital Radio	ILR	X		X		X			X		
1548	Radio Bristol	BBC	X	X			X					
1548	Radio Forth	ILR	X	X		X				X		
1548	Radio City	ILR	X	X								
1548	Radio Cleveland	BBC		X								
1557	Hereward Radio	ILR	X	X		X	X			X		X
1557	Radio Lancashire	BBC	X	X					X			
1584	Radio Nottingham	BBC	X	X						X		X
1584	Radio Shropshire	BBC	X	X								
1584	Radio Tay	ILR	X	X						X		
1602	Radio Kent	BBC	X									

Fig. 1

radiates BRT 2 on 1512, was received by **Julian Wood** of Buckie, Scotland, using a Trio R2000 receiver.

During March, Paul Logan monitored 1521 for Radio Beijing. He found that the signal peaked up around 1700 and that a second weaker peak occurred at 2100—he is now anxiously awaiting the arrival of their QSL! An excellent signal at 1822, from UAE RCTV Dubai on 1481, was noted by Graham Powell in his log for March.

In a survey of the l.w. band between 140 and 200kHz, Bill Kelly was unable to confirm that all the l.w. Broadcast Stations had in fact complied with the frequency changes mentioned last month in "On The Air". It seems DLF W. Germany 153 and Radio France Inter 162 are on the new frequencies, but DDR, Europe 1 W. Germany is 183 instead of 180 and there is a station in German on 176, so all has not been fully implemented yet.

Local Radio DX

There has been a considerable amount of activity here, as can be seen from Fig. 1. **Roy Spencer** of Nuneaton, Warwickshire, says "I find the early daylight hours to be the best for Local Radio DX, as there is too much interference from Europe at night".

It was fortunate for Steven Woods that the BBC Engineers had to turn off his local BBC Trowell Moor transmitter on 1521 for an hour recently, for this enabled him to log ILR Beacon Radio on 990 and ILR Radio Mercury on 1521!

Paul Logan says "The prize Local Radio catch for me was BBC Radio Kent (Rusthall) with only 0·25 kilowatts!"

Writing from Forfar in Angus, Scotland, **Stewart Russell** says "I noticed on the IBA teletext that two new stations are due to start operation in late September/October, namely, Radio Trent (Derby) on 945kHz and Ocean Sound (Southampton) on 1557kHz"—well thanks Stewart, for pointing this out to DXers, let's hope they have plenty of QSLs waiting!

As you can see, **Simon Hamer** of New Radnor, Wales, has been really busy! He says "I had quite a struggle with some of the station identities, because of interference from the Irish pirates. It is interesting to see the BBC is using 'County' names for the new Locals".

"I am still trying my best to hear BBC Radio Stoke-on-Trent on 1503, or even ILR Signal Radio on 1170 but I am beginning to wonder if I am expecting too much" says Alan Merritt—Why not try a different time of day Alan?

Receiver News

Two *PW* readers, **Frank Gregory** of Walton-on-Thames, Surrey, and **Les Smith** of Witham, Essex, have now built the little reflex receiver, as used by **John**

Ratcliffe of Southport, Queensland, Australia, and have written to tell me that they are pleased with its performance. New ideas are now being tested out—Les is now making a l.w. version of the set and Frank—who used BC108 transistors in the circuit—is now going to try an antenna *Q* multiplier. Many other readers are building this set and I hope to include news from them in future issues of *PW*. It is quite an incredible design, since so few components are used!

QSL Addresses

Red Dragon Radio, Radio House, West Canal Wharf, Cardiff CF1 5XJ, S. Wales.

BBC Radio Leeds, Broadcasting House, Woodhouse Lane, Leeds LS2 9PN.

BBC Radio WM, P.O. Box 206, Pebble Mill Road, Birmingham B5 7SD.

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

Our nearest star, which we call the sun, is at the centre of a complex system consisting of our planet earth and eight other major planets. It is in fact the only star in the universe which we can see clearly, for all the other stars are so remote that they appear as a point of light, even when viewed through the World's most powerful telescopes! Our sun is located 149·5 million km (about 93 million miles) away from us and a ray of light, or "sunshine", takes 500 seconds or 8·3 minutes to reach us.

For at least 4 billion years the sun has been turning hydrogen into helium and releasing a wide range of electromagnetic radiations and charged particles into space. Some of the many forms of radiation released are vital to life on earth, but others have harmful effects. There is an ever changing intensity in the level of these radiations and why this is so and exactly what the sun is going to do at any given time in the future is only known in a general way.

Ultraviolet and X-ray radiation, the ionising agents of solar energy, ionise the oxygen, nitrogen and nitric acid present in the rarified atmosphere above the earth to form the ionosphere. The basic principles of s.w. propagation via the ionosphere have already been discussed in this series (see October 1985 *PW*, page 72) and some aspects of the effects which solar events, sunspots and the solar sunspot cycle have on the ionosphere, were revealed in a later article (see March 1986 *PW*, page 63).

In addition to the relatively regular variations, already discussed in the previous articles, when the sun is said to be "quiet", when the sun is "active", the ionosphere can be subjected to sudden disturbances, which may adversely affect s.w. propagation. When an eruption or **solar flare** occurs on the surface of the sun, an intense emission of electromagnetic radiation consisting of X-rays, ultraviolet, visible light and radio waves takes place and these reach the earth in 8·3 minutes.

The effect of the bursts of ultra-violet and X-ray radiation on the ionosphere, is to increase the level of ionisation of the D layer to the point where it may absorb all radio waves before they can reach the higher reflecting F layers. This will cause a **"Dellinger fade-out"**—a complete or partial loss of all signals—which may last for a few minutes or an hour or more! This is usually referred to as a **"sudden ionospheric disturbance"** or **"s.i.d."**.

Solar flares, which vary in magnitude and effect, occur without warning and are frequently located close to a major sunspot. They usually last for only a very brief period and seldom for as long as an hour. In addition to the intense electromagnetic radiations emitted by a flare, streams of fast moving particles may also be ejected from the solar atmosphere into space and some of these may travel towards the earth. These charged particles arrive here about two days after a s.i.d. has occurred and cause another form of radio fade-out or black-out—the **"ionospheric storm"** —which can last anything from a few hours to several days! (Note, however, that if the particles miss the earth, then a storm will not occur)

Ionospheric storms may be divided into two main types, **"isolated"** and **"recurrent"**. The isolated type are usually associated with solar flares and are most common during the peak years of the sunspot cycle. However, they are much more significant at sunspot minima, since poor propagation conditions may well exist at that time.

Not all storms are caused by solar flares and the recurrent type of storm may be the result of emissions of fast solar particles from other sources on the surface of the sun. Since the rotation period of the sun, as seen from the earth, is about 27 days, recurrent storms reappear with the same frequency and they may regularly recur for a year or more. Initially, a single storm in a recurrent series may last for a few days, but as time goes by, the duration tends to be less. Storms of this type mainly arise a few years after a solar sunspot maximum period.

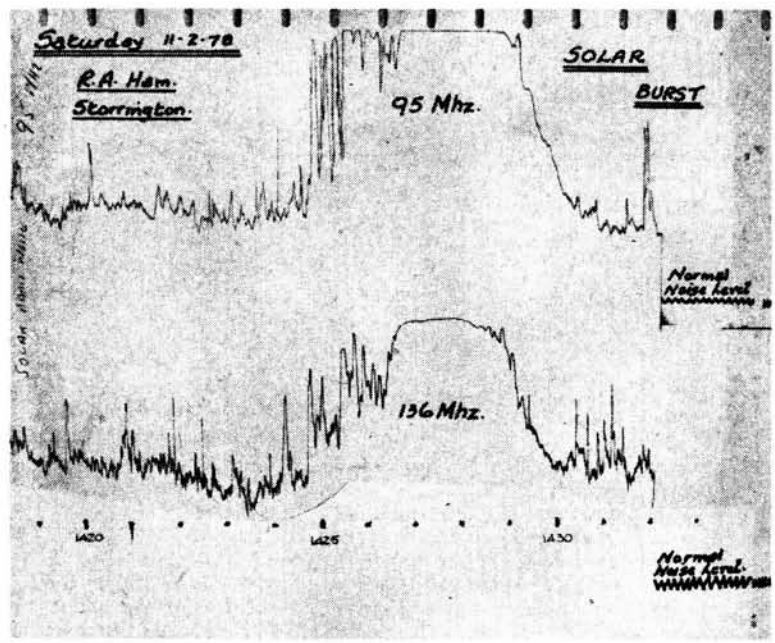
The charged solar particles cause magnetic disturbances as well as ionospheric storms when they arrive and these bring about changes in the strength of the geomagnetic field, which indirectly result in spectacular visible displays of **"aurora"**. A photograph, taken by special techniques, of an actual solar flare occurring on the surface of the sun and a pen recording of the associated radio noise emitted by this flare is shown in Fig. 1. **WARNING: NEVER look at the sun through binoculars or a telescope—you will be permanently blinded.**

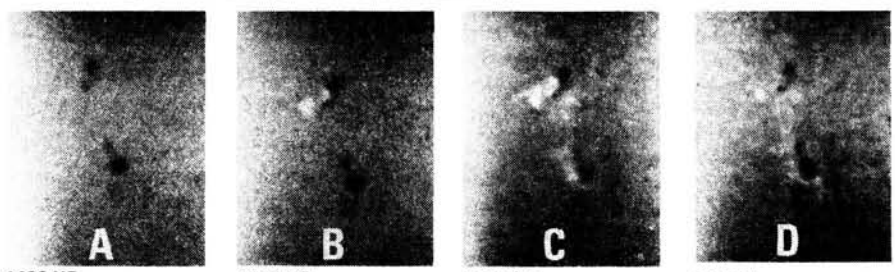
Conditions on 25 and 21MHz

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

The low sunspot numbers are adversely affecting the 25MHz (11m) band and consequently most broadcasters have migrated to lower frequencies. However, VOA still broadcast to Australia from their relay station in Tinang, Philippines, on 26·000MHz between 0000 and 0200, but there has been no mention of this trans-

Fig. 1





1426 HB 1427 HB 1428 ½ Hα 1437 Hα

mission in the logs from Australia or Malaysia.

On the 21MHz (13m) band, many signals are audible during the morning and afternoon. **Fred Tagg** of Sherwood, Nottingham, has been busy testing a new G2DYM trap dipole antenna with his Icom R71 receiver and was pleased to hear UAE Radio Dubai 21·605 broadcasting in Arabic and English between 1000 and 1430; RFI France 21·620 with French at 1030; AFRTS 21·670 via their Tinang, Philippines, relay at 1150; Voice of Israel 21·760 in Hebrew at 1120 and WYFR 21·525 from Okeechobee, Florida, at 1635, to mention only a few of the stations in his log.

Alan Merritt of Abingdon, Oxon, has been listening to "Africa Today" from Radio RSA, Johannesburg 21·590 at 1400 and **Philip Rambaut** also logged this transmission in Macclesfield, Cheshire. His extensive log included Radio Nederlands at 1205, via their Madagascar relay on 21·480; Radio Cairo, Egypt 21·465 broadcasting in Thai and Indonesian at 1221; RBI Berlin 21·540 from 1300 and RSI Stockholm beaming to Africa at 1400 on 21·555.

By late afternoon, many of these stations have left 21MHz, but **George Morley** of Redhill, Surrey, has been hearing quite a good signal from Radio Nederlands, via their Bonaire Neth. Antilles relay station, on 21·685 at 1923, when they beam on Africa, with a transmission in English and French.

The 17 and 15MHz Bands

On 17MHz (16m) **Tommy Dougan** of Belfast, N. Ireland, has been hearing the Voice of Greece on 17·565 with News in English at 1049 and 1344. He also listened to All India Radio, New Delhi at 1030, broadcasting in English on 17·387. **Robert Taylor** of Edinburgh says that AIR are very anxious to get reports on their 17·875 transmissions, at 1000—this is beamed to Australia, but no doubt reports from other countries will be welcome, too!

Radio Pakistan beams to Europe at 1005 on 17·660 and **Ben Dias** of Bristol, Avon, enjoyed their live broadcast of a test match between Pakistan and Sri Lanka. In the Isle of Lewis, Scotland, **Calum MacLeod** has been busy with his Yaesu FRG-7700 receiver and his log of 17MHz stations included Radio Afghanistan, relayed by the USSR on 17·720 at 0900 and Radio Nederlands, via their relay in Madagascar on 17·575, at 1225.

UAE Radio Dubai beams to Europe at 1330 on 17·775 and 17·830. **Phil Englehard** of Macclesfield, Cheshire, says "The feature programme following the News is always worth catching for an insight into Arab culture and tradition."

A new venture in s.w. broadcasting will commence this month—stereo from the USA station NDXE! The transmissions to Europe on 17MHz will be from 1400 to 1800—the exact frequency is not known at the time of going to press. To receive these signals, two s.w. receivers will be needed. From the technical point of view, I am not fully convinced that this s.w. stereo system will work too well, because selective fading and phase distortion takes place on s.w. to a varying degree all the time, so it will be interesting to see what does happen to the signals—so please send along your reception reports and comments to me for "On The Air".

RCI Montreal, Canada, can be heard beaming to Africa on 17·820 at 1800 and there is usually plenty to interest the listener in their programmes. **Ted Tew** of Northallerton, Yorkshire, enjoyed their "Listeners' Corner" programme at 1830. At 1900, Phil Englehard has noticed that the WYFR signals on 17·750 from Okeechobee, Florida, USA, come through well. Later, at 2000, **Peter Mills** of Sherborne, Dorset, heard Radio Algiers, Algeria, for the first time, broadcasting News in English at 2000 on 17·745—apparently, this was a good signal until the band conditions rapidly changed and it faded out at 2017.

Conditions for long distance reception on 15MHz (19m) have been variable and generally unreliable. However, signals from KYOI Saipan, N. Mariana Islands, logged by **Tim Shirley** of Bristol and others on 15·150 from 0900, have been quite good at times. Radio Australia is sometimes a strong signal in the UK on 15MHz—both Tim and Calum Macleod noted their transmission to Asia on 15·405 at 1050 as good.

A strong signal from Iran can be heard on 15·084 and **David Middlemiss** of Eyemouth, Berwickshire, has been listening to VOIRI, Tehran at 1115 with his Eddystone 7173 Mk2 receiver.

Darren Taplin of Tunbridge Wells, Kent, has been monitoring the band with his DX150A receiver, during the evenings. His log includes Radio Sophia, Bulgaria, on 15·310 at 1830 and AFRTS via Greenville USA on 15·430 at 2000—this station was also received well by David Park of Bradford, Yorkshire, who uses a Panasonic RF-3100L receiver and a 6m wire antenna. David has been trying to receive some of the USA Religious Broadcasters and heard WYFR on 15·566 at 1600—however, WHRI on 15·310 at 1700 and WINB on 15·150 at 1800 are very much in the background. **Andrew Hill** of Cheslyn Hay, Staffs, who uses a Vega 206 receiver, has been hearing Radio HCJB Quito, Ecuador, on 15·270 very well at 2130—this is certainly one to look out for!

The Voice of Free China broadcast programmes about Chinese cooking at 2100 on 15·440—these seem to be very popular with **Sheila Hughes** of Morden, Surrey; **Anthony Beldon** of Barnsley, Yorkshire; **Alan Curry** and **Michael Hill**, both of Stockton-on-Tees; Andrew Hill and David Middlemiss!

The Voice of Nigeria on 15·120 is not often mentioned by s.w.l.s in their letters; however, Sheila Hughes says she has been hearing their News broadcast from Lagos at 0700 and **Fred Pallant G3RNM** of Storrington, Sussex, enjoyed their "Hi-Life" music at 1700. Fred has also been monitoring Africa No.1, Gabon, during the day. This station operates on 15·200 between 0800 and 1700 and then moves to 15·475 until 2300.

The 11, 9, 7 and 6MHz Bands

These bands are full of signals from all Continents. Some of the interesting signals heard on 11MHz (25m) by **Keith Hitchman** of Didcot, Oxon, include Radio Beijing on 11·610 at 1140; RHC Habana, Cuba on 11·795 at 1830; AIR New Delhi 11·620 from 1845; VOA on 11·760 via their relay in Tangier, Morocco at 1915 and Radio Kuwait on 11·675 from 1800. His log for 9MHz (31m) mentions Radio Australia on 9·655 at 0930—**Roy Spencer** of Nuneaton, Warwickshire, spent several mornings monitoring this transmission between 0700 and 0800 and found it to be excellent.

Keith Edwards of Oxford has been listening to some of the other transmissions from Radio Australia, for example their ABC relay on 9·680 around 0800 and their service to Papua and New Guinea on 9·760 between 0800 and 0900. Radio Australia also broadcast in the 7MHz (41m) band on 7·205 from 1530. **Peter Edwards** of Abingdon, Oxon, is a regular listener to their 6MHz (49m) transmission, targeted on Europe from 1500 on 6·035.

A relative newcomer to s.w.l.ing, **Craig Harris** of Laceby, S. Humberside, uses a Sharp GF-570 twin cassette radio plus 36m long wire antenna. He enjoys the Saturday night "Rock On" music broadcast by Radio Kuwait from 1915 on 11·675 and has received AIR New Delhi 11·740 at 2245; Adventist World Radio on 9·670, with "DX News" at 0800; Radio Kiev 7·230 at 1700; Radio Vilnius, Lithuania 7·165 at 2300 and RBI Berlin, 6·080 at 1630.

Writing from Dendermonde, Belgium, **Maurice Andries** says he has been comparing the signals from UAE Radio Dubai at 1615 on 11·955 and 9·595—although the 11MHz signal is good, he found the 9MHz signal to be very weak.

Because of his hours of work—see MW section—**Al Dupres** of Cardiff hunts for stations late at night with his Yaesu FRG-8800 receiver! In his interesting letter Al mentions News from Athens via the Voice of Greece 9·935 at 0130; Radio Cairo on 9·475 at 0230; TWR Bonaire, Nederlands Antilles 9·535 at 0300 and UAE Radio Dubai 7·310 at 0330.

NDXE plan to broadcast Stereo to Europe from July, in the 11MHz and 9MHz bands—times are 0000 to 0300, but exact frequencies are not known.

Peter Jones of Abertillery, S. Wales, sent along the only reception report of Radio Earth International, USA, which broadcasts via Radio Milano, Italy, on Sundays from 0700, with a transmission for Europe on 7·295. Peter has a Yaesu FRG-7 receiver and a vertical antenna. Another station not often mentioned is the Voice of Vietnam. **Julian Wood** of Buckie, Scotland, has been receiving their broadcast to Europe on 10·040 at 1900.

An interesting log from **Alan Hollingworth** of Southsea, Hampshire, includes RCI Montreal, Canada on 9·760 at 2200. He also mentions good reception of Radio RSA, Johannesburg on 9·585 at 2100 with News; Radio Sophia, Bulgaria on 9·700 at 2300 and News from Radio Polonia, Warsaw on 9·540 at 1730. **John Sadler** of Bishops Stortford, Hertfordshire, also listens to RCI Montreal, Canada, and tunes to 11·945 at 2030 on Saturdays for their DX programme. His log mentions Radio Peace & Progress Moscow on 9·875 at 1630; Radio Yugoslavia, Belgrade 6·100 at 2000 and Radio Budapest, Hungary on 9·835—this station has a DX programme on Fridays at 1415.

Vatican Radio of Rome, broadcasting on 9·645, was received by **David Wright** of Telford, Staffordshire, at 0620, during an early morning listening session. Using a Sony ICF7600D receiver, some of the other stations heard were RBI Berlin on 5·965 at 0600; Radio Polonia, Warsaw on 9·675 at 0630 and VOA via their Tangier relay on 9·650 at 0700.

The 5, 4, 3 and 2MHz Bands

Although the conditions for long distance reception on the Tropical bands have been good, the identification of some of the DX stations received is never easy!

Michael Sargeant of Bolton, Lancashire, concentrated on these bands and sent along an extensive log which included ELWA Monrovia, Liberia 4·760; Radio Mundial Venezuela 4·770; Radio Atlantida Peru 4·790; Africa No. 1 Gabon 4·830; Radio Jornal do Brazil 4·875; Radio Yaracuy Venezuela 4·885; Radio Rumbos Venezuela 4·970 and Ecos Del Torbes Venezuela 4·980.

Leslie Biss of Knaresborough, Yorkshire, has been exploring these bands with his new Trio R600 receiver and listened to African music from Radio Douala, Cameroon on 4·795 at 2040 and to S. American music from Radio Nacional Porto Velho, Brazil on 4·945 at 2100.

Up in Scotland, **Neil Dove** of Lockerbie, Dumfriesshire, noted GBC Ghana 3·366; AIR Delhi 3·905; BBC Kranji Singapore 3·915; Xinjiang China 4·735; RTM Mali 4·835; ORTB Cotonou Benin 4·870; Senegal 4·890; FRCN Lagos Nigeria 4·990; Equatorial Guinea 5·004 and Radio Sutatenza Columbia 5·095 in his log!

Using the general coverage receiver of his Yaesu FT-757GX transceiver, **Albert Fisher G4VBH** of Heston, Hounslow, has been hearing FRCN Kaduna, Nigeria 4·770, but says, "I measure it as 4·775." Do you get the same readout on l.s.b./u.s.b. as a.m. Albert? I make it 4·770 here—has anyone heard this station operating off frequency?

John Romano of Glasgow, Scotland, has been experimenting with antennas and enjoys looking for the low power Tropical stations—his latest DX is Radio Mundial Boliva, Venezuela on 4·770, heard at 0145. **Graham Powell** of Pontypridd, S. Wales, has also been hearing some S. American DX, including La Voz Evangelica, Honduras 4·820; Radio Reloj, Costa Rica 4·832; Radio Capital, Venezuela 4·850 and Radio Timbira, Brazil 4·975. Graham also head 4VEH from Haiti on 4·930—often a good signal at 2300 and RFO Cayenne, Fr Guiana on 5·055 at 2239.

Another keen listener, **Jon Snooks** of Andover, Hampshire, decided to look for tropical DX for the first time and his extensive log included Radio Burkina, Ouagadougou 4·815; ORTM Nouakchott, Mauritania 4·845; Radio Yaounde, Cameroon 4·850; ORTS Dakar, Senegal 4·890 and Radio Togo, Lome 5·047.

Andy Kennedy of Leicester has been searching for more DX and was delighted to hear signals from 4VEH Cap Haiten, Haiti on 4·930 at 2316. He says "I spent much time on 90m this month and most rewarding it was, too. Radio Zaracay, Ecuador on 3·395 in particular, was a solid and regular signal." Others logged were HCJB Quito, Ecuador 3·220 (Home Service in Spanish); Radio/TV Togolaise Kara, Togo 3·222; Radio Occidente, Venezuela 3·225; ELWA Monrovia 3·230; Radio RSA 3·230; Radio Cultural, Guatemala 3·300; CHU Ottawa, Canada 3·330. On 75m, signals from the BBC Kranji, Singapore station on 3·915 were received.

In Selangor, Malaysia **Mat Jusoh** has been listening to the 75m band signals from AIR New Delhi on 3·900 at 1500; BBC Kranji, Singapore on 3·915 at 1545; Nippon BC Japan on 3·925 at 1510 and Radio RRI, Padang on 4·000—relaying News from FR Jakarta at 1600. On 60m, Africa No.1, Gabon 4·830 at 2300; ORTM Nouakchott, Mauritania 4·845 at 1945; Radio San'a, North Yemen 4·850 at 2000; VLM4 Brisbane, Australia 4·920 at 2010 and FRCN Lagos, Nigeria 4·990 at 2200 were logged.

At his listening post in Belfast, N. Ireland, **Bill Kelly** has been busy checking the Tropical bands during the night, with his

Fig. 1

JRC NRD 515 receiver. On 90m, Bill listened to "Good Morning Africa" via Radio RSA on 3·230—a very good signal at 0345 and on 75m heard the BBC Kranji, Singapore station on 3·915 at 2330 and RFI Allouis 3·965 at 0330. His extensive 60m band log includes Radio Bafoussam, Cameroon 4·000 at 0535; Radio Kabul, Pushto (USSR Relay?) 4·740 and Radio Garoua, Cameroon 5·010 at 0445.

Tim Shirley of Bristol—pictured in Fig. 1—has continued his search for DX on these bands and logged LNBS Lesotho 4·800 at 2140; RTB Cotonou, Benin 4·870 at 1925; Radio Nacional, Porto Velho Brazil 4·945 at 0300; Radio Rebelde, Cuba 5·025 at 0205 and Radio Cultura do Para, Brazil 5·045 at 0100.

Station Addresses

Radiodiffusion TV Gabonaise, Boite Postale 10150, Libreville, Rep. Gabon.

RHC Habana, Emiss. de Ondas Cortas, Apartado de Correos 7026, La Habana, Cuba.

WYFR Family Radio, 290, Hegenberger Road, Oakland, CA. 94621, USA.

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Have Yaesu FT-203R hand-portable with batteries, case, rubber antenna and home-brew speaker mic c/w handbook. Would exchange for FT-200 or any similar h.f. TX/RX. Simon G0EHU. Tel: Derby 515908. *B293*

Have FR100B amateur bands receiver, in working order with manual. Would exchange for RX audio processor, MFJ or Datong or similar. Sharp. Tel: Swindon 826325 after 7pm. *B294*

Have Canon Auto Zoom cine camera plus two projectors, also have Texas TI/99A computer as new. Would exchange for Yaesu FC-707 a.t.u. or a pair Tandy TRC1001 handheld CBs. Ian. "The Dormouse", 5 Sunset Walk, Bush Estate, Eccles-on-Sea, Norfolk NR12 0SX. *B295*

Have Yaesu head set, boom mic and switch box, as new boxed. Would exchange for Icom equivalent. Garry. tel: 0625 530200 (Wilmslow). *B296*

Have 48K Spectrum computer plus Protek interface and lots of games (joystick if wanted). Would exchange for AT130 or TL130 or p.s.u., other offers considered. Douglas. Tel: Hamilton 426476. *B304*

Have 10m, 3-section, glass fibre tower, new and unused. Would exchange for 144MHz mobile multimode or f.m. Delivery can be arranged. Bill G0CYD. Tel: Bristol 828591. *B312*

Have Tandy 40-channel CB 4 watts, plus extension microphone. Would exchange for Sony ICF–2001 receiver and power supply, or communications receiver of some sort. Cash adjustment either way. Mike. 14 Doverfield Road, Brixton, London. *B326*

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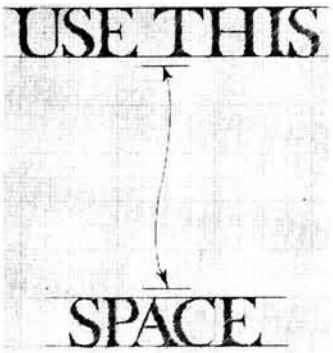

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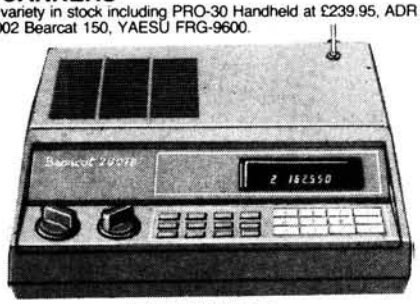

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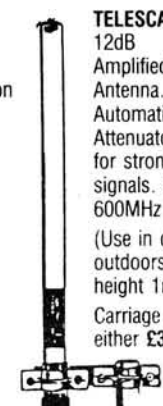

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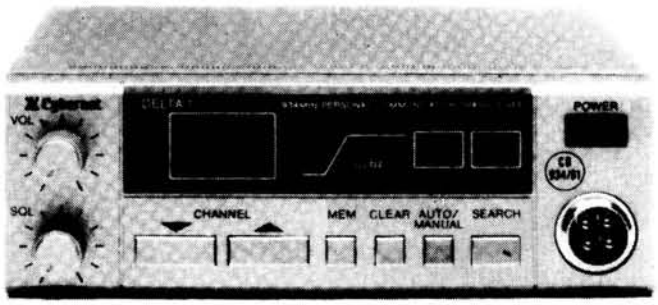

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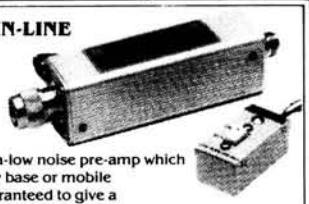

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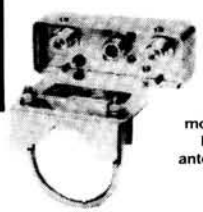

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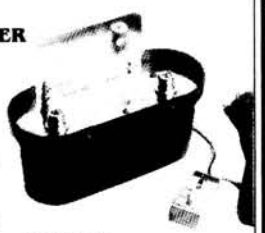

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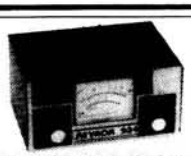

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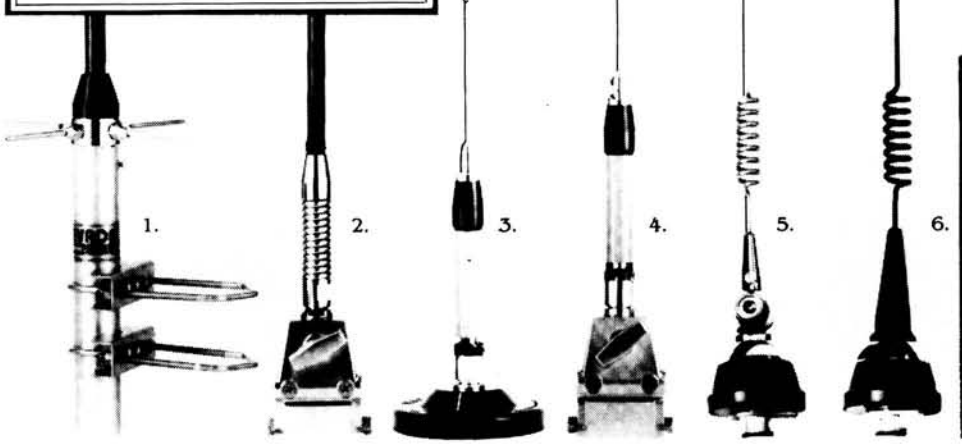

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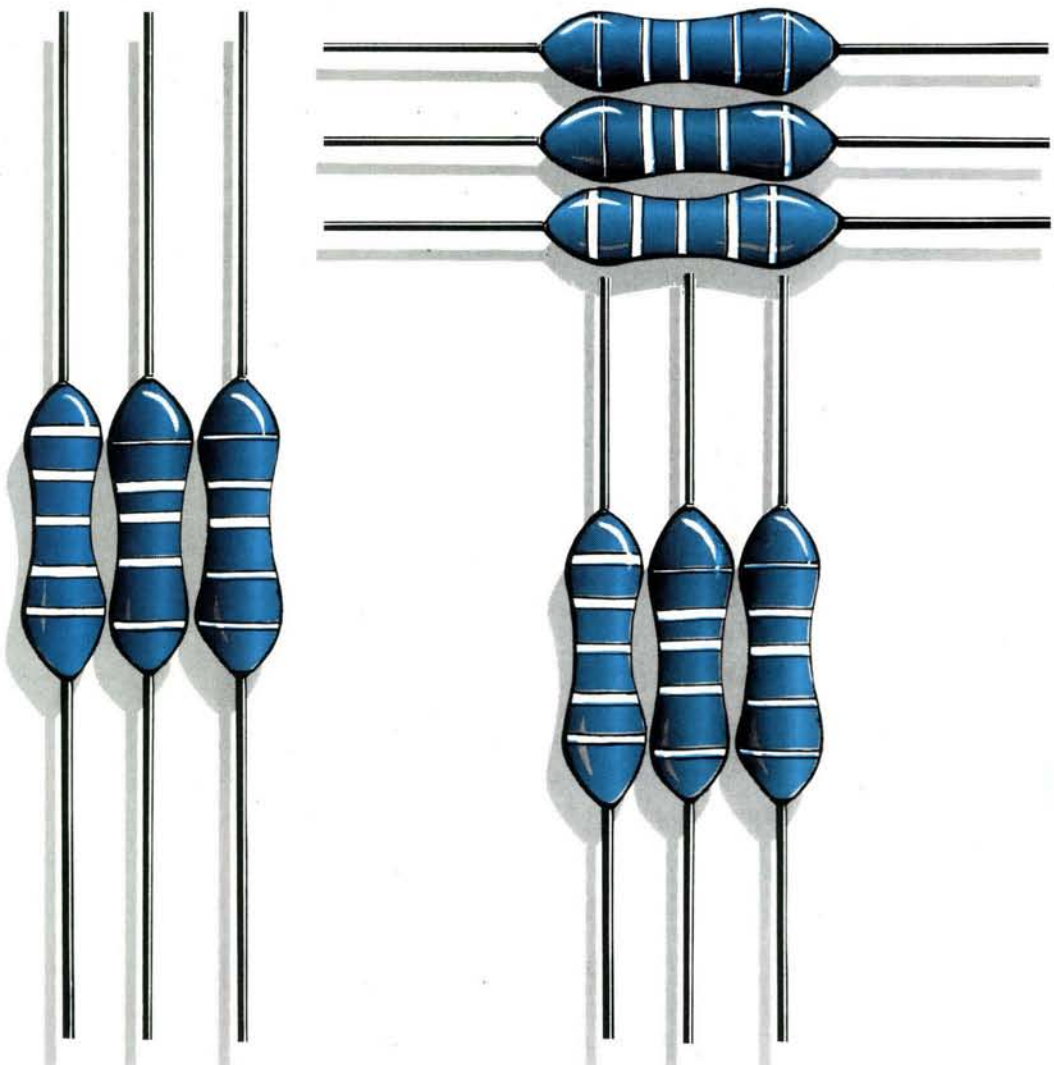

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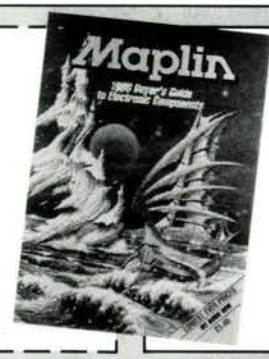

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