W STYLE

Practical Wireless

The Radio Magazine

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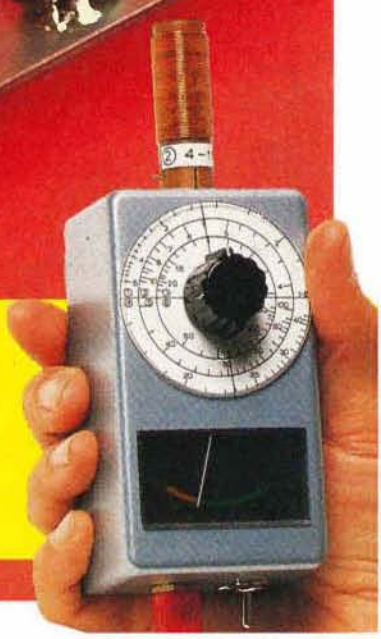

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TS830S	9 Band TX General Cov RX	1295.00	(—)
TS830S	160-10m Transceiver 9 Bands	832.75	(—)
AT230	All Band ATU/Power Meter	157.99	(2.00)
SP230	External Speaker Unit	47.73	(1.50)
TS530S	160m-10m Transceiver	698.00	(—)
TS430S	160m-10m Transceiver	720.00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

NEW MODELS

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

Linear Amps

TONO (G series)

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

TOKYO HIPOWER AMPS. NOW BACK IN STOCK

MICROWAVE MODULES

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

B.N.O.S.

LPM 144-1-100	2m, 1W in, 100W out, preamp	181.00	(2.50)
LPM 144-3-100	2m, 3W in, 100W out, preamp	181.00	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	157.00	(2.50)
LPM 144 25-160	2m, 25W in, 160W out, preamp	217.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	247.00	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	247.00	(2.50)
LP 144-3-50	2MN 50W out, preamp	108.00	(2.50)
LP 144-10-50	2M 10W in, preamp	108.00	(2.50)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	235.00	(2.50)
LPM 432-3 50	70cm, 3W in, 50W out, preamp	235.00	(2.50)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00	(2.50)
LPM 432-10-100	70cm, 10W in, 100W out, preamp	335.00	(2.50)

SWR/PWR Meters

HANSEN

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

WELZ

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

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TOYO

T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(1.50)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(2.50)
SX200	VHF/UHF Scanner	325.00	(2.50)
SX400	VHF/UHF Continuous Coverage	625.00	(2.50)
AOR2001	VHF/UHF Continuous Coverage	345.00	(2.50)
FDK RX40	141.00-180.000 MHz	159.00	(2.00)

Icom Products

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

Mutek Products

SLNA 50	50MHz Switched preamp	44.90	(1.50)
SLNA 144s	144MHz Low noise switched preamp	39.95	(1.50)
SLNA 145sb	Preamp intended for 290	29.90	(1.50)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	79.90	(1.50)
RPCB 251ub	Front end IC251/211	84.90	(1.50)
BBBA 500u	20-500MHz Preamp	34.90	(1.50)
GFBA 144e	2m Mast head preamp	149.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	89.90	(1.50)
TVHF 230c	2M FM Transverter	334.90	(5.00)
LBPF 144v	Bandpass Filter	22.40	(1.50)
LBPF 432u	Bandpass Filter	22.40	(1.50)
TVVF 50c	6M Transverter	199.90	(2.50)
GLNA 433e	70cm Pre-amp	79.90	(2.50)
TVVF 144a	2M Transverter	239.90	(2.50)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	29.90	(1.50)
FL2	Multi-mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	33.90	(1.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
LC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

Tono 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	329.00	(2.50)

MICROWAVE MODULES

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

BENCHER

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

HI-MOUND MORSE KEYS

HK702	Up down keyer marble base	30.95	(1.50)
HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	15.49	(1.50)
HK706	Up down keyer	16.96	(1.50)
HK708	Up down keyer	14.95	(1.50)
HK802	Up down solid brass	86.30	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)

KENPRO

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

Yaesu

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

NEW MODELS

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

Power Supplies

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

Aerial Rotators

FU200	Light Duty	49.95	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	385.00	(4.00)

Switches

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

Miscellaneous

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

TOKYO HI-POWER

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

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On sale Friday 4 October

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LOWE SHOPS

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

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

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

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

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

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

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex. (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

TRIO
TS940S

hf transceiver
with general coverage receiver

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

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

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

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

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

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

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

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

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

LOWE ELECTRONICS LTD.

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

send £1 for complete mail order catalogue.

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

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

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

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

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

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

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

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

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

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

TS430S

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

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

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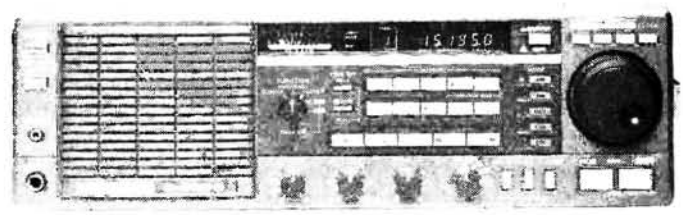
R2000



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

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

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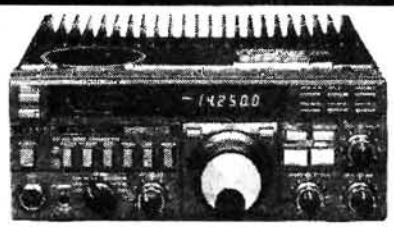

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XF8.9KC	600Hz CW filter	19.95
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FRB757	Switch box for FT757GX to FL2100Z	9.95
MMB20	Mobile mount for FT757GX	18.00
FIF65(A)‡	Computer interface for Apple II	47.15
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FRG9600	60-905MHz Scanner, FM, SSB, AM, CW	449.00
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SP980	External speaker with audio filter	78.95
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D410004	Interconnect lead FT980 to FC757AT	28.75
FL2100Z	Linear 160-10M (9 band) 1-2KW P.E.P.	699.00
FT203R	Tx/Rx Thumbwheel, 2M, 1.5W c/w FBA5	175.00
FT203R	Tx/Rx Thumbwheel, 2M, 2.5W c/w FNB3	195.00
FT203R	Tx/Rx Thumbwheel, 2M, 3.5W c/w FNB4	198.00
FT703R	Tx/Rx Thumbwheel, 70cm c/w FBA5	215.00
FT703R	Tx/Rx Thumbwheel, 70cm c/w FNB3	235.00
FT703R	Tx/Rx Thumbwheel, 70cm c/w FNB4	239.00
FBA5†	7.2/9V cell case only (6×AA)	6.50
FNB3†	10.8V Nicd Pack (425mAH)	38.65
FNB4†	12.0V Nicd Pack (500mAH)	34.95
CSC6	Soft carrying case (FBA5 or FNB3)	5.75
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YH2†	Headset (PTT via vox)	14.95
MH-12A2B†	Speaker microphone	16.50
MMB21†	Mobile hanging bracket	7.65
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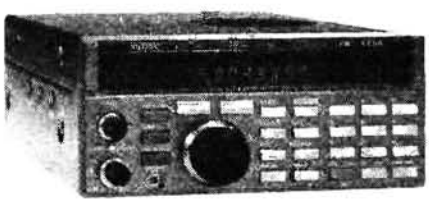
YHA14	Antenna helical (BNC fitting) 2M	8.45
FT270R	Transceiver 2M, FM, 25W synthesised	315.00
FP270RH	Transceiver 2M, FM, 45W synthesised	365.00
FVS-1	Voice synthesiser module	20.70
FT2700RH	Tx/Rx, 2M/70cms, 25W/25W, full duplex	499.00
FL2050	Linear amplifier 50W output 2M	115.00

FM2033

144 MHz, 12VDC Transceiver. 25W/5W Hi/Lo (both adjustable). Compact $2^{2}/_{16}$" × $6^{3}/_{8}$" × $7^{3}/_{16}$". 12½ KHz steps (100 fast QSY). Amber LCD Sunlight View, Side Lit. Display, 100's of Hz or channel number. Sensitivity <0.2µV for 12dB SINAD. Single knob frequency control "Dial". Endless or non-endless dial options. RIT; 1 KHz steps, V.F.O. + memory. Two 5 slot memories A, B, A+B, A×B. 11th memory instant "call" channel. Memories simplex or duplex channels. Band scanning, programmable limits. Scan halts squelch + centre zero. Pause on scan halt for 3 seconds. Scan/tune/RIT from microphone ±600 KHz split, plus cross memory. Repeater input listen by pressing "dial". Setable; steps, tone, splits, limits. Simple controls for safe mobile operation. C/W mobile mount, mic and handbook.

£239 inc



FRG 9600
£449.00
PA4(C)
£12.65

An all mode scanning receiver covering 60 through 905MHz continuously, with 100 keypad-programmable memory channels. In addition to FM wide (for FM and TV broadcasts), FM narrow and AM (wide and narrow) the FRG-9600 also provides SSB (single sideband) reception up to 460MHz. A front panel tuning knob simplifies tuning of SSB and narrowband AM. Seven tuning/scanning rates between 100Hz and 100kHz assure fast and efficient scanning while permitting easy tuning of narrowband signals. The scanning system allows full or limited band scanning and memory channel scanning, with auto-resume. In addition to carrier sensing scan stop, audio scan stop sensing is also selectable to avoid stopping on inactive "carrier-only" channels. Scanning steps are selectable, with the wide steps indicated on the front panel display. Signal strength indicated by a two-colour graphic S-meter. A 24-hour clock/timer, recorder output, cpu band selection outputs, multiplexed (FM wide) output, AF and RF mute and other control signals for maximum expansion potential with future options or for own add-on hardware for special applications. The direct control link to the cpu in the FRG-9600, allowing virtually unlimited customized control functions such as multiple, organized memory banks; automatic tuning; and customised scanning systems; using most personal computer and a Yaesu FIF CAT Interface Unit. The FRG-9600 requires 12VDC.

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FT209R	Tx/Rx "Keyboard" 2M, 2.7W c/w FNB3	239.00	FT726R	Main frame only	629.00
FT209R	Tx/Rx "Keyboard" 2M, 3.7W c/w FNB4	245.00	21/24/28	HF module for 15M, 12M and 10M	210.00
FT209RH	Tx/Rx "Keyboard" 2M, 2.3W c/w FBA5	225.00	50/726	6M module	185.00
FT209RH	Tx/Rx "Keyboard 2M, 3.7W c/w FNB3	245.00	144/726	2M module	150.00
FT209RH	Tx/Rx "Keyboard 2M, 5.0W c/w FNB4	249.00	430/726	70cm module	255.00
FT709R	Tx/Rx Keyboard, 70cms, c/w FBA5	239.00	SAT726	Full duplex module	95.00
FT709R	Tx/Rx Keyboard 70cms c/w FNB3	259.00	XF455MC	600Hz CW filter	49.85
FT709R	Tx/Rx Keyboard, 70cms, c/w FNB4	265.00	FYP80	12V power supply	65.55
CSC10	Carrying case (FBA5/FNB3)	6.90	QTR24D	World time clock quartz	33.35
CSC11	Carrying case (FBN4)	8.05	FF501DX	Low pass filter	29.90
FT208R	Tx/Rx Handheld, 2M, 2.5W, Keyboard	209.00	YP150Z	Terminated Wattmeter 5-30-150W FSD	97.75
FNB2	Nicad Battery Pack	27.02	YC1000L	Data Logger (V, F, T etc)	419.00*
FBA2	Battery pack sleeve (fits FNB2)	3.85	YM24A	Hand 2K, 6 pin min, speaker/mic, handheld	23.75
FBA3	Charging sleeve (for use with FT207 acc)	5.00	YM36	Hand 600, 8 pin, noise cancel	18.80
NC7C	Base Master	34.65	YM47	Hand 600, 7 pin, scan control	13.80
NC8C	Base Master with quick charge and PSU	64.80	YM49	Hand 600, 7 pin, speaker/mic	20.20
MMB10	Mobile bracket	7.65	YE7A	Hand 600, 4 pin	9.60
FT690R	Transceiver 6M 2.5W multimode synthesised	289.00*	YD148A	Stand 600/50K, 4 pin	24.90
FT290R	Transceiver 2M 2.5W multimode synthesised	315.00	MH 1B8	Hand 600, 8 pin scan adjustable tone	15.70
NC11C	Slow charger (180mA)	11.50	MD-1B8	Desk 600, 8 pin scan adjustable tone	64.80
MMB11	Mobile mount	30.00	SP55	External Mobile speaker	14.95
CSC1A	Soft carrying case	5.00	YH55	Headphones padded low Z ¼" jack	15.35
YHA15	Flexible helical antenna	7.65	YH77	Headphones lightweight low Z ¼" jack	14.95
YHA44	Antenna 70cms, 0.5 wave, semi-flexi	7.65	MF-1A3B	Boom Microphone Mobile	18.00
YHA44D	Antenna 70cms, 0.5 wave, semi-flexi	9.95	YH1	Lightweight mobile headset/boom	14.95
FL2010	Linear amplifier 2M 10W	65.00	SB1	PTT switch box wired for FT208/FT708	15.70
FL6010	Linear amplifier 6M 10W	50.00*	SB2	PTT switch box wired for FT290/FT790	13.80
FRG8800	Rx 0.15-30.0MHz AM/CW/SSB/NBFM	475.00	SB10	PTT switch box wired for FT2700R/FT270R	14.95
FRV8800	Convertor 118-175MHz	80.00			
FRVWFM	Module for wide band F.M	TBA	* Special offer – limited stocks.		
FT680R	Multimode transceiver 6M	379.00	‡ Matches FT980 and FRG8800		
FP80A	Power supply unit	57.50	† Accessories for FT209 also.		

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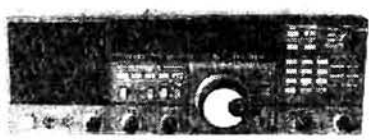

FRG 8800
£475.00
FRV 8800
£80.00

Continuous coverage from 150kHz to 30MHz. Two speed spin tuned VFO plus keyboard plus computer interface control. The FRG-8800 demodulates SSB (USB & LSB) CW, AM (Wide and Narrow) and FM narrow as standard, useful for 10M, CB and for VHF. The FRG-8800 comes with twelve memories programmed and scanned at the touch of a single button. Any of the memory channels will accept a frequency including the VHF range (optional VHF unit). The mode is also stored in the memory. Four filters are fitted as standard (SSB/CW, AM, AM-NAR and FM-NAR) chosen for optimum performance, with switchable AGC and variable tone control. The back-lit green L.C.D. display incorporates easy to read "any angle" 10mm digits. A twelve function display indicates the status at a glance. It includes memory channel number, mode, and frequency to a resolution of 100Hz. Also included is a two dimensional LCD, graphical SIMPO and 'S' meter. A 12 button keyboard allows quick accurate changes of frequency and band. Dual accurate 12 hour clocks, with AM/PM indicators uses the main digital display and features full back-up facilities (mains failure) and can activate the receiver or tape recorder via relay contacts. The FRV-8800, extends coverage to include 118-174MHz all within the main frame, allowing monitoring of, PMR, marine and air bands, as well as 2M. 240-220VAC to 110-120V, 50/60Hz mains are standard. 12VDC operation is optional.

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

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ICOM ICOM

IC-735, The Complete HF Radio

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

Tuning ranges from 100kHz to 30MHz, made continuous by using a high side IF and a CPU control system. RTTY operation is also possible. Dynamic range is 105dB with a 70 451 MHz first IF circuit. The direct feed mixer rejects spurious response and gives higher sensitivity and wider dynamic range. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB

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

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

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

IC-3200E Dual-band

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

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

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

STOP PRESS» Contact us regarding 50MHz equipment for new issued band!

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IC-505, 50MHz A New Dimension for the U.K.

At last, permits are now available in the U.K. for the 50MHz (FM) band. If you wish to use this less crowded amateur frequency the IC 505 SSB CW portable transceiver has already gained an excellent reputation world wide.

The IC-505 features microprocessor frequency control, dual VFO's and 6-channel memories with memory scan. LCD ensures clear visibility even in sunlight. The 505 accepts a standard dry-cell pack rechargeable nicad battery pack (BP10) or 13.8V external power supply.

Standard accessory circuits such as split switch, noise blanker, squelch and CW break-in are incorporated in the 505.

Other accessories available include the EX-248 FM unit, BC-15 charger unit and the LC-10 carrying case.

All these features make the IC-505 a great transceiver that will enable you to operate on the 50MHz band, after all the rest of the world does!

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Amcomm, London (S Harrow), 01-422 9585
A.R.E. Comms Earlstown. Merseyside, 0952-29881.
Arrow Electronics Ltd , Chelmsford, Essex, 0245-381673 26.
Beamrite, Cardiff, 0222-486884.
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Reg Ward & Co. Ltd S W. England, 0279-34918.
Waters & Stanton Electronics, Hockley Essex, 0702-206835

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

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

Please note that we have a retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 369464. Give it a visit, BCNU.

IC-271 & 471

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

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

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

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

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Tel (0227) 363859

AUDIO FILTERS
MODELS FL2, FL3, FL2/A

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

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

ACTIVE RECEIVING ANTENNAS

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

- highly sensitive (comparable to full- size dipoles).
- Broadband coverage (below 200 kHz to over 30 MHz).
- needs no tuning, matching or other adjustments
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- very compact, only 3 metres overall length. ● professional performance standards.

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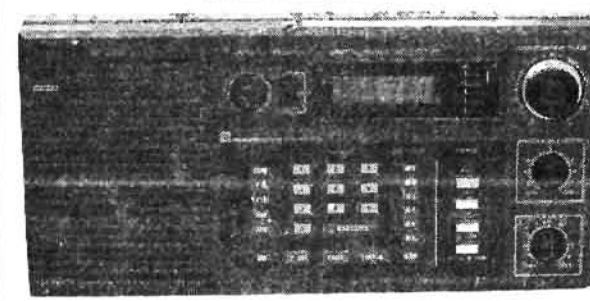

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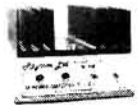

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DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER

The HOWES DcRx receivers are simple, easy to build single band designs. You can choose versions for the following bands: 20, 30, 40, 80 or 160 Metres. They all work from a 12 to 14V DC supply (a battery is fine) and provide plenty of audio output to drive a loudspeaker or headphones. The DcRx has been the first introduction to shortwave listening for many an aspiring amateur. Read the SWL column in the August '85 issue of "Amateur Radio" and find out what Trevor Morgan has to say about the DcRx and how one of his correspondants has claimed a Bronze Award for prefixes and countries heard on his HOWES DcRx20. You will be amazed just how well a simple design can work. A case and a couple of tuning capacitors are the only major items to add to finish your receiver. We have suitable capacitors for all but the 160M version at £1.50 each.

DcRx kit £14.80. Assembled PCB module £19.90.

CTX QRP CW Transmitters

Two versions are available at the moment, one for 80M and the new 40M version. These super little rigs produce up to 5W RF output on 80, and 3W on 40. They come complete with one crystal, but there is also provision for an external VFO for full band coverage (HOWES CVF40 or CVF80). Read the reviews in the August '85 issue of Practical Wireless and the March '85 Shortwave Magazine. A CTX transmitter makes a ideal introduction to HF operating. A few months spent using simple CW only equipment will help to make you into a first class operator. I can only admire the skills of some of our customers, many only having recently passed the Morse test, the sheer number of countries they manage to work with their HOWES QRP equipment puts me to shame! But then I started on HF a few years ago with a black box and a microphone – something I now regard as a mistake!

CTX40 or CTX80 kit £12.95. Assembled PCB module £18.95.

CVF VARIABLE FREQUENCY OSCILLATORS

The HOWES CVF40 and CVF80 VFOs are designed for use with the CTX transmitters. They enable you to tune the whole band instead of being "rock bound". Dual buffered outputs are provided so that you can also connect up your DcRx and form a transceiver. IRT, voltage stabilisation, FET oscillator are some of the features of the CVF designs. These kits require a tuning capacitor of about 50pF (we can supply these at £1.50 if required).

CVF40 or CVF80 kit £9.30. Assembled PCB module £14.90.

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Add more "punch" to your signal with the AP3. Automatically compensates for changes in speech levels, so giving accurately controlled clipping levels and hence clean audio quality. This kit is one of our big sellers, and they enjoy a very good reputation on the air. Suitable for high or low impedance mics. and can even be used with ICOM rigs with a couple of simple mods which we can give you.

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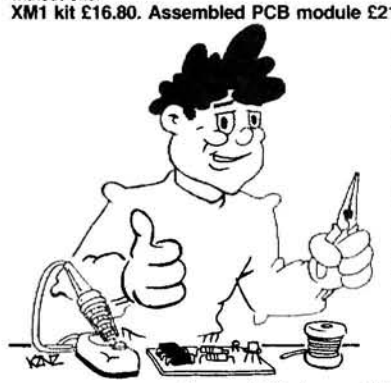

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73 from Dave G4KQH, Technical Manager.

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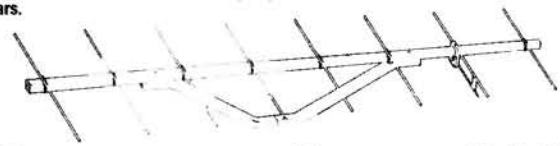

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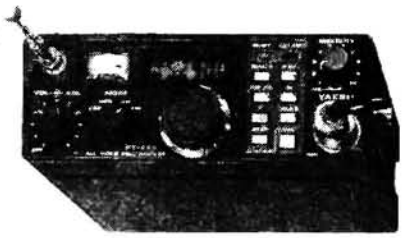

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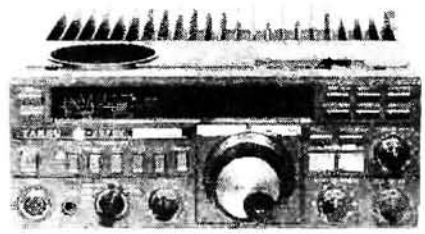

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Albanian Aggro

Sir: In his letter regarding Amateur Band Occupany (*PW* August 1985), Pat Hawker states that Albania "is still not a member of the ITU". Rare though it is that such an eminent authority as Mr. Hawker gets his facts wrong, I must point out that Albania is indeed a member of the ITU, and has been since at least the time when the 1959 Radio Regulations were produced. I have a copy of the said Regulations in front of me, and one of the several reservations which Albania (along with Bulgaria, Czechoslovakia, Hungary, Poland and Romania) made at that time, has a bearing on the current situation.

The above countries declared that "The Clauses of the Radio Regulations designed to extend the authority of the IFRB in managing the utilisation of the frequency spectrum and, in particular, the examination of the utilisation of the radio spectrum on the initiative of the IFRB (Article 9 and several others) are in contradiction with the sovereign rights of Administrations. The above-mentioned Delegations reserve the right for their Administrations to accept or not to accept these clauses".

The same Administrations also expressed doubts about the effectiveness of the current procedure for the allocation of frequencies within the "official" short-wave broadcasting bands, and again reserved the right to apply, or not to apply, that procedure.

Taken together, it does seem that Albania gave due notice that it could not be relied upon to comply with the majority decision. Many other countries made similar reservations concerning specific frequencies or procedures which do not happen to come into conflict with Amateur Radio. Albania is always mentioned as the "villain" because, for reasons of its own, it has chosen to exercise its declared independence within the fairly narrow confines of an amateur band. I do not, of course, support this policy, but to be absolutely objective, it must be noted that Radio Tirana has tended to stick to several well-known spot frequencies (albeit with less than perfect stability) and its behaviour can at least be described as fairly predictable.

As a matter of interest, for the first time in many years Albania actually registered some frequencies within the official bands for the summer broadcasting season this year. Perhaps the Albanian delegation to the recent WARC Conference on Shortwave Broadcasting came away with a more positive attitude, and has begun to obey the rules. Time will tell.

As a postscript, I am surprised that there hasn't been more coverage in the amateur radio press about Iran's use of 3775kHz (variable) for broadcasts to Iraq, which results in quite a portion of the 3·5MHz band being spoiled during the evening hours, as Iraq jams the broadcasts, not always on the same frequency! This has been going on for several years now, and both countries are most definitely ITU members!

A. G. Sennitt
Associate Editor
World Radio TV Handbook

Regulation

Sir: Now the amateur bands are being extended (?) to 50MHz I wonder what your readers' views are on this possibly fascinating band? Wondering, too, what possible restrictions there may be, I venture to say that they will be mandatory.

If the restrictions are, then I reckon all amateur band-plans ought to be mandatory. There could be

PW COMMENT

Changes, Changes

WITH THIS ISSUE, we are making several changes to *Practical Wireless*. The first and most obvious one is the bigger page size, which gives you around 10 per cent more for your money. Apart from that, we're altering the names of some of our regular features, and shuffling some of them around a bit. I hope you won't feel too lost whilst you get used to all this.

One of the changes is to turn *Computing in Radio* from a roughly quarterly feature into a monthly one, kicking off this month with a review of the Tatung Einstein computer which has much to offer the radio enthusiast. Next month we shall be looking at the use hobbyists are making of Prestel, Micronet 800 and Bulletin Boards.

We're not the only one making changes. On July 26, it was announced in Parliament that the Radio Investigation Service of the DTI would be switching its resources towards enforcement—dealing with pollution of the radio spectrum by those who operate without licences and those who abuse their licence conditions. There will be a phased withdrawal from the time-consuming and largely fruitless effort currently put into dealing with domestic TV and radio reception problems. Experience has shown that most complaints result from installations having no external antenna or one of poor quality, from improperly tuned or maintained sets, or from sets lacking adequate immunity to interference. British Standard BS905, which provides minimum immunity standards for TV receivers, will be incorporated into legislation as soon as possible. It will then be an offence to sell, manufacture or import TVs which do not comply with the standard.

In future, the public will be expected to diagnose their own reception problems, in conjunction with their TV dealer or repairman, aided by a DTI booklet which will be available shortly from Post Offices. If you do call on the RIS for help, you'll have to pay a call-out charge of £21, and provide them with a proper log of reception problems. No log, or no external antenna, means no visit. And, from 1987, you'll only get a visit if your dealer certifies he can't cure the problem.

This shift in resources—in 1983/84 only £0.8m of the RIS budget was spent on enforcement action and some £7.1m on remedying interference—will no doubt be seen by some as an attack on personal freedom. Perhaps it is for someone with a badly tuned transmitter, or a linear amplifier that's anything but linear. But that one transmitter can spoil TV reception for tens or even hundreds of neighbours, and I think their personal freedom is just as important.

However, there are several by-products of these changes which deserve further thought. Where can a radio amateur with a "clean" transmitter, at loggerheads with a neighbour over TVI, go for the sort of technical (and moral) support which he got from the RIS in the past?

Why should a TV viewer who's paid his £58 licence fee (part of which goes towards financing the RIS) and could logically expect that this would entitle him to a reasonable standard of reception, have to pay out yet again to get help in tracing and curing interference?

If someone does nevertheless call in the RIS to investigate interference, and it proves to be the fault of the transmitter and not the receiver, does the complainant get his £21 back? The answer from the DTI is **no,** which seems a little hard on someone who's bought a new TV that complies with BS905, had an efficient antenna properly installed, then finds his reception is spoiled by squiggly lines or "Donald Duck" voices.

At least schemes like the NHBC new homes guarantee give you your £42 claim fee back if your complaint is judged to be valid.

Geoff Arnold

some possible well-ordered amateur radio operation within the present frequencies if this were so. For those who mutter "rubbish" I have no apology because of a thing that we call "democracy". After all, we have various restrictions (official) placed on operating procedure, power levels, safety, etc., so why not have mandatory band planning.

Apart from the out-of-band operations, licensed and unlicensed, there is or should be sufficient grey matter in a thing called a brain to tell even the most inexperienced operators where they can operate. The FCC (Federal Communications Commission, USA) have mandatory band plans which the US ham operators, in general, agree with.

It's all very well to talk about a gentleman's agreement but that's where every known facet of Amateur Radio begins to go haywire. We all know there are always exceptions but these so-called exceptions are looming larger these days. In addition, we talk about policing our own bands. Poppycock, I say! Why, you may ask. It's illegal to jam even an unlicensed station, let alone chase one when you have d.f.-ed it. So where do we go from here? I'll tell you. Write to your MP (or the DTI, who have limited resources, I regret) but better still vote for amateur-orientated candidates at your local or not-so-local election.

Before you mutter, "Piffle, O.M.", do you know anything about the US system of lobbying for amateur radio interests? You don't? Then I must inform you that a fair number of congressmen and women, and senators, are "Radio Hams" as they call themselves in the States. It means that these people represent in full all amateur interests. One very formidable "ham" is Senator Barry Goldwater. Of course, he is only one of many, but how long will it be before the amateur fraternity here literally get smart? Remember there is certain danger of further encroachment on the amateur bands at large. Do you care?

You see, if we had mandatory band plans amongst other official plans then, like the FCC in the US, these plans could be enforced by the DTI if you broke them. The obvious reason why band planning is mandatory in the US is because, amongst other thing [illegible] levels of amateur radio operators, a system which we in this country appear to be embarking upon by way of potential legislation on novice licensing, etc.

You may ask, is it really necessary? I believe it is. Now I've done my bit, what will my amateur friends do? Let's see.

John A. Holmes G4LRS
London E4

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R1155

Sir: Concerning your issue of March 1985 and the article on the R1155. I was using one of these sets back in the fifties and encountered certain faults. These were:
1. Intermittent frequency jumping. This was traced to C34 (h.f. oscillator anode feed decoupling) going intermittently open-circuit. This capacitor is one of those 0·1μF units in the cylindrical, stud-mount aluminium cans. If this problem were to manifest in other parts of the circuit it could cause intermittent loss of gain and/or instability, etc.
2. Mistracking of the h.f. oscillator relative to the r.f. circuits on the short-wave ranges, particularly Band 1 (7·5–18·5MHz). This is due to the oscillator series padding capacitor value having been incorrectly calculated and made too small. Needless to say, this has an adverse effect on sensitivity and image rejection. It is not satisfactory merely to increase the padding capacitance to the correct value as then the dial calibration is thrown off. What would have to be done (I did not actually get around to it) would be to install "complementary" padders in the r.f. tuned circuits; correct (3-point) tracking would then be obtainable whilst retaining the dial calibration. Note: the set I had was made by Plessey. Whether this fault would show up in other makes I cannot say.

Note also, that pin No. 1 of the converter (V4) is used as an h.t. tie-point. This should be disconnected and earthed if the VR99/X66/X65 is replaced with a metallised or otherwise self-shielded type such as ECH35, 6K8, etc.

Don Sutherland ZL2AJL
New Zealand

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Have SSTV monitor model Venus SS2, mint condition. Would exchange for Standard C-78 or Yaesu FT-790R 430MHz portable. Tel: 061-764 7697 (Bury, Lancs). *A224*

Have transceiver model Swan 700-CX high power output h.f. rig in very good condition. Would exchange for a VHS video recorder in good working condition. V. E. Raybould, 13 Greenway Gardens, Sedgley, West Midlands DY3 1PH. Tel: Sedgley 71796. *A228*

Have a powerful flashgun, Vivitar 283, mint condition and boxed complete with remote sensor, quality slave unit, lens/filter adaptor and wallet of filters etc. Would exchange for mint Yaesu FRT-7700 a.t.u. Tel: Keynsham 61589. *A229*

Have records (classical/opera) boxed sets, also turntable, tuner-amp., speakers-immaculate. Would exchange for *Practical Wireless* magazines, about 1950 to 1970. Swapper collects. Would accept offers of magazines only K. B. Hubbard, 64 Martival, Uppingham Road, Leicester LE5 0PH. *A231*

Have Lowe 28MHz f.m. rig with repeater shift and 70W linear and 5/8 wave mobile antenna. Would exchange for small DXTV ie Bands I and III 625 lines or good quality h.f. receiver. Tel: 0322 57853 evenings (Crayford, Kent). *A232*

Have Akai X355B reel to reel and 13 tapes, all in excellent condition. Would exchange for a.t.u. or good radio gear, w.h.y. D. Wright, 47 Wyvern, Woodside, Telford TF7 5QQ. *A255*

Have Collins TCS equipment (1944). TX, RX. p.s.u., service manual. TX 40W c.w., 20W a.m., 1·5–12MHz. All in good condition and used by EI8FY on 7MHz. Would exchange for h.f. transceiver or h.f. communications receiver. Would also consider v.h.f. equipment. Please write to James McKinney EI8FY, Ballyloskey Road, Carndonagh, Co. Donegal, Ireland. *A257*

Have Spectrum computer with Interface One, two microdrives, two joysticks, speech synthesiser, music synthesiser, plus extras. Would exchange for either an h.f. receiver or 144MHz/430MHz transceivers. David Tel: 01-992 7210 after 5pm. *A274*

Have Yaesu FT-208R 144MHz hand held, PA3 car adaptor/charger, YM-24A speaker/mic and ¼ wave whip antenna. Would exchange for an FT-290R. G6CJL QTHR. Tel: Halifax 54635. *A324*

Repeater News

Finding a balanced solution to the "Isle of Man affair" has recently dominated the workload of the RMG and its seemingly tireless chairman, Mike Dennison G3XDV. As you may remember (see *News*, page 20, May issue), reports of severe co-channel interference were received from users of GB3VT (R1, Stoke-on-Trent). Whether this was primarily due to anomalous propagation (lift conditions) or simply the large coverage of GB3GD remains to be seen.

However, after the initial enforcement of reduced e.r.p., members of the RMG visited GB3GD during this spring. It transpires that the optimum antenna for this above cloudbase repeater was the original Finglass 3dBd colinear, which has been found to offer the best combination of low windage, high flexibility and a high current anti-node. Roughly translated this means that the antenna will survive reasonably at an altitude of 600m a.s.l. whilst permanently subjected to "springtime" windspeeds of 40 knots ***sustained.*** In winter, rapid ice build-up has caused the demise of other commercial devices—the Finglass radiator flexes and shakes the ice off before it can become established!

The site of GB3GD has mast height restrictions imposed by the owners—6m of mast ***without*** guys is the maximum available, hence the need for an antenna with its radiating point located as high as possible a.g.l. Dipole stacks and Yagi beams offer far too much wind loading to the wall clamped mast. Add to this the peculiar IOM geography, which dictates that all centres of population are located near to sea level and underneath mountainous terrain, and you have in the words of the RMG, "a situation that defies a textbook solution". But we have to be practical and a solution has now been proposed and awaits the full approval of both the IOM and surrounding repeater groups.

The proposal put forward by RMG recognises the potential for co-channel interference to the Stoke Repeater and the fact that no other co-channel problems have been encountered. Accordingly, after much discussion with the groups involved it has been proposed that GB3VT is relocated on R5, GB3BM (Birmingham) on R3 and GB3MH (Malvern Hills) on R1. At the same time GB3PW (Powys), which is currently experiencing co-channel interference from users of GB3MH will move to R7. The IOM group have agreed to reimburse groups and individuals covered by this relocation. Those affected will be able to trade in and receive replacement crystals via the RSGB on a "new for old" basis. A majority of GB3VT users in attendance at a recent open meeting voted to accept the proposals—it now remains for the FM Group Western to decide. Hopefully, actions will have been taken before the onset of the autumnal tropo season.

General News: At a recent RMG meeting at Coventry a proposal to introduce sub-audible tones to u.h.f. repeater outputs was made in an effort to prevent the occasional "Danish" howlround. During tropo conditions the repeaters locked-up with RU system counterparts would be equipped to detect the relayed tones and reduce system gain to the point where the DX feedback ceased. Several 29MHz repeater proposals, together with three 10GHz alternative inputs to existing u.h.f. repeaters, are about to go to the DTI. An RMG technical conference will be held in the Crawley area during November. Site changes have been cleared for GB3IOW (RB4), GB3HK (Hawick, RB14—the repeater is now located above its users!) and GB3TP (ex-GB3AE) R5 to Keighley.

Proposals have been made to microwave link GB3BI at Inverness with a new unit to be established at Aviemore, providing coverage of the Perth/Inverness A9 road.

The long defunct London 144MHz repeater GB3EL (RO) is to resume from a new location under new control, hopefully by the end of 1985.

GB3GV, the Leicester 1·3GHz ATV repeater, which recently became co-sited with the majority of the groups other repeaters caused a problem for the Clee Hill (Shropshire) CAA radar system—good DX for 25W e.r.p. The a.m. signals from GB3GV apparently caused the computer controlling the radar system to acknowledge them as non-valid ground clutter and promptly blanked areas of the display. However, due to an excellent display of co-operation between the CAA, DTI, RIS and the repeater group, tests were made which rapidly established that a move to repeater channel RMT2 and the use of f.m. completely removed the problem. The CAA were very impressed by the shut-down reaction time and the responsible attitude displayed by the amateur group. The group were in turn equally impressed by the rapid response from the RIS and DTI to allow the channel change with minimal interruption of the ATV repeater operation.

Special Event

North Staffordshire Amateur Radio Society have been asked to organise an amateur radio exhibition in Stoke-on-Trent, as part of a festival celebrating two civic anniversaries occurring this year.

First, the 75th anniversary of the constitution as a County Borough of the six pottery towns, Hanley, Burslem, Tunstall, Stoke-on-Trent, Longton and Fenton. Second, the 60th anniversary of Stoke-on-Trent being elevated to "City" status, by Royal Letters.

The exhibition will be held on Sunday 22 September, at the King's Hall, Stoke-on-Trent, where it is planned to display a complete range of radio equipment from yesteryear through to the latest technological developments. In addition, base stations will actively demonstrate amateur radio, in its many modes over all bands, using the special event callsigns GB4SOT and GB8SOT.

Further details from: ***The Secretary, David E. Morgan G6MLI, "Just in time", 33 Newmount Road, Fenton, Stoke-on-Trent, Staffordshire ST4 3HQ. Tel: (0782) 332657.***

The China Syndrome

Well I suppose you could describe it as that! Cornwall, apart from its popularity for the holidaymaker, provides the principal source of China clay, the mining of which creates a considerable quantity of "lunar landscape" type humps. When the local v.h.f. and u.h.f. repeaters GB3NC and GB3HB were installed the site was "in the clear". However, on-going extraction has resulted in the gradual envelopment of the repeater sites, with resultant reduction in coverage. Fortunately the owners of the aforementioned humps also use radio links to co-ordinate their operations and have offered the use of the mast shown in the photograph to the newly formed mid-Cornwall beacon and Repeater Group. The move should take place in the near future and will locate the units adjacent to their current site at Hensbarrow Down (IO70OI) near St Austell.

RAE Courses

Courses to prepare students for the Radio Amateurs Examination (City and Guilds 765) will be available at the following locations.

Beckenham, Kent—*Beckenham Adult Education Centre, 28 Beckenham Road, Beckenham, Kent. Tel: 01-464 5745 and 01-650 1383.* 28 week Morse class commencing 17 September between 1930 and 2130. Tutors will be Steve Palmer and Peter Grant.

Fareham—*Adult Education Centre, Wickham Road, PO16 7DA. Tel: (0329) 280709.* Fridays 1900–2100, commencing 27 September. Details from the tutor A. S. Chester G3CCB on (0329) 288139.

Glasgow—*The Glasgow College of Nautical Studies, 21 Thistle Street, Glasgow. Tel: 041-429 3201.* Both an RAE course and Morse class will be held and interested parties are advised to contact the College as soon as possible.

Leamington Spa—*Mid-Warwickshire College of Further Education, Warwick New Road, Leamington Spa CV32 5JE. Tel: (0926) 311711.* Commencing Thursday 19 September and further details are available from the College.

Liverpool—*Riversdale College of Technology, Department of Electronic and Radio Engineering, Riversdale Road, Aigburth, Liverpool L19 3QR.* Enrolment 9 to 11 September. Classes on Mondays and Thursdays between 1900 and 2130, commencing 16 September. Further details from Gordon Andrews G3DVW, Tel: 051-727 1685

London, Islington—At the Islington Institute, commencing Monday 16 September between 1830 and 2130, enrolment during the previous week and the Course Lecturer will be Brian Bond G3ZKE. For further details Tel: 01-485 7065.

London, Paddington—*Paddington College, Department of Engineering Technology, 25 Paddington Green, London W2 1NB Tel. 01-402 6221.* Classes are on two evenings a week commencing 24 September and enrolment is on 9 10 and 11 September between 1300 and 1600, and 1800 and 2000. This course not only covers the full RAE syllabus, but students carry out practical experiments using the facilities provided by the Electrical Engineering Department. The Course Tutors will be David Peace G4KKM and David Hunt G6MFR. For further information contact David Peace at the College on extension 54.

Manchester—*Hulton Highschool, Little Hulton.* RAE course enrolment 11 September with the first session on 25 September leading up to the May 86 exam. Further details from the tutor Jim Brett G6EBR on (0942) 883729.

Poole, Dorset—*Bournemouth & Poole College of Further Education, Division of Electrical and Electronic Engineering. North Road, Poole, Dorset. Tel: (0202) 747600.* Enrolment is in early September and Course Tutor will be C. F. Balson. Details from the College.

Stamford, Lincolnshire—*Stamford College of Further Education, Drift Road, Stamford, Lincolnshire.* The course starts in September and the Course Tutor will be G. C. L. Parker G4EMK. Further details from either the College or the Tutor, Tel: (0778) 425224.

Stockport, Cheshire—*Reddish Vale Evening Centre, Reddish Vale Road, Stockport, Cheshire SK5 7HD. Tel: 061-477 3544.* An RAE and a Morse course is available, and enrolment for either is on the 16, 17 and 19 September between 1900 and 2100. RAE course will be on Mondays between 1900 and 2100, over three terms, and the Morse class will be on Thursdays, same times, over two terms. Further details from the College.

Tonbridge, Kent—*Adult Education Centre, Avebury Avenue, Tonbridge, Kent. Tel: (0732) 354313.* Starting in September, the Course Tutor will be J. C. Thwaites. Further details from the Centre.

Kingston upon Thames—*Kingston College of Further Education, Kingston Hall Road, Kingston upon Thames, Surrey.* Monday evenings 1900–2100, commencing 16 September. Enrolment Monday/Tuesday 9/10 September between 1830–2030, Room 303 at KCFE. Further details Mr J. Harris or Dave Chambers G4SYT, 26 Drummond Gardens, Epsom, Surrey.

Bristol—*Brunel Technical College, Dept. of Aerospace and Radiocommunications, Ashley Down Road, Bristol BS7 9BU.* Three separate courses are available covering the RAE, Morse and practical aspects of amateur radio. Enrolment 9/10 September. For further details contact the course tutor Phil Brouder G3ZJH on (0272) 4142 ext 64.

Loughborough—*Loughborough Technical College, Dept. of Electrical Engineering and Computing, Radmoor, Loughborough, Leics. LE11 3BT.* Tel: (0509) 215831. A combined RAE (C&G765) and Morse course will be run, commencing 10 September for 26 weeks. The tutor will be Doug Doughty G3FLS.

GW Convention

Apart from the *PW* presence on Sunday 6 October at the Welsh Amateur Radio Convention Oakdale Community College Blackwood, Gwent, you will no doubt be pleased to know that the event will be officially opened at 1100 by Mrs. J Heathershaw G4CHH, the current president of the RSGB. Doors open at 1000 and a lecture programme, including Chris Bartram G4DGU of muTek on "The Fifth Generation of Transverters", is scheduled throughout the day together with BT Morse test facilities. The usual trade, Bring and Buy and RSGB stands will be in evidence and all for a mere £1.50 admission. Further details from ***R. B. Davies GW3KYA, 16 Vancouver Drive, Penmaen, Blackwood, Gwent NP2 0UQ or Tel: 0495 225825.***

Can You Help?

A reader, recently hooked on shortwave listening, has a WW2 American BC342J receiver and would dearly like to obtain a service manual. If you can help, please contact: ***L. D. Thomas, 25 Goytre Crescent, Goytre, Port Talbot, West Glamorgan SA13 2YD.***

The instruction manual and circuit diagram for a Windsor Universal meter, Model 88A, manufactured by Taylor Electrical Instruments is sought by a *PW* reader. If you can help please contact: ***Mr. T. W. Ryan, 37 Cecil Court, Burr Hill Chase, Southend-on-Sea, Essex SS2 6PG.***

Annual G2NM Day

Chalk Pits Museum, Sussex, is the venue once again this year for the Annual G2NM Day, organised by the Chichester and District Amateur Radio Club.

The museum's callsign on Sunday 15 September will change from GB2CPM to GB2NM for the day and the station will be operational on the 3·5 and 7MHz bands (80 and 40m), especially to chat to the old timers of amateur radio.

Any radio enthusiasts visiting the museum that day will, as always, be welcome to visit the radio building, see the station and the vintage wireless exhibition as well as a collection of early amateur radio documents.

Chalk Pits Museum, Houghton Bridge, Amberley, Nr Arundel, West Sussex BN18 9LT. Tel: Bury (079 881) 370.

More News on page 20

ELHOEX 85

Following the success of last year's Electronic Hobbies Exhibition, ELHOEX 85 will again provide a focal point for enthusiasts in the North East. Organised by the Hornsea Amateur Radio Club, in conjunction with several other local amateur groups, this event aims to provide comprehensive demonstrations of all aspects of radio and related electronic interests. The exhibition will be held on Sunday 20 October at the Floral Hall in Hornsea. Doors open at 1100 with admission at 35p and free parking for early arrivals. Talk-in will be provided on S22 v.h.f. plus u.h.f. under the Callsign G4EKT. Further details from ***N. A. Bedford G4NJP on (0262) 673635.***

RSGB HF Convention

The RSGB is arranging a Convention for h.f. enthusiasts, to take place on Sunday 29 September at the Belfry Hotel, near Oxford on the A40, and close to Exit 7 of the M40. Doors open at 10.00am and admission is £2.00 per person.

A twin lecture stream covering the following subjects is planned: HF Propagation and the USSR Satellites (G3IOR); ATUs—The Least Understood Part of the Station (G3RZP). The Sunspot Minimum, How Long will it last? (G3LTP); DXpedition to Navassa Island (G3RFS); Introduction to Contest Operating (HF Contests Committee); G-QRP Club—Simple Sideband (G3ROO), Milliwatting (G4BUE); Life Begins on 40 (G3VTT); and Applying for Planning Permission (RSGB Planning Committee).

Additional attractions will include a planning forum, display of QRP gear, RNARS QRQ c.w. tests, RSGB bookstall, DX quiz, h.f. demo station (GB2HF), h.f. and h.f.-contests forum, DXpedition videos, c.w. pile-up tape, car boot sale (£2.00 per pitch), QSL checking for awards (not DXCC), QSL arrivals board (bring your card), testing booth and licensed bar. Morse Tests will be available, by prior arrangement with Gavin Williams G3YCP, BTI Radio Station, Worston Lane, Highbridge, Somerset TA9 3JY. Also, BYLARA, G-QRP and other groups will have stands.

Further details, including talk-in frequencies (run by Mid-Thames RAYNET) will be publicised via GB2RS and *Radio Communication*, or can be obtained by contacting: ***The Convention Publicity Officer, Don Field G3XTT, 105 Shiplake Bottom, Peppard Common, Henley-on-Thames RG9 5HJ. Tel: Reading (0734) 724192.***

Come and Join us

Practical Wireless staff will be manning stands at the following rallies etc., where we look forward to meeting our readers.

Lincoln Hamfest—Lincolnshire Showground, near Lincoln, on Sunday 8 September.

Telford Radio Rally and Exhibition—Telford Town Shopping Centre, Shropshire, on Sunday 8 September.

Scottish Amateur Radio Convention—Dundee College of Education, Dundee, on Saturday 21 September.

Great Lumley ARES Rally—Community Centre, Great Lumley, near Chester-le-Street, County Durham, on Sunday 6 October.

Welsh Amateur Radio Convention—Oakdale Community College, Blackwood, Gwent, on Sunday 6 October.

BTI Morse Tests will be conducted at the Telford Radio Rally and Exhibition and at the Welsh Amateur Radio Convention.

On the *PW* stand we will be selling recent issues of the magazine, the full range of *PW* publications, computer program tapes and *PW* parabolic dishes.

Healthy SSTV

Following a successful pilot scheme run in south west England, British Telecom have introduced a high definition slow scan TV system which allows surgeons remote from their hospitals to examine patients, X-ray and medical records. Developed by BT's Martlesham Heath research laboratories the Imtran (Image Transfer) system comprises a portable mains powered transceiver that can be directly interfaced with a body scanner or TV camera. Normal telephone landlines are used to pass 32 second frame SSTV audio tones to the hospital monitor, thus speeding up the process of diagnosis and ultimately saving lives.

PW Questionnaire

Readers who filled in the questionnaire in our June issue were invited to estimate how many would be returned to our offices by May 24.

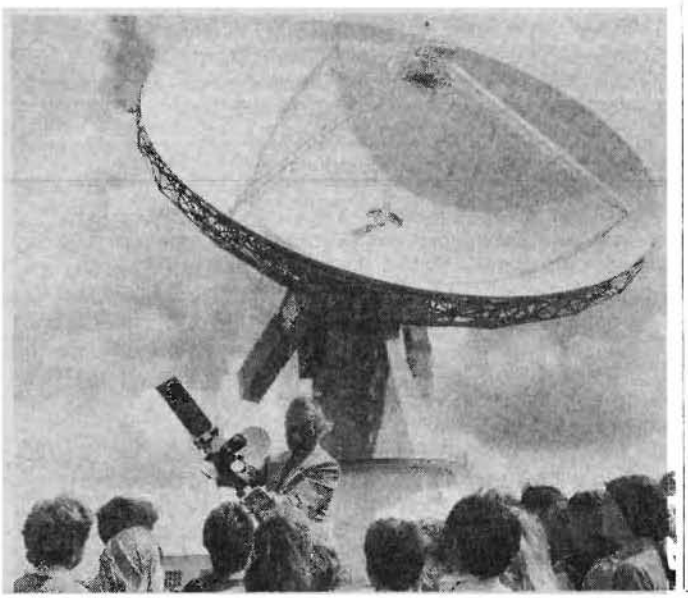
The number of completed questionnaires actually received by that date was 2103. The nearest estimate was 2100, a figure selected by no fewer than three readers. A tie-breaker question was sent to each of these, asking them to say in not more than 30 words, what they considered to be the most interesting and useful application of a computer for the radio hobbyist.

The winner was judged to be Mr A. Steele, of Keighley, West Yorkshire, and he receives the star prize of a Trio R-2000 h.f. communications receiver plus VC10 v.h.f. converter. The runners-up, Mr D. Cousins of Rotherham, and Mr W. G. Abrahams of Marke, Belgium, each receive a collection of *Practical Wireless* reprints plus a year's subscription to the magazine.

We hope to have the analysis of our questionnaire results completed in time for publication in our next issue, along with the results of the similar surveys carried out in the USA and Japan.

Almost Vintage Earth station

It may seem hard to believe but British Telecom's Goonhilly Downs satellite earth station is 22 years old. Operating in conjunction with geostationary satellites 35000km above the equator Goonhilly now has seven major antennas—Aerial 6, costing a total of £9 million has just come on stream. During 1984, the station handled a staggering 386 million telephone calls from the UK, together with simultaneous transmission and reception of several dozen TV programmes.



New Catalogues

As a source of information, availability and price, manufacturers' and suppliers' catalogues represent an essential tool to the radio and electronics enthusiast. As we seem to have received more than the usual quota this month, only brief details of current catalogues are given.

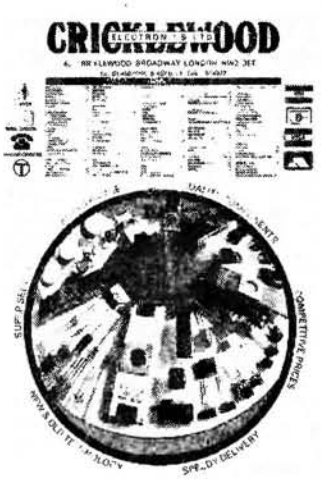
Greenweld Electronic Components, 443 Millbrook Road, Southampton SO1 0HX. Tel: (0703) 772501/783740. Features an enormous range of components, plus bargain list and £1.00 worth of discount vouchers. All for £1.00.

Electrovalue Ltd., 28 St Judes Road, Englefield Green, Egham, Surrey TW20 0HB, Tel: (0784) 33603, Northern Branch, 680 Burnage Lane, Manchester M19 1NA. Tel: 061-432 4945. Lists all their components and equipment and is available free on application.

Harris Electronics (London), 138 Gray's Inn Road, London WC1X 8AX. Tel: 01-837 7937. Full colour 12-page catalogue of their TMK range of test instruments and many others, available free on application.

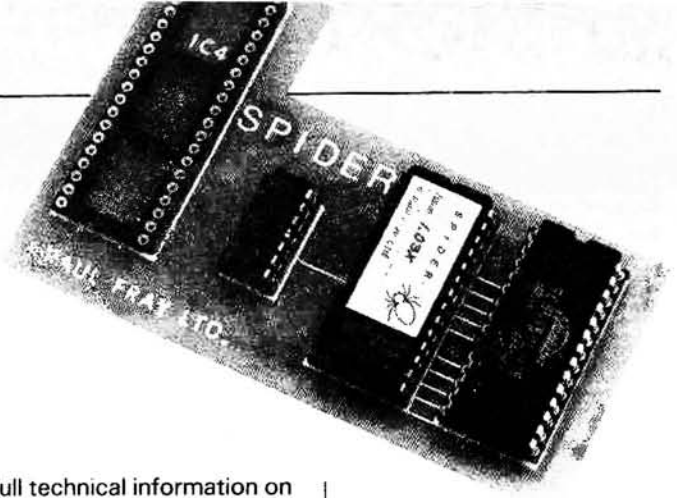
Keithley Instruments Ltd., 1–3 Boulton Road, Reading, Berkshire RG2 0NL. Tel: (0734) 861287. Covers their complete range of electronic measurement instrumentation and is available free on application.

Cable and Wire Group, STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DE. Tel: (0279) 26777. Entitled Cable and Wire Book, this 65-page catalogue features full technical information on the most comprehensive range of electronic cable and wire, and includes details of a wide selection of wiring accessories. Available free on application.



West Hyde Developments, Ltd., 9–10 Park Street Industrial Estate, Aylesbury, Bucks. HP20 1ET. Tel: (0296) 20441. Details a most comprehensive range of cases, enclosures and associated equipment. Costs £2.00, but includes £2.00 voucher redeemable with first order.

Cricklewood Electronics Ltd., 40 Cricklewood Broadway, London NW2 3ET. Tel: 01-450 0095. Lists a wide range of useful electronic components. For your free copy just phone or write.



Real-time Spider

An ingenious add-on for the BBC-B microcomputer has been introduced by Paul Fray Ltd. Called the Spider it is a combination of sideways RAM and advanced ROM based software which extend the capabilities of the BBC micro into serious control applications.

The Spider not only adds a set of practical real-time I/O tools to BBC BASIC but also allows a degree of parallel processing. It also provides a set of process timers which can time-out independently of the signals from external sources.

In the same way that a real spider catches its prey the computer can respond quickly and efficiently to an event in its "web" of sensors. Should a second "fly" trigger the "web" during the brief period in which it is dealing with the first event its presence will still be noted to be dealt with as soon as the first has been fully processed.

The economy version, Spider-B works with the User Port and Printer Ports only and is priced at £65 inclusive of VAT while the more exotic Spider-X uses the higher performance 1MHz bus on the BBC-B and costs £115. Further details from **Paul Fray Ltd., Willowcroft, Histon Road, Cambridge CB4 3JD. Tel: 0223 66529.**

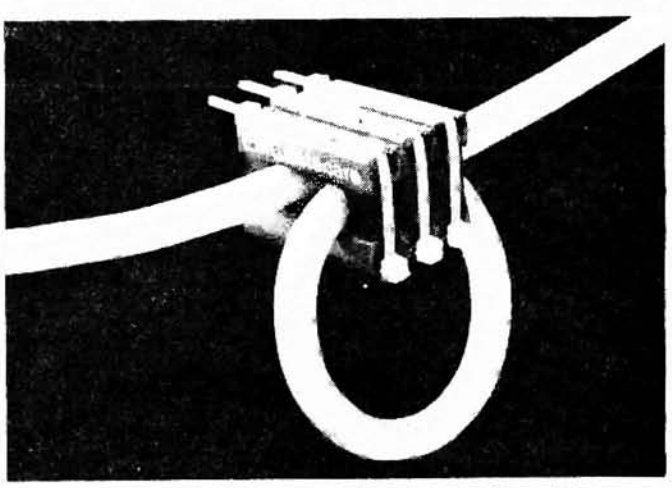
Clamp-On Suppression

EMC Datacare Ltd. announce a new component—the D910 Series clip-on radio frequency choke—that will help solve the problems of radio frequency interference that afflict domestic radio, TV, and audio as well as professional computers, process control and telecommunication systems. An introduction "D918" kit of eight choke cores and associated hardware is available complete with application notes that will help the user to install them successfully. There is no risk of invalidating any product guarantee.

Most r.f.i. problems arise from cables acting as antennas. Usually unwanted signals are "common mode", and can be visualised as travelling along the outside of the cable. They can be reduced without affecting the normal function of the circuit.

These chokes can be installed on cables of up to 10mm diameter without the removal of any connectors, indeed it is not essential to have any access to the ends of the cable. For large or rigid cables several pairs of cores are required while for smaller flexible cables, multi-turn chokes may be fashioned from the same components to provide substantial impedance to interference currents at a very modest price.

Orders for the D918 kit at £23.30 each including VAT and delivery in the UK, and requests for the D910 series data sheet to Richard Marshall at **EMC Datacare Ltd., Power Court, Luton, Beds LU1 3JJ. Tel: (0582) 450092.**



DMM +C

Capacitance measurement is not very common on low-cost multimeters so Global's latest addition to their range looks very interesting.

The new GDM.1-11 provides eight measurement functions including a built-in

capacitance testing facility. The instrument has a $3\frac{1}{2}$ digit display with a basic d.c. accuracy of 0.5 per cent. Five voltage ranges cover 200mV to 1000V f.s.d. (750V a.c.) while the four current ranges cover 2mA to 10A, both d.c. and a.c. Six resistance ranges are provided with the lowest covering 100Ω and highest 20MΩ while the capacitance measuring ability covers from 20nF to 20μF f.s.d. in four ranges. The meter also provides for diode testing and h_{fe} measurement.

Built-in automatic polarity selection with negative polarity indication is standard as is automatic zero adjustment, overange and battery-low indication. Measuring 175 x 91 x 36mm the GDM 1-11 operates from a single 9V battery and costs £79.95 inc. VAT. **Global Specialties Corporation, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ.**

Useful Tool

The latest addition to the Britool Multi-Bit screwdriver range is seen here with the well-known "Medium" and "Chubby" versions. The B432 "Long Shaft" version has the same four interchangeable bits which are stored in the handle, while the 178mm long shaft should give access to those usually awkward screws deep inside the average piece of radio gear. Retail price is £9.10 including VAT.

Solder

A new range of solders for everyday use has been introduced by Multicore. Packaged on descriptive cards with full instructions, the range comprises five handy solder dispensers, priced at 99p each, six small reels of solder at £2.99 each and several other useful ancillary products such as desoldering wick, plumber's flux paste, solder cream and tape solder.

You should be able to find these products locally, but in case of difficulty contact **Multicore Solders Ltd., Bib Solder Division, Kelsy House, Wood Lane End, Hemel Hempstead, Herts HP2 4QR. Tel: 0442 61291**

New Shop

R. Withers Communications have opened a new shop just two doors from their main store in Hagley Road West. The new shop is called Technical Surplus, a truly descriptive name for an emporium dealing in all types of surplus radio, electronics, CB and military bits and pieces. Open 9 to 5 Monday to Saturday constructors should find **Technical Surplus** an ideal place to escape to. The address is **576 Hagley Road West, Quinton, Warley.**

THE TATUNG EINSTEIN

REVIEWED

The invasion of your screens by the computer has taken many by surprise. Only 18 months ago, about the only adverts of any size seen in *PW* were on bolt-on-goodies for the Dragon-32, and RTTY on the ZX81. The problem, at least as far as the average amateur has seen, is that the computers around at the time were all rather pricey. There wasn't much in the way of a performance computer with good ports to get data in and out easily. The Apple, maybe (usually reserved for the business end of the market), and the BBC-B, with lots of expensive goodies to play with, were perhaps it. Add a couple of disks and you might have been talking four figures, if you weren't careful, or serious, or rich.

Last year, Tatung (UK) Ltd., released on to the market a machine they called the Einstein. With 64K of RAM, 16K of video RAM, 8K ROM (I'll come to that in a minute), resolution of 256 by 192. in 16 colours and 32 sprites, it is arguably an attractive machine, if not actually inspiring. However, given that you load the language from the built-in disk—there's room for another inside the case—and it talks CP/M, it begins to look a little better.

Getting signals in and out of the computer is very easy, and the radio enthusiast will find the ports of considerable interest. There is a port to RS232C standard (Baud rate selectable). This would be very handy if you possess either of the Yaesu h.f. "CAT" system rigs, FT757 or FT980, which can be controlled from the Einstein. There is an 8-bit parallel port, and a Centronics Standard printer port. There are a couple of pairs of analogue ports (A–D conversion, settling time 40μs), which are handy for such measurements as v.s.w.r. and beam headings, for example, and a 60-way buffered bus from the Z80A processor called the "Pipe". You can connect your TV set, or try the optional Monitor (RGB or YUV standards) which sits on the top of the box. There is an optional 80 column monochrome card, from which we may hopefully conclude that there is to be something significant in the "professional" line of software. If there is a drawback, it's the price of £499. Mind you there are often the offers from the larger discount stores which may bundle software or alter prices, and compared to the price of an equivalent set-up from another maker, it's not too bad.

Graphics are easily accomplished, and those of you who have had, or seen, a Sharp MZ80 may well recognise the language of Crystal BASIC. Tatung/Crystal BASIC 4 is supplied with the machine, as well as Dr. Logo. Forth is also available. BBC(Z80) BASIC is not quite the same, if only because of the different graphics abilities of the two machines, but it is good, none the less. Other languages which run under CP/M, and thus may be configured for the Einstein include Pascal and micro-Prolog. The loading of files (including languages), to and from the 3 inch disk is very simple, both from BASIC or the DOS (Disk Operating System), which is said to be CP/M compatible. Not being experienced in the ways of CP/M, I would not like to judge the issue.

In use the keyboard, with its light action, is really quite quick. The cursor controls are easy to use and understand, and erasure of an error on a line in the listing is done "on-screen" rather in the same way as a PET (or a Sharp). Move the cursor where you want the error corrected, and the "INS /DEL" key will do the job. There are 8 function keys on the top row, which, when using the "SHIFT" function give 16 user-programmed features to any BASIC program that you have in mind. They are easy to use, as well. One of the beauties of the BASIC is that you can if you've a mind to, patch in some of the more esoteric maths functions like SINH, COSH or TANH. These will relieve you of those thorny problems to do with EXP and so on. The "circular" functions can be handled in both Radians and Degrees, which at least takes some of the sweat out of the conversions, with their attendant inaccuracies. Logs to base 10 and "*e*" are included, and there is a real-time clock (Hours, Minutes & Seconds), that you can set at any time in a program, which is great for timing bench tests, or measurements, not to mention contest logging.

Programming in the BASIC is very straightforward, and both sound and sprites may be generated with comparative ease. Taken all round, the language is comprehensive, to put it mildly. I have not tried to use Forth, or anything more than a passing stab at Dr. Logo but the BBC(Z80) BASIC is adequately documented, and works well. The supplied books (there are three), fall between the "assume all" and "assume nothing" school of production, but all the information is in there somewhere, including the graphics tables, ASCII table sets, as well as excellent detail of the pinouts of the sockets around the computer.

The ROM, which I mentioned before, is there to provide a "boot" routine upon switch-on, the character set, and some of the system data. In all other respects, the machine is "clean"; handy if you want to write your own language. The case is quite large, and strong enough to stand your monitor upon. At the front is a recess for the built-in loudspeaker, and the disk units

▶ 35

The Tatung Einstein computer is seen here with the optional monitor and joystick. The 3 inch disc drive is above and to the left of the keyboard—provision has been made for a second drive

PW FET DIP Oscillator

For several years John Thornton Lawrence GW3JGA, taught the RAE course at the local Evening Institute. This generated much of the material for the Practical Wireless publication Passport to Amateur Radio.

For the last two years John has been running a Practical Amateur Radio course to introduce newly licensed amateurs to the "joys" of home construction and other practical skills. This dip oscillator is one of several test gear projects which have been successfully completed by the class.

The dip oscillator has long been a standard piece of test gear in the radio amateur's shack. Its primary use is to measure the resonant frequency of a tuned circuit, but over the years the radio amateur with his usual ingenuity, has used it to make a wide range of tests and measurements.

The dip oscillator comprises a tunable free-running *LC* oscillator with provision (usually a meter) for monitoring the amplitude of oscillation.

In use the coil in the oscillator circuit is loosely coupled, inductively, to the resonant circuit to be investigated, in most instances by holding the oscillator coil near to the circuit. The dip oscillator is then tuned, by means of its variable capacitor, through its frequency range(s).

At the resonant frequency of the external circuit, power will be coupled out of the oscillator causing its amplitude to fall. Thus when tuning across the-band a "dip" in the oscillator amplitude will be noticed at the resonant frequency of the external circuit, as shown in Fig. 1.

Usually a number of plug-in coils are necessary to cover the frequency range required and the actual frequency is read off the tuning capacitor dial either directly or by means of a calibration graph.

The dip oscillator originated in the valve era where the oscillation amplitude was measured by a d.c. microammeter connected in series with the grid resistor. Hence the original name of grid dip oscillator or g.d.o.—a term which is still used even when referring to solid-state versions.

Today, the field effect transistor (f.e.t.) with its valve-like characteristic makes an ideal device for use in a dip oscillator and its low operating voltage allows the convenience of battery operation.

Choice of Oscillator Circuit

The *LC* oscillator can be either a Hartley type (tapped coil) or a Colpitts type (capacitive tap), each has advantages and disadvantages. The tapped coils for the Hartley are more difficult to make but only a single stator tuning capacitor is required, whereas the coils for the Colpitts are much simpler but a split stator capacitor is required.

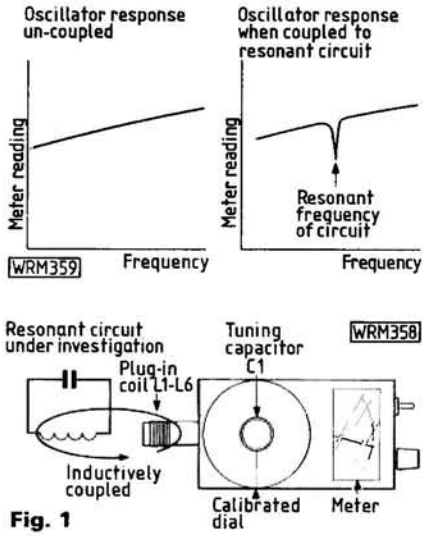


Fig. 1

Because of the difficulties of obtaining a supply of reasonably priced split stator capacitors, the Hartley circuit was chosen for this project. The tuning capacitor used is a Jackson C804 100pF single stator type and this is often available surplus, at rallies or purchased new from a number of suppliers (see Components List).

Either circuit configuration can be re-arranged to allow a particular part of the circuit to be at earth potential. In this design the Hartley circuit has been arranged so that the rotor and spindle of the tuning capacitor are earthed directly to the metal case of the unit.

An important characteristic of a dip oscillator is that it should be able to oscillate "gently" and the amplitude vary smoothly as it is coupled to the circuit being investigated. It should also come in-and-out of oscillation smoothly without any hysteresis or backlash effects. The "gain" (small signal common-source forward transfer admittance) of a junction f.e.t. can be controlled by varying the gate-source voltage (V_{GS}) and this useful characteristic is used to both stabilise and control the amplitude of oscillation in the f.e.t. dip oscillator to be described.

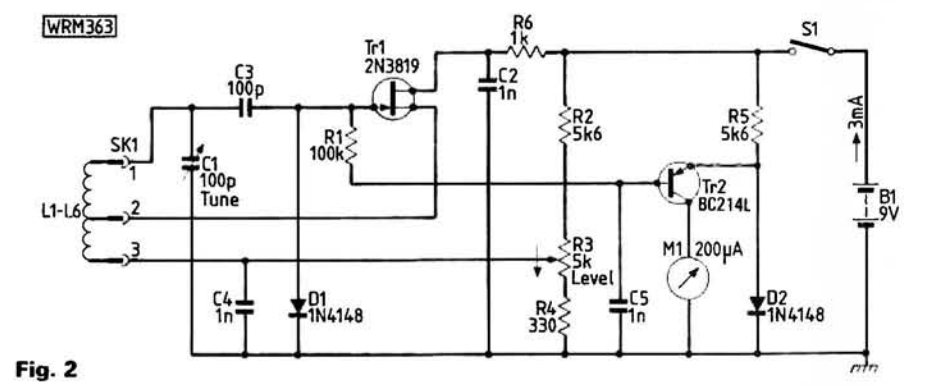


Fig. 2

Circuit Description

The complete circuit of the dip oscillator is shown in Fig. 2. The oscillator tuned circuit comprises the plug-in coils L1 to L6 and the tuning capacitor C1. This covers the frequency range 1·8MHz to 150MHz in six overlapping ranges as shown in Fig. 3.

For oscillation to be maintained, losses in the circuit must be overcome by the gain provided by the f.e.t. Tr1. The gain of Tr1 can be controlled by changing the gate-source voltage by adjusting the LEVEL control R3. This allows the amplitude of oscillation to be set to a convenient level on each frequency range.

When the circuit is oscillating, D1 conducts on positive half cycles and a negative voltage proportional to the amplitude is developed across R1. This bias voltage appears between the gate and the source of Tr1 and helps to stablised the oscillator amplitude. The voltage also drives a current through R1 to the base of Tr2. This small direct current is amplified by Tr2 to operate the moving coil meter M1, thus giving an indication of oscillation amplitude. Resistor R5 and diode D2 are used for biasing purposes.

The dip oscillator is powered by a 9 volt 6–F22 (PP3) type battery via the on-off switch S1. Consumption is about 3mA.

Operation as a Wavemeter

An added feature of the circuit is that when the LEVEL control is turned to minimum, so that oscillation stops, then the tuned circuit together with D1, Tr2 and the meter form a very sensitive absorption wavemeter covering 1·8 to 150MHz. In addition, if the LEVEL control is set immediately below the point where oscillation commences then the circuit operates as a *Q*-multiplier wavemeter giving even greater sensitivity and selectivity, a most useful feature when checking low power circuits.

Construction

To keep "metal-bashing" to a minimum the dip oscillator is built in an aluminium alloy die-cast box. The box used for the prototype is very easy to drill and file and provides a sturdy compact chassis for the oscillator and other circuits.

The die-cast box should be marked out in pencil and the hole positions centre-punched before drilling. The smaller holes can be drilled directly but it is advisable to use a chassis punch or taper reamer for the larger ones. The drilling information for the box is given in Fig. 4.

The rectangular hole is specifically for the Cirkit low-cost VU meter, see Components List, and was cut out using an Abrafile and then carefully filed to size with a flat file.

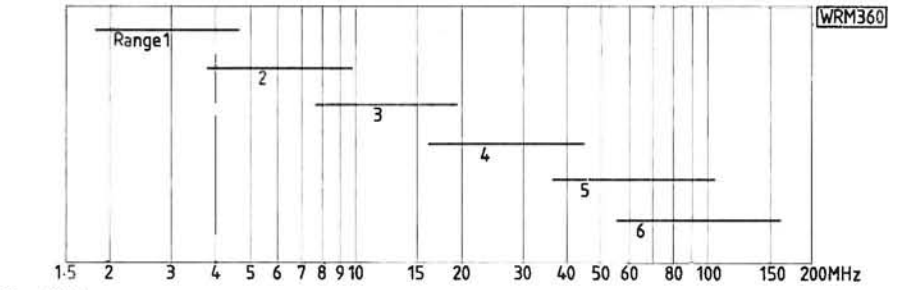
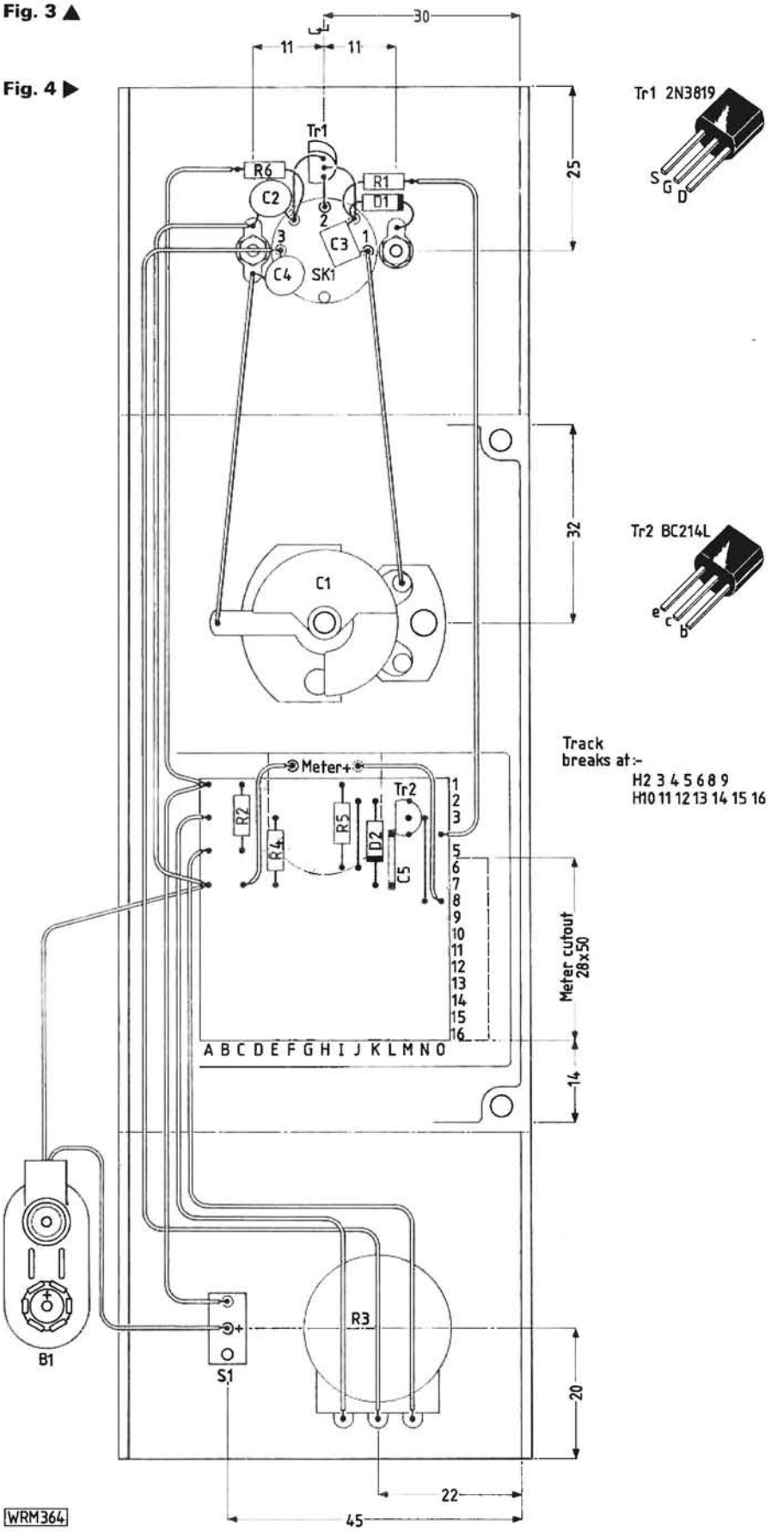


Fig. 3 ▲

Fig. 4 ▶



You could substitute any small moving coil meter that has a full scale deflection in the range 200μA to 1mA. When marking out the hole for an alternative type take care that the meter body does not foul the potentiometer or the switch.

The Veroboard panel, shown in Fig. 4, is also arranged to suit alternative types of meters and has a component-free area which will allow the panel to be mounted directly on the meter terminals if this is more convenient.

To give a more professional finish, the drilled box may be rubbed down and sprayed using car aerosol paint —primer first then matt black or a colour to match your other amateur radio equipment. It helps if you warm the box before spraying.

Assembly and Wiring

The DIN socket should be fitted and wired first as this is the most crowded area. The DIN socket is a 5-pin type and as the coils use 3-pin plugs the spare tags (4 & 5) are used as compact anchoring points as shown in Fig. 4. It is best to fit all the components and wires onto the socket tags first and after a bit of judicious bending and positioning solder them in position. Keep the component leads short and direct.

The meter, potentiometer, switch and completed Veroboard panel are fitted and wired next and finally the tuning capacitor. When fitting the tuning capacitor and the potentiometer it is convenient to fit a shakeproof washer or extra nut between the body of component and the case—or the spindle bush may protrude too far. Keep the two wires to the tuning capacitor very direct, tag to tag. All other interconnecting wires should be pressed flat against the sides or into the bottom corners of the box to prevent stray coupling to the tuning capacitor and oscillator components. A few strips of adhesive tape can be used if necessary. Stray coupling will show up as spurious dips in the oscillator response but by following the recommended layout no problems should be encountered.

Fitting the Dial and Tuning Knob

A full sized drawing of the dial is shown in Fig. 5, this can be photocopied and cut out for attaching directly to the die-cast box. The centre hole should be cut out carefully as this will enable the scale to be centred on the tuning capacitor fixing nut. The scale can be stuck down using a suitable adhesive.

The tuning knob has attached to it a Perspex disc. On the original prototype the disc was 56mm diameter and 1·5mm thick, but it was found that the dial could not be turned by the thumb (see title photograph). By increasing the size of the Perspex to 60mm and a thickness of 3mm the problem was solved. The disc has a cursor line scribed on the underside and this is filled in with black drawing ink. Some improvisation may be needed here depending on the tools and materials you have to hand.

Perspex may be obtained from a local sign manufacturer or cut from a sandwich box lid, plastic drawer divider etc. It need not be a complete circle—a strip say 20mm wide with a line scribed down its centre would be satisfactory. The Perspex cursor has a hole drilled in its centre to clear the tuning capacitor spindle and is fixed to the underside of the knob using Evostik impact adhesive.

When fitting the knob to the tuning capacitor spindle it is very important to remember that the capacitor can rotate over the wrong half of the scale (180 degrees out) the change of capacitance with rotation will be reversed and the scale readings will be meaningless.

1: With the box open, observe the tuning capacitor and set it with the vanes fully meshed (maximum capacitance).

2: Fit the knob with its cursor disc or pointer onto the spindle so that the cursor line agrees with the scale dividing line. Lock the knob in position.

3: The right hand cursor line must only be used for the upper half of the scale, Ranges 1, 2 and 3. The left hand cursor line for Ranges 4, 5 and 6. Mark the knob to identify the cursor for Ranges 1, 2 and 3, as shown in Fig. 6.

Preparing the Coil Formers

The coil formers are made from s.r.b.p. (synthetic resin bonded paper) tube having an outside diameter of 16mm ($\frac{5}{8}$in) and an inside diameter of 12·5mm ($\frac{1}{2}$in).

1: Saw the s.r.b.p. tube into lengths just slightly over the finished size, so that when the ends are filed (or turned) square the total coil former length is 50mm for Ranges 1 to 4 and 30mm for Range 5. For Range 6 a former is not necessary, but a short sleeve of the same material makes for easier handling.

2: Mark pencil lines at 90 degrees across one end of the coil former where slots are to be cut, this becomes the "bottom" end.

3: Hold the former bottom-end-up in a vice, then, using a "Junior" hacksaw, saw two sets of slots in the bottom, at right angles to each other as shown in Fig. 7. Saw to a depth of 7mm. That is until the back edge of the Junior hacksaw blade is flush with the end of the coil former.

4: Widen out the slots using a very thin file—a metal nail file is ideal—to approaching 1mm, so that a piece of 20 s.w.g. (0·94mm dia) tinned copper wire only just passes into the slot.

5: Draw pencil lines along the coil former, in line with three of the four slots.

6: From the "top" end (opposite end to the slots) measure very carefully along each line the appropriate distances along the former as shown in Fig. 7. Mark the positions of the lead-through holes (Fig. 8). Note that two holes are required at the "tap" position.

7: Using a 1mm diameter (No. 60) drill, carefully drill lead-through holes in the positions marked. A 1mm drill is very fragile, so drill gently!

This completes the preparation of the coil formers.

Winding the Coils

Winding coils is a tricky business at the best of times and requires care and determination to get it right. Before you start, make sure you have all these items to hand:

Quantity of appropriate gauge enamelled copper wire. 34 s.w.g. for Range 1 and 24 s.w.g. for Ranges 2–5.
20 s.w.g. tinned copper wire
Penknife or Stanley knife
Small bench vice—clamp-on type is ideal
Side cutters
Pointed-noise pliers
Soldering iron
Solder (60/40 cored)

WRM361

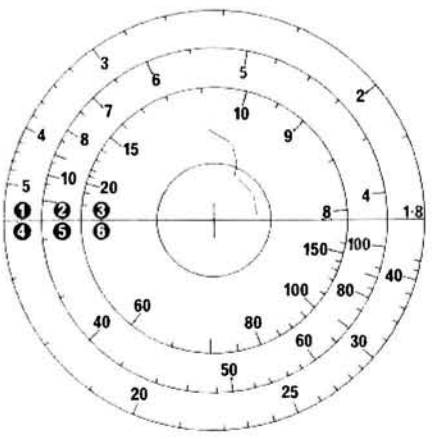


Fig. 5

WRM362

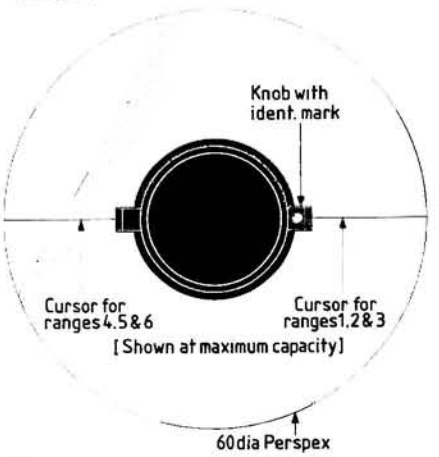
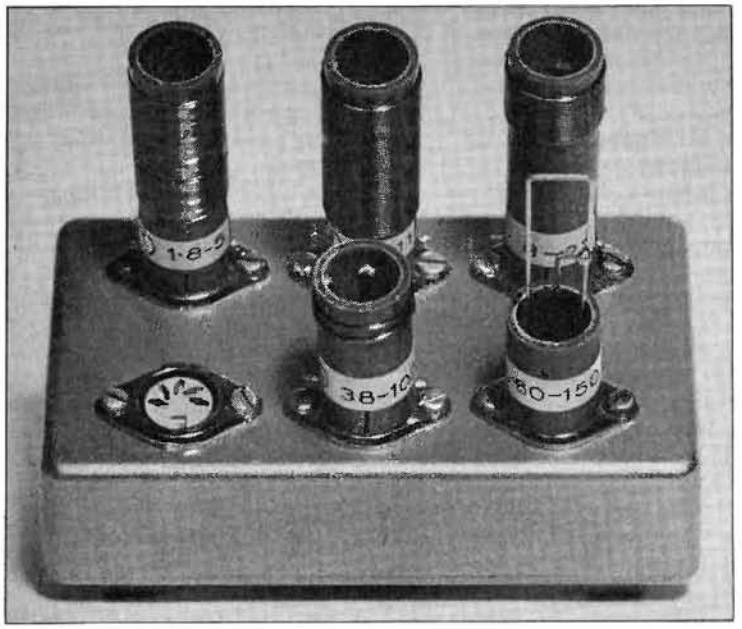


Fig. 6



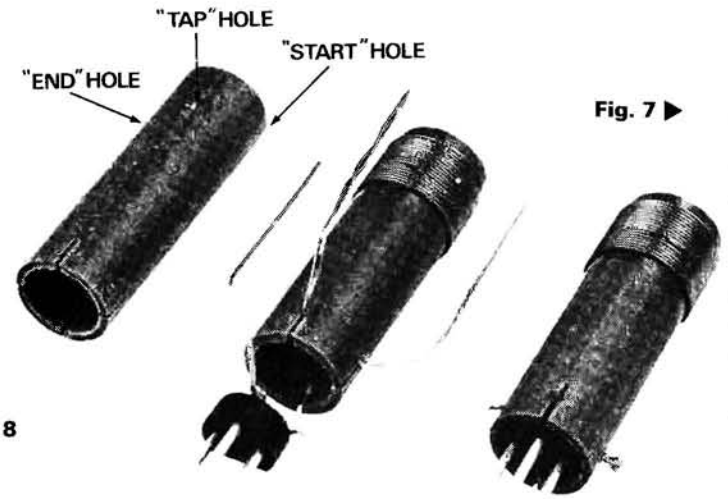
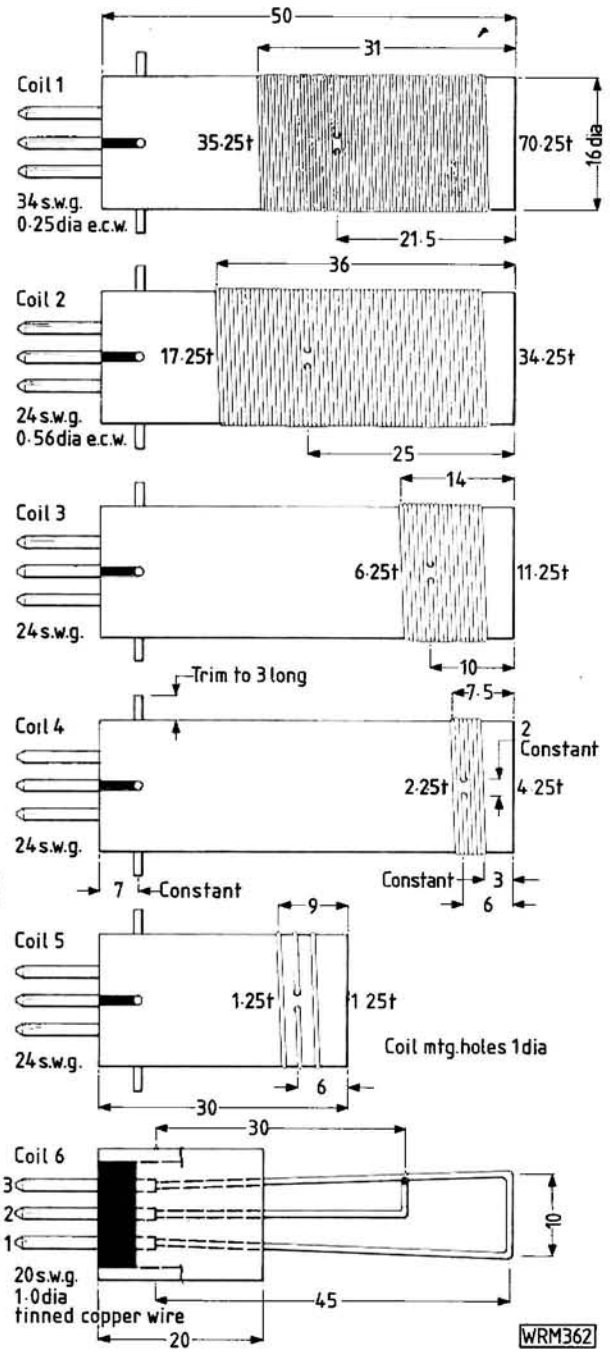


Fig. 8

Fig. 7 ▶



Coils, Ranges 1–4

Start with the Range 4 coil as this is the easiest.

1: Take the end of the enamelled copper wire and feed it inwards through the top "start" hole, down the inside of the former and pull it through the slot (in line with the hole). Leave about 50–70mm spare and pull it tightly to remove any slackness in the wire inside the coil former. To keep this free end out of the way you can temporarily feed it through and around the slots.

2: Where the wire enters the top hole, bend it over in the direction it is to be wound and commence rotating the coil former with one hand whilst feeding the wire with the other. The wire should be wound on "under the fingers" so that the turns can be held securely whilst the rotating hand can keep renewing its grip after each revolution. Wind the turns on tightly—if you accidentally let the winding go loose it's best to start again.

3: Keep counting the turns as you wind, when you have reached the required number, stop about a quarter of a turn short and cut the wire, leaving about 150mm free. Whilst still holding the turns tightly poke the free end into the "tap" hole and pull it out of the bottom of the coil and into the appropriate slot. Pull it fairly tight and remove any bends or bulges where the wire enters the "tap" hole. To keep the free end out of the way you can again feed it through and around the slots. At this point you may safely let go of the winding without it uncoiling like a clock spring! The next section of the winding is tackled in the same way, winding in the same direction towards the bottom of the coil former. There should be no gaps between the turns.

4: To obtain a tightly wound coil, it's sometimes helpful to first heat the reel of copper wire by standing it on a radiator or by the fire so that its temperature is well above ambient. As it cools on the coil former, after winding, it will contract slightly thus tightening-up the winding. This technique can improve a good winding but it is unlikely to tighten one that is already slack. Ranges 1–3 are wound in a similar fashion.

Range 5 Coil

On the Range 5 coil (30mm length former) the turns are not wound close together but are double-spaced. Wind the coil with the turns spaced two wire diameters apart and then, after pulling the wire taut through the "end" hole, adjust the wire position slightly to give as even an appearance as possible.

Range 6 Coil

The Range 6 coil is made using 20 s.w.g. tinned copper wire bent into a hairpin shape.

First the hairpin is cut to size and soldered into the 3-pin DIN insert (pins 1 and 3). The centre section is then soldered to pin 2 and then to the pin 3 side of the hairpin as shown in Fig. 7. Dimensions are critical. If desired, a small length of coil tubing may be fixed over the base insert to carry the coil identification label.

Assembling the Coils

For Ranges 1 to 5

1: Dismantle the 3-pin DIN plugs—

only the 3-pin inserts are required. These form the base and pin connections for the coils.

2: For each coil base-insert you will require three base connecting wires (20 s.w.g. tinned copper wire). Make each base connecting wire 50mm or more long (for ease of soldering) as this can be cropped to length later.

3: Whilst holding the 3-pin insert, in a vice, solder the 20 s.w.g. base connecting wires to each pin, as shown. It is important that the base connecting wires are in line with the centre of each pin and at 90 degrees or they may not fit easily into the slots in the base of the coil.

4: Prepare the coil lead-out wires, ready for soldering. The easiest way to do this is to take the appropriate lead-out wire through its particular slot and then clamp the end of the wire in a vice. By holding the coil by the ends, between the finger and thumb, the wire can be pulled taught and kept at right angles to the coil former—leaving one hand free.

5: Using a penknife or Stanley knife very carefully scrape the varnish off the wire for about 10mm outwards from the coil former. The part nearest to the coil former is most important. Where two wires are in the same slot, treat each individually. Take care to scrape off all the varnish without cutting the wire—gently does it! Of course, if you are using self-fluxing wire then the scraping is not necessary, a hot soldering iron will melt the enamel.

6: When all the wires are prepared, use a soldering iron and cored solder to "tin" each wire prior to assembly. The solder must thoroughly "wet" the wire without any gaps or blobs for at least the first 5mm from the coil former.

7: Push the prepared base with its connecting wires into the bottom of the coil, each base connecting wire should fit snugly in its slot. Push the base firmly home until the pin side of the moulded base is flush with the bottom of the coil former, as shown in Fig. 7.

8: Solder the coil lead-out wires to the base connecting wires. A really good joint is essential—not a lot of solder but all wires nicely tinned. Crop off the excess wire leaving a small stub of 3mm sticking out.

9: Check that each completed coil functions satisfactorily in the dip oscillator by rotating the LEVEL control and noting that the meter deflects, then secure the base of each coil to its coil former with a small quantity of Araldite forced into the gap around the base. To protect the windings, the coil may be varnished by painting with polystyrene cement, shellac varnish or clear nail varnish (see YL or XYL). Each coil should be labelled with its range and frequency coverage. ***PW***

★COMPONENTS

Resistors

¼W 5% Carbon film

330Ω	1	R4
1kΩ	1	R6
5·6kΩ	2	R2,5
100kΩ	1	R1

Potentiometer

16mm dia. Carbon lin. law

5kΩ	1	R3

Capacitors

Min. plate ceramic

100pF	1	C3

Disc Ceramic

1nF	3	C2,4,5

Variable airspaced

100pF	1	C1 (Jackson C804)

Semiconductors

Diodes

1N4148	2	D1,2

Transistors

BC214L	1	Tr2
2N3819	1	Tr1

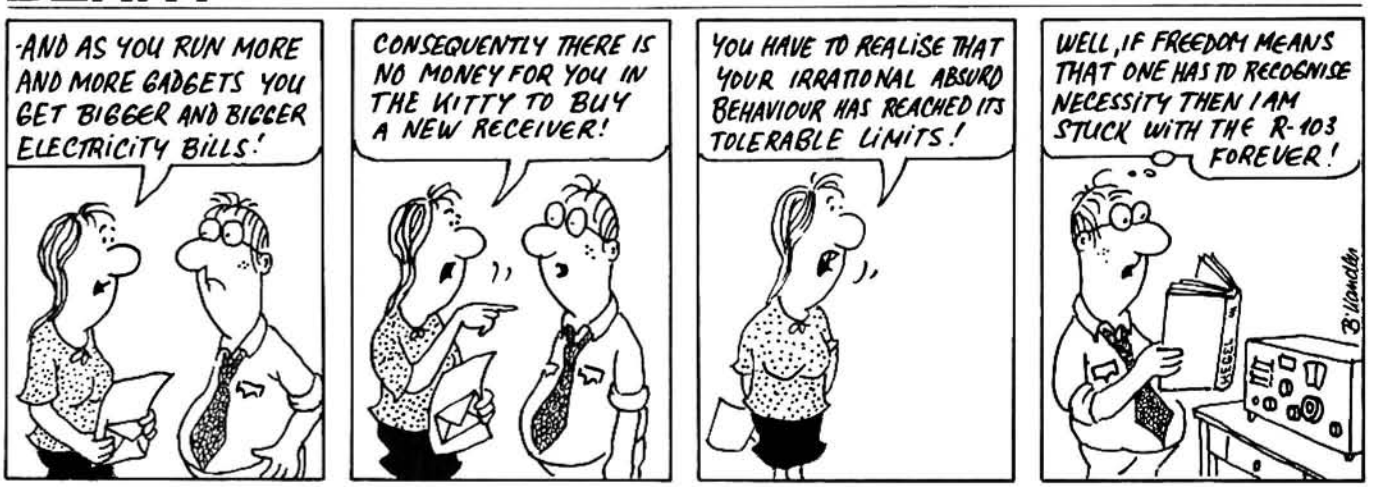
Miscellaneous

Undrilled coil formers: 114 x 64 x 55mm die-cast box; s.p.c.o. min. toggle switch; 5-pin DIN socket; 3-pin DIN plug (6 off); Tuning knob, ¼in spindle knob; Veroboard; Wire; Feet (4 off); 6-F22 battery; battery connector.

The prototype was built in an RS Components box type number 509–989. A set of undrilled coil formers is available from Geoffrey Martin, 40 Aberconway Road, Prestatyn, Clwyd LL19 9HL. Tel: 07456 3255 priced £1.70 inc. p&p. Jackson C804 capacitors are available from Bi-Pak Semiconductors, PO Box 6, 63a High Street, Ware, Herts; Cirkit, Park Lane, Broxbourne, Herts; Electrovalue, 28 St Judes Road, Englefield Green, Egham, Surrey and John Moxham, 22 Whiting Road, Windmill Hill, Glastonbury. The VU meter can also be obtained from Cirkit.

NEXT MONTH—"Using the FET Dipper"

BENNY



Why Digital?

Why should you consider a digital multimeter, or d.m.m., over an analogue volt-ohm meter or v.o.m.? And what kind of d.m.m. features and functions should you look for to handle your measurement needs? This article is designed to answer these questions and more.

It is written both for inexperienced or occasional d.m.m. users, and for experienced analogue v.o.m. users who may be considering buying their first d.m.m.

We've included information about measuring d.c. and a.c. voltage and current, as well as resistance. And we've pointed out some special d.m.m. features you should know about. When you finish this article you'll not only understand what a d.m.m. does, but also what it can do for you.

DC Voltage Measurement

Measuring d.c. voltage is one of the most basic tasks of a d.m.m. Typical d.c. sources include batteries and rectifiers that convert alternating current, or a.c., to direct current.

To measure a d.c. signal, the d.m.m. must convert the analogue signal into something that its electronic brain can understand. It is this analogue-to-digital, or a-to-d conversion that allows a physical event such as a d.c. voltage to appear as a digital reading. The better the quality of the d.m.m., the more accurate is the a-to-d conversion.

Contrast this technique with the manner in which v.o.m.s display information. A v.o.m. uses the actual d.c. voltage to turn a moving coil attached to a needle. The user then judges the voltage level based on the position of the needle on the scale. This kind of measurement technique draws energy out of the circuit to make the needle move. In more sensitive circuits, this drain can result in very inaccurate measurements.

All voltage measurements are made in PARALLEL with the circuit. To avoid disturbing the circuit under test, a high-impedance meter is needed.

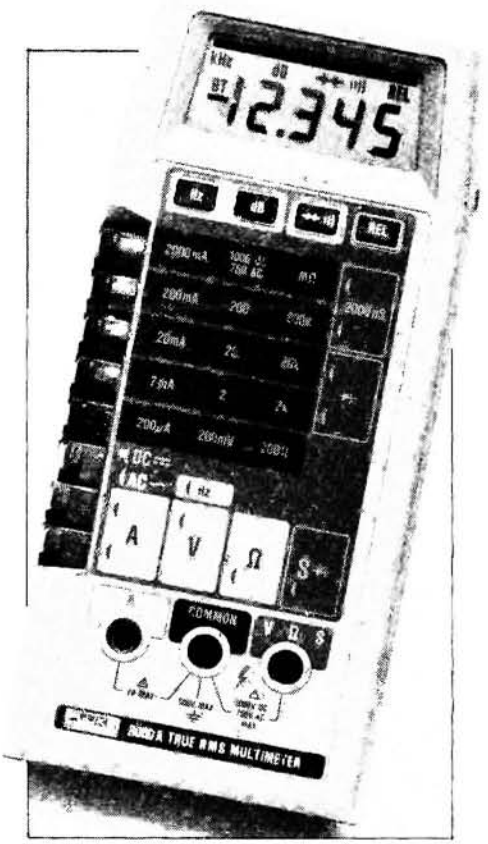
Glossary of Terms

Digits (Resolution): The number of digits the d.m.m. can display. For example, 1999 volts would require three full digits capable of displaying from 0 to 9, plus what is called a "half" digit, which can only display a "1". Therefore, 1999 volts could appear on a $3\frac{1}{2}$-digit d.m.m.

Digits (Accuracy): There are two ways to express the accuracy of a d.m.m.—as a percentage of the reading or as the number of digits of error. In fact, most accuracy specifications appear as a mixture of these two ways, for example: ±(0·3% + 1 digit). For a reading of 1·000V d.c. 0·3% of the reading equals 0·003V d.c. In terms of counts or digits, 1·000V d.c. has 1000 counts or 1000 digits (always ignore the decimal). One digit is therefore 1 out of 1000, or 0·001V d.c. out of 1·000V d.c. Applying the total accuracy specification, then, means that you can expect a reading of 1·000V d.c. in this example to be accurate to within ±(0·003 + 0·001) = ±0·004V d.c.

Input Impedance: The impedance a multimeter inserts into a circuit, from one test lead tip through the meter to the other test lead tip. The higher the input impedance value the better the meter's sensitivity and the less it will disturb the circuit under test. The impedance of v.o.m.s usually doesn't exceed a few thousand ohms (kΩ), while d.m.m.s usually have an impedance of 10MΩ, 100pF. A few specialised d.m.m.s have a higher impedance still.

On circuits with microprocessors, a low impedance meter can cause permanent damage.



The Fluke 8060A $4\frac{1}{2}$-digit true-r.m.s. multimeter has a high input-impedance mode of 10 000MΩ. Its bandwidth on a.c. volts is 20Hz — 100kHz

Measurement Problems

Noise on a d.c. circuit: An unwanted a.c. signal will degrade the accuracy of your d.c. measurement. Most d.m.m.s have filtering circuits that reduce the effects of this a.c. "noise". A typical specification would be "n.m.r.r. (noise mode rejection ratio) of 60dB," which means the effect of a.c. noise is reduced more than a thousand times. For example, 1V a.c. on a 150mV d.c. signal may cause the display to vary only ±1mV, equal to 1/1000 of 1V a.c.

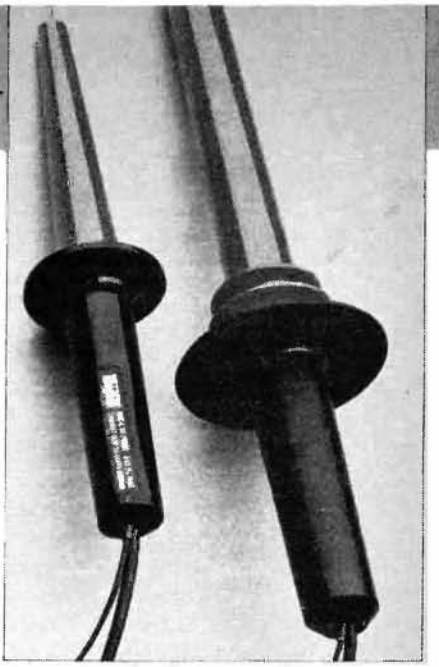
Rectified d.c. voltages are prone to a.c. noise, while most d.c. signals derived from batteries are free of noise.

Transient high voltage spikes: Perhaps the biggest danger to any digital multimeter is transient high voltage. Unprotected d.m.m. circuitry can be destroyed by transients commonly found on ordinary power lines linked with high-capacity motors or transformers. Well designed d.m.m.s, however, have protective circuits to withstand large, fast transient pulses, perhaps reaching 6kV with a period of 10μs.

High Voltage probes. To measure high voltages safely the d.c. signal must be reduced. High-voltage probes are available with very high resistance to allow only 1/1000 of the voltage to reach the meter.

Such probes are not intended for electricity supply applications in which high voltage is also accompanied by high energy. Rather, they are intended for use in lower energy applications such as television and c.r.t. troubleshooting

Temperature probes. To measure temperature, special probes that incorporate semiconductor junction devices are needed. These devices accurately detect temperature and output a proportional d.c. voltage to a d.m.m., which serves as the thermometer.



The Fluke 80K-6 and 80K-40 high voltage probes

AC Voltage Measurement

In the United Kingdom the mains electricity supply is 240V a.c. Other parts of the world may have household voltages of 100 to 120V a.c.

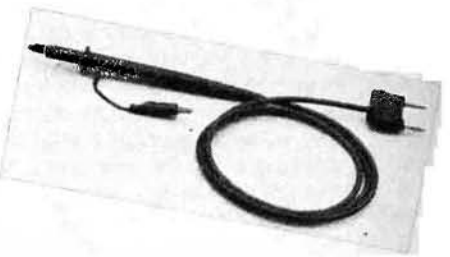
An a.c. signal oscillates or changes over time. The oscillation frequency of the mains supply in the UK is a constant 50Hz (50 cycles per second), because of the stability that comes with a large electrical generation and distribution system. In other countries, a.c. frequency may be 60Hz. Typical mains frequency on aircraft is 400Hz.

Industrial installations generally use a three-phase 415V power supply or its derivative. This higher voltage allows power to be delivered at a lower current using smaller conductors. This reduces transmission loss, which occurs mostly as heat due to line resistance.

To measure a.c. voltage, d.m.m.s employ a converter that outputs the equivalent d.c. voltage to the a-to-d converter. Two converter types are available: **averaging** a.c. converters and **true-r.m.s.** a.c. converters. An "averaging" d.m.m. is good for measuring signals that are sinusoidal and stable. If the signal is being altered or distorted in any way, consider using a meter with true r.m.s. capability, to gain far better accuracy.

Besides these a.c. conversion issues, a d.m.m.'s ability to measure a.c. voltage can be limited by the frequency of the signal. Most d.m.m.s can measure from 50 to 500Hz, while others can measure from 20 to 100kHz.

Analogue v.o.m.s usually have a wide bandwidth. Some may exceed 100kHz. Their input impedance in the a.c. mode is so low, however, that the circuit under test will be substantially affected.



The Fluke Model 85RF r.f. probe

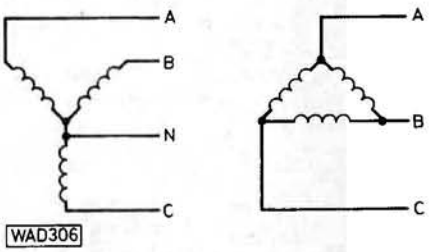


Fig. 1: "Y" and "Delta"-connected sources

Glossary of Terms

True r.m.s. voltage: The voltage corresponding to a d.c. voltage that has the same heating value as the a.c. voltage. In mathematical terms, this is the geometric average of the voltage.

Average voltage: The simple arithmetical average of the rectified a.c. voltage (i.e. without regard to the negative signs).

Peak voltage: The instantaneous voltage high points in an a.c. wave train.

Crest factor: The ratio between the peak and the true r.m.s. voltage.

Three-phase power supply: The power generators' windings are connected such that electricity is transmitted to the user through four conductors, or through three where a delta-connected supply is used (Fig. 1). The sinusoidal voltage waveforms are at the same frequency and amplitude, but they are at three different phase angles—each one is 120 degrees out-of-phase from the others (Fig. 2).

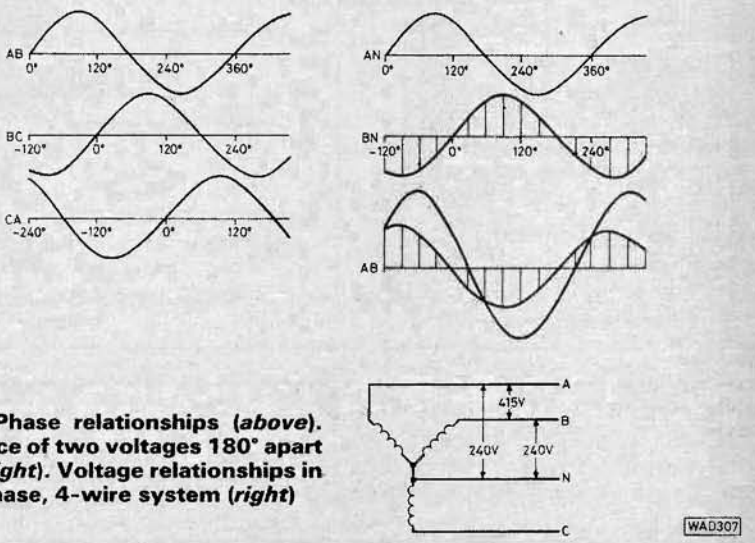


Fig. 2: Phase relationships (*above*). Difference of two voltages 180° apart (*above right*). Voltage relationships in a 3-phase, 4-wire system (*right*)

Measurement Problems

High-voltage (multi kilovolt) mains distribution circuit: CAUTION: Ordinary d.m.m.s should NOT be used to measure high-voltage and high-energy circuits because of potential hazards. Also, errors are easily induced in the sensitive d.m.m. circuitry by the strong electromagnetic fields which surround high energy circuits.

Three-phase circuit (Y-connected): The voltage difference between the wires in a three-phase circuit creates a complex situation when making a measurement. Ideally the voltage difference between two phase wires is 1·732 times the difference between a phase wire and neutral wire. For example, in the UK the phase-to-phase voltage is 415V, while the phase-to-neutral voltage is 240V.

Accessories

RF Probes: These probes extend the ability of the d.m.m. to respond to radio frequency signals.

DC and AC Current Measurement

To handle current measurements, the circuitry of most popular d.m.m.s includes low-value resistors, called current shunts. By connecting your test leads to the correct d.m.m. input jacks, and then touching the correct test points, you will have connected the internal current shunt across the external circuit.

The d.m.m. then measures the voltage drop across the current shunt and, using Ohm's Law, calculates the value of the current and displays it in digits. Measurements of d.c. and a.c. current are handled the same way.

To make a current measurement, first turn off the circuit. Then connect the test leads at the proper point in the circuit, typically between the power source and the load (Fig. 3). Use caution to avoid shorting out the power source. Once the leads are connected, reconnect the circuit to the power supply.

Current measurements may also be made more easily without contacting the circuit, either by using a current transformer or a Hall Effect probe. These devices help protect the operator from potentially dangerous voltages.

All current measurements are made in SERIES to the circuit. To avoid loading down the circuit, low value resistors are used.

Glossary of Terms

Hall Effect probe: A semiconductor device that measures the magnetic field around a current conductor to determine the current's value. These probes can be used for both a.c. and d.c. measurements.

Current transformer: Used to measure a.c. current only. These devices usually divide the current by 1000 so it is within the range of the d.m.m.

Current shunt: Low-value precision resistors that are inserted into a current path

Measurement Problems

Overheated current shunts: The heating power of a current in a shunt is directly proportional to the square of the current (heat = current^2 × resistance). Increasing the current will cause excessive heating. Avoid increasing current carelessly.

Misconnection across a voltage source: The low value resistor will cause excessive high current to flow momentarily into the d.m.m. until a high-energy fuse blows, either inside the d.m.m. or in the circuit breaker of the voltage source. Use extreme caution under these circumstances. If the circuit has no overload protection, an arcing fireball could be created.

Three-phase circuits: Current with different phases cannot be simply added arithmetically Vector addition is used in this case. In the examples shown in Fig. 4, note how the current changes in the phase wires as loads are added to each phase.

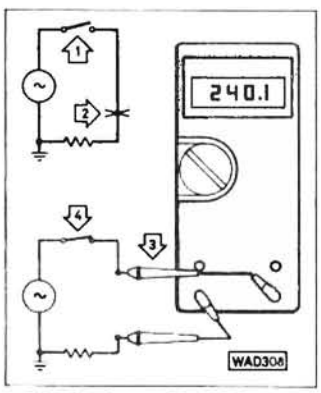
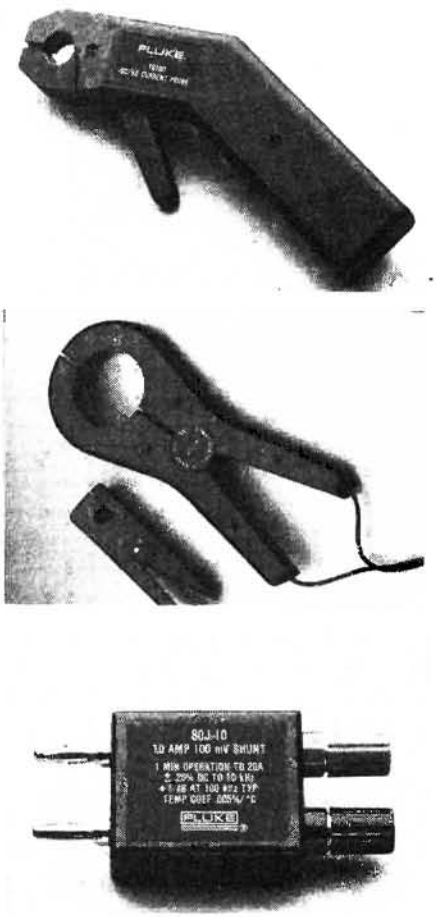


Fig. 3: Steps in taking a current measurement



Fluke current-measuring accessories: the Y8100 Hall Effect probe, the Y8101 and 80I-600 current transformers, the 80J-10 current shunt

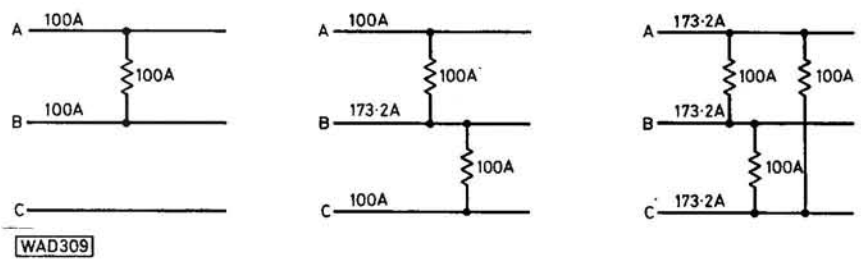


Fig. 4: Currents in 3-phase circuits cannot be simply added arithmetically. Vector addition must be used instead

Resistance Measurements

Resistance values vary greatly, from a few thousandths of an ohm (milliohms) for contact resistance to many millions of ohms for insulators. Most common d.m.m.s will measure from $\frac{1}{10}$th ohm to tens of millions of ohms.

To measure resistance, the d.m.m. must provide a small current or voltage ▶

across the resistor to complete a circuit. Most d.m.m.s use the ratio method for resistance measurements, comparing the unknown resistor to a standard known resistor inside the d.m.m.

The reciprocal of resistance is conductance. By reversing the roles of the internal standard and the unknown resistors, d.m.m.s can register conductance.

Continuity, which is merely a quick resistance test, distinguishes between an open circuit and a closed circuit, and is often indicated by a beeper in the d.m.m. The level of resistance required to trigger the beeper varies from model to model of d.m.m.

If the d.m.m.'s test voltage is less than 0·3V d.c., it will be able to measure the value of resistors that are isolated in a circuit by diodes or semiconductor junctions. This often allows you to test resistors on a circuit board without unsoldering them. Test voltages above 0·3V d.c. turn diodes and semiconductor junctions on, causing the d.m.m. to evaluate the resistance of the entire circuit rather than only the resistor under test.

If the test voltage is higher than 0·7V d.c., the same resistance function can be used to determine whether or not a diode or any other silicon junction is functional (Fig. 5). The diode test is sometimes handled by a special constant-current circuit, usually 1mA. In this case, the d.m.m. will display the forward voltage drop across the diode.

Most v.o.m.s use high test voltage (e.g. 6V d.c.), resistance measurements. Not only is in-circuit testing not possible but such high test voltage can cause damage to semiconductor junctions, microprocessor, etc.

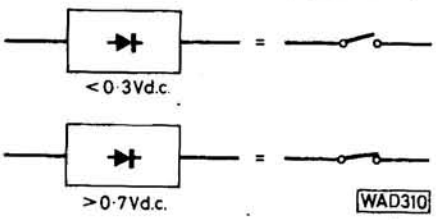


Fig. 5: A test voltage of less than 0·3V d.c. will not turn on diode or transistor junctions. A test voltage greater than 0·7V d.c. will turn them on

Glossary of Terms

Leakage: This is very high resistance found in materials that are normally insulators. The amount of leakage changes with the amount of test voltage that is applied. It is not unusual to apply 500 to 1000V d.c. for adequate insulator testing.

Test current: The d.c. current supplied by the d.m.m. to the unknown resistor.

Test voltage: The d.c. voltage the d.m.m. provides across an unknown resistor.

Measurement Problems

AC noise: Most d.m.m. resistance circuits are designed only to measure resistors that are isolated from the circuit. Consequently they do not include a.c. filters such as those found in the d.c. function.

Temperature sensitivity of resistors: The resistance value of many resistors increases considerably as they heat up.

Test lead resistance: When measuring low resistance, the value of the test lead resistance (typically less than one ohm) must be subtracted from the overall value to get an accurate measurement. A "relative" function will save time here. (See "Special d.m.m. functions".)

Accidental overload: Most d.m.m.s provide protection in case of accidental contact with live voltages while resistance is being measured. Most common v.o.m.s do not.

Special DMM Functions

Some d.m.m.s are capable of a wide range of additional functions that utilise built-in intelligence and special add-on accessories. Understanding what these features and accessories can do will greatly enhance the utility of your d.m.m.

K-type thermocouples: Thermocouples convert temperature measurements into d.c. voltage which a digital multimeter can interpret and display. However, a d.m.m. still needs to have a "cold-junction" compensating circuit to provide proper temperature measurements.

Peak hold: Using a charging capacitor circuit, some d.m.m.s can capture and hold the peak value of a changing signal. This allows the user to measure voltage or current surges. The display will not last a long time—the charge will gradually leak and the reading will diminish. The faster the capture circuit, the faster the reading will decay.

Relative or offset: Most d.m.m.s include microprocessors that allow for mathematical operations. Some take added advantage of this intelligence to perform relative or offset measurements. This capability makes it possible to subtract a stored value from all subsequent readings, allowing the operator to make quick comparisons among different signals.

Frequency counter: If you test communications instruments, you know the importance of frequency measurements. Some recent d.m.m.s have a frequency measurement capability.

dB display: Another mathematical function of some d.m.m.s allows them to compute and display voltage measurements in terms of dBm (decibels relative to one milliwatt) in specific resistance loads. In conjunction with a relative function, relative dB can be displayed.

Display hold: Some d.m.m.s, in conjunction with a special probe, can freeze a reading on their displays. A button on the probe, when pressed, holds a voltage or resistance reading on the display.

Autorange: A clear advantage of many d.m.m.s over v.o.m.s is their ability to autorange. The autoranging d.m.m. electronically determines the proper range for displaying a measurement with the best resolution.

Touch-Hold: One d.m.m., the Fluke 77, uses its microcomputer to determine when the input signal is steady, then locks the value on the display automatically. After putting the meter in the touch-hold mode, the operator merely touches the test leads to the test points, then reads the display at his/her convenience. Touch new test points and the reading updates.

Automatic power down: Some digital multimeters sense when they have not been used for several minutes, powering down into a "sleep mode" to save battery life.

Self test: Because of their built-in-intelligence, many d.m.m.s are able to check the integrity of their circuitry automatically as they are powered up.

The Fluke 77 is an autoranging d.m.m. which incorporates touch-hold and automatic power-down facilities, and combines digital and analogue readouts for maximum versatility

We are grateful to John Fluke Mfg Co Inc for permission to base this article on their booklet *The ABCs of DMMs*. Copies of the booklet are available to readers in the UK free of charge, from Fluke (GB) Limited, Colonial Way, Watford, Herts WD2 4TT.

Five and Ten

A report for Talking Newspaper Week, 21–28 September 1985, by John F. Feeley G4MRB—Chairman of QTI-TNA

Talking Newspaper Week, which takes place this month, celebrates ten years of the Talking Newspaper Association of the UK. By a happy coincidence it is also the fifth birthday of *QTI-TNA*, the technical talking newspaper serving the radio amateur and the s.w.l. with visual handicap

What is a Talking Newspaper?

A talking newspaper is local or community news recorded on tape. The service is aimed at blind and partially sighted people the severely physically handicapped and others who find reading a strain.

A cassette containing news and magazine-type articles is packed in a special wallet and is carried free under the postal concession "Articles for the Blind" to visually handicapped people, or by hand of volunteers (or post paid) to others.

After listening to the tape on their own cassette recorders or on one provided on loan by a talking newspaper group, the wallet label is reversed and the cassette returned to the talking newspaper in the same way.

A talking newspaper is produced by teams of volunteers who share the tasks of editing, reading and recording the news from the "black print". They often compile magazine material on to a master tape. This is copied on a high speed copier to produce one or more cassettes for each recipient.

Inside the UK there are now well over 400 talking newspapers and magazines. While some major magazines and Sunday papers are available from the Talking Newspaper Association of the United Kingdom the vast majority are community based exercises.

Many of the local talking newspapers in the UK number amongst their volunteer teams radio amateurs, whose technical knowledge is very welcome. Some act as visitors–cleaning tape recorder heads and carrying out minor repairs. Others act as "technical experts" or simply take part in the reading of material onto tape.

Since the running of any talking newspaper is an expensive task, supported entirely by voluntary contributions, people willing to lend a hand to raise funds are always very welcome.

Talking Newspapers in the Amateur Radio Community

A community doesn't have to be an actual place. Every radio amateur feels that the hobby makes him or her part of a worldwide community in which he plays a part, keeping up to date with the news and gossip and joining with others in a process of "self-training" in technical matters.

Like other communities, amateur radio has a number of talking newspapers. Most are club magazines available to club members only.

Radial—the magazine of the RAIBC—is read by Brenda Godfrey G4VXL, and *Radio Communication*—the journal of the RSGB—is read by Geoff Perkins G3VIJ. Recently the AMSAT journal has been read by Peter Jackson G3ADV. These are distributed to visually handicapped club members by Roy Gerrard G3LAZ of Enterprises by the Blind (Bedfordshire). A newspaper for BBC micro users is run by Dave Calderwood in Wales, and there is a monthly magazine based on CB and short-wave listening in the south of England.

Other countries, too, have talking newspapers serving the hobby. American services include *Worldradio* read by a priest Tom Carten K1PZU and distributed by George (Kel) Hicken. The Courage Centre and Handihams —the American version of RAIBC— also offer a service of readings of their club journal. The Australian Radio Society club journal is recorded and distributed by a national library. A small group called BRATS (Blind Radio Amateur Tape Service) produce a local talking newspaper and also distribute the international version of QTI. Roy Taylor VK3BTL is the leader of this team.

QTI-TNA: The Voice of the Radio Press

The technical nature of the hobby means that keeping up to date is a major problem even for those of us with sight. Five years ago I started to read onto tape, for Peter Jones G3DRE, articles of a technical nature. After he told several of his friends the demand proved so great that now the talking newspaper that grew out of this provides about 180 C90 cassettes each fortnight inside Europe and master tapes for Australia and the USA.

Useful Addresses

TNAUK
Ted Davies. 68a High Street, Heathfield TN21 8JB.

QTI-TNA
Mrs D. Feeley (Hon Sec). 2 Cartmel Walk, North Anston, Sheffield S31 7TU. Tel: 0909 566301.

Radial
Hon Sec RAIBC. Cathy Clark G1GQJ. 9 Conigre, Chinnor, Oxon OX9 4JY.

RadCom & AMSAT journal (£3 p.a.)
Mr R. L. Gerrard. 46 Hadrian Avenue, Dunstable, Beds LU5 4SP.

BBC Micro TN
Mr David Calderwood. Hafan, Minford, Penrhyndeudreath, Gwynedd LL48 6HP.

Ragchew (Magazines for warblind amateurs)
St. Dunstans, PO Box 4XB, 12–14 Harcourt Street, London W1A 4XB.

Amateur Radio Books & Manuals
RNIB Public Relations Dept., RNIB, 224 Great Portland Street, London W1N 6AA. (House magazine *New Beacon* carries an s.w.l. feature.)

Services available overseas—contact addresses known to us.

USA
Handihams. The Courage Centre, Golden Valley Road, Golden Valley, California, USA.
Quarterly Magazine for visually handicapped electronic constructors. Smith/Kettlewell Technical File, Smith/Kettlewell Eye Research Foundation, 2232 Webster Street, San Fransisco, CA 44115.
Worldradio. Mr. George (Kel) Hicken. Box 7497, Macon, GA 31209, USA.

Australia
Roy Taylor. Box 554 Morwell, Victoria 3840, Australia.

Italy
Radio Club Ciechi D'Italia, Via Lima, 22–00198 Roma, Italy.

Norway & Finland
Norman Aslaksen, Sarpemyrveien, 1560 Lakkollen, Norway.

West Germany
Alfons Grössl. Kirchenweg 10, D–8566 Lienburg, West Germany.

QTI-TNA provides two services. The international tape is a very technical magazine dealing with the latest in physics, radio theory, digital theory rig reviews and other such items which will not suffer from being transported by slow ship and getting lost for a few months! This is sent out monthly to Australia and the USA in master form. The UK-Region 1 service is distributed inside Europe on a fortnightly basis. One tape of this service is drawn from the international for the month while the other is a more general interest tape made up of readings from the news-stand magazines of the UK and the club journals of the G-QRP club, and for the visually handicapped lady amateurs—the BYLARA Newsletter.

How does *QTI-TNA* work and can I help?

QTI-TNA works in much the same way as any other talking newspaper except that reading is "farmed out" around the country to people who have an expertise in the field they are reading.

QTI-TNA runs on funds raised from dealers, clubs and individual radio amateurs. The visually handicapped members pay £3.50 to join, and for this they are provided with the tapes and a postal pouch. After this they are invited to contribute a voluntary subscription, but the service is never refused to those unable to pay.

If you wish to offer help to a Talking Newspaper the address of your local one may be obtained from TNAUK (see address box) or by ringing me at QTI in the evening (again see address box).

DX operators who contact "white stick" stations during Talking Newspaper Week might like to use the list of addresses to help the visually handicapped find their local services. Due to the problems of distance, the blind are often unaware of the services available to them.

Let us use Talking Newspaper Week as an opportunity to spread the word.

QTI-TNA may often be found fundraising at radio rallies and are presently seeking volunteers in the Sheffield area to assist the "core team". **PW**

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fit either side. There is room to expand here, too, for there is another socket on the back to plug-in more disk units, single or double.

In the shack, the QRM is not too bad. I regularly operate my IC2E next to it, usually with an external antenna, and have not experienced any real problems, in either direction. The IC2E and its helical even stood on the top of the case listening to the local net without suffering too greatly.

That isn't to say there is no interference; but there is not enough to bother me at the time. This seems to indicate that a great deal of thought has gone into the design, and screening, of the switched mode p.s.u., though I am tempted to say that many amateurs would willingly pay a bit more for really good screening of the case. Mind you, much can be done by the amateur himself, using good earths and filters, etc., if not actually painting the inside of the case with some suitable conductive film—although this might not endear you to your supplier in the event of a guarantee claim.

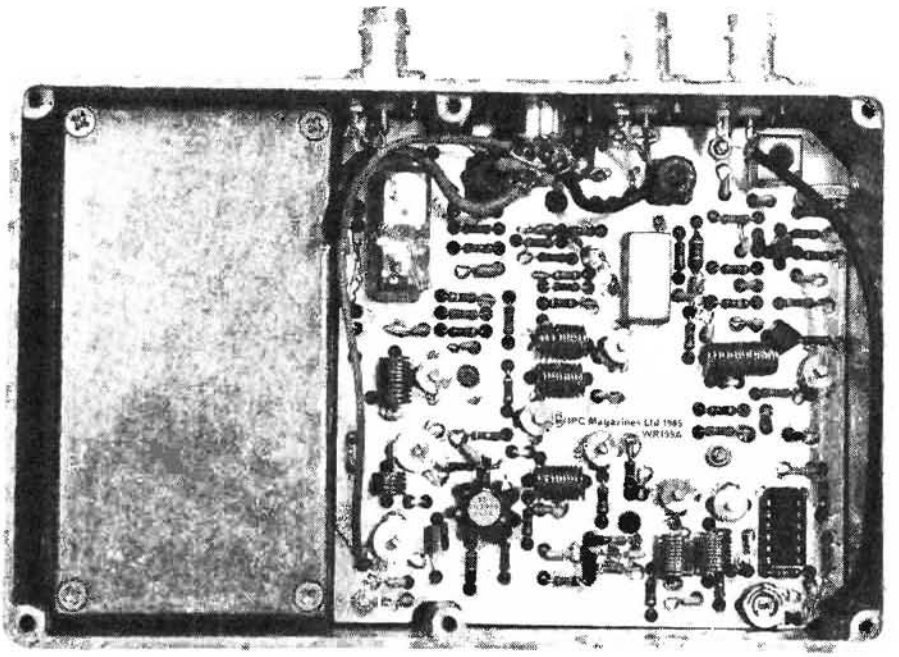
There seems a paucity of good software at the moment, but perhaps the software houses are busy with MSX implementations at present. New titles slide in at reasonable intervals, but you have to look for them. I am told that the Service Dept. will now supply titles direct to the user, in cases where local shortages exist. The radio amateur may well find himself writing a lot of his own (is that what "self-training" means?). I understand that efforts are being made by a rather busy amateur to write some Morse/RTTY and other software, but I cannot confirm this. The machine should do very well for the radio enthusiast especially with AMTOR and the prospect of packet radio or satellite images which seem to whet so many appetities. Getting your *PW*, or ST5 or /8, terminal connected could hardly be easier via the Domino DIN serial input connector. You will need a reasonable bandwidth for your monitor, and a 15MHz display will handle all, including the 80 col. card, which fits on the back, plugged into the "Pipe". This card has its own ROM, and can be set for either the "Einstein" set of characters or the usual International ASCII set. It also has its own video output (phono) socket.

In conclusion, I wonder why this box has not been taken up by more software houses, especially the specialist ones who do much for the radio amateur and his peculiar needs. The plugs and sockets are of good quality, and should stand almost any amount of pulling and pushing. With standard signals and a memory map, it should be easy, even in BASIC. Taken all round, I think it is worthy of far more attention than it seems to be getting up to now. I would like to thank Tatung (UK) Ltd., for their help in the production of this article. G8UYZ

8 EXTRA PAGES

PW Meon 50MHz Transverter

Ready to go on 50MHz? This compact design by Dave Powis G4HUP and Sam Jewell G4DDK shows the way



Several years ago the authors decided that they would like to operate on the 70MHz amateur band. Being confirmed constructors the obvious way to become operational was to build transverters that could be used in conjunction with existing h.f. transceivers. The big problem was that there were few published designs to choose from—in fact the only one found was by G3XBY that had appeared in a copy of the RSGB publication *Radio Communication* back in the mid 70s.

Although this design was quite good it was felt that several useful improvements could be made, such as the use of a ring mixer in the receive side to increase the strong signal handling characteristics. Also the overall size of the unit could be reduced so that it would fit into just one diecast box; anyone who has seen the original G3XBY unit will appreciate the significance of that comment!

The prototype 70MHz transverters were so successful that more than 20 such units were built by other local and not so local amateurs. Several of these transverters were being used in various parts of the country during both 1984 and 1985 v.h.f. NFD.

The 70MHz *PW* Meon described in this article was used to drive a 4CX250B valve p.a. and produced a best DX of 600km for G3PFM/P, manned by the Flight Refuelling Amateur Radio Society—over 200 QSOs in total.

In 1983 G4HUP was fortunate enough to be one of those to be issued with a 50MHz band permit. Up to this time there had been very little incentive to build a complete transverter for the 50MHz band and so, in common with many of the other amateurs doing crossband work to 50MHz, he only had a receive converter. The most obvious solution was to modify one of the 70MHz transverters to work at 50MHz. However, the 50MHz band does not lend itself well to transverting from a 28MHz i.f. on transmit, since twice 28 = 56MHz and twice the local oscillator frequency at 22MHz = 44MHz. These two products are only 6MHz either side of the required 50MHz output. It is asking rather a lot of the mixer and filtering in the transmit side to provide more than 50dB rejection of these products and yet provide a clean signal on the wanted band.

The conversion was therefore approached with some apprehension. When the modified transverter was tested on a spectrum analayser our fears were found to be unjustified as over 50dB rejection was easily obtained, helped by careful setting of the local oscillator drive level into the transmit mixer and optimising the output for the relatively narrow band between 50 and 51MHz. If as amateurs we are fortunate enough in the future to obtain an allocation of more than a few MHz in this part of the spectrum then great care will be needed in aligning the transverter to give the required coverage, whilst still retaining good rejection of the unwanted products. This is still practical but will probably require the use of better filters than have been incorporated into the present design. It may be that these will have to be mounted external to the transverter case.

The unit described here consists of a single printed circuit board on which is mounted a complete receive and transmit converter producing up to 0·5 watts output. Provision is made for adding a higher power output amplifier stage if the intending constructor wants more power. It is possible to construct just the receive converter on its own and this will provide the builder with a very high quality receive capability. The unit may be used on its own providing an output of up to 0·5 watts, or the builder can choose to use it with an add-on amplifier stage.

Since the transverter was originally designed for use on the 70MHz band some of the components have had to be changed to give coverage of the lower frequency band. In several instances this has meant that physically different parts have had to be accommodated on the p.c.b. This should explain why there are some apparently unused holes in the board.

Details will be given later of the changes necessary to give the original 70MHz coverage and how to use the *PW* Meon on 144MHz!

Circuit Description

A block diagram of the complete transverter, including the frequencies involved in generating and receiving the 50MHz band, is shown in Fig. 1.

The crystal oscillator uses a Colpitts circuit operating at 22MHz with a third overtone crystal. The crystal is housed in the popular wire ended HC 18/U package. This oscillator circuit is not able to generate the required power

to drive the receive converter high level mixer without some assistance from the following buffer amplifier. The receive mixer needs about +7dBm to give low conversion loss and high dynamic range. An attenuator is connected between the output of the buffer and the input to the SBL1 mixer in order to present a good match to the mixer local oscillator port. This is important in order to achieve good mixer performance. In the 144MHz version of the transverter the buffer is used as a frequency multiplier, where it is still capable of giving sufficient output level. The buffer output is split to provide a local oscillator signal for both the transmit and receive mixers but since the transmit mixer requires only a fraction of the drive power a capacitive divider is used to achieve the correct level.

A dual-gate m.o.s.f.e.t. is used in the r.f. amplifier stage to obtain a low noise figure and good dynamic range. In addition the stage can be made unconditionally stable without resorting to the use of neutralisation. Very low noise figures are not needed for a receive system on 50MHz since external noise will override the receiver's own noise by many dB under most conditions. This can easily be demonstrated on the complete receiver by plugging in a resonant antenna and observing the large increase in background noise. Why then, you may wonder, should we go for a low noise device in the front-end? The answer is that we can trade the low noise performance for extra dynamic range.

Potentially the mixer is the stage most susceptible to the effects of strong signals. A good mixer must be used if the converter is going to cope well with these strong signals. Schottky diode ring mixers such as the SBL1 used here are popular with receiver designers since they provide the required performance at reasonable cost. But this performance can easily be thrown away by the use of unnecessary gain ahead of the mixer. Why should we want to place extra gain ahead of the mixer? The reason is that although the SBL1 may have an already acceptably low noise figure, by the time the insertion loss of the necessary image rejection filter is added ahead of the mixer, external noise no longer overrides the receiver's own noise, thus making the addition of an r.f. stage necessary. The problem now is that the extra gain that the r.f. stage adds will directly subtract from the dynamic range of the mixer. This effect can be minimised by the use of just enough gain in the r.f. stage to overcome the loss of the filter and mixer.

The cascade noise formula shows that the overall noise figure of the receive system is dominated by the noise contribution from the first stage, with lesser contributions from later stages where the effect of their noise is reduced by the gain of the previous stages. This may tend to suggest that the higher the gain of the first stage the better. This is true but remember this gain is reducing the dynamic range of the receiver.

Re-examining the formula we can see that if the noise from the first stage is lower than we need then we can allow a greater contribution from the second stage and still achieve the required overall noise figure. Hence the gain of the first stage can be reduced to the advantage of dynamic range.

$Ft = F1 + (F2-1)/G1 + (F2-1)/G1 \times G2 + \ldots\ldots$

Where Ft = total noise factor of the system
F1 = noise factor of the first stage
F2 = noise factor of the second stage
G1 = power gain of the first stage
G2 = power gain of the second stage

Note that all terms are in ratios, not dB. Noise factor can be converted to noise figure by the formula: Nt = 10 LOG Ft

Tailoring of the gain to obtain the optimum noise figure is achieved by the use of the attenuator between the r.f. stage output and the mixer input.

The mixer is followed by a wideband termination formed by R37 and C41 which is necessary to maintain the mixer performance. Any serious mismatch here could result in an increase in the mixer conversion loss and a decrease in the dynamic range.

A second dual-gate m.o.s.f.e.t., Tr6, is used as the post-mixer i.f. amplifier. The input impedance to this stage is much higher than the 50 ohm output from the mixer. A simple *L* match consisting of L11 and C43 is used to achieve the impedance transformation. Transistor Tr6 is biased to give low gain with good dynamic range. The network L12/C47 resonates at 29MHz, but is damped by R42 to give a broad response.

An active double-balanced mixer is used in the transmit side because of its inherent conversion gain. If another SBL1 had been used then the maximum output from the mixer would have been in the order of 0·1mW. This would require 37dB of gain in the following linear amplifier stages to reach 0·5 watts—almost a certain recipe for instability if all that gain was packed onto one board without interstage screens. By using an active mixer the output level is over 1mW and the required amplifier gain is that much less. The SO42P i.c. chosen as the transmit mixer is available at low cost and will work satisfactorily to over 200MHz. Potentiometer R1 is used to set the i.f. drive level into the mixer while C32 and C33 ensure that the correct local oscillator drive level is applied. Inductors L1 and L2 together with capacitors C5 and C8 form a bandpass filter at 50MHz.

The first amplifier stage is a dual-gate m.o.s.f.e.t. rather than a bipolar transistor, since experience has shown that they are able to provide stable gain with good linearity at these levels. A tap on the inductor of the tuned circuit at the output of the m.o.s.f.e.t feeds the output stage. A 2N3866 transistor is used here in preference to one of the newer devices, since they are readily available and work well. This stage would become the driver stage if a subsequent output amplifier is added.

Matching the output of the 2N3866 transistor to 50 ohms proved to be quite easy. With a supply of 12 volts and an output of 0·5 watts, the transistor output impedance works out to be close to 50 ohms. The following formula gives the output impedance of a transistor in terms of its operating conditions.

$RL = (Vcc-Vce)/2Po$

Where RL = transistor load resistance
Vcc = supply voltage
Vce = saturated collector/emitter voltage
Po = power output

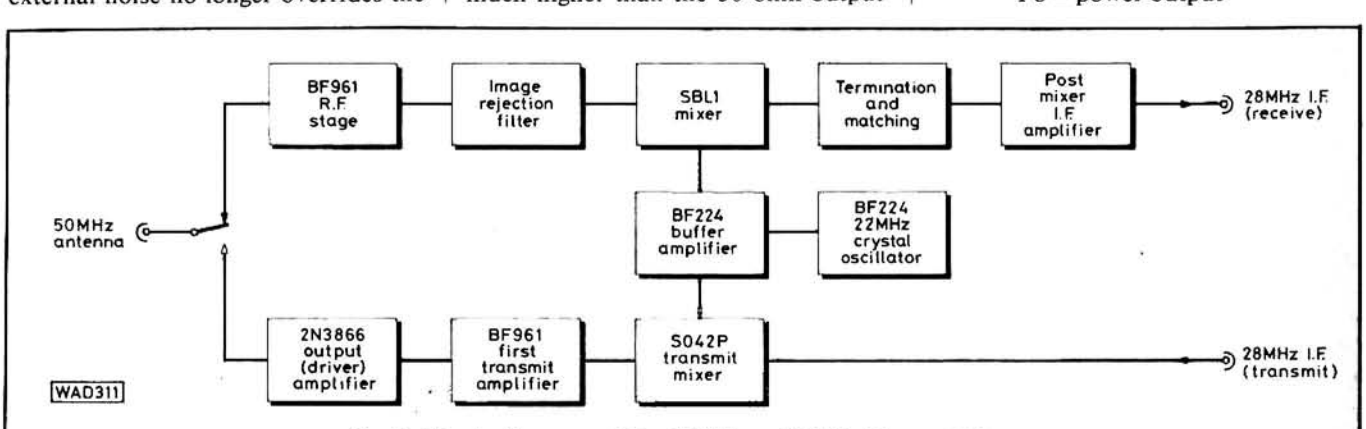


Fig. 1: Block diagram of the *PW* Meon 50MHz Transverter

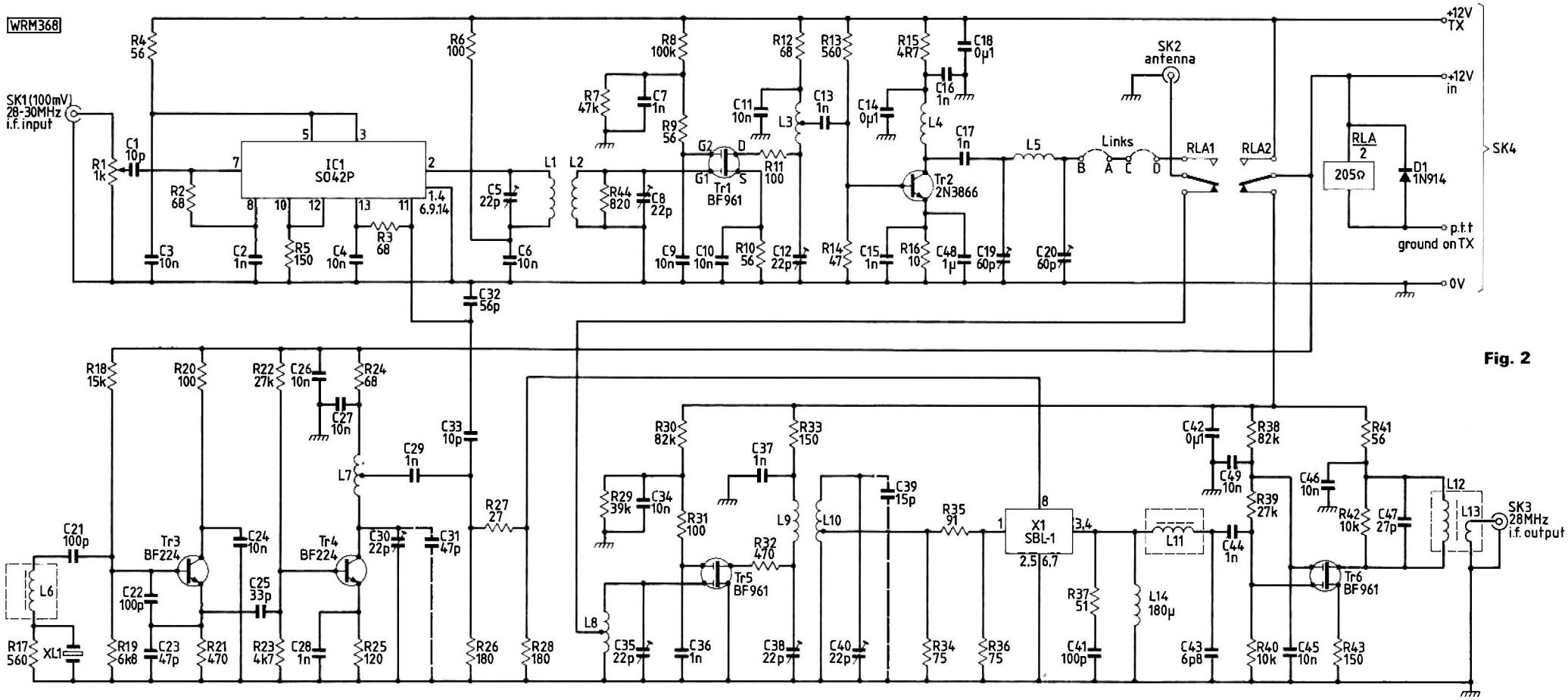


Fig. 2

★COMPONENTS

50MHz Transverter

Resistors

¼W 5% Carbon film

4·7Ω	1	R15
10Ω	1	R16
27Ω	1	R27
47Ω	1	R14
51Ω	1	R37
56Ω	4	R4,9,10,41
68Ω	4	R2,3,12,24
75Ω	2	R34,36
91Ω	1	R35
100Ω	4	R6,11,20,31
120Ω	1	R25
150Ω	3	R5,33,43
180Ω	2	R26,28
470Ω	2	R21,32
560Ω	2	R13,17
820Ω	1	R44
4·7kΩ	1	R23
6·8kΩ	1	R19
10kΩ	2	R40,42
15kΩ	1	R18
27kΩ	2	R22,39
39kΩ	1	R29
47kΩ	1	R7
82kΩ	2	R30,38
100kΩ	1	R8

Horizontal skeleton preset

1kΩ	1	R1

Capacitors

Miniature plate ceramic

6·8pF	1	C43
10pF	2	C1,33
15pF	1	C39
27pF	1	C47
33pF	1	C25
47pF	2	C23,31
56pF	1	C32
100pF	3	C21,22,41
1nF	11	C2,7,13, 15-17,28,29, 36,37,44
10nF	13	C3,4,6, 9-11,24,26,27, 34,45,46,49

Multilayer ceramic, 63V

0·1µF	3	C14,18,42
1µF	1	C48

Miniature film trimmers

22pF	7	C5.8,12,30,35, 38,40
60pF	2	C19,20

Semiconductors

Transistors

BF224	2	Tr3,4
BF961	3	Tr1,5,6
2N3866	1	Tr2

Diodes

1N914	1	D1

Integrated circuits

SO42P	1	IC1 (Siemens)

Miscellaneous

SBL1 Schottky balanced mixer, X1; 22MHz HC18/U, third overtone crystal, XL1; 2-pole c/o relay, 12V coil (RS349-658), RLA/2; clip-on heatsink for Tr2; Eddystone 6827p (187 × 118 × 56mm) diecast aluminium box; 50Ω BNC square sockets (3); 5-pin DIN socket; p.c.b.; Veropins; 50Ω miniature coaxial cable; 0·7mm en. cu. wire; Toko 10K coil former (Cirkit stock no. 35-33330) (3). Moulded choke 180µH, (L14).

With a supply of 12 volts, and an output of 0·5 watt, a 2N3866 with a Vce of 1 volt produces an output impedance of approximately 40 ohms. The *pi* network between the transistor and the output allows easy matching to 50Ω and also provides some lowpass filtering prior to the output amplifier.

A relay is used to provide both antenna changeover and power supply switching between transmit and receive. Links are used to select whether the integral output stage or an external output amplifier is connected to the relay. In this way the board can be used self-contained for low power operation, or any other amplifier stage can easily be added.

Construction

The *PW* Meon p.c.b. was designed to fit into a popular size Eddystone 6827p diecast box allowing an output amplifier to be accommodated within a separate 7134p box. Cut-outs are required in the p.c.b. in the places shown in order to clear the pillars of the box.

The printed circuit board is double-sided with one side left almost intact to act as a ground plane. The board layout is shown in Fig. 4. Plated through holes are not used in the interests of cost reduction but several links are, however, needed to ground certain of the components. Where this is the case these holes are marked on the p.c.b. layout. If you are making your own p.c.b.s from the layout given in the article please remember that clearance is required on the ground plane side around the leads of most of the components where they pass through the board. This is most easily accomplished by countersinking the ground plane side of the board with a 3mm drill bit.

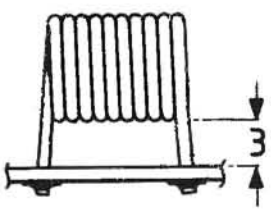
Before any components are soldered onto the board, cutouts are needed in the places indicated. These will only be necessary if the transverter is to be fitted into the recommended Eddystone diecast box. The board is fitted into the box by means of 6BA tapped pillars. In order to mark the correct drilling places the p.c.b. (without components fitted) should be placed in the right position in the bottom of the box and a scriber used to mark the box through the holes in the board. The board can then be removed and the correct size clearance holes drilled in the box. If 6BA pillars are to be used then a 3mm drill bit can be used. Select eight 3mm long 6BA screws and four 12mm long tapped pillars. Screw the pillars to the inside of the box with four of the screws. Check that the remaining screws can be tightened to hold the board in place. When you are satisfied that the board will fit, construction can begin.

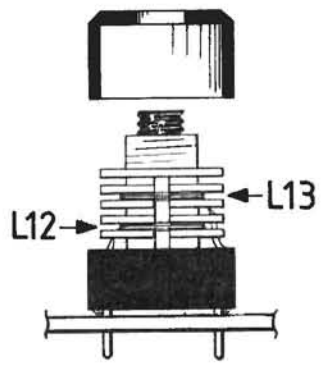
The component layout is shown in Fig. 4. Begin construction by soldering all the resistors into place, checking carefully that you are putting them into the right holes. Next, fit the fixed capacitors. When you have soldered all the fixed capacitors into place the trimmer capacitors can be fitted. These should be treated with care, especially while soldering, since excess flux from the solder can easily damage them. The side of the trimmer that is connected to ground needs to be soldered on both sides of the board. Trimmers C19 and C20 have a larger diameter than the other trimmers and require that the side which is connected to ground does **NOT** go through the board but instead the leads should be bent flat against the ground plane and soldered as shown. Potentiometer R1, D1 and L14 can then all be fitted. Coil winding details are shown in Fig. 3. Inductors L6 and L11, together with the i.f. transformer L12/13 are wound on the formers of old Toko 10K, 10·7MHz i.f. transformers such as the KALS 4520. The old windings will need to be carefully removed, as will the built in resonating capacitor (if fitted). The former can then be rewound with either the recovered wire or some new 34 s.w.g. enamelled copper wire. Exact gauge is not too critical. It is wise to mark which can contains which coil. When they have been rewound and checked for d.c. continuity they can be soldered into place. Note the can of L12/13 provides a ground link for the i.f. output.

The semiconductors can now be fitted, being careful to observe the correct polarity of the connecting leads as shown in Fig. 4. Note that the m.o.s.f.e.t.s are all mounted with the writing towards the track side of the board and showing through the mounting hole when viewed from the component (ground plane) side. The SO42P and SBL1 mixers can now be soldered into place, taking great care that they are connected the correct way round. Pin 2 of the SBL1 mixer is directly below the letter M printed on the top surface of the device. The relay is fitted last only because it is so tall that it can make the fitting of other components very awkward, unless you have small fingers. Links A-B and C-D can be connected according to your requirements for the final unit. Pin E provides 12V on transmit.

Once the board is built it is best installed in the diecast box for alignment. Short lengths of miniature 50 ohm coaxial cable, such as RG174, should be used for the i.f. and antenna connections. Power and p.t.t. leads should also be soldered onto the board.

If the recommended diecast box is to be used for the transverter then BNC sockets should be mounted where shown in Fig. 4. followed by whatever power feed and control socket you prefer. Possibles here are a four-pin microphone socket of the type fitted to Japanese rigs or a five-pin DIN socket. When the sockets are fitted then the coaxial and d.c. leads can be connected to their respective sockets. It is a good idea to carefully dress these leads as an accidental short circuit here could be expensive. The authors use heat shrink sleeving for this job since it produces a neat finish to the inside of the equipment. While it is probably true that few people will see the inside of your finished work it is none-the-less much ▶





L1,2,9	10T	L6	12T
L8	10T tap 2T	L11	15T
L10	10T tap 1½T	L12	9T
L5	6T	L13	2T
L7	18T		

0·7mm e.c.w. closewound 6·4mm internal diameter, self-supporting

L4 12T

0·4mm e.c.w. closewound 4mm internal diameter, self-supporting

0·1mm e.c.w. on Toko 10K coil former (Cirkit 35-33330). Note L12 and L13 are wound on the same former as shown above

Fig. 3: Inductor winding details for the 50MHz *PW* Meon. See text for alternative band options

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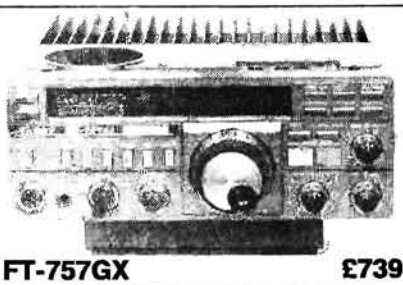

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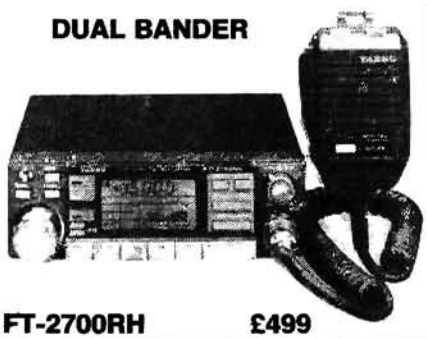

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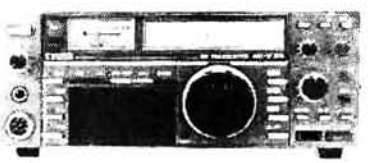

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Alignment

To align the transverter you will require certain items of basic test equipment:

1. An absorption wavemeter to cover the range 22 to 60MHz.
2. A power meter to read up to 1 watt at 50MHz.
3. A multimeter.
4. A frequency counter (optional).

Connect the multimeter, switched to its highest current range, in series with the supply lead to the transverter. Switch the transverter to receive and connect a 12–13·5 volt d.c. supply to the unit. The current taken by the board will depend upon the initial condition of the tuning but should in any case be no more than approximately 40 to 50mA. If the current taken is appreciably more than this then disconnect the supply and carefully examine the board for signs of damaged components or unwanted short circuits. When you are satisfied that nothing is disastrously wrong, the local oscillator alignment can begin.

Connect your frequency counter to the junction of C25 and R23 and adjust the core in L6 until the counter reads 22·000MHz. This type of oscillator circuit often exhibits hysteresis. This will be noticed as a tendency to stop oscillating, or a reluctance to restart once it is switched off. It can easily be overcome by resetting the frequency with the core of L6. To achieve exact frequency it may be necessary to adjust by one or two the number of turns on L6 or change the values of C22/C23. In most cases the circuit will work perfectly and no fiddling will be necessary. If you do not have a frequency counter, or cannot borrow one, then the absorption wavemeter can be used. First you will need to remove the can from L6; tune the wavemeter to 22MHz and position it close to the coil. Adjust the core for a maximum reading on the meter; retune the wavemeter slightly to check that the oscillator is on the correct frequency. Now place the wavemeter close to coil L7 and adjust C30 for a maximum reading again at 22MHz. You may now assume that the local oscillator is correctly tuned.

Alignment of the receive converter is best accomplished with the use of a signal generator, but its use is not essential since nature has conveniently provided us with one—noise! Connect a receiver tuned to 29MHz to the i.f. output of the converter and with the supply on, tune L12/13 for maximum noise output from the receiver. Now tune L11 for a further increase in the noise output. Trimmers C38 and C40 are now adjusted for a peak in the noise output. Connect a resonant antenna to

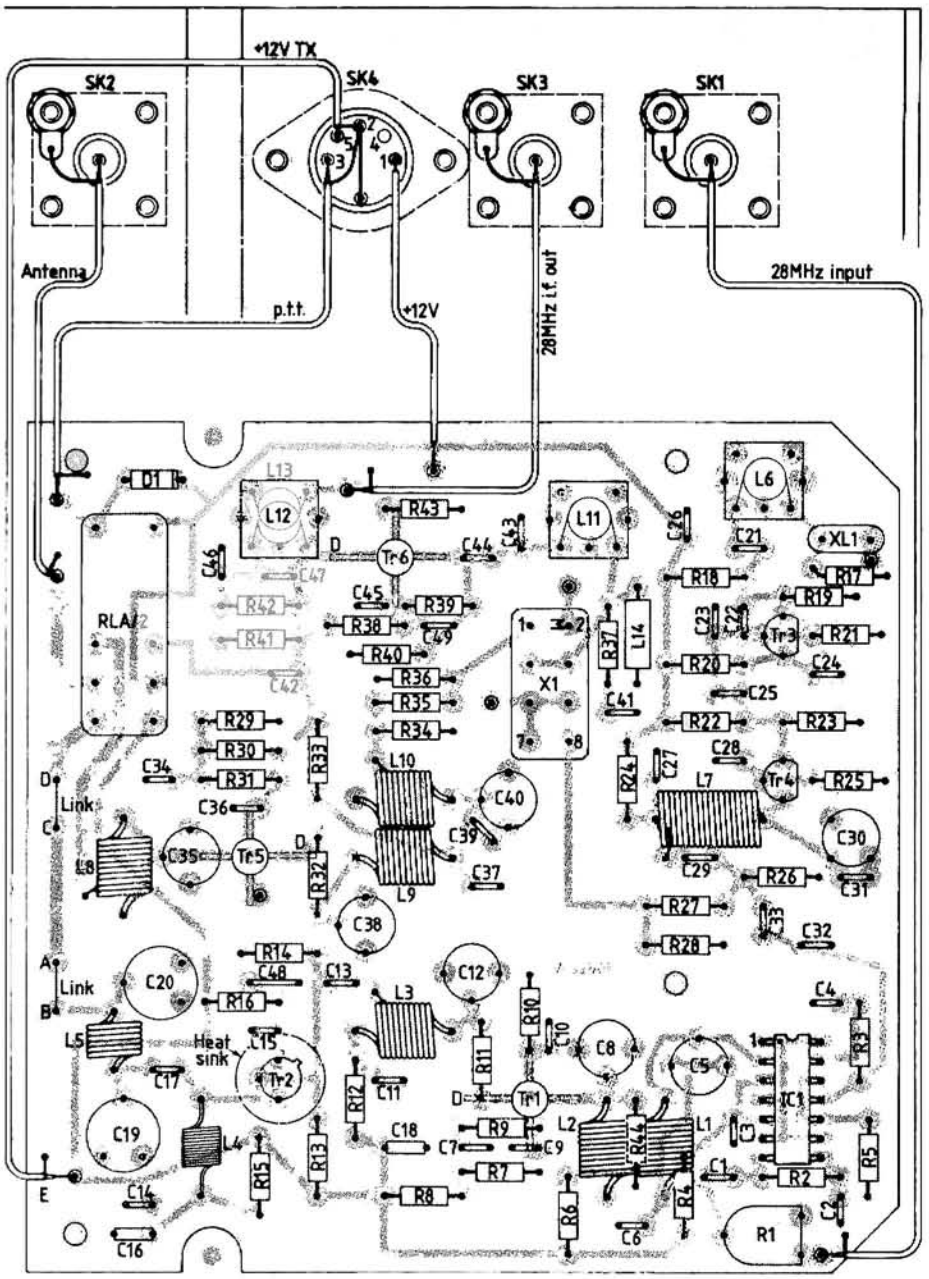
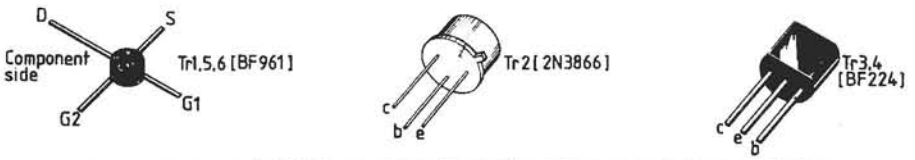
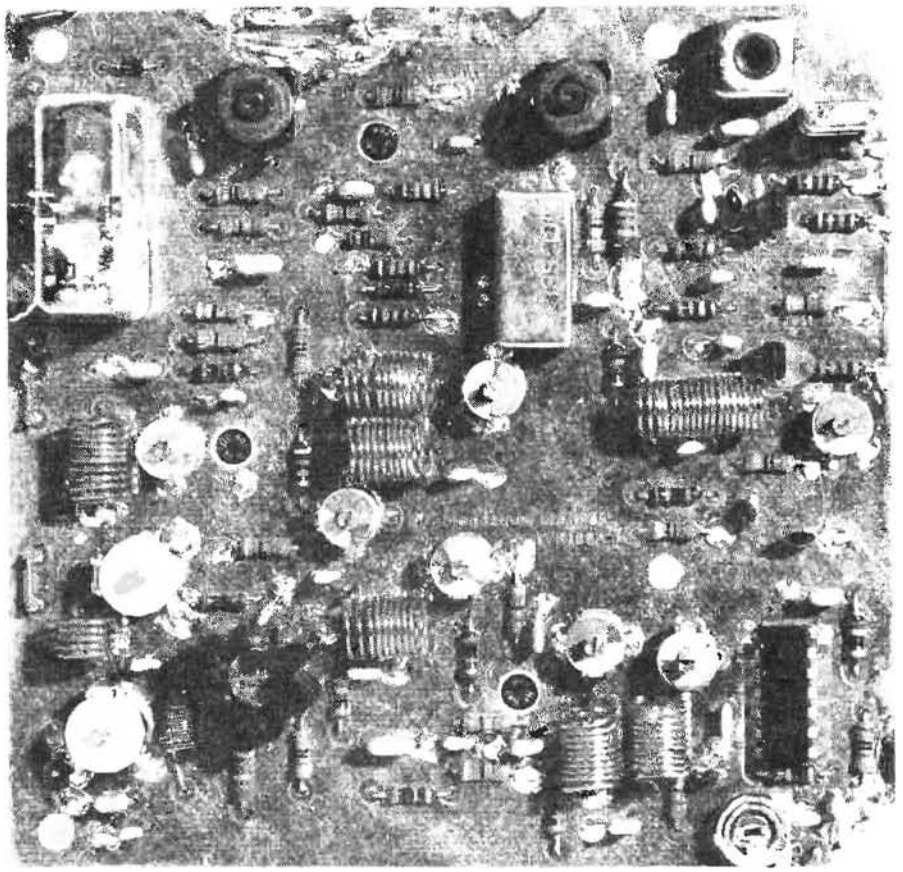
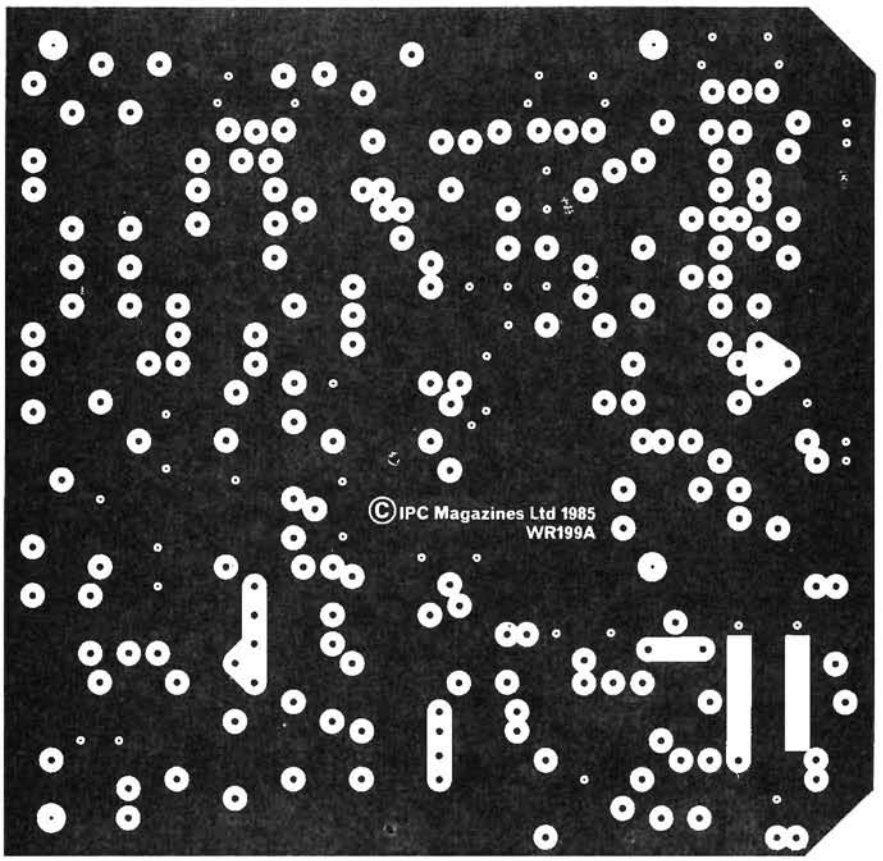


Fig. 4: (Opposite) Component location and p.c.b. track pattern, shown full size. (Below) Semiconductor pin-out details, prototype p.c.b. photograph and component side ground plane. The can of XL1 is grounded via the adjacent through-board pin. Connection to an add-on p.a. or filter stage is made from pins B and D







the antenna socket of the converter and adjust C35 for a further small increase in noise output. It may be necessary to go back to C30 in the local oscillator and readjust it for maximum noise from the receiver. The reason for this readjustment is that the maximum reading you obtained on the wavemeter may not have corresponded exactly with the correct tuning point of the tuned circuit.

The receive converter can be left tuned for maximum sensitivity at 50MHz, or it can be band-spread to cover up to 52MHz. If this is the case then the tuned circuits associated with C38 and C40 will need to be carefully adjusted to obtain an even response across the range. This is accomplished by tuning the i.f. receiver to 28·5MHz and adjusting C38 for maximum noise output, then retuning to 29·5MHz and adjusting C40 to repeak the noise. It will be found that there is some interaction between these two circuits by design and that it will therefore be necessary to go back and forth between the two until no further improvement can be obtained.

It should now be possible, given a reasonable location, to hear one of the 50MHz beacons. Final "tweaking" can be performed as necessary, using one of these signals.

It is wise to check the current consumption in the transmit condition before alignment. The multimeter should again be connected in the supply lead to the transverter and the current drawn noted when the supply is switched on. Again it will depend on the initial state of tune, but should not be greater than about 100mA. If the current being drawn is within this limit then you may proceed to the alignment, otherwise repeat the exercise of looking for a possible fault condition.

Turn R1 fully counter-clockwise to give maximum i.f. drive to the mixer. Connect a power meter and 50 ohm dummy load to the output of the transverter, switch to transmit and apply up to 1mW of i.f. drive to the TX input socket. Place a sensitive absorption wavemeter close to L1. Adjust C5 for a maximum reading on the wavemeter at 50MHz (assuming that the i.f. drive is at 28MHz). Check that the reading that you get is at 50MHz and not the second harmonic of the i.f. at 56MHz or the second harmonic of the local oscillator at 44MHz.

When you have positively identified the wanted product then transfer the wavemeter to the proximity of L2 and tune C8 for maximum reading. The wavemeter can now be placed close to L3 and C12 adjusted for maximum output from Tr1. By now the power meter connected to the transverter output should be indicating some output signal present. Trimmer capacitors C19 and C20 should be adjusted to maximize the power out, which will be between 0·25 and 0·5 watts.

The next stage is to reset R1 so that you do not overdrive the transmit

mixer. This can prove difficult to do without the use of a spectrum analyser but satisfactory results can be achieved by a system of trial and error.

First set R1 fully clockwise and apply an i.f. drive signal at the intended level. Now slowly rotate R1 counter-clockwise until a reading is obtained on the power meter at the output. Continue rotating R1 until the output starts to show signs of giving very little more output for increasing drive level. You are now driving the transverter into saturation and the output will probably sound awful to anyone listening. At this point reduce the drive level by rotating R1 clockwise until the output power starts to fall sharply. The setting of R1 will be close to optimum and can be finally set by obtaining reports on the air. The typical i.f. drive level at the mixer input should be 100mV and will be compatible with the majority of transceivers fitted with low-level transverter ports.

Alignment of the board is now complete and it can be used in its own right as a low power transverter to get a feel for the 50MHz band. As any second harmonic energy will fall within the Band II v.h.f. broadcast band it is highly recommended that the simple low-pass filter, as described in the appendix, is inserted across the p.a. stage pin-outs when using the barefoot board.

Other Bands

In the introduction to this article it was stated that the transverter was designed initially for use on 70MHz (4m), this band being less than 2MHz wide. However, this article has been written around the 50MHz version, which initially is only required to cover 50–50·50MHz.

The basic design can be set up to cover 50–52MHz as previously stated. However, if the band allocation is increased coverage of the section between 52 and 54MHz can easily be provided by switching a second local oscillator crystal at 23MHz to replace the 22MHz one. The switching can be by means of a small toggle switch mounted adjacent to the crystal oscillator or better still a diode switch can be used. A suggested circuit is given in Fig. 5(b).

70MHz Option

For those constructors who require a 70MHz band transverter the necessary changes are as follows:

1. Change the local oscillator crystal XL1 to a 42MHz third overtone type.
2. Reduce the number of turns on L6 to seven.
3. Reduce the number of turns on L5 to five.
4. Leave out C31, the 47pF capacitor across C30.
5. Change C22 to 56pF.

The local oscillator circuits should now be tuned to 42MHz instead of 22MHz; all other circuits are tuned to 70MHz. No changes are required to components in the amplifier and it merely requires retuning to 70MHz.

144MHz Option

It is also possible to use the transverter on 144MHz (2m). The performance of the SO42P is not as good at these frequencies, possibly leading to insufficient suppression of the local oscillator signal. Additional filtering would help to achieve satisfactory results.

Performance of the receive converter up to and including 144MHz is outstanding, being at least as good as any that the authors have used previously. A greater number of changes are required to the basic circuit values than for the 70MHz version. These are as follows:

1. Change crystal XL1 for a 38·666MHz third overtone type.
2. Reduce the number of turns on L6 to 12.
3. Reduce the number of turns on L7 to five and tap at one turn from the "cold end".
4. Reduce the number of turns on L1, L2 and L3 to five and tap L3 at one turn from the "cold end".
5. Reduce the number of turns on L5 to four.
6. Reduce the number of turns on L8 to eight, tapped at one and three quarter turns.
7. Reduce the number of turns on L9 and L10 to five. Tap L10 at one turn.
8. Change C19 and C20 to 22pF variables.
9. Change Tr4 to a BFR34A.
10. Change Tr1 to a BF981.
11. Change R34/36 to 470 ohms and R35 to 10 ohms.

All coil details, except those given, remain as the original.

Alignment now requires that the crystal oscillator is tuned to 38·666MHz and the buffer amplifier now becomes a frequency tripler. There is sufficient output from the multiplier to provide the required +7 dBm at the SBL1 mixer. All other circuits should be tuned to 144MHz. The transmit output level is about 0·5 watts. A noise figure of better than 2dB should be expected from the receive converter together with an input intercept of close to −8dBm. The following receiver will have to be very good to match this dynamic range, however.

Appendix

The authors have made a series of measurements on an early evaluation sample 50MHz *PW* Meon produced by G0API. These results are summarised in Table 1.

The receiver analysis program, TCALC, produced by Ian White G3SEK, was used to analyse the receive converter performance and as a result several changes were made to the original design. These changes have been incorporated into the published *PW* Meon design. The results shown in Table 1 reflect the excellent performance of the receive converter. The block diagram Fig. 5(c) shows the receiver parameters so you can try them in TCALC for yourself.

A linear transmit converter should exhibit low intermodulation levels. In order to measure the intermodulation performance of the transmit side of the design a two-tone test was performed at various output powers, with a separation of 500kHz used for the two tones. Spectrum plots of the results are shown in Fig. 6(b/c) and clearly these are again excellent and should cause no distress to other users of the band.

The output spectrum of the transmit converter was also plotted and is shown in Fig. 6(a). A good low-pass filter would obviously be needed between the output and the antenna and to cater for this the 50MHz low-pass filter shown in Fig. 5(a) is presented.

A push-pull outboard p.a. would undoubtedly help, since it inherently cancels even-order harmonics. Evaluation of several alternative p.a. designs is currently in progress and it is hoped to present one of these in the near future.

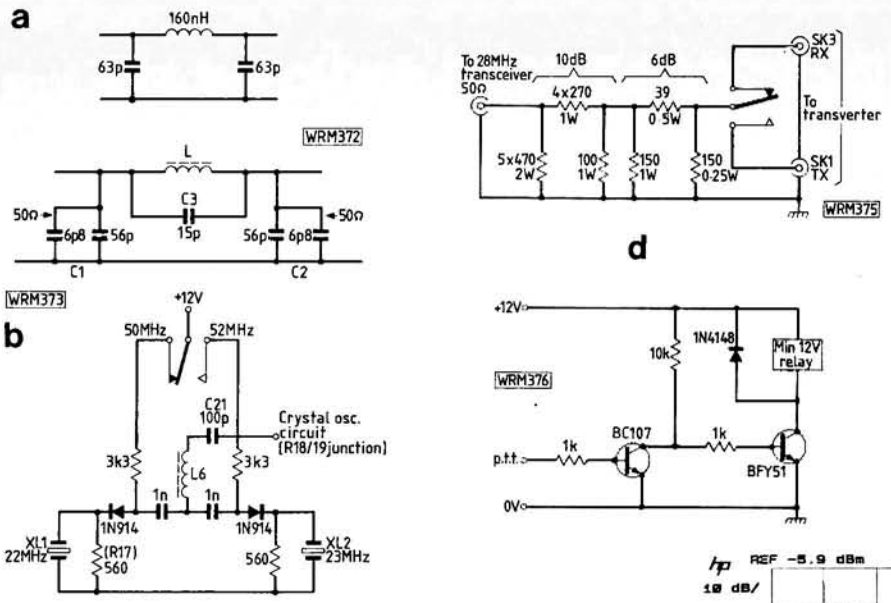
A versatile transverter design has been presented which should provide the builder with a piece of equipment of unequalled performance for its price. It is easy to build, thanks to the use of a printed circuit board. Since so many have been built successfully already, the constructor need have no fears of spending money on a design that stands no chance of working. ***PW***

Table 1

Receive Converter	
Gain	20dB
Noise figure	4dB
1dB compression point	−16dBm at the input
Spurious free dynamic range	88dB
Bandwidth (3dB)	1·75MHz
Transmit Converter	
Saturated power output	0·5W
Third order i.m.d. at 50mW p.e.p.	−37dB
Third order i.m.d. at 200mW p.e.p.	−30dB
Fifth order i.m.d. at 200mW p.e.p.	−46dB
Suppression of 44MHz	53dB
Suppression of 2 × i.f.	60dB
Suppression of second harmonic	24dB
Suppression of third harmonic	35dB

Buying Guide

The estimated cost of this Intermediate rated project is £45. Eddystone diecast boxes are available from Hawnt Electronics Ltd, Firswood Road, Birmingham B33 0TQ. Tel: (021) 784 2485. The SBL1 and BF961 devices are stocked by Cirkit and the Siemens SO42P i.c. and the B78108S 180µH choke (L14) by Electrovalue. Crystal XL1 from IQD.



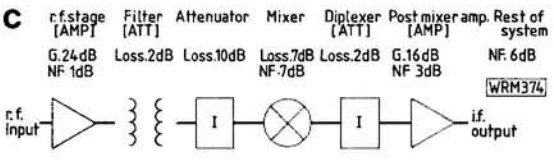
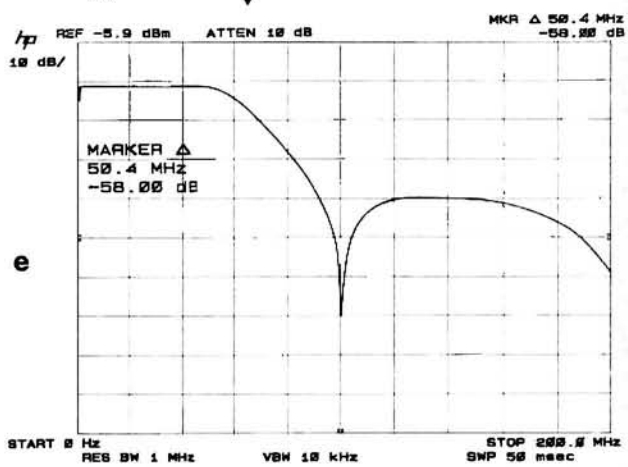
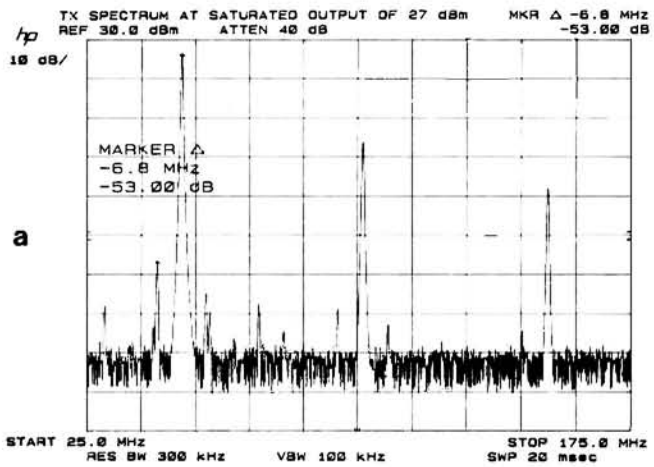
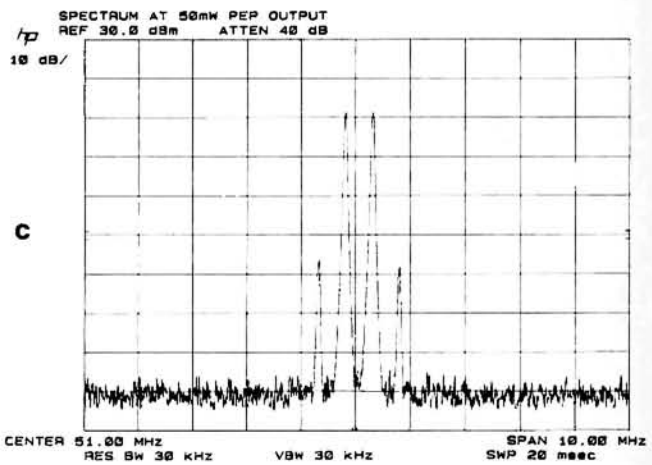


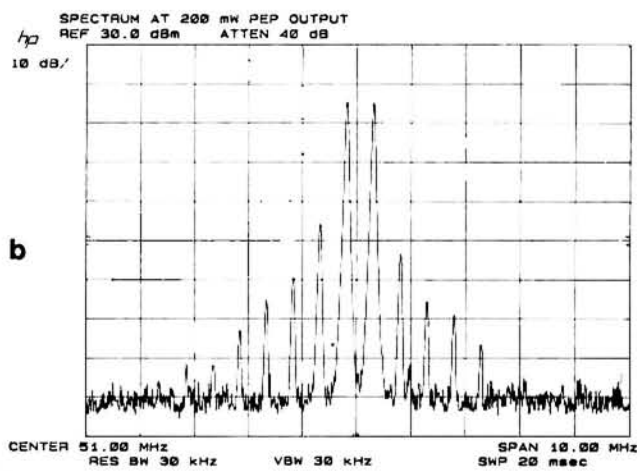
Fig. 5: (Above) (a) Simple and trapped low pass filters for 50MHz. Inductor L is a Toko S18 coil (Cirkit 35-10403), core fully in; capacitors ceramic plate. (b) Optional l.o. switching. (c) TCALC block diagram. (d) Switched attenuator for TS120/130 series transceivers

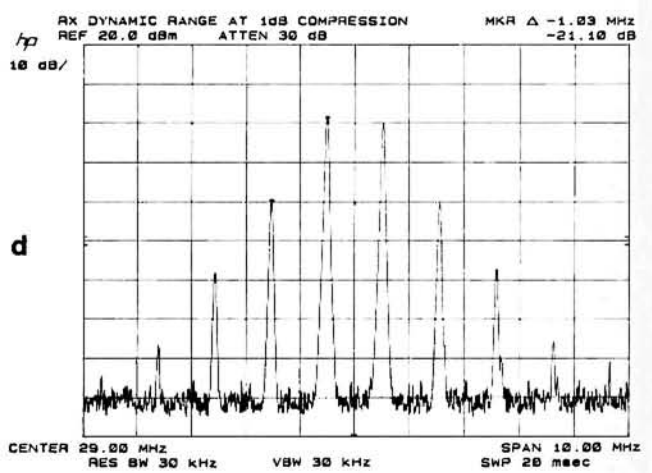
Fig. 6: (a–d) Spectrum plots of the 50MHz transverter. Plot (e) shows the response of the trapped filter: –58dB at 100MHz and 0·5dB in-band insertion loss











Weather Satellites

In the second part of this series Terry Weatherley G3WDI examines the ESA Meteosat system

In the last article we looked at the polar orbiting weather satellites launched by the US—the NOAA series and the USSR—the Meteor series. The satellites are in low polar orbit with orbital periods of around 100 minutes giving about fifteen earth orbits a day. Although the orbits were chosen so as to obtain complete earth coverage in any twenty-four hour period not all orbits are within range of any one suitably equipped earth receiving station. On average there are three consecutive daytime passes together with three consecutive night-time passes which are within range for a worthwhile length of time. During daylight hours the NOAA satellites transmit pictures in both the infra red and visible light and during darkness in the infra red only. The equatorial crossing times for NOAA-9 for June 1985 are given in Table 1. The orbits giving useful pictures are marked with an "*". Only short periods of signal will be received from the other orbits. This then is a restriction on the use of the polar orbiting satellites. They do give detailed local information but for only some of the time.

Orbit	Time	Degrees W
2407	1:25:59	166·2*
2408	3:08:04	191·7*
2409	4:50:09	217·2
2410	6:32:14	242·7
2411	8:14:19	268·2
2412	9:56:24	293·8
2413	11:38:30	319·3*
2414	13:20:35	344·8*
2415	15:02:40	10·3*
2416	16:44:45	35·8
2417	18:26:50	61·4
2418	20:08:55	86·9
2419	21:51:00	112·4
2420	23:33:05	137·9*

Table 1

A satellite placed in a geostationary orbit does not suffer from this disadvantage. Its orbital period is such that from a point on the surface of the earth it appears to remain stationary in the sky. If such a satellite is equipped with a camera and suitable transmitting equipment it should be able to send pictures to earth on command for twenty-four hours a day to any suitably equipped receiving station that the satellite can see. From such an orbit a satellite can see a large area of the earth. A chain of five such satellites can be spaced at suitable intervals around the globe to give nearly complete coverage of the earth's surface.

It was just such a system that was instituted by the World Meteorological Organisation (WMO), see Fig. 2.1. The European Contribution to this system is Meteosat. Meteosat was conceived, designed and built by the European Space Agency (ESA) and launched by the ESA rocket Ariane from the launch site in French Guiana. It will be remembered that AMSAT OSCAR-10 was launched by *Ariane L6*. Meteosat's position is over the point latitude 0, longitude 0. From that position the satellite can see from Antarctica in the south to Greenland in the north and from Brazil in the west to India in the east. Coverage obtained from the other geostationary weather satellites is shown in the photographs (Figs. 2.2 and 2.3).

The first of the Meteosat satellites was launched in November 1977. The imaging system failed in November 1979. The second Meteosat was launched in June 1981. During an in-orbit checkout it was discovered that the transponder system used for data collection from remote data collecting platforms was defective. This system was, however, still working on Meteosat-1 so between them the two Meteosats are able to provide full mission coverage.

The Meteosat system comprises both the satellite and a ground system which consists of the data acquisition, telemetry and tracking station. The satellite provides the images of the earth every thirty minutes in both the visible and the infra red. From these images the ground system disseminates corrected and annotated images by re-transmitting the images back to

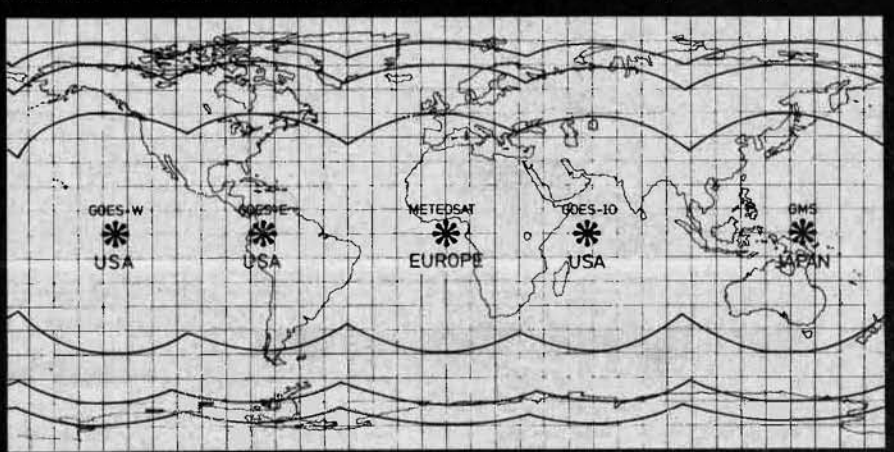


Fig. 2.1

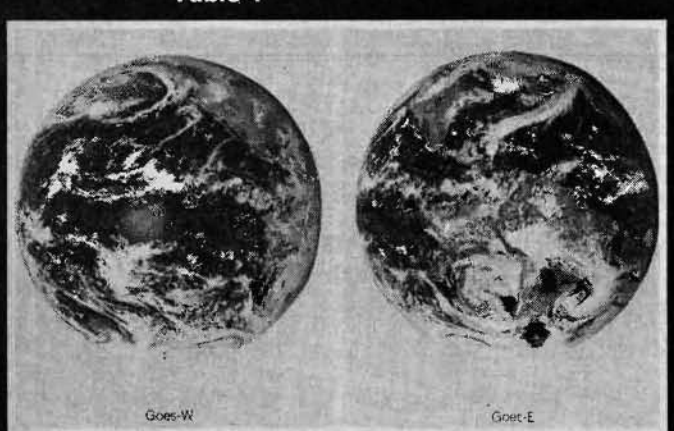


Fig. 2.2

Fig. 2.3

What's Up There?

the satellite from where they are retransmitted by the satellite to ground stations around the world according to a predetermined time-table. Images are transmitted in two forms, high resolution data transmissions for primary users and APT compatible transmissions for secondary users including many radio amateurs. The transmissions are carried on two frequencies. They are 1·491GHz and 1·4945GHz. Most APT transmissions are on 1·4945GHz while the data transmissions together with APT whole earth pictures and other "products" are on 1·691GHz.

The satellite itself is cylindrical in shape (Fig. 2.4) with an overall diameter of 2·1m and a length of 3·2m with a weight of 293kg falling to 245kg as the hydrazine propellant used for station keeping is used up during its lifetime. In orbit the satellite spins at 100r.p.m. about its main axis. The axis is aligned nearly parallel to the earth's north south axis. The cylindrical surface is used to mount the six solar panels, one of which contains a large oval hole for the radiometer telescope. The cylindrical surface of the smaller drum shaped body on one end of the main cylinder is covered with an array of radiating dipole antenna elements. Electronics within the drum activates individual elements in sequence, in reverse order to the satellite spin sense, and this system constitutes an electrically despun antenna for S-band transmissions. Two cylinders mounted on top of the drum are toroidal pattern S-band and low u.h.f. antennas. In addition, four thin rods forming a turnstile antenna extended from the top of the drum and are used for v.h.f. links.

The imaging instrument on the satellite is a Ritchey-Chretien reflecting telescope. This telescope allows permanent imaging of the earth with a resolution at the sub satellite point of 5km in the infra red and 2·5km in the visible frequency spectrum. As the satellite spins an east-west line of elements is generated. A succession of lines is generated by rotating the radiometer telescope stepwise from south to north synchronously with the satellite spin period. The optical information is converted into analogue electrical signals by five sensors, two in the visible and three in the infra red. Each detector generates an instantaneous 5km square field of view. One full infra red image consists of 2500 lines of 2500 pixels while a visible light image yields 2500 lines by 5000 pixels. When both visible channels are used then 5000 lines by 5000 pixel images are obtained.

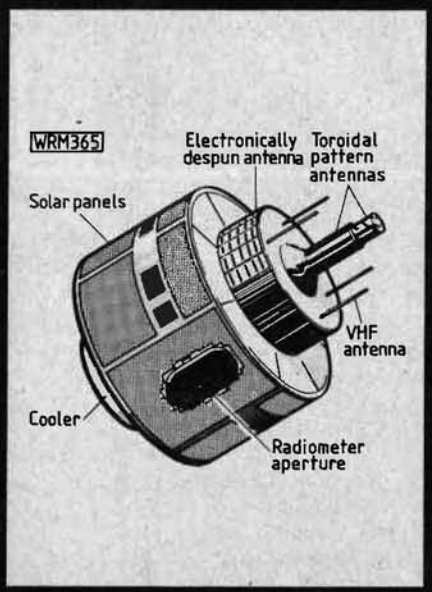


Fig. 2.4

Raw data in the form of 32 bit words is transmitted to the ground station in Darmstadt in Germany. Transmissions are in the S-band (1·670–2·110GHz). The data rate of the raw image data is 166Kb. During each spacecraft spin the radiometer only sees the earth for 1/20 of a revolution. A memory allows one line of image to be stored and transmitted to ground during the remaining 19/20 of a revolution. It takes 25 minutes to obtain information for a whole earth scan followed by a five minute retrace and stabilisation period. Thus one set of pictures is available every half hour. The high resolution pictures obtained in each of the three ranges visible light, infra red and water vapour is shown in Figs. 2.5, 2.6 and 2.7.

At the ground station the transmissions are received using a 15m fully steerable parabolic dish antenna. The dish is operated by remote control from the main complex 50km away. The data is computer processed, checked and corrected for distortion to produce a high resolution image before being further processed for retransmission to the spacecraft for dissemination by the spacecraft to user stations. One very useful feature is the superimposition of coastlines onto the picture together with lines of latitude and longitude. This allows easy identification of areas of interest even if they are covered by thick cloud. The format used is the standard WEFAX form. Each picture is 800 lines transmitted at 240 lines a minute and can be displayed on equipment used to display pictures from the polar orbiting satellites. All that is required is a converter to convert the 1·491/1·4945GHz signals to 137·5MHz.

Facilities are also available to receive pictures from the GOES geostationary satellite and retransmit this through Meteosat (Fig. 2.8).

An article in the *European Space Agency Bulletin* showed quite vividly the way Meteosat images could be used to detect natural disasters. The images


Fig. 2.5

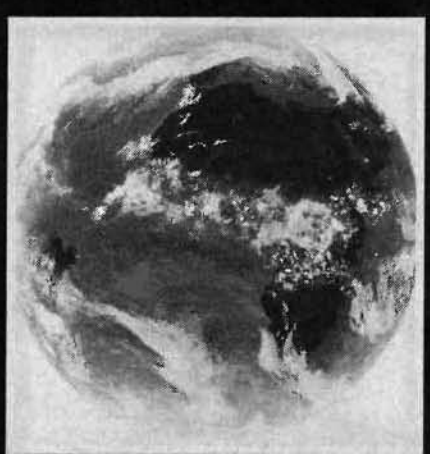


Fig. 2.6

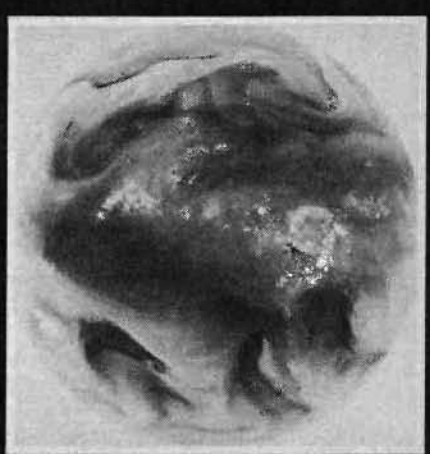


Fig. 2.7

Fig. 2.8

Fig. 2.9

Fig. 2.10

could be used for near real time tracking of hurricanes and to estimate their intensity. Tropical storms can also be tracked from image to image. Tropical cyclones can be observed from time to time over the Arabian Sea and the Indian Ocean. Meteosat is also able to interrogate data collecting platforms in remote areas and this information transmitted on u.h.f. by a 5W transmitter using a 1·5m helical antenna gives ground measurements to supplement the image data. Examples of the work being undertaken using these remote data collection platforms include earthquake prediction in Turkey and storm surge predictions in the North Sea. Figs. 2.9 and 2.10 respectively.

Pictures from Meteosat are available twenty-four hours a day in a variety of formats. The whole area seen by the satellite is divided into smaller areas. The D format consists of nine such areas and the pictures available are in the infra red or water vapour spectrums. A smaller C format is available for visible light pictures during daylight hours together with a C-D format giving visible light pictures over the infra red picture area. The satellite is also used to send a test card and grey scale together with admin messages on a daily basis giving any change to the published program together with any spacecraft news. The schedule ensures that the infra red picture together with the two visible light pictures D2 CO2 and CO3 are transmitted every 30 minutes. Whole earth pictures can be built up over a three hourly period from the nine C-D format pictures, see Figs. 2.11 and 2.12.

Three times a day whole earth images are transmitted in the infra red, visible light and water vapour. The visible light images are interesting since they show phases of the earth at 9am and 3pm with the night/day terminator clearly seen. As mentioned before pictures from GOES-E are transmitted showing the weather over the USA together with South America. Cloud heights can be estimated from the raw data and cloud top height pictures are transmitted with the degree of whiteness of a cloud indicating its height above sea level. A key to the heights corresponding to each step is displayed down one side of the picture. At certain times of the day meteorological charts are transmitted to supplement the pictures. These give wind strength and direction together with surface temperatures.

A photographic archive is maintained on photographic negative film using a laser beam recorder. The film size is 425 by 460mm and with a very small spot diameter each picture consists of 11 000 lines of 11 000 pixels with 64 shades of grey. This archive can be interrogated by computer and should build into a useful research tool for Meteorologists and others in the future.

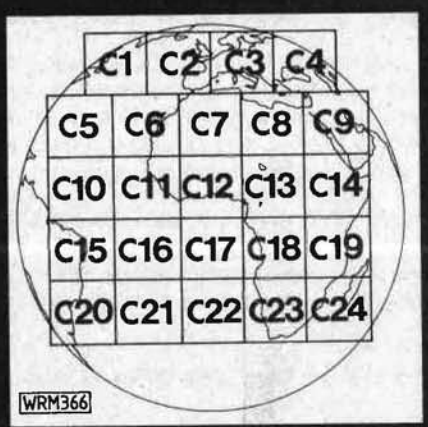


Fig. 2.11

Fig. 2.12

It is expected that the current Meteosat series of spacecraft will continue into the mid 1990s, but there are already plans for a second generation Meteosat. Since only minor improvements to the present instruments could be included in the present design thus giving only minimal advantage to users an opportunity arises for a new satellite to be conceived. Such a new satellite could have a more sophisticated imaging system giving 1km resolution together with more spectral channels. Thus regional images of higher resolution could be used for "nowcasting" in severe weather. The spacecraft could carry an instrument to perform atmospheric soundings to give water vapour profiles of the upper atmosphere. It is also feasible to carry the LASSO (LAser Synchronisation of atomic clocks from Synchronous Orbit) system on the spacecraft. Decisions on these systems are several years away but Meteosat is with us now and sending a daily stream of weather pictures.

A lot of interesting data about the Meteosat system is freely available from the European Space Agency:
Meteosat Data Management
Department,
Robert-Bosch Str. 5,
D-6100 Darmstadt
Federal Republic of Germany.

In the next article I will discuss the signal characteristics of the transmissions from weather satellites together with the now many different ways of receiving signals and displaying the picture information they contain; from using an oscilloscope to computer interfaces and framestores.

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3: *ESA Bulletin 29.* Detection of Natural Disasters via Meteosat.
4: *ESA Bulletin 35.* The Meteorological Product: cloud analysis.
5: *ESA Bulletin 37.* ESA's plans for Future Earth Observations Programmes.

WEATHER SATELLITES

Fed up with space invaders?

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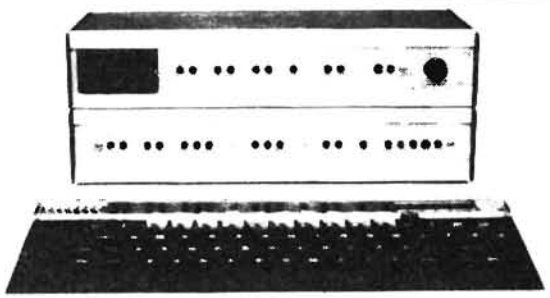
Switch on the TV in the early evening and you are bound to see one of those magnificent satellite pictures the weather men are so found of. These are taken by satellites continuously orbiting the earth to help meteorologists study the world's climate and predict our weather. The equipment they use costs an arm and a leg but now for the first time a complete package of hardware and software is available at a realistic price, both in kit form for the adventurous, and ready built for those short of time. The vast cost reductions are due to the superiority of the BBC with its interface capabilities and graphics combined with the use of our innovative software.

Timestep who have been making satellite systems for British Telecom for years, have now acquired the exciting new 2.0 version software from Matthew Atkinson, which in conjunction with the new WSAT receiver enables anybody to beat the weathermen. Schools and farmers will find this project particularly interesting.



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Full Data on system **50p**

UoSAT SATELLITES

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Proving our ability to lead the forefronts of RF Technology we have already sold over 2,000 of the receivers and pre amps that this system is based on. Tracking of the aerial and receiver is not needed for any of the satellite passes. For the ultimate the optional data correlator designed by James Miller can be used. Using advanced correlation detection techniques and a matched filter this unit provides stable data under most signal conditions. The correlator is suitable for both UoSAT 1 and 2.

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Aerial	**£18.50**
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Built module	**£10.95**
Receiver (MK2) kit	**£37.50**
Built module	**£48.50**
Software on disc UoSAT 1 or 2	**£12.95**
Data correlator kit	**£42.00**
Built module	**£56.50**
Receiver and correlator built and boxed	**£138.50**
Full data	**50p**

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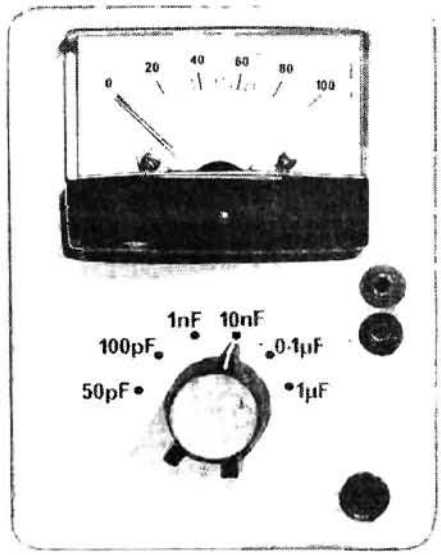
Simple Capacitance Meter

If you have accumulated a box full of unknown capacitors you will find this project by Martin Michaelis DK1MM a useful addition to your test gear.



For this simple piece of test gear an old principle was adapted. This, simply stated, says that the a.c. current flow through a capacitor is dependent on the capacitance, frequency and applied voltage.

The main part of the circuit is the voltage controlled oscillator which in this circuit is an LM566 p.l.l. chip. To ensure that the calibration of the meter remains stable regardless of battery condition the supply rail to the p.l.l. is stabilised by IC2.

The frequency of the v.c.o. is determined by the *CR* combination selected by rotary switch S2. Six ranges are provided with an accuracy of ±2 per cent of full scale.

The output from the v.c.o. is a squarewave which allows the unknown capacitor, Cx, to charge to its full potential. This permits the measurement of d.c. current flow and the resultant meter reading is a linear function of the value of Cx.

Calibration is carried out by adjusting the six multi-turn trimmers R3-8 using various known accurate capacitors as references.

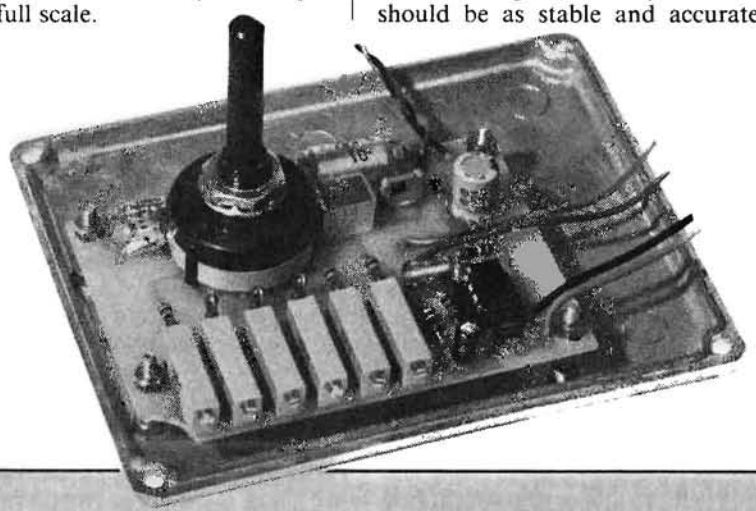
Construction

The components are all mounted on a conventional single-sided p.c.b. as shown in Fig. 2. The capacitors C1-6 should be as stable and accurate as possible so do not be tempted to use odd types out of the junk box or because they are cheap. The accuracy over long periods depends on the stability of these components.

The multiturn trimmers chosen are a compromise in terms of cost and performance. The addition of the series fixed resistors R3a-R8a allows a cheaper type of trimmer to be used with a common value of 10kΩ.

The rotary switch used is the common type known as "midget wafer" and to allow the tags to fit the holes on the p.c.b. it will be necessary to clip off the loops at the ends of the tags. The push-button switch is connected to the p.c.b. with flying leads.

Any 100µA f.s.d. moving coil meter



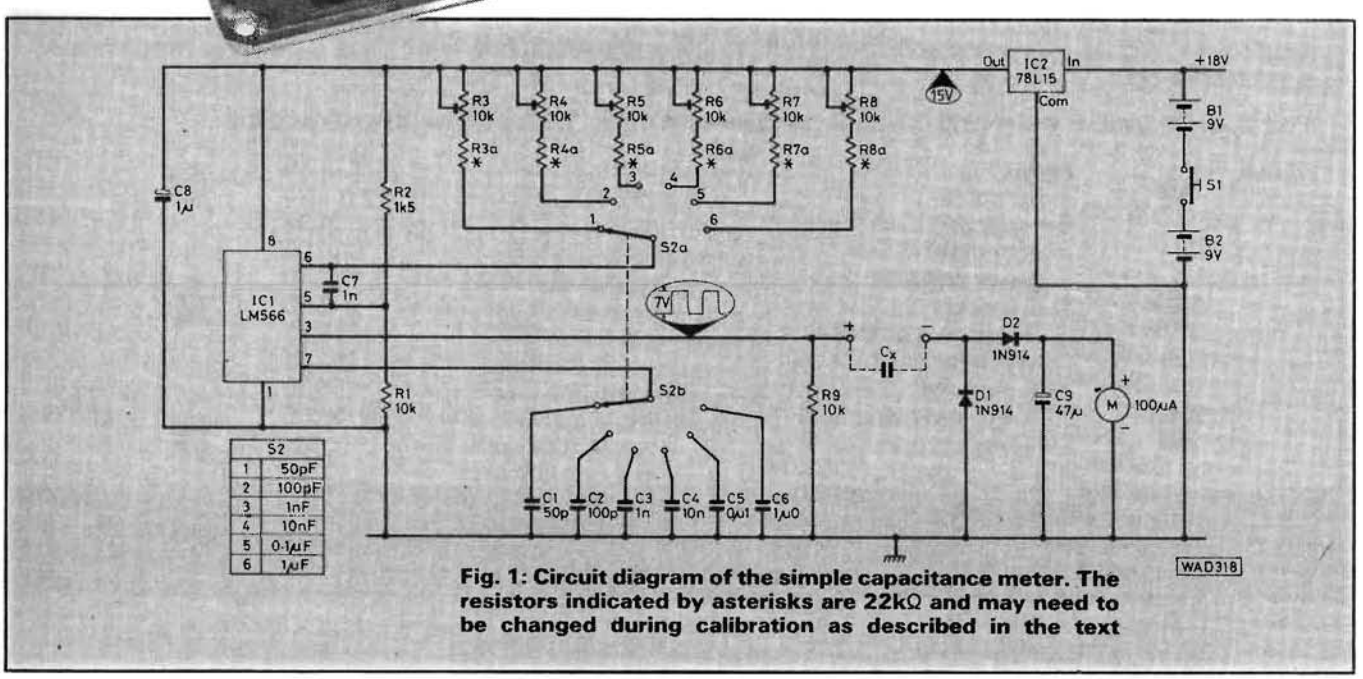


Fig. 1: Circuit diagram of the simple capacitance meter. The resistors indicated by asterisks are 22kΩ and may need to be changed during calibration as described in the text

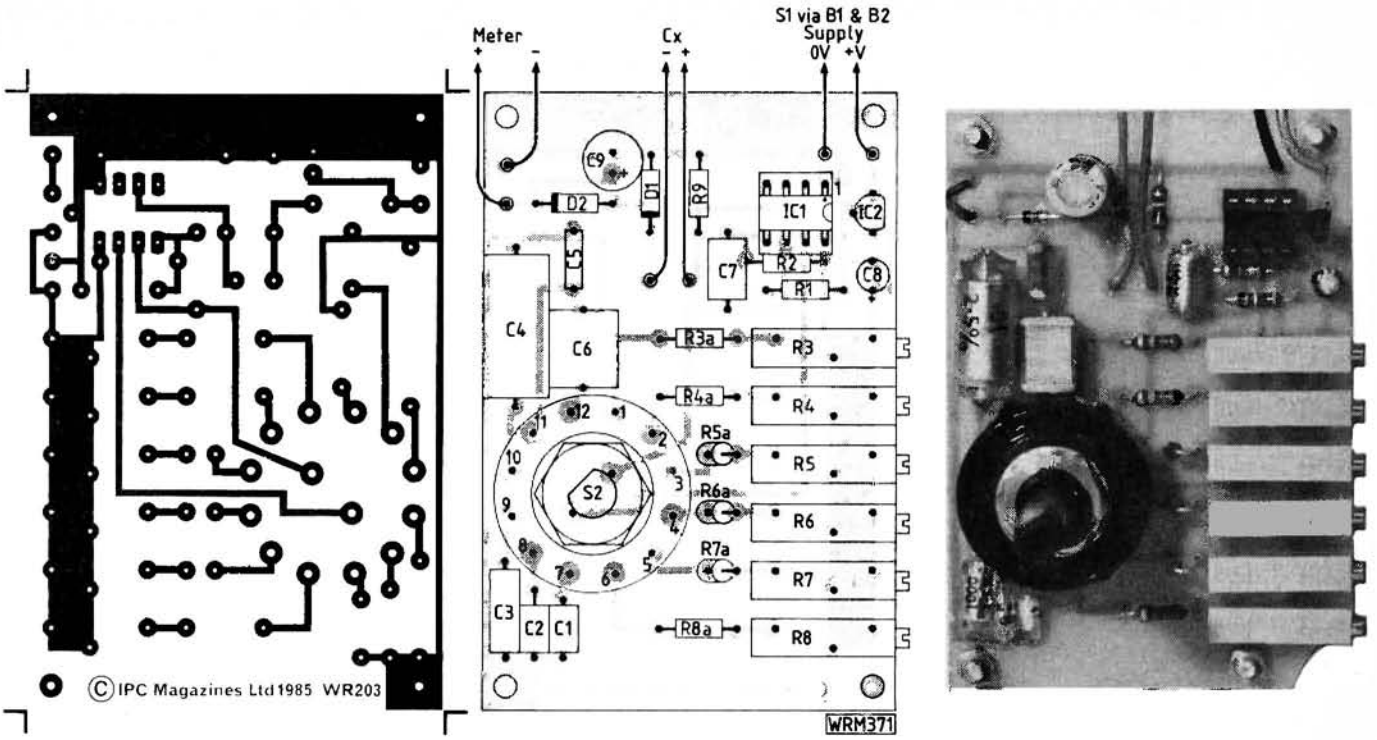


Fig. 2: (Above left). The copper track pattern for the printed circuit board is shown here full size. The component layout together with a photograph of the prototype p.c.b. is also shown full size. Note that the rotary switch will need to have the ends of the tags cut off to allow them to pass through the holes in the p.c.b. The two 9V batteries can be secured into the box either by specially made metal straps or with self-adhesive pads

may be used and if the scale is calibrated 0 to 100 then all that is required is for the "μA" marking to be blanked out.

The finished p.c.b. must be mounted in a metal box to provide adequate screening from the effects of the operators hands. Any metal box can be used as long as it is physically large enough to house the p.c.b., two 9V batteries and the meter. The p.c.b. can be mounted in two different ways. It may be attached to the top of the box using the nuts provided on the rotary switch or alternatively it can be fixed to the bottom of the box using four long 6BA screws with nuts to act as spacers to lift the board above the metal bottom of the box. Our prototype used the second method of mounting with a diecast box.

Calibration

To calibrate the instrument you will need a selection of accurate, known value capacitors. The values of these capacitors should be such that they lie near the top end of each switched range. For example the reference capacitor for calibrating the 50pF range should lie somewhere between 35pF and 50pF.

With the appropriate capacitor plugged into the test sockets and S1 switched to the range to be calibrated, the associated trimmer is adjusted to give the correct reading on the meter scale. If it is impossible to achieve the correct reading then you will need to change the associated series resistor. For example to calibrate the 100pF range plug in a capacitor of say, 82pF and adjust R4 to achieve a reading on the meter scale of 82. If this is not possible then change R4a until R4 can be adjusted. Repeat for the other five ranges.

Using the Meter

When using the meter to measure unknown capacitors always set the instrument to the highest range and work down. This will help to prevent bent meter needles. It should be obvious that to operate the meter S1 has to be pushed down for as long as it takes to obtain a stable reading.

If it is preferred a pair of crocodile clips could be substituted for the two sockets to make testing somewhat easier. ***PW***

★ COMPONENTS

Resistors

Carbon Film ¼W 5%

1·5kΩ	1	R2
10kΩ	2	R1,9
22kΩ	6	R3a to R8a

Multiturn trimmers ¾ inch

10kΩ	6	R3 to 8

Capacitors

Polystyrene 2%

50pF	1	C1
100pF	1	C2
1nF	2	C3,7
10nF	1	C4

Polyester

0·1μF	1	C5
1μF	1	C6

Min. Electrolytic p.c.b. type

1μF 40V	1	C8
47μF 40V	1	C9

Semiconductors

Diodes

1N914	2	D1,2

Integrated Circuits

LM566	1	IC1
78L15	1	IC2

Miscellaneous

Metal box 72 x 140 x 44mm; Knob, Meter 100μA; Test sockets (2); Battery clips and leads (2); Printed circuit board; Push-button switch; Midget wafer rotary switch 2p 6w (S2).

How Much? & How Difficult? £22 Intermediate

Mods

No.34
Roger Hall
G4TNT (Sam)

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 also 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.

ICOM IC-2E

Mr G. Blackman, G6ICK, sent in this month's first mod. It allows the IC-2E to be used with a speaker mic while the main speaker is still working, which makes it far better for mobile use.

First remove the clip from the back of the set and then take out the battery pack. Now remove the four screws in the base of the rig and take out the battery pack guide. Next undo the two screws that retain the back cover, remove the back and then ease off the front panel, taking care not to damage the speaker wires. Remove the two screws from the side of the frame on the p.t.t. side and hinge open the frame to expose the printed circuit boards.

Now find the ±600 switch, which is about 15mm down from the top of the board, and cut the printed circuit tracks in the three places shown in Fig. 1. To do this it may be easier to temporarily remove one end of the link wire (the one with the clear insulation) as this holds down some wires that may be obscuring the tracks.

Solder on the new link wire shown in the drawing. This gives a –600 shift for working duplex through repeaters.

Remove the red wire that is connected to the speaker jack socket at point A (the one with the capacitor on it) and resolder it to the centre contact of the shift switch (point 2).

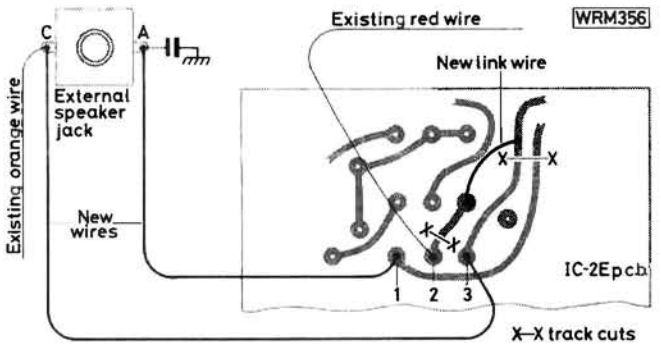


Fig. 1

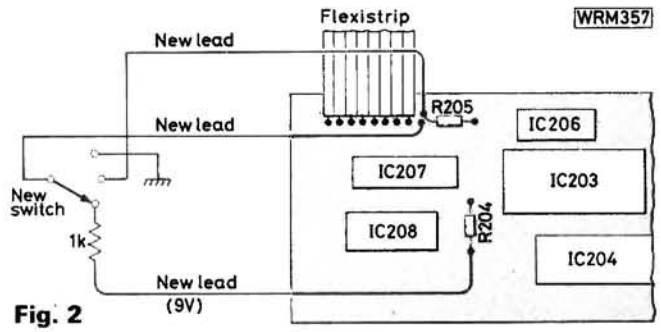


Fig. 2

Solder a new wire onto the speaker jack socket at point A and connect the other end to the left-hand side of the switch (point 1). Now solder a new wire onto the speaker jack socket at point C (the one with the orange wire already soldered to it) and solder the other end to the right-hand side of the switch (point 3).

Replace the link wire that was temporarily removed and then replace the screws and the covers.

The effect of this mod is that the ±600 switch can now be used to switch between speakers. The rig can be operated with the main speaker on and the speaker mic off or with the speaker mic on and the main one off. The main speaker is always on when the mic is removed. Many thanks Mr Blackman.

Bearcat 220FB

Way back in Mods 28 (May 1984) I mentioned a button-juggling way of tricking the Bearcat 220FB into receiving a.m. on any band instead of just airband. I also mentioned that it is possible to hardwire in a switch that will do this and, as several people have asked why it was never printed, here it is—twice!

John Parry GJ8RRP wrote in from St. Saviour to tell me how easy it is to make the 220FB a.m. or f.m. on all bands. The first step is to locate IC3 and R7. Unsolder one end of R7 (the one furthest away from the chip), stand it up on one end and solder a lead to the free end. Solder another lead to the hole in the p.c.b. where the resistor was and run both of the leads to the hole in the p.c.b. where the resistor was and run both of the leads to a suitable switch (e.g. Tandy 275–625). This switch can then be mounted in a convenient place. John suggests the front panel and he also has a useful tip to pass on. When drilling through the case it is a good idea to put a small magnet just under the hole as this catches the metal swarf and keeps it away from the circuit boards. With this switch installed it is possible to change from f.m. to a.m. on any band. A nice idea John.

On the same theme, Tommy wrote in from Sweden with a refinement of the mod. He suggests starting by finding R205, the 1Ω resistor that is just to the right of the eight-lead flexistrip on the microprocessor board (Fig. 2). Unsolder the left-hand side of this resistor and solder a wire to its free end. The other end of this wire should then be soldered to the middle tag of a single-pole, three-way switch. The upper tag of the switch should be connected to earth at any convenient chassis point and the lower tag is used to pick up 9 volts. An easy way of doing this is to run a lead from the lower end of R204 through a 1kΩ resistor to the tag. Use a new lead to connect the input of the switch to the hole in the p.c.b. where R205 used to be and then install the switch in a convenient place. Tommy suggests drilling a hole in the back of the case just to the left of the battery holder. Tommy's mod offers three options: with the switch in the upper position the 220FB will receive only f.m., in the lower position a.m. and in the middle position the set will operate normally i.e. a.m. on airband and f.m. on all others.

Tommy's letter contains a wealth of information including the useful little snippet that anyone wishing to make a b.f.o. for this set should make sure that it runs at 400kHz instead of the more usual 455kHz as the 220FB has a peculiar intermediate frequency. Thanks for the letter Tommy and perhaps you will now tell me what the DIN socket is for.

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IC 505

The Icom IC 505 is a portable transceiver for the 6m band. It covers 50-54MHz and has a 10W output on FM, SSB or CW (at 13-8V DC) it can be powered by internal dry cells or ni-cads and it will also accept an external 13-8V DC power supply. This is a very nice radio for portable or mobile use for just

£349.00

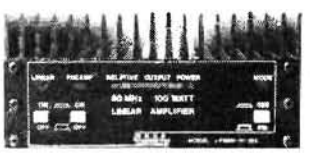
FT 690R

The FT 290R's host of features combined with its compact size has made it probably the most popular amateur radio ever made. Now Yaesu have released in the UK the FT 690R. This 6m radio is almost identical to its 2m partner but covers 50-54MHz with FM, AM, SSB or CW. The output power is 2.5W (0.8W AM) and it can be powered by internal dry cells or ni-cads or by an external (8.5 - 15.2V) DC supply. If you liked the 290, you'll love the 690

£289.00

BNOS

BNOS have just announced a new 100W linear for 6m. In the LPM series format, the LPM50-10-100 has the usual BNOS bargraph power meter, low noise pre-amp, RF VOX/PTT switching and overdrive protection. Although designed to give 100W out for 10W in at 50-54MHz, the input can be from 500mW to 15W without harming the device. Power requirements are 13.8V DC at 14A (+/– 15%). All this for just



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Mutek TVVF 50c

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Mutek TVVF 50u

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NAMES from the PAST

Alessandro Volta

by Tony Smith G4FAI

Before 1800 the main source of electricity for experimental scientists was the "electric machine", a disc of plate glass, rotated by hand, with contacts drawing off static electricity.

On March 20 that year, Volta wrote to Sir Joseph Banks, President of the Royal Society of London, describing the construction of a new apparatus, "of unfailing charge" and "perpetual power". This was his voltaic pile, a device which, for the first time, converted chemical to electrical energy, providing a source of continuous current and opening up a new era in scientific experimentation.

The pile comprised stacked pairs of discs made from silver and zinc, each pair separated from the next by wafers of cardboard or other spongy material, moistened in salt or alkaline solutions. Attached to the ends of the pile, strips of metal connected to pots of mercury, formed electric terminals.

He also described a voltaic cell, plates of zinc and copper immersed in dilute sulphuric acid within a glass jar, an arrangement leading to much development and improvement, by others, in the years ahead.

Born in 1745, Volta was professor of physics at Pavia University in northern Italy. His family had wanted him to become an attorney but, by the time he was eighteen, he decided to devote himself to the study of electricity. He read the works and repeated the experiments of other scientists, and made his own instruments when those specified were not available to him.

He invented the electrophorous, a new source of static electricity. He was interested in meteorology. He discovered methane gas, and various other inventions included an electric pistol, a lamp burning inflammable gas, a eudiometer, and improvements to the electroscope.

In 1791, Luigi Galvani, professor of anatomy at Bologna, published the results of experiments using different metals connected by frogs' legs, which had resulted in the production of electricity. Galvani was convinced he had discovered a new source of energy, and the phenomenon became known as "animal electricity".

Volta was sceptical, judging physicians to be "generally ignorant of the known laws of electricity". In the following year, however, at the request of colleagues in pathology and anatomy, he repeated Galvani's experiments successfully. He tried many other types of animal tissue as well, in place of the frogs' legs, and came to the conclusion that none were necessary to produce the electrical effect.

This, he decided, was caused by joining two dissimilar metals through a moist conductor (he later concluded that the electromotive force originated at the junction of the two metals). He then ranked various metals according to their electrical activity in his batteries and attempted the same with the materials for the moist wafers, which he called "conductors of the second kind".

His views caused great consternation and the champions of animal electricity fought back vigorously, under Galvani and his nephew Aldini, to prove he was wrong. His successful battery of 1800 should have settled the matter, but the controversy continued for some years after.

He was called to Paris to demonstrate the voltaic pile before a special commission set up by Napoleon. The emperor, himself, witnessed the demonstrations and awarded Volta a gold medal, elevating him to the rank of Count and appointing him a senator of the kingdom of Lombardy. He authorised a further medal to be awarded each year, for the best experiment "on the galvanic fluid", plus a prize of 60000 francs for whoever made a contribution to electricity, "comparable to Franklin's or Volta's".

Scientists everywhere now constructed their own voltaic batteries and, in 1813, Sir Humphry Davy assembled 2000 pairs of plates to form an enormous battery in the cellars of the Royal Institution.

Many improved batteries evolved from Volta's original concept, notably those of Daniell in 1836, Grove in 1839 and Bunsen in 1842, all of which gave valuable service for many years. Leclanche's cell, the most famous of all, survived for over a hundred years.

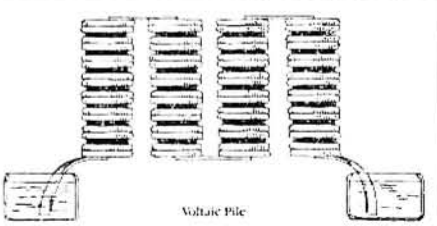
Strangely enough, Volta made no further contribution to the development of the battery, although he spent some years disputing the concept of animal electricity which still had its supporters. In 1805 he submitted a paper under the name of his student, and later successor, Configliachi in a competition set by the Italian Society of Science.

Entrants were asked to explain "with clarity and dignity, without offending any one, the question of galvanism disputed by our worthy members, Giovanni Aldini and Alessandro Volta". In the event, no prize was awarded. Volta's paper was published by Configliachi in 1814, and represented his last words on the subject.

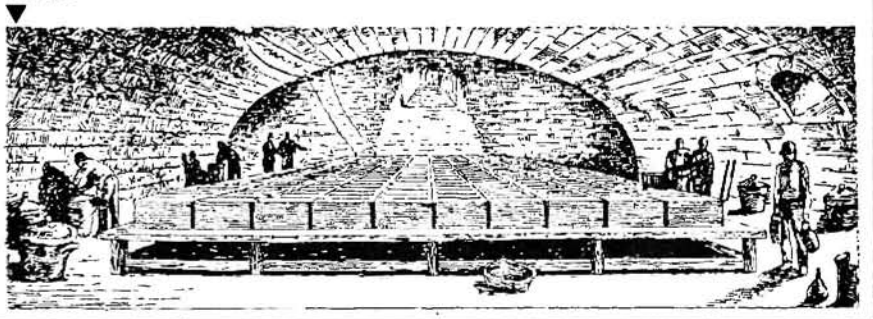
The tremendous upsurge of electrical development in the 19th century finds its origins in Volta's battery. In 1881 the unit of electromotive force was named the "volt" in his honour and remains, to this day, a memorial to a great experimenter and to the important milestone in the history of science for which he was responsible. **PW**

The Voltaic pile opened up a new era in scientific experimentation ▶

Illustrations from Packaged power, Duracell International, 1981



Two thousand cell battery, Royal Institution, London, 1813 ▼



Feature

A report by Jonathan Marks on the 19th European DX Council Conference, recently held in the Spanish capital . . .

Movements in Madrid

On paper the statistics for the recent EDXC meeting look impressive. Nearly 180 participants from all over the world gathered in the Spanish capital to talk radio over the Whitsun holiday weekend. Now that a few months have past, it seems appropriate to reflect on the event.

The word "Council" seems to be misleading. The EDXC was originally set up to promote the flow of ideas between the various shortwave listener clubs in Europe. This year's report by Secretary General Michael Murray indicated that a general apathy exists within many European clubs. Faster communications also means that those clubs that are active exchange between themselves, rather than via the *EDXC Newsletter*. This reaches a mere 41 subscribers. However, the annual EDXC Conference remains unique. It is not held along the lines of a UN Security Council session, as the title might imply. Instead it is a unique social occasion. Participants bring news with them, and that is the key to the conference's continued success. This year the hosts were Spanish Foreign Radio, who did a remarkable job of organising the events. Unfortunately, the conference hotel was not so co-operative.

Saturday morning is traditionally the time for presentations, which included one by J. A Tartjo, a telecommunications engineer with Spanish Television. Later, both the European Space Agency and Radio Netherlands gave presentations with a common theme. This examined Direct Broadcasting Satellites and the influence of computers to the hobbyist.

DBS Versus Shortwave Radio

Both NASA's space shuttle and the European Space Agency's *Ariane* rocket have been launching communications satellites in the last few years. They have had a mixture of success and failure. But now *Ariane* seems to have proved that Europe is capable of going its own competitive way for launching communications satellites, and larger projects as well. In July of next year. France is planning to launch Europe's first direct broadcasting satellite called TDF-1. Consultations continue in Paris as to who will be broadcasting from the transponders in space way up to 12 000MHz, or 12GHz. The British *SKY* channel is one organisation that is interested. Another English consortium run by independent television companies plans a service called *SUPERCHANNEL*. It is estimated that the French project will cost about £250 million. That is the cost before any programmes are broadcast!

Other DBS projects are being delayed. The German DBS Programme is now running behind schedule, for their TV-SAT is now expected in 1987. The Scandinavian Tele-X project has also run into trouble, so probably can't make its scheduled 1987 launch. Britain's DBS project seems to be always four years away—now its launch is 1989 at the earliest, with a continuous debate as to whether it is financially viable. *It has since been announced that Britain's DBS project has been shelved—Ed.*

"Olympus" is perhaps the most interesting DBS project that will be put up between now and the end of the decade. It is being put into space at the cost of around £600 million. In slightly oversimplified terms, it is a sort of "flying commercial" for the European Space Agency. It will have many uses, besides broadcasting of course, and it is also very much bigger than conventional communications satellites.

It is very important to distinguish between a communications satellite and a Direct Broadcasting Satellite. Communications satellites operate as a fixed point-to-point, or point to multipoint service. They use frequencies in the 1GHz range. They are low power, anywhere between 5 and 20 watts being used by the transponder. Satellite dishes on the ground have to be large. There are amateurs in the UK, and other parts of Europe, watching the American Forces Radio and TV Service feeds via INTELSAT to Frankfurt, or the Russian Gorizont satellite. But they're using 4 to 5 metre dishes to do so, and that puts the price of "DXing" the satellites well beyond the average media enthusiast, for the moment.

"Olympus" on the other hand will be much larger, with a transponder capable of 200 watts beamed back towards certain parts f Europe. The first version will have · wingspan of something like 25 metres. The wings carry the solar panels to power the on-board electronics. But ESA sees larger versions of Olympus having a 50 metre tip to tip wingspan, with a 7kW transmitter on board.

DBS Technology is Ready

But what about the programmes? A group of national TV organisations have already got together to form what they call Olympus TV and plan to start regular broadcasts in November this year. Not by DBS yet, but by 1988 they intend to take up an offer made by the European Space Agency. The latter won't charge them for the first three years of their use of the Olympus satellite. But it remains to be seen if the TV companies can come up with something constructive to serve such a widely differing continent as Europe. The suggested programme schedule calls for "European News", sports, maybe films and even financial news.

But EDXC delegates were told that if you're planning to be one of the first to watch it directly from the sky, you'll need to make a large initial investment. Many articles refer to the 0·9 or even 0·7 metre dish you'll need to position on your roof. Although this will be feasible in 1988, it will be very expensive. For it to work properly, you will need very low noise electronics to go with it, and mass production has not yet brought the price of such designs down to a consumer level. Bearing in mind the current state of the art technology if you want to enjoy snow-free pictures in all weather conditions you will need a 1·2 metre dish. Estimates put the price at £400 for the dish and the electronics.

But no self-respecting hobbyist will be satisfied if the dish can only pick up one station, especially if other DBS satellites are within grasp. You will therefore need to install two motors, plus the electronics to steer your antenna to the right point in the heavens. Add an extra £200 for that equipment.

Further Complications

Calculations show that Luxembourg will be one of the best places to "DX" the satellites, around 1991. You will be able to see most of the satellites from there. However, there are two further snags yet to come. First, just like TV and f.m. radio signals, the DBS signals will be horizontally or vertically polarised. This requires extra electronics again if you want to look at more than one satellite.

The biggest obstacle to DXing will be the fact that many DBS channels are to be scrambled. The picture is destined to have low security, i.e. it will be scrambled so that the home constructor could build something to decode the picture, at least partially. That is deliberate, because the operators know that a moving picture will get the interest going. But the sound channel will be digitally encoded, and that will not be economically practical for the hobbyist to attempt to break. TV without the sound isn't much fun.

It is clear then that European DBS has a lot of hurdles yet to come. What about the fees that presenters and actors are paid at present for national TV productions? TV stations cannot afford to put up their salaries 15 times to cover the simultaneous performing rights in other European countries. The cost of audience research on a European scale to prove that anyone is watching is very high. Will the politicians simply stand by and watch?

Satellite Radio?

International radio via DBS services is possible. Tests last year in West Germany showed that you could either put out one TV channel on a DBS satellite, or 16 channels of radio in digital stereo. But using a frequency near 12GHz means that you will have to point the dish exactly at the satellite, within a degree. This makes reception in a car impossible, which is regarded as a serious disadvantage. Proposals were submitted to the World Administrative Radio Conference on Geostationary Satellites (ORBIT) in August '85 in Geneva that frequencies near 1·2GHz could be used for national broadcasting, particularly in developing parts of the world. That means one satellite to cover a country the size of Botswana.

The design of solar powered radios to receive this frequency range has been studied at one of the European Space Agency's centres at Noordwijk in Holland. Other studies have been made by UNESCO during a project in Kenya. But no one has the permission for international broadcasting by this means, and the granting of that permission may prove very difficult indeed.

The Solution for Shortwave

The question remains: what can be done to upgrade shortwave broadcasting in its present state? Everyone is aware that with the combination of low sunspots and increased interference, the medium is suffering badly at the moment. Our knowledge of ionospheric propagation is improving, thanks to better mathematical models of the ionosphere. Studies are being made of other layers such as the magnetosphere much further out, that directly influence the ionosphere, and thus propagation conditions. These programs are also very important now, as plans are being drawn up for the WARC-87 conference, to decide the fairer sharing of the present shortwave broadcasting spectrum. An extremely complex computer program is now being developed which, if adopted, will be used to change the present system by which stations appear on the shortwave dial.

The problem is that a large number of computations are needed to do the job, and the existence of jamming is being ignored. That is not only a problem facing the West-East media battles in Europe, but also those in the Middle East at present. At the moment the computer assumes everyone has similar station facilities. But that is definitely not true. Will a more modern station be ordered to move frequencies more than they would like to? After all, their transmitters are agile, and older weaker transmitters in other countries are not. That will no doubt be a hot point of debate in a few years' time.

Computer technology is having more and more of an impact on the receivers in use today. Development, especially in Japan, continues to make it even simpler still. We're not far off the concept of credit card s.w. radio, where programme schedules could be issued in the form of a magnetic strip. The receiver would then know details of parallel frequencies, and the times of English language broadcasts automatically. That may not be such interesting news for the DXer of course, but for the average shortwave listener that's a very exciting trend indeed.

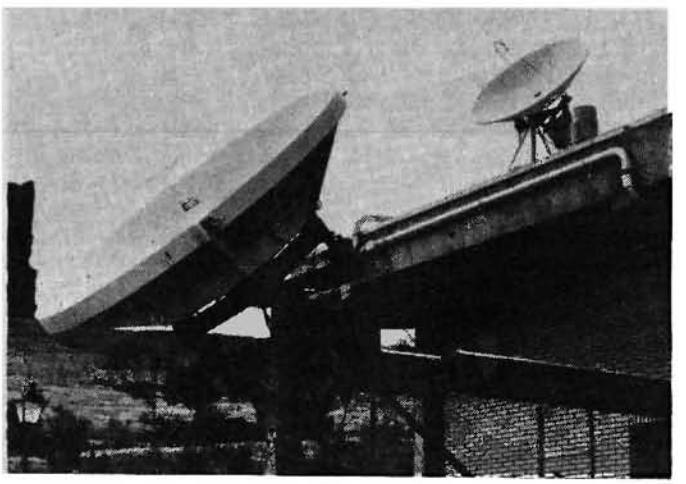
Working Groups: Publishing & Computing

On Sunday, working groups formed to discuss various aspects of shortwave listening. The "DX Publishing" group examined ways to upgrade the standard of editing in DX magazines, and bridge a serious language gap that exists.

The EDXC Computer Committee was able to report progress after its formation in Stockholm in '84. The first priority has been to collect information about software and hardware available for the shortwave listener. The range of software seems to be quite varied, and this has enabled the production of two publications, both issued with backing from the international broadcasting community. The first is entitled *The DXers Guide to Computing*. Compiler of this project is George Wood, and copies of the guide are free on request from the DX Editor, Radio Sweden International, S-105 10 Stockholm, Sweden. The second publication, also free, is entitled *INFODUTCH*, and is available through the Media Network programme, Radio Netherlands, Box 222, 1200 JG Hilversum, The Netherlands.

It would seem that there is a mixed response to computers amongst the European DX Clubs. Many people do not see the connection between a computer and the hobby of shortwave listening. These are usually people who do not own a computer! That of course is still a majority. However, the pattern is changing, and there is big demand from certain sections of the shortwave community for radio related software. Plug-in RTTY units for the Commodore 64 computer were one of the most

Simon Spanswick and Michael Murray of the EDXC



Is this the Dream system of the future? Not just yet

"asked-for" pieces of hardware this past year. People also wanted propagation, logbook and sunrise-sunset programs.

In North America, the concept of bulletin boards is becoming popular. There are, however, snags in Europe, high international telephone charges being a major consideration. Most home computer modems use 300 baud which is rather slow, though it might be worth giving it a try. In Switzerland, a club there started a "bulletin board" service in German on July 1. Further information from the Shortwave Listeners Club Switzerland, Ruetihofstrasse 2, Postfach 161, CH-8049, Zurich, Switzerland. It will be interesting to see whether their investment has been worth it. A comparison can also be made with DX Hotline telephone services, which have been tried in some parts of Europe. Active listeners are asked to call a special telephone number, but these generally tend to be a dismal failure. Answering machines are not very personal, and are not interactive.

The Association of North American Radio Clubs started a computer committee a few years ago. It recently

Radio Cristal on 98MHz organised by Rueda de Emisoras Rato in Madrid

moved to 4347 29th Street S.E., Rochester, Maryland USA. The committee appears to be doing well, concentrating on providing software for different brands of computer, including the Commodore 64, Sinclair Spectrum and Apple IIe. The programs are relatively simple, but are provided on a non-profit basis. At EDXC Madrid it was decided that duplicating this excellent service was unnecessary. Instead, the EDXC will shortly organise a European-wide survey to find how shortwave listeners are using their home computer in the shack.

Several participants at the meeting reported on the growing interest in being able to directly couple a shortwave receiver to a home computer. So far the only set with this feature is manufactured by Yaesu Musen of Japan, namely the FRG-8800. The Icom IC-R70 and IC-R71 both have facilities for computer tuning, but not the software support. It would be nice if computer-aided tuning was standardised. Proper shielding, especially with computers such as the Apple IIe and Commodore 64, seems to be the biggest problem. There is little point in using a computer to DX, if the microprocessor is totally destroying reception.

Conclusions

After nearly two decades of existence, the EDXC seems to be better off concentrating its efforts towards an annual conference, and specialist projects which are better organised on an international scale. This year's conference did not conclude any serious resolutions, but the participants didn't travel the distance to do so. They went to enjoy themselves, and it looks as though the Paris conference in '86 will be along the same lines. ***PW***

ERRORS & UPDATES

On the Air—SW Broadcast Bands August 1985

The resistor in series with the 3-30pF trimmer and 1MHz crystal from pin 1 of the 7400 i.c. should be 220Ω and not 680Ω as shown in Fig. 1.

PW Review—The Nevada 934MHz Range, September 1985

It has been pointed out to us that the comments regarding UK manufacturers of equipment for the 934MHz band overlooked the Uniace 400 transceiver, designed and produced in the UK by Uniace Telecommunications Ltd., Unit 8, Conway Road Industrial Estate, Llandudno Junction, Gwynedd, North Wales. Further details of this set are available direct from the manufacturers or from leading distributors.

Did You Know...

Eric Westman

That Parisians could listen to the opera in their homes before the invention of wireless?

During the 1880s, people living in Paris could get a telephone connection to the famous Opera building and so listen to the singing and music of the nightly performances in their own homes. Even more remarkable, this wired forerunner of radio was stereophonic, for two microphones with separate connections fed each listener's two earpieces to give aural authenticity. A somewhat similar service became available in London during the 1890s. The French service was in operation 40 years before the BBC gave its first experimental stereophonic transmission, and 80 years before the establishment of regular stereophonic broadcasts in Great Britain.

Owing to the increasing pressure on the space allotted to Club News a different format is being tried. With a county by county list it should be easier for a reader to find his local club.

Antrim

Antrim & District RC: Brian Sheepwash GI4KIS, 204 Donore Crescent, Antrim. Meets in the back room of the Railway Bar, Antrim. More details from Brian.

Avon

Bristol ARC: D. Gully G4YOC (Bitton 4116). Meets Tuesdays, 7.30pm at the YMCA, 6 Park Road, Kingswood, Bristol. RAE & code tuition plus lectures.

Bristol RSGB Group: Colin Hollister G4SQQ (Bristol 508451). Meets at 7.30pm in the Small Lecture Theatre, Queen's Building, University Walk, Clifton. September 30 is G8MWR on microwave techniques.

North Bristol ARC: Ted Bidmead G4EUV (Bristol 691685). Meets Fridays, 7pm at the Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol. On September 11 is visit to the BT radio station at Highbridge.

Gordano AR Group: John Davies G3LJD, 273 Down Road, Portishead, Bristol. Meets 4th Wednesday, 8pm in the Ship Inn, Redcliffe Bay, Portishead.

Bedfordshire

Dunstable Downs RC: Phil Morris G6EES (Dunstable 607623). Meets Fridays, 8pm in Room 3, Chews House, High Street South, Dunstable. September 13 is G4ZJF on a pilot's view of *Airport 85*. Car boot sale on the 21st at Old Warden Aerodrome.

Shefford & District ARS: Alan Little G4PSO (Hitchin 57946). Meets Thursdays, 7.45pm at the Church Hall, Ampthill Road, Shefford. September 12 is G8HVV on repeaters past and present, junk sale on the 19th, on 26th is G8LOK on weather satellites and October 3 G3WRJ on understanding s.w.r. measurements.

Berkshire

Newbury & District RS: M. J. Fereday G3VOW (Newbury 43048). Meets 2nd Tuesday at the Newbury Technical College. Junk sale on September 10.

Reading & District ARC: Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading. Meets alternate Tuesdays at the White Horse, Peppard Road, Emmer Green, Reading. September 17 is G4EEE of Wood & Douglas with the company's products. October 1 is G8VR on improving your v.h.f. DX.

Cambridgeshire

Cambridge & District ARC: Brian Davey G4TRO (Cambridge 353664). Meets Fridays, 7.15pm at the Coleridge CC, Radegund Road, Cambridge, in the Visual Arts room. Code classes and a problem corner are popular features.

Cheshire

South Cheshire ARS: Nick Gutten G6IGW (Crewe 60062). Meets 2nd and 4th Monday, 8pm at the Victoria Club, Gatefield Street, Crewe. September 9 is G1JAT on mast construction.

South Manchester RC: Dave Holland (061-973 1837). Meets Fridays, 8pm at the Salemoor CC, Norris Road, Sale. September 13 is h.f. activity night, the 20th is a junk sale and the 27th is John Nelson G4FRX of the RSGB.

Clwyd

Alyn & Deeside ARS: Tony Jones GW1CEV, 53 Central Drive, Shotton, Deeside. Meets alternate Mondays, 8pm at Shotton SC, Shotton Lane, Shotton. September 16 is Roy Honeyman on computers in data communications and G8RXB talking on RAYNET on the 30th.

CLUB NEWS

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

Cumbria

Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith. Meets 3rd Thursday, 7.30pm in the Kings Arms, Temple Sowerby (on the A66). RSGB Region 1 rep, G3XSN, talks on the RSGB on September 19.

Devon

Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282). Meets 1st Friday, 7.30pm at the Cavalier, West Street, Axminster. September 6 is G3GC on pre-war transmitter gear and vintage equipment. Note, AGM on October 4.

Exeter ARS: Roger Tipper G4KXR (Exeter 68065). Meets Mondays at the Exeter CC, St. David's Hill, Exeter. September 9 is a visit to the Devonair Radio Studios (early booking recommended).

Dorset

Poole RAS: Phil Dykes G4XYX, 68 Egmont Road, Poole. Meets last Wednesday at Poole College. September 25 is introducing QRP.

Dumfries & Galloway

Maxwelltown ARC: Trig Rodgers GM4NNC, 5 Elder Avenue, Lincluden. Meets 1st and 3rd Wednesdays, 8pm at the Tam O'Shanter Inn, Dumfries. September 4 is an inter-club meeting with Carlisle ARS, the 18th is on antennas for the WPX contest.

Essex

Colchester Radio Amateurs: F. R. Howe G3FIJ (Colchester 851189). Meets 1st and 3rd Thursday, 7.30pm at the Colchester Institute, Sheepden Road, Colchester. September 19 is on test equipment. AGM on October 3.

Havering & District ARC: D. St. J. Gray G0BOI (Hornchurch 41532). Meets Wednesdays, 8pm at the Fairkytes Arts Centre, Billet Lane, Hornchurch. September 11 is a d.f. hunt, the 25th is a surplus gear sale.

Vange ARS: Mrs D. Thompson (Basildon 552606). Meets Thursdays, 8pm at Barstable Community Centre, Basildon. The mobile rally is on September 15 at Nicholas School, with more details from the sec.

Fife

Glenrothes & District ARC: Drew Givens GM3YOR, 41 Veronica Crescent, Kirkcaldy. Meets at Provosts Lands, Leslie. AGM is on Sunday September 15.

Glamorgan

Bridgend & District ARC: T. C. Morgan GW3SML, 4 Rhiw Tremaen, Brackla, Bridgend. Meets 1st and 3rd Fridays, 7.30pm at the YMCA, Bridgend.

Greater Manchester

Trafford ARC: Graham Oldfield G1IJK (Urmston 9804). Meets Thursdays, 7.30pm at the 9th Urmston Scout Group HQ, Bradfield Road, Urmston.

Hampshire

Basingstoke ARC: Dave Burleigh G4WIZ (Tadley 5185). Meets 1st Monday, 7.30pm at the Forest Rings CC, Sycamore Way, Winklebury, Basingstoke. AGM is October 7.

Binstead ARS: A. F. Knight G4RTT (IoW 295951). A new club to this feature. Meets Wednesdays, 7.30pm at the 1st Ryde/1st Binstead Scout HQ, Binstead, IoW.

Fareham & District ARC: Brian Davey G4ITG (Fareham 234904). Meets Wednesdays, 7.30pm at the Porchester CC, Westlands Grove, Porchester (Room 12). September 11 is G6XHR on a 1kW u.h.f. linear and the 25th is G6MVL on v.h.f rhombic antennas.

Three Counties ARC: K. D. Tupman G6WWE (Petersfield 66489). Meets Wednesdays, 8pm at the Railway Hotel, Liphook, September 18 is G6SNS on SW France and October 2 is the Farnham VHF Group on v.h.f. repeaters.

Winchester ARC: Robert Stone G4FPC (Winchester 64747). Meets 3rd Saturday, 7.30pm at the Log Cabin, Stockbridge Road, Winchester. Morse classes always available.

Hereford & Worcester

Bromsgrove & District ARC: Norman Westwood (Bromsgrove 73847). Meets 2nd and 4th Fridays, 8pm at the Avoncroft Art Centre. Constructional meetings on 4th Friday.

Worcester & District ARC: D. W. Batchelor G4RBD (Worcester 641733). Meets 1st and 3rd Mondays, 8pm at the Oddfellows Hall, New Street, Worcester. September 30 is AGM and October 7 Dewsbury Electronics are visiting.

Hertfordshire

Welwyn Hatfield ARC: Dave Fairbank G0AII (Welwyn Garden 26138). Meets 1st and 3rd Mondays, 8pm at the Knightfield Scout HQ, Welwyn Garden City. Would welcome more members as they are a newly-formed club. Net is on S15.

Humberside

Grimsby ARS: George Smith (Grimsby 887720). Meets Thursday, 7pm at the Cromwell SC, Cromwell Road, Grimsby. September 12 is a d.f. hunt, the 19th a talk on propagation and another d.f. hunt on the 26th. AGM and awards is October 3.

Hull & District ARS: C. North G4PEP (Hull 77249). Meets Fridays, 8pm at the West Park Recreation Centre, Walton Street, Hull. RAE classes on Tuesdays.

Isle of Man

Isle of Man ARS: Anthea Matthewman GD4GWQ (Douglas 22295). Meets 8pm, Mondays at Howstrake Hotel, Harbour Road, Onchan; Tuesdays at Peveril Court Hotel, Ramsey;

Thursdays at Tynwald Inn, St. Johns and Fridays at Perwick Bay Hotel, Port St. Mary.

Kent

Biggin Hill ARC: Robert Senft GOAMP (Farnborough 57848). Meets 3rd Tuesday, 8 30pm at St. Marks Church Hall, Biggin Hill. September 17 is the RSGB Space Shuttle Project video.

Cray Valley RS: B. Rowe G4WYG, 28 Malyons Road, Hextable, Swanley. Meets 2nd and 3rd Thursdays at the Christchurch Hall, Eltham.

Darenth Valley RS: Mrs Sheila Hillman, 140 Goddington Lane, Orpington. Meets at the Crockenhill Village Hall, between Orpington and Swanley. September 11 is G3GJW on RAYNET.

Maidstone ARS: Graham Edy G4AXD (Maidstone 29462). Meets Fridays, 7.30pm at the YMCA Sports Centre, Melrose Close, Cripple Street, Maidstone. September 13 is G4XRH on fault diagnosis of 27/31MHz rigs and the 27th is G30RP on antennas. New chairman is Peter Pickering (Maidstone 676776).

Medway ARTS: Tony Faram, 6 Regent Road, Gillingham. Meets every Friday, 7.30pm at St. Lukes Church Hall, King William Road, Gillingham.

Swale ARC: Brian Hancock G4NPM (Sheerness 873147). Meets Mondays, 7.30pm at the Ivy Leaf Club, Dover Street, Sittingbourne. September 9 is G4RVV and G3TIS on the Kent repeaters.

Lancashire

Bury RS: Brian Tyldesley G4TBT (Burnley 24254). Meets Tuesdays, 8pm (main meeting being 2nd Tuesday) at the Mosses CC, Cecil Street, Bury. September 17 is G3LEQ on propagation and the Rev. George Dobbs G3RJV will be at the construction contest on October 8.

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

Preston ARS: George Earnshaw G3ZXC (Preston 728275). Meets at the Lonsdale Club, Fulwood. September 12 is G4DBU on atomic structure and the 26th is a test-your-rig night.

Skelmersdale & District ARC: Gordon Crowhurst G4ZPY (Ormskirk 894299). Meets Thursdays, 7.45pm at the Beacon Park Golf Club.

Skelmersdale RE & CC: Joe Singleton G4WJR, 3 Willow Drive, Skelmersdale. Meets Wednesdays, 8pm at the Royal British Legion, Liverpool Road, Skelmersdale. They would welcome any potential lecturers, too.

Thornton Cleveleys ARS: Mrs E. E. Milne G4WIC (Blackpool 821827). Meets Mondays, 7.45pm at the 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool. September 16 is a sale of components and the 23rd is judging the construction contest. Chairman Jack Duddington G4BFH (Blackpool 853554) is also available for answers about the club.

Lincolnshire

Lincoln SW Club: Pam Rose G4STO, c/o the club address. Meets 3rd Wednesday, 8pm at the City Engineers' Club, Central Depot, Waterside South, Lincoln. Sunday, September 8 is Lincoln Hamfest in the Exhibition Centre and a marquee on the Lincolnshire Showground (4 miles N. of Lincoln on the A15) from 10.30am to 5.30pm. RAYNET talk-in on S22 and SU8, parking and overnight accommodation, refreshments, licensed bar, BT Morse tests and many trade stands. September 22 is a d.f. hunt, the 25th is G6DHL on video recorders.

London

Acton, Brentford & Chiswick ARC: George Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3. Meets 3rd Tuesday, 7.30pm at the Chiswick Town Hall, High Road, Chiswick W4 September 17 is members showing pre-1939 equipment.

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

Southgate ARC: R. F. Snary G4OBE, 12 Borden Avenue, Enfield. Meets 2nd Thursday, 7.30pm at St. Thomas' Church Hall, Prince Georges Avenue, Oakwood, London N14.

Merseyside

St. Helens & District ARC: Alan Riley G6MXT (051-430 9227). Meets Thursdays, 7.30pm at St. Helens Information Technology Centre, Water Street, St. Helens. Club has access to electronics and computing labs.

Wirral ARS: Cedric Cawthorne G4KPY (051-625 7311). Meets 1st and 3rd Wednesdays, 7.45pm at the Parish Hall, Heswell, Wirral. September 18 is G3EGX on Smith charts simplified and October 2 a surplus equipment sale.

Wirral & District ARC: Gerry Scott G8TRY (051-630 1393). Meets 2nd and 4th Wednesdays, 8pm at the Irby Cricket Club, Irby, Wirral.

Middlesex

Echelford ARS: Peter Coleson G4VAZ (Sunbury 83823). Meets 2nd Mondays and last Thursdays, 7.30pm at St. Martins Court, Kingston Crescent, Ashford. September 9 is Chris Page G4BUE lecturing.

Edgware & District RS: John Cobley G4RMD (Hatfield 64342). Meets 2nd and 4th Thursdays, 8pm at the Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. September 12 is G3GC on pre-war transmitters and the 26th is a quiz run by G3PSP.

RS of Harrow: Alison Wilson G6NDJ (Rickmansworth 53642). Meets Fridays, 8pm at the Harrow Arts Centre, High Road, Harrow Weald. September 6 is construction evening, the 13th a 28MHz activity night, the 20th is Community Radio and the 27th is a 21MHz activity night.

Northumberland

Border ARS: Mrs S. Jones G1IUK (Berwick-on-Tweed 305465). Meets 1st and 3rd Fridays, 8pm at the Tweed View Hotel, Berwick-on-Tweed.

Nottinghamshire

ARC of Nottingham: Ian Miller G4JAE (Nottingham 232604), Meets Thursdays, 7.30pm at the Sherwood CC, Mansfield Road, Nottingham.

Worksop ARS: Carole Gee G4ZUN (Worksop 486614). Meets Tuesdays, 7.30pm at the Sub Aqua Club, the Maltkins, Gateford Road, Worksop. September 17 is Ken Walton on lightning protection and October 1 is the RSGB Space Shuttle video.

Oxfordshire

Vale of White Horse ARS: Ian White G3SEK (Abingdon 31559). Meets 1st and 3rd Tuesdays, 7.30pm in the Upstairs Meeting Room, Waterwitch, Cockcroft Road, Didcot. Note lecture by Jim Bacon G3YLA coming soon.

Shropshire

Salop ARS: John Orrells G6DQY (Shrewsbury 260668). Meets Thursdays, 8pm at the Olde Bucks Head, Frankwell, Shrewsbury. September 12 is a d.f. hunt and on the 26th Shrewsbury Model Centre on model aircraft.

Telford & District ARS: Tom Crosbie G6PZZ (Telford 597506). Meets at the Dawley Bank CC, Bank Road, Dawley, Telford. September 18 is about the DXpedition to GM-land and the 25th is surgery for failed project time.

Somerset

Street & District ARS: Colin Webster G4SCD (Street 45145). Meets 1st Tuesday, 7pm at Strode College. October 1 is G4DZW on gardening for the amateur.

Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533). Meets Thursdays, 7.30pm at the Recreation Centre, Chilton Grove, Yeovil. September 12 is G3MYM on ground reflection of radio waves, the 19th is G3GC on radiation patterns and October 3 is JFET audio amplifiers.

Staffordshire

North Staffs ARC: Paul Morgan (Stoke-on-Trent 332657). Meets Mondays, 8pm at the Harold Clowes CC, Dawlish Drive, Bentilee, Stoke-on-Trent.

Suffolk

Ipswich RC: Jack Toothill G4IFF (Ipswich 44047). Meets 2nd and last Wednesday, 8pm at the Rose & Crown (Club Room), 77 Norwich Road, Ipswich. September 11 is Morse code tuition.

Surrey

Sutton & Cheam RS: Alan Keech G4BOX, 26 St. Albans Road, Cheam. Meets 3rd Friday, 7.30pm at the Downs LT Club, Holland Avenue, Cheam. September 20 is G3GVV on the International Amateur Radio Union and the 22nd is a d.f. hunt.

Thames Valley ARTS: Bob Muir G3LHN, Lone Oak, 19 Eastwick Drive, Great Bookham. Meets 1st Tuesday, 8pm at the Thames Ditton Library, Watts Road, Thames Ditton.

Sussex

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

Chichester & District ARC: C. Bryan G4EHG (Chichester 789587). Meets 1st Tuesday and 3rd Thursday at the Fernleigh Centre, 40 North Street, Chichester. Club net is 145·275MHz, 7pm Wednesdays.

Crawley ARC: Dave Hill G4IQMM (Crawley 882641). Meets 2nd and 4th Wednesdays, 8pm, at the United Reform Church, Ifield Drive, Ifield. Anniversary lecture (September 25) is antenna tuning methods by G3LHZ.

Horsham ARC: Peter Head G4LKW (Horsham 64580). Meets 1st Thursday, 8pm at the Guide HQ, Denne Road, Horsham.

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

Warwickshire

Stratford-upon-Avon & District ARC: David Boocock G8OVC (S-u-A 750584). Meets 2nd and 4th Mondays, 7.30pm at the Baptist Church, Payton Street, S-u-A. This is the venue from September 9, reached by turning left after the bus depot on the A46. September 9 is Technical Topics discussion and the 23rd is a talk on d.f. hunting.

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ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

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

I've had an interesting letter from a reader who passed his RAE some time ago but is determined to go straight to the "A" licence. He sat for the code test and failed on sending but passed OK on receiving, the reverse of the "normal" situation! As he works away from home during the week he finds it very difficult to get to his local club and so has to practice on his own. This is very undesirable, as all practice, whether sending or receiving, should be done with a competent operator as a guide. I have suggested he gets his "B" licence and then gets some useful practice over the air, which is possible with the "B" licence variance which is now available.

General

The Southdown ARS will be running an RAE course at their clubroom at Hailsham Leisure Centre, Vicarage Lane, Hailsham, E. Sx, starting at 7.30pm on Tuesday September 17. More details from **Jan Alblas G4XNL** on Eastbourne 638653.

Some fine enterprise has been shown by the West of Scotland ARS who have spent the summer converting an old curtain factory into clubrooms which will be opened by the President of the RSGB, Mrs Joan Heathershaw G4CHH, at 8pm on Friday September 20. The premises comprise a shack for h.f. and v.h.f. operation, a room for Morse code tuition and constructional work, a lounge, kitchen and cloakrooms. The club meets there every Friday at 7.30pm.

As part of their 10th anniversary the Newport ARS (GW4EZW) will be operating from Lundy Island as GB4LIE from September 2 to 28 on all bands from 430MHz (70cm) to 1·8MHz (160m) with the aid of 13 operators, so 24-hour coverage is anticipated. This could be the last major expedition to Lundy as, apparently, the helicopter service is to be discontinued from the end of September. Contacts with WAB members will be especially welcome and an attempt will be made to work DXCC and other awards. An 18m tower is being taken over by boat. Special QSLs will be available via the RSGB Bureau or direct from POB 33, Newport, Gwent, from where more info or skeds can be obtained, or ring 02912 6867.

The Amateur Radio & Computer Club AMRAC has been formed recently to promote the use of computers in amateur radio and to encourage the use of digital techniques. The club meets every fourth Friday at 8pm, at the Crown pub at Bishops Waltham, Hants, and the sec is Trevor Tugwell on 04895 81032. There are already some 31 members, most of whom are active on 144MHz with packet radio or ASCII. Note that it is every fourth Friday and not the fourth Friday of the month for meetings.

According to **Goff Curtis BRS20104** a Listener's Information Exchange has been started by GW4OXB (1 Jersey Street, Hafod, Swansea) and more members are wanted and eventually it is hoped to produce a callbook of s.w.l.s and details of their equipment and interest, etc. Goff says that he and three others started the Geoff Watts *DX Newsheet*, and that is now believed to have a circulation of over 3000 so the same thing could happen to this new venture.

Don't forget the Cray Valley RS 15th SWL contest running from 1800Z Saturday September 7 to 1800Z on the Sunday, with no more than 18 hours of logging allowed in the 24 hours, although multi-op stations can log for the whole 24 hours. Telephony and c.w. sections, single or multi-op on bands from 1·8 to 28MHz but the new WARC bands are excluded. Log sheets and more info from **Owen Cross G4DFI**, 28 Garden Avenue, Bexleyheath, Kent, and closing date for logs is October 28.

From **G. Hands G6WKK/PE** (Clarrisenhof 6, 4133 AC Vianen, the Netherlands) comes news of the ECRA award of the Dutch Christian RA Group which goes to licensed amateurs or s.w.l.s working the requisite number of ECRA stations. A signed declaration is sufficient evidence of achieving the target. The cost is 6 IRCS and the Awards Manager is at Postbus 9316, 3506 GH Utrecht, the Netherlands, from whom details can be obtained.

DX Bands

A delightful letter and QSL card from **Tony Granback SM3-7128** of Matfors in Sweden says he came into amateur radio as a result of reading this column in January 1983. It was good of you to write Tony. He has a Kenwood R-600 receiver and dipoles plus a 3-element Yagi beam antenna. He mentions that the sun is up nearly all night in the summer so the 3·5MHz band is pretty poor, and 7MHz is useless because of BC QRM. Anyway, on 3·5MHz he copied J28EI, Z21EV, ZS3GB, while up on 14MHz were 4S7PVR, 4S7VK, 5Z4DE, 9J2ER and 9J2YM (QSL JF3CLB), 9V1TS, KH6SB, KL7HD, ZS1SO, ZS6APF and TR8PC. On 21MHz only 5T5MS and 5X5GK were of any interest. So far, Tony has heard 170 countries but only has 14 confirmed.

Melvyn Dunn BRS86500 (Grimsby) continues to log a lot of DX over several bands with his FRG-7700 fed from a 40m-long wire On 21MHz there were 4Z4UT and HB9CGJ/P, with TG9HH, KA5BPE/C6A, 5B4OA, HH2CL, TI2CC, and CX2DC on 14MHz. The 7MHz QRM eased sufficiently to log FP4CJ, HK2AMX, CE2CZM and XT2BR (QSL to POB 37, St Pierre Island). Around 3·8MHz it was 9G1HT (QSL POB 357 Accra), FT8XA (QSL via F6FYD), OX3OX and HH7PV. QSL cards have been received from 9K2DZ, 7X2LS, HI8LAR in 12 days, VK6LK, VK9NS, CE0ZIJ and KP2AH.

Phil Brouder G3ZJH, right, receives a certificate of life membership of the North Bristol ARC in recognition of his services to the club, from Chairman Eric Harris G2FXO *Photo by G3IZM*

In Tonyrefail, Mid-Glamorgan, **Tom Blamey BRS87461** sticks mainly to 14MHz these days, which still seems to carry most of the DX traffic The receiver is a Kenwood R-600 and Amtech 200 a.t.u. plus 17m-long wire. Mainly South Americans on 21MHz like CX1TI, LU9IA, PP5YC plus 5T5RG. More varied on 14MHz catching CX5CC, EL2P, JE2YRD, PZ5JR, 5N4DNE, ZD7AL on St Helena, 5H3HM, 9K2SA, 9L1NB, 9J2YM and 9U5JB in Burundi. A good one on 7MHz was JH4AAG.

Robert Parsey BRS85875 of New Malden, Sy, also has an FRG-7700 and a.t.u., plus a 60m-long wire 5m above ground. Catches on 3·5MHz included CN2AQ, and around 0300Z CP1BA, NP4AT, TR8IG and ZS6G. About the same time, on 7MHz HK3BED PZ2AC (QSL POB 86, Nickerie, Surinam), and OA4ASY. The 21MHz band came up with A71AD, TU4BK, VU2GI, XT2BR (QSL POB 116, Ouagadougou), and 3X0HAB with just CT2DG on 28MHz.

It is good to hear from **Denis Norton BRS87100** of London W6 again, after some months. He now has an FRG-7700 and matching a t.u. plus Datong FL2 audio filter. Antennas are a 14AVQ-WB and 20m-long wire. A good one on 14MHz in view of the situation there was OD5MJ with cards to POB1136654, Aialtoon, Beirut, plus TG9HH, TK5FF, TR8DR (QSL W2PD). VP2MDG (QSL W6FBG), 9Y4NP (QSL W3HNK), VP9CP and SV0AH on Crete with QSLs to American Embassy VOAR, APO New York 09253. Up to 21MHz and TA1A, a club station thought to be operated by TA8AH and cards to POB 587 Istanbul, Turkey, then TI2KD, TT8AQ (QSL F6GXB) and ZP5RG (QSL POB 331, San Jose, Asuncion, Paraguay.

Phil Dykes G4XYX in Poole, Dorset, continued to be active in spite of a bout of hay fever. With his converted CB rig and 10W p.e.p. he reached out on 28MHz to EA6OT, HG19HB a special event station in Hungary, HW4MU (QSL FD1HWB), I0SNY/ZB2 for a new country, ON5SD and RA9FCB while "gotaways" included EA9RM, YV1DPS, NP4GD and NA2S/PJ2, not bad for a "dead" band as Phil remarks. With just 750mW on c.w. on 7MHz, Phil worked a number of G stations plus GM3OXX and PA0WDW, using a dipole or W3EDP antennas. These were all QRP stations but QRO stuff worked were EA1MB, DL7ALP, ON4PV, SP4JAE,

UB4DWG, UQ2GMI and YU3CCD. Incidentally, Phil is also active now on 144MHz f.m. with another converted CB rig and linear running 50W.

What could be the last log for a while has been received from **Brian Fields G4XDJ** who is confined to bed after damaging nerves in his back while ice skating. All we can say is "get well soon, OM". Brian, who lives in Billingham, Cleveland, runs 1W on 7MHz c.w. and worked SM7KWE also on QRP, YU1ABH, UB4XWB, IK4EPE, UQ2GMK, and OY1R with W2KF on the key. The QRP rig is the famous *PW* Severn. Brian has been on fone for the first time running 3W on 28MHz f.m. working DA2XF/M, who is WA7NTF with the US forces, and F6GIA and DF4WY.

Dick Stanbridge up in Leiston, Suffolk, complains about the stations that decide to tune up on a choice bit of DX. I'm afraid there is little one can do about that with modern transceivers, but in the "bad old days" with home-brew separate transmitters it was possible to turn on the v.f.o. only and net on to the required frequency without radiating a signal. Such is "progress"! Dick runs a Trio R-2000 and AT1000 a.t.u., a half size G5RV and Datong AD370 active antenna. Thanks for the almost exclusive c.w. log, OM, with UA2FFQ on 1845kHz, UZ9AWZ round 3·5MHz, on to 7MHz and HP1XKR, YV5ANE, CE0ZIG, OA4ZV, CE3DNP, YB0TK, LU4FC, and a wonderful catch in 3H8C in Chengdu, China, which appeared to be quite genuine and the subject of a massive pile-up. Only s.s.b. logged on 7MHz was VK7CV. On s.s.b. on 14MHz was VE8RCS up in the Arctic regions. On 21MHz it was D44IS on c.w. and S79CW on s.s.b.

From Weymouth Dorset, a log from **Mike Willgoss G4XRR** who has a Yaesu FT 902DM and 2-element Avanti quad antenna. This antenna is really intended for CB work, but works well on 28MHz it seems. On 28MHz, Mike worked 4X4YM, 4X6BP and K1EM for a surprise one in view of the conditions now on the band. Mike frequently works G4XYX, mentioned previously, and has decided to go on to QRP as well, and is converting a CB rig for that purpose.

Goff Curtis BRS20104 of Harrow, Middx, has been keeping an eye on the new WARC bands of 10, 18, and 24MHz and finds very little on except 10MHz where he logged DL4TA/HB0, JA6HW, KP4DJ, OY1R, ZB2HS and several US and other Euros, all c.w. of course. Reports on these bands would be appreciated.

Photographs of rigs and shacks are in very short supply, so what about a nice, clear pic of yours? Colour or, preferably, black and white, is OK. Don't forget the monthly copy deadline of the 15th of the month.

Some late news on the 3H8C says it was a special event station with QSLs to POB 148 Chengdu.

The team shown here ran the NFD station G4GCT/P for the North Bristol ARS. They are, left to right, G4ZYF, G4LTL, G1KSX, G4UGO, G4UYX, G2FXO and G4ULH *Photo by G3IZM*

VHF Bands

I expect that most v.h.f. enthusiasts will have heard by now of the DXpedition undertaken by the West Kent ARS and now under way in Galway, Eire, on a spot 460m a.s.l. with a view to contacting VE1YX, and hopefully others, on 144MHz. High power is being used to four stacked and bayed long Yagi antennas. If successful, it will be the first direct transatlantic contact on this band. The operation is scheduled to end on Sunday September 8. Although I wish them well I feel that they are unlikely to be successful unless there happens to be some very unusual propagation conditions during the period. G3VYF once worked into Israel on 144MHz, which is a comparable distance and probably via tropospheric propagation over what is almost a continous land mass, conducive to tropospheric propagation.

Pandemonium broke loose on July 3, on 144MHz, when HB9CUA/P came up in the late evening. I managed to work him OK, as did many others, due to some very smart, fast operating. The Italian station I4VFQ was reported around the same frequency but I did not hear him myself. At the time there was a high pressure area to the south-east of the UK and a low pressure one to the north.

The next morning the Scottish beacon GB3ANG was 579 with me and EI2CLB was a good signal, but not many takers for some strange reason. Weak GW's and GM's were around. During the RSGB VHF Field Day on July 6/7 many portables from GM, GW, GI and EI and the nearer European countries were copied at 59, which shows how important a good take-off is on v.h.f.

After his stint in the FD ON4ASL was worked at the QTH of GJ4HXJ/P and was putting a terrific signal into the UK with some 400W and 4 × 11-element Yagi beam. Again, the pile-up was reminiscent of 14MHz at times but I imagine many stations got their first GJ on 144MHz as a result.

Flight Refuelling ARS on the Purbeck Hills (IO80WP) in Dorset were also out for NFD. A large construction programme allowed a useful improvement to their 70MHz results. Using a prototype *PW* Meon transverter, TS 830, single 4CX250B p.a. and a 12-element NBS Yagi G3PFM/P managed to work 208 stations with a best DX of 604km. On 144MHz a W1SL twin 4CX250B linear (finished two weeks before the event), 4 × 14-element Parabeams and an FT-221R resulted in 514 QSOs for G4RFR/P and a best DX of 974km to F6HIJ/P in JN12EK. *PW* Technical Editor and FRARS Chairman GOAPI used his own callsign on 432MHz with the K2RIW p.a., 4 × 24-element quad loop Yagi and a TR-780 producing 286 contacts and a best DX of 875km. On 1296MHz G4WHO/P found the going very variable and often slow. This was despite a 400-element quad loop array, GaAsf.e.t. pre-amp and 150W cavity p.a. being used (e.r.p. approximately 0·2MW!). Some 60 QSOs resulted with a best DX of 781km occuring at 0330 to HB9AMH/P.

July 12 came up with a very good opening to the south-west from the UK and the Brittany beacon FX3THF was 599 for some time although its power is reputed to be only 4W! Many French stations around as well as GU4WRP and GJ6OZB both worked at 59 both ways, in IN89RL and IN89VG respectively. EA1CYE was heard very weakly but some Gs did manage to work him, then he disappeared. A good catch the next day was G8YYB/A at St Mary's in the Scilly Isles. IN69UW for a very rare square, with 59 signals for long periods.

Andorra was around with C30AAU reported on July 13, but not heard at my QTH.

Information and photos are most welcome for this v.h.f. spot from both s.w.l.s and licensed amateurs. Don't forget the 15th of the month copy deadline.

In spite of its slow movement favouring stations in the southern hemisphere, Oscar 10 satellite continues to provide some good QSOs. Stations worked included TK5BF in Corsica, LU1EN and PJ2MI in Curacao all on s.s.b. and ZS5WT on c.w. The rig here still has fixed horizontal antennas which means that best results are obtained when the "bird" is rising or setting. The up link is 50W to an 18-element Parabeam with an FT-480R and 9-element Tonna for the downlink.

RTTY

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

by Ron Ham BRS15744

The results of the British Amateur Radio Teleprinter Group 1985 Spring RTTY contest have been announced. The single-operator section was won by ON4UN with 9H1EL placed second, while in the multi-operator section LZ1KDP was first and LZ2KRR second. The field of 12 in the s.w.l. section was won by OZ1KEO and OH2-777 came second. BARTG's contest manager, Peter Adams G6LZB, was delighted with the 118 logs that he received for the event. He found that the number was slightly up on last year and that there were seventy countries represented in these logs. The Autumn VHF/UHF RTTY Contest, open to licensed amateurs permitted to use RTTY within Zones 14 and 15, will be held on the 144 and 432MHz bands between 1800GMT on October 12 and 1100GMT on the 13th, with a compulsory four hour rest period during the event. Further details are available from Peter, at 464 Whippendell Road, Watford, Herts WD1 7PT.

MW & SW Bands are now found at the end of On the Air

"Most of the regular user prefixes were logged, but nothing at all exotic," reports **Len Fennelow** G4ODH, Wisbech, for the month prior to July 11. During the period, Len received AMTOR signals from stations in England, Germany and Sweden on 3·5MHz, Germany and Italy on 7MHz, Eire, France, Germany and Switzerland on 14MHz and one from Germany on 28·307MHz and another on 29·073MHz. "I think that this is the first time I have read AMTOR signals on 29MHz," said Len. His RTTY log, along with that of **Norman**

Country (Prefix)	Band (MHz) 3·5	7	14	21	28
Aaland Is. (OH0)			X		
Argentina (LU)			X		
Austria (OE)			X		X
Balearic Is. (EA6)			X		
Belgium (ON)	X		X		
Bolivia (CP)			X		
Brazil (PY)			X		
Bulgaria (LZ)			X		
Canada (VE)			X		
Canary Is. (EA8)			X	X	
Ceuta & Melilla (EA9)			X		
Channel Is. (GJ, GU)			X		
Chile (CE)				X	
Cyprus (5B)			X		
Czechoslovakia (OK)			X		
Denmark (OZ)		X	X	X	
Ecuador (HC)			X		
Eire (EI)			X		
England (G)	X	X	X		X
Faroe Is. (OY)			X		
Finland (OH)			X		
France (F)		X	X	X	X
Germany (DF, DJ-DM)	X	X	X	X	X
Gozo & Comino (9H4)			X		
Greece (SV)			X		

Fig. 1

Country (Prefix)	Band (MHz) 3·5	7	14	21	28
Holland (PA)	X	X	X		
Hungary (HA)			X		
India (VU)			X		
Ireland (GI)		X	X		
Israel (4X4, 4X6)			X		
Italy (I)		X	X	X	X
Japan (JA, KA)			X		
Luxembourg (LX)			X		
Norway (LA)			X		
Oman (A4)			X		
Panama (HP)			X		
Poland (SP)			X	X	
Portugal (CT1)			X	X	
Rumania (YO)			X	X	
Scotland (GM)		X	X	X	
Sicily (IT9)			X		
Spain (EA)		X	X	X	X
Sweden (SM)		X	X		
Switzerland (HB9)			X	X	
USA (K, N, W)			X		
USSR (UA, UB, UK, UT, UZ)			X		
Venezuela (YV)			X		
Wales (GW)					X
Yugoslavia (YU)			X	X	X
Zaire (9Q5)			X		

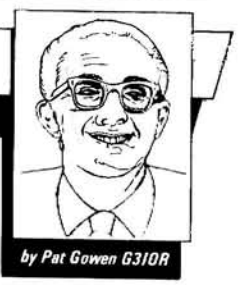
Fig. 1 This time it lists fifty international prefixes. Among Norman's impressive list of RTTY signals copied between June 15 and July 10, are CP1IL, CP5LK in Bolivia, VE6UX half-way up this side of the Rocky Mountains, OE3HGB/YK (Golan Heights), WA9PCI/9Q5 in Zaire. At 2215 on July 7 he copied his best DX and, for him, a new country, a QSO between YS7OB in Salvador and VE2BHH. In Aldershot, **Peter Lincoln** BRS 42979, found 14MHz open to north and south America most nights during the month prior to July 12 and logged strong RTTY signals from Brazil, Canada and Venezuela Like me, Peter was delighted to copy HP1AZO in Panama and OH0BT/OY in the Faroe Isles. Having received QSL cards from A92DU and OE3HGB/YK Peter has added two more countries to his confirmed total. Peter's own QSL cards, letters and reports are produced from a Sharp 700 computer.

During the sporadic-E openings on June 18 and 28, I copied 2 DEs and an OE and an EA respectively on 28MHz. Among the interesting QSOs I noted on 14MHz was one between Ron Mills GJ3MWR and YU2FY at 1119 on June 21 and also VU2VIM and UT5RP at 1912 on July 6. The Indian station was very strong as well as a new and rare country for me. At 0905 on June 26, I received UK3KPF, a "Soviet special callsign" and at 2015 on July 12, I copied part of the RTTY news on 3·5MHz from the Dutch National Amateur Radio Station PA0AA, using a speed of 50 baud.

Jennings, Rye, and my own, was used to compile our monthly reception chart,

SPACE & SATELLITES

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



by Pat Gowen G3IOR

By mid June it appeared that the USSR were preparing to de-orbit the SALYUT-7 space station to a Pacific Ocean re-entry burn up like its predecessors, as it had remained unmanned for many months, and had decayed to an average altitude of only 375km. **John Branegan** GM4IHJ had been monitoring 166·000MHz for the tell-tale signal from the expected "Progress" robot automatic docking supply flight that normally precedes the SOYUZ crew flight in vain, and was not rewarded until the end of June when the station became manned again, probably in the nick of time.

It would appear that SALYUT-7 had a few initial problems that must have made the docking manoeuvres difficult. The 142·423MHz f.m. voice transmissions made by the fresh two-man crew when in range of the Russian command ground station were rather distorted and prone to QSB, and visual observations made by your scribe showed a dual variation in brightness as the spacecraft apparently toppled and rolled. Both of these indicators suggesting some instability difficulties, but within the week all appeared to be stable again

For those who would wish to observe SALYUT 7 both by radio and visually, Fig. 1 and Table 1 will help. They are reproduced from print-outs from GM4IHJ's "SPACEMAN' Spectrum program for manned orbiters which gives tabled tracking, world maps and skytracks for both Shuttle and SALYUT and indicates visible passes. Being some 18 tonnes in mass, the space station is a large object seen easily against a dark clear sky, and often brighter than Venus Note that the passes given are subject to the present orbit being maintained according to motor firing, which cannot be forecast, so some variation in the exact timing is probable. What is more, the pass is for the G3IOR QTH, and will vary over different parts of the UK. For these reasons, start observing at least nine minutes before, and keep looking after the times given to be sure that you do not miss it.

John reports that for most of the in-range passes of SALYUT-7 he can monitor the two-way conversations between the crew members and the ground staff, and overheard one conversation between an astronaut and his XYL. The said XYL took up some two to three minutes of high speed Russian monologue to be answered by a single "Da!" (UA for "Yes" without the "Dear"), this happening several times over. "It is obvious and apparent" said John "why this man became a cosmonaut, as he obviously got little peace on earth!"

The good news is that another ISKRA (UA for "the Spark") satellite will be launched from the orbiter in January next year. The ISKRA satellites are made by the students from some twenty-seven countries studying at the Moscow Aviation Institute, who often come on using the club-call UK3ABT. The satellites are more for demonstrating the results of the building skills of the students in a practical form rather than for any special communications experiments. This latter aspect has nevertheless been of great interest, as the ISKRA satellites were hand-launched into the centre of the mean F2 layer, and gave evidence of ionospheric ducting. (See the graph of the pre- and post-horizon levels labelled Fig. 2 in the August *PW*, where we regret that the captions of Fig. 2 and Fig. 4 became reversed.)

ISKRA-1, callsign RKO1, was launched into a 650km 97·9 minute orbit with a Meteor weather satellite on 10 July 1981, and carried a 29·650MHz c w. beacon. ISKRA-2 gave its telemetry groups and callsign RKO2 on 29·578MHz, and had a non-inverting transponder with a 21·230–21·270MHz uplink to give a 29·580–29·620MHz downlink. It took the form of a six-walled cylinder 470mm long by 340mm diameter, and weighed 23kg (See Fig. 2.) It was launched by hand through the airlock of SALYUT-7 at 1107UTC on 17 May 1982 into an initial 91·5 minute, 51·58° inclination, 357km apogee, and 342km perigee orbit, but after only some two weeks the severe drag brought the period down to only 90·8 minutes, and it finally burnt out during the early hours on 9 July 1982. Possibly due to frictional heating, or blocking on the 21MHz command frequency, the transponder was unable to be commanded on.

ISKRA-3, callsign RKO3, was a virtual twin of its predecessor, and went into a 365km apogee, 350km perigee, 91·5 minute orbit on 18 November 1982 at an identical inclination. Immediate heating caused deterioration of the on-board electronics, resulting in termination of the experiment before re-entry after one month. The heating effects were followed with close examination of the telemetry, and many bets were made on the exact time of burn-out, many within minutes of being correct! This time the transponder was able to be commanded on for numerous periods, and strong mutual sub-horizon signals on the downlink and uplink were evidenced, with many Canadian and American stations heard via the satellite that were inaudible by the F2 medium.

ISKRA-4 is now nearing completion, and is due for ejection from SALYUT-7 within the next few months. As this new satellite will be in orbit at close to sunspot minima, it will provide an interesting comparison to the earlier models that flew in high m.u.f. times. It should help to maintain our use of 21 and 29MHz if a transponder is included, but a beacon on 21, 29, or 145MHz is a distinct possibility. We shall try to publish the telemetry values before launch, so that readers can follow the passage from launch to incandescence.

Future RS Developments

Over the weekend of 29/30 July a large space-communications symposium was held in the Lithuanian SSR, with over 200

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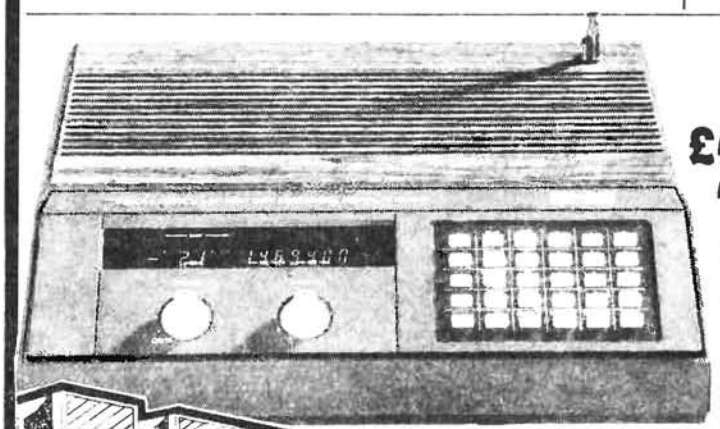

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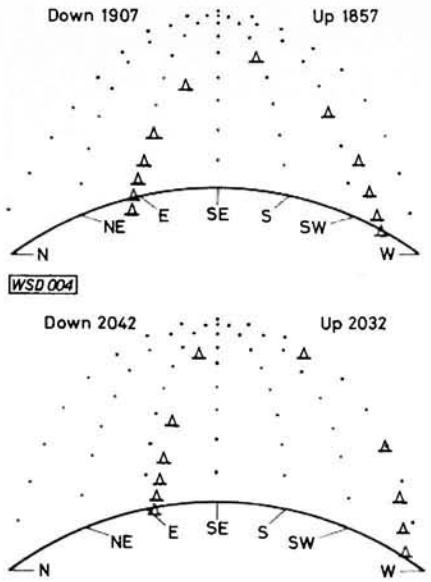


Fig. 1: Skytrack of the same pair of orbits as observation guide. Note that on the first orbit, SALYUT rises in the west at 1857, comes up to a maximum elevation of 48 degrees at 1901 at SSE, dropping below horizon again at ENE at 1907, but eclipses at 1904. The second orbit rises at 2032 in the west up to 58 degrees elevation before it eclipses at 2036 at SSW, finally dropping to horizon at 2042 in the east

SALYUT on 14/9/85

UTC	AZ	EL	LAT	LON	Sat	in	Sta
1856	244	−1	41	22	Sun		Shd
1857	242	3	43	18	Sun		Shd
1858	239	8	45	13	Sun		Shd
1859	234	16	47	8	Sun		Shd
1900	220	30	48	3	Sun		Shd
1901	173	48	49	356	Sun		Shd
1902	112	35	50	352	Sun		Shd
1903	94	19	51	346	Sun		Shd
1904	87	10	51	340	Shd		Shd
1905	83	4	51	334	Shd		Shd
1906	82	0	51	328	Shd		Shd
1907	80	−3	50	322	Shd		Shd

SALYUT on 14/9/85

UTC	AZ	EL	LAT	LON	Sat	in	Sta
2031	269	−2	47	30	Sun		Shd
2032	268	2	49	24	Sun		Shd
2033	268	7	50	19	Sun		Shd
2034	266	14	51	13	Sun		Shd
2035	262	27	51	7	Sun		Shd
2036	244	58	51	1	Shd		Shd
2037	117	54	51	355	Shd		Shd
2038	102	25	50	349	Shd		Shd
2039	98	13	50	343	Shd		Shd
2040	97	6	48	338	Shd		Shd
2041	96	2	47	332	Shd		Shd
2042	96	−2	45	326	Shd		Shd

Table 1: Tracking table for SALYUT–7 for two passes on Saturday 14 September 1985. Data reads Time in UTC (GMT), Azimuth and Elevation of SALYUT from Norwich, Latitude and Longitude of sub-satellite point and whether SALYUT and station are in Sun or shadow. When the sky is dark and the satellite is in sunlight, it can be seen as a bright travelling star. Note that visibility ceases as the satellite goes into earth's shadow at 1904 and 2036 when both station and satellite are in shadow. If both observer and satellite are in sun, it can rarely be seen by the naked eye

amateurs and those responsible for the building and launch of the USSR satellites in attendance.

Eighteen stations were active on the satellites and e.m.e. path using special R2P prefix callsign allocations, with three on OSCAR-10 running 2, 10 and 40 watts respectively, all using the special perigee "transponder-on" period that was organised by the international satellite community specially for the event. Of great interest was a new Mode "J" transponder (145 to 435MHz) designed and built by UA3CR, and a Mode "L" (1·2GHz to 435MHz) transponder by RC2CA, who is ex-UC2CED.

Satellite DXCC

In their wisdom, ARRL DXAC have decided to issue DXCC for Phase III satellite QSOs, and even mixed with Phase II contacts, which may be used retroactively! This has resulted in much reaction in the user community, as it would have appeared to have degraded the value of "Satellite DXCC", which was issued for proven contacts made through polar sun-synchronous satellites of less than 2400km altitude. In comparison, OSCAR-10, the first of the Phase III birds, can be used to work virtually all of the world (with the exception of ZL and close islands when seen from the UK) and in fact is a much easier DX band than any h.f. amateur allocation.

As no-one on earth had 100 active countries available within true mutual range of the Phase II spacecraft it took each of the six recipients (W1NU, W2BXA, W2LV, G3IOR, G6RH and WA2CBB) at least five years of hard effort by Es and F2 scatter to achieve this coveted award.

To quote Ed Bizub WA2CBB, who finally got his SDXCC 5 after seven years of sustained work ". . . I value this award as my most prized even over the Honor Roll . . . I am outraged . . . ARRL should reconsider". W2RS and many more are equally upset, especially as it appears that no power limitation declaration is sought. The satellite mode is ruined by QRO stations who attenuate the logically powered stations out of the transponder, thus competition is destructive and detrimental, where at least the use of high power does not destroy the F2 layer for competitive users of the h.f. bands.

Shuttle Hams

The ten finalists for the first citizen in space included David Marquart WA7QKD, William Townsend WB1CRB, but Jeannine Duane WB2MBW, just missed. Already scheduled for flights in March and November '86 and July '87 is AMSAT member Dr. Ron Parise WA4SIR who is now both training and planning his amateur radio schedule. On Flight 61-A in October this year Dr. Ernst Medderschmid DG2KM and Dr. Reinhard Furrer DD6CF, will be aboard the D1 Spacelab and are now planning cross-band transponder operation. (Like Modes "B" and "J" on the OSCAR satellites).

They hope to use f.m. from eight 435MHz channels and four 145MHz channels for two-way QSOs with auto logging of all calls made when they are QRL with their scientific duties. A 1 watt 435MHz beacon is also planned to aid tracking. Also aboard the same flight is Dutchman Wubbo Ockles, who earlier stated his intention to have a PA0 licence before the mission.

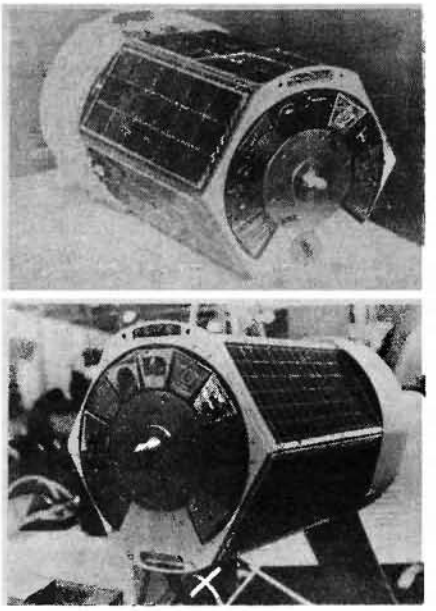


Fig. 2: ISKRA–2 and ISKRA–3 under pre-launch tests at the Moscow Aviation Institue UK3ABT. Note the badges of the nations of all the contributing students decorating the end-plates

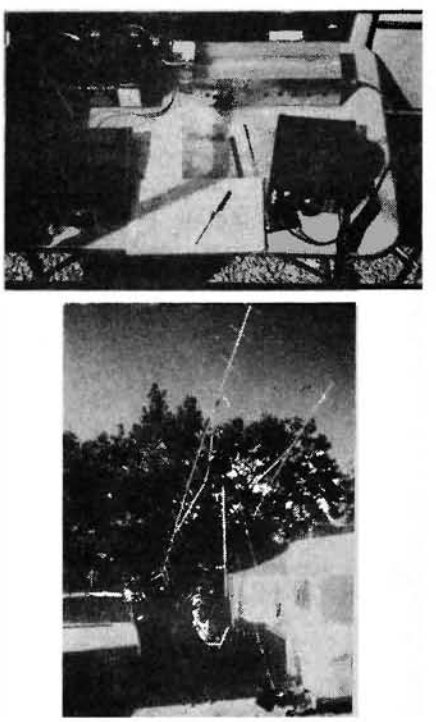


Fig. 3: This is the entirely portable satellite station of Claude Carlier F1CDC/P who operates from Verdon in SE France

John Branegan GM4IHJ, points out that NASA are having to re-think the Shuttle v.h.f. communications all over again. The first microwave geosynchronous TDRS (Tracking and Data Relay Satellite) barely made it into orbit, having to use attitude control fuel in order to get there. Thus, TDRS No. 2 was delayed until they were quite sure that the nozzle shroud problem that nearly stopped the first was solved. Now that TDRS-1 has been operating for several months it has revealed a tendency to be susceptible to signals from earth that QRM it unintentionally, so TDRS-2 is being

redesigned to try to correct this quite serious fault. As this all means that it will be a while yet before TDRS-2 and 3 are operational, World Shuttle watchers can keep listening on 259·4 and 296·8MHz still.

Mode-L

To the delight of the 1269/435MHz OSCAR-10 users, the FCC (American DTI equivalent) have now granted US Extra-Class licensees the use of 1269·050 to 1269·850MHz for a satellite uplink. A listing of stations active on this mode made by Bill McCaa W0RZ, shows twenty-eight DLs, one EA, one F, four Gs, three HB9s, one HL, seven Is, thirty-seven JAs, twenty-seven Ws, one YV, seven OEs, one each of OH, OK, Z22 and ZL, two PA0s, six VEs, three VKs, two YUs, and two ZSs.

Powers vary from 1 to 300 watts of r.f. to antennas from single 15-element Yagis to arrays of 16 × 21-elements and 11 metre dishes! Mode "L" is very popular in Japan, partially because of the relatively low price of the equipment, but mainly due to the fact that the entire band (including the space-band) is taken up by terrestrial f.m.!

For the Beginner

Satellite communications can prove to be a little problematical for a starter, the very terminology itself not always self-evident. In response to many readers' letters, we shall be commencing a series for the strict beginner entitled *Getting Started on Satellites*. It will be published in this column as a monthly inclusion according to the pressures of space (*sic*) and updated news.

VHF BANDS

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

by Ron Ham BRS15744

Despite the sun being generally quiet during the period June 15 to July 14, **Cmdr Henry Hatfield,** Sevenoaks, using his spectrohelioscope, located one filament on June 18 and a few small filaments and two minor prominences on the 27th. **Ted Waring,** Bristol, counted three sunspots on the 24th, a big jump to 22 on July 6 and 27 on the 8th. In Selsey, **Patrick Moore** watched the progress of these spots between the 5th and 8th, Fig. 3.

With this in mind, it was no surprise to learn that around 1830 on the 12th, **Dave Coggins,** Knutsford, received auroral video signals on Chs. E2 48·25MHz, R1 49·75MHz and E3 55·25MHz, with his 2-element Yagi peaking at 040°. "Frequencies from 29 down to 6MHz were affected by rapid QSB and the BBC World Service transmissions on 17·845MHz were badly disturbed," said Dave. At 1925 **Gordon Pheasant** G4BPY, Walsall, with his beam north-west, logged 55A signals from the 50MHz beacons GB3NHQ and GB3SIX.

"This last month the magnetosphere has been relatively quiet, although two sunspot groups are now well in evidence," writes **Ron Livesey,** Glasgow, about the month prior to July 8. Ron is the auroral co-ordinator for the British Astronomical Association. He continues "I detected noctilucent clouds at 2300 on July 5 and according to present views, these clouds should be most evident when the magnetosphere is relatively quiet, although it has been known on occasions for aurora to be present at the same time." The July issue of *Solar News,* published by the London Solar Committee, is available from "Brindles", Mill Lane, Hooe, Battle, East Sussex TN33 9HT, at £1 per specimen copy. It has about ten A4-size pages of observational reports and helpful articles entitled: Total Lunar Eclipse 1985 May 4, Solar Activity and Halley's Comet, How to Record Your Solar Observations and The New Observatory on La Palma.

The 50MHz (6m) Band

Gordon Pheasant made crossband QSOs (28/50MHz) with EA4CGN at 0700 on June 11, CT1WW at 0557 on the 12th, OZ9QV and YO2IS around 0635 on the 13th as well as OZ7JV and SM6PU around 0630 on the 15th. On June 16 he worked LA6QBA via meteor scatter and, later that day at 0656, SM6PU. Early on June 30, Gordon worked LA8AE and LA9DL direct on 50MHz and between 2200 and 2300 on July 2, he exchanged reports with VE1YX and 14 stations in the USA direct, plus 8 on crossband.

Norman Hyde G2AIH, Epsom, uses a Trio R-600 receiver to tune the i.f. of his 50MHz converter. At 0645 on June 30 he received signals from LA8AE and LA9DL, then on July 13 he made his first crossband QSO with G3WBN. Dave Coggins logged c.w. signals from CT1WW at 1952 and 1305 on June 15 and 16 respectively. On s.s.b. he received signals from LA9DL at 0700 on the 30th, VE1YX and W2CAP around 2245 on July 2 and EI0RTS at 2236 on the 3rd.

During this period Dave also logged G2ADR, G3AZI, G3ENT, G3LEQ, G3NOX, G3MCS, G3OSS, G3UUF, G4GLT, G4HK, G4IFX, G4IJE, G4OBK, G4RXD, G5UM, G6XM, GW3LDH and GW3MHW. In Rainham, **Gordon Grigg** G3PRX is equipped to listen to 50MHz and, during the sporadic-E events, he heard many British stations working crossband with stations in Portugal, Scandinavia and Spain. On June 11, he heard YU5OM at strength 5 and the Gibraltar beacon ZB2VHF at 599. On the 15th, YO2NS was working into the UK and on the 26th and 30th he heard a YU and LA station respectively. In July he heard WA1OUB calling CQ Europe at 2240.

Between June 15 and July 12 Norman received signals, via meteor reflection, from the beacon GB3SIX on several occasions around mid morning. On June 12, **Filip Rogister** ON1BRL, Overijse, heard EA4CGN working crossband with several G4s.

The 28MHz Band

Stan Williams G3LQI, Lancing, using an FT-101 and a TA33JR antenna at 12m a.s.l., took advantage of the 28MHz openings on June 4, 5 and 15. He made c.w. QSOs with stations in EA, EH, G, GM, HA, I, PY, SM, UA, VE, W, YU, and 9H. **Fred Pallant** G3RNM, Storrington, heard GM0AVR using only 10W from north-Shetland at 1810 on the 28th. My Tono Theta copied c.w. signals from stations in Germany and Holland at 0908 on June 16, Switzerland and Yugoslavia at 1207 on the 18th, Eire and Sweden at 1105 on the 21st as well as Spain and Yugoslavia at 0955 on the 28th.

Dave Coggins had a good haul from South America during the evening of June 15, when he logged signals from Argentina, Brazil, Easter Island (CE0FQU in QSO with the UK), Puerto Rico and Uruguay. The following day he logged stations from Argentina and the USSR, then on July 2 he heard the USA and Eire with the USSR on the 6th.

During the month, Filip Rogister copied c.w. signals form Europe, Scandinavia and South America.

Propagation Beacons

My thanks to **Chris van den Berg,** The Hague, **John Coulter,** Winchester, Dave Coggins, **Len Fenlow** G4ODH, Wisbech, Henry Hatfield, Norman Hyde, **Bill Kelly,** Belfast, Ted Owen, Gordon Pheasant, Filip Rogister and Ted Waring for their 28MHz beacon logs which enabled me to compile the monthly chart of beacons heard, Fig. 2. Bill Kelly reports that the Dutch beacon was sending, "TEST DE PA0ETE" on 28·303MHz. "The predominance of DL0IGI and LA5TEN is quite marked and clearly shows the direction from which most sporadic-E has occurred," writes Len Fennelow. His computer print-out log indicates that a watery signal was received from EA6AU on June 17 and 18, and a very strong and penetrating tone from LA5TEN at 1700 on the 20th. DL0IGI was also very strong at various times on days 21, 22, 28 and 29. On July 6, both Ted Owen and Filip Rogister logged robot transmissions from IY4M around 28·195MHz.

Between John Coulter and Len Fennelow, the beacons on 14·100MHz, CT3B and OH2B were heard almost daily from June 15 to July 12, 4U1UN/B on most days during the period and 4X6TU and ZS6DN/B less frequently. In addition, Len heard W6WX/B on July 2 and 9. Gordon Pheasant logged the 50MHz beacon in Cyprus 5B4CY on June 20–24, 26 and July 4, 6, 10 and 13 as well as Gibraltar ZB2VHF on June 15. Norman Hyde heard 5B4CY early on the 14th and 26th and ZB2VHF around 1050 on the 15th. Dave Coggins received signals daily throughout the period from both GB3NHQ and GB3SIX.

Chris van den Berg heard the Wrotham beacon GB3VHF 144·925MHz, almost daily from June 15 to July 9 and the Belgian beacon ON4VHF on July 3, 4 and 9. GB3VHF was a steady 539 signals at my QTH each day except for June 15–17, 25 and July 3, 12 and 13, when there was a marked increase in its power due to the prevailing tropospheric openings.

Sporadic-E

Using 10W from an Icom IC-211E to a 7-element Yagi, **Jack Booker** G3JMB from Haywards Heath made the most of the sporadic-E opening on June 5. On 144MHz he worked two LZs and five YUs, with his best DX being 2003km to LZ1KDP. During the same event, Gordon Grigg worked stations in Bulgaria, Greece and Italy and heard a YU6 and UW2PK. He reports that the band opened again at 1440 on the 6th, for about half an hour, when he heard 9H1DO, but could not raise him.

I logged intense sporadic-E openings, mainly affecting 28 to 80MHz during the mornings of June 16, 18, 20 and 29, the afternoons of days 17, 24 and 27 and the early evenings of days 17, 26 and 28. While these events were in progress, both **Harold Brodribb** and I, using ex-military receivers and dipole antennas, counted the numbers of east-European f.m. broadcast stations that appear between 66 and 73MHz. At times it was as low as 12, with an average around 30. However, there were peaks, due to the intensity of the disturbance, of 55 on June 16, 66 on the 17th, 46 on the 18th and 50 on the 28th. These signals are usually very strong, but are subject to deep and sharp fading shortly before the beginning and end of each event.

Tropospheric

The figures in the monthly atmospheric pressure chart, Fig. 1, are slightly rounded and are the readings taken from my barograph, at noon and midnight, for the period June 15 to July 14. In Malden, the readings on Ted Owen's barometer are similar to mine and we both show a low of 29·7in (1005mb) on June 22 and a high of 30·3in (1026mb) on July 7. Harold Brodribb compares his barometer and tropospheric DX with the weather chart in his daily newspaper **Paul Burnett G1DAT**, Cleveland, takes pressure readings every 6 and 12 hours from a rather unique style barometer seen above the loudspeakers in Fig 4. He uses an FT-480R and an 8-element Yagi for DX working on the 144MHz band. He says that incorporated in his barometer is a 100Ω potentiometer, which he plans to use—with extra electronics—to drive a pen recorder.

Chris van den Berg received signals from the 144MHz repeaters in Tacolneston GB3NB R1 daily from June 20 to July 9, Leicester GB3CF R0 on the 29th and Maidstone GB3KN R4 from the 29th to July 3. I heard signals through the Bristol Channel repeater GB3BC R6 at 0102 on July 4 and several Dutch stations working through a repeater on R4.

Band II

Paul Logan, Lisnaskea, began broadcast DXing in 1983, his interest extended to Band II at the end of May '85 after receiving good stereo signals from mid-European countries. On June 2, Paul added Italy, Spain and possibly an Arabic station to his DX list.

Using a loft dipole, he received signals from stations in Austria, Italy, Luxembourg, Portugal, Switzerland and Yugoslavia on June 16. At 1220 the same day he identified Radio Provincia Barcelona, Radio France Montepellier at 1330, RTL at 1435, Radio HURO Klagenfurt at 1535, Osterreicher Rundfunk, Osterreicher Cabare at 1540 and Radio Suisse at 1545.

John Parry G4AKX, Hartford, heard several Spanish stations during the weeks prior to June 25 and, like many of us, is looking forward to the day when the land mobile stations leave Band II.

At 1400 on June 5, Bill Kelly, using a Grundig Satellit 3000, received a strong signal around 100MHz from Czechoslovakia with rapid QSB. Between 1230 and 1300 on the 28th, he logged stations from Czechoslovakia, France and Spain. Early on the 19th, Harold Brodribb heard French programmes from Abbeville, Amiens, Le Havre and Paris and then from France again as well as Holland on July 1. At 1800 on July 2, I was portable in east Sussex and noted several French stations between 96 and 100MHz and two, very strong, Dutch or German voices between 99 and 100MHz.

Harold was alerted to another opening at 0630 on the 13th, by a hefty signal from BBC Radio Devon, normally a poor direction for his loft antenna. Using his Plustron with its own telescopic antenna he found Radio Kent being swamped by a Dutch transmission and then French and Dutch stations between 100 and 108MHz. Like Harold, I found Band II full of signals on the 13th, at 0750 I counted 14 foreign voices between 87 and 103MHz. To enable Harold to continue with his tropospheric studies, he has installed a loft antenna directed towards France and now, under the worst conditions, he can receive France-Culture, Inter and Musique from Boulogne, Lille, Rouen and Frequence-Nord from Boulogne.

Just after 0930 on July 7, Andrew Collinson, Doncaster, using a Technics X55SL tuner and 4-element Yagi, angled at 045°, received signals from Sunshine Radio in Dublin and reported that the strength of the ILR station, Signal Radio, was above normal.

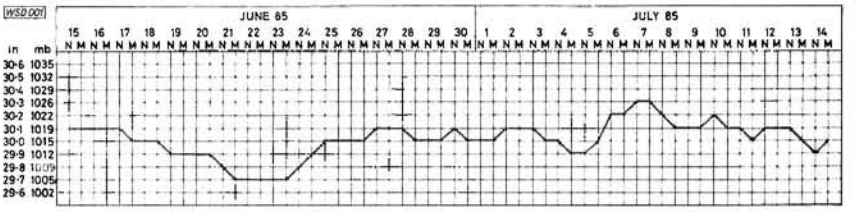


Fig. 1 ▲

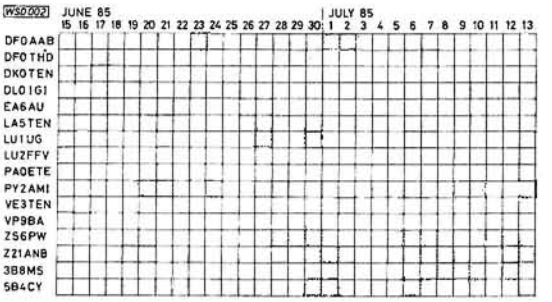


Fig. 2 ▶

Fig. 3 ▼

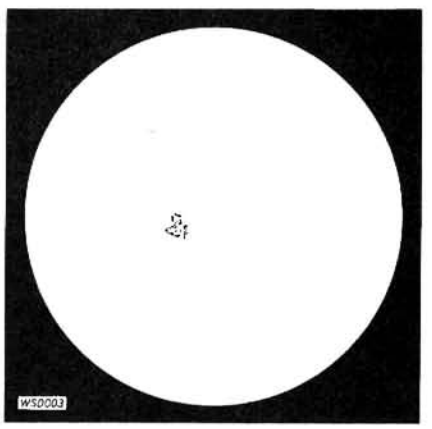


Fig. 4

Microwaves

Both Jack Brooker G3JMB and Alan Wyatt G8LSD have built the *PW* Exe 10GHz transceivers. With the assistance of Ron Allen G2DSP and Ern Downer G8GKV, Jack was operational for the 10GHz contest on June 16 from a site in Ashdown Forest. During the day he made his first microwave QSO with Ern, who was at Chanctonbury Ring, another high spot on the Sussex Downs, some 44km away. G8CIU/P was his second contact situated further along the downs at Ditchling Beacon. From Chanctonbury, Ern worked 11 contacts, including G3JHM/P on a 125km obstructed path, F6DCK/P at 141km and F8WN/P at 176km. Ern used a home-brew transmitter with an output of 10mW and all QSOs were 59 both ways.

TELEVISION

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

My thanks to those who supplied detailed logs so I could compile the list of countries, Fig. 1, that were received in Band I during the sporadic-E disturbances between June 4 and July 14.

From the impressive letters I found that as many as 21 different captions were seen, plus clocks from 9 countries and the news captions BPEMR, DVENIK, HIRADO, HOBOCTN, and TACC COObWAET. As for the subject matter in the programmes seen, I think they covered every subject under the sun! We begin to realise just how intense and widespread these events were when you see the spread of test cards identified. Readers saw CST-D1, GRUNTEN, ORF-FS1, JRT BGRD, RUV ISLAND, RS-KH, SWF-RG1, TV1 SVERIGE, YLE HLK2 and +PTT-SRG1.

Regional test cards such as Bagn, Gamlem, Greipstad, Gulen, Kongsberg, Melhus and Steigen from Norway; Spanish captions Andelucia, Barcelona, Gamoniteiro, La Muela and Santiago were all reported.

"A Sunday to remember," said **Simon Hamer** about June 16. That was when he logged most of the countries against his name (shown in Fig. 1). One of those programmes was Pope John Paul II at the Vatican on RAI.

David Appleyard was pleased with his results because he was using a National receiver with its own telescopic antenna on the ground floor of a four-storey block of flats. To TVDX the countries **Ian Davidson** saw, he uses a Vega 402DE with a loft mounted 4-element Yagi—facing due east.

Philip Hodgson received a QSL card, Fig. 2, from Bayerischer Rundfunk acknowledging his report on their Grunten signal on Ch. E2. The pictures of RS-KH, Czechoslovakia Fig. 3 and HOBOCTN Fig. 4.

Although sporadic-E is uppermost in our minds during the summer months, tropospheric openings also occur. At 0618 on June 17 **Harold Brodribb** received strong negative pictures from France on Chs F5, 7 and 9 in Band III and Chs. 21, 48, 51 and 54 in Bands IV and V. Harold logged French v.h.f. and u.h.f. pictures again at 1350 on June 30 and from Belgium he saw Wavre Kanal 8 early on July 1 and 4.

On June 24 **Rodney Hayman,** using a Grundig receiver and a standard type domestic antenna, received pictures from Central Television, HTV, TSW, TVS and BBC West On July 2 he logged a German station and Radio Telefis Eireann—RTE 1 and 2 in Band III. While tuning for RTE 2 between 1500 and 1800 on June 16, **Brendan Gaffney,** Dublin, found pictures from Belgium, Denmark and Sweden. During the evening of the 18th, he again received pictures from Scandinavia. Around the same time, **Alex Mackow,** Margate, logged u.h.f. idents from Belgium—BRT 1 and 2 and Holland—PTT-NED 1 and 2. Alex tells me that some French stations he can see every day. **Fraser Lees** received adverts from Holland on Ch. E4, cartoons from Belgium on Chs. E8, 10 and 43 and Wimbledon Tennis from BRT 2, Ch. 46, on July 2.

While using my Plustron TVR5D with its rod antenna on Telegraph Hill, Sussex, at 1400 on July 3, I received strong negative pictures in Band III. From home, around 2230 on the 12th, I noted some co-channel interference on u.h.f. signals and watched BRT Journaal from Belgium on Ch. E10. This opening continued overnight and by 0750, I was looking at colour test cards from Holland on Chs. E4, 5 and 7 and a weak caption from Germany's WDR-1 on Ch. E9. Between 0600 and 0800, Harold Brodribb watched BBC and IBA pictures from Devon on Chs. 23, 26 and 33, Heathfield on Chs. 55 and 56 and Wenvoe on Chs. 47 and 51. "By 0930 the French were beginning to take over," said Harold, who, by then was receiving negative signals on several u.h.f. channels. Early in June, **George Garden,** spent a holiday in Germany and while there he used his JVC CX610 to see some of the popular v.h.f. and u.h.f. transmissions, and on the hotel set he saw several test cards such as DBP, BR MCHN 3 Programm, Wendelstein and a bit of DX, ORF-FS1.

Report from India

Major Rana Roy observed the effects of sporadic-E on signals in Band I during the early mornings of May 27, June 2, 4 and 7, the afternoons of May 23 and early evenings of May 31 and June 3 and 6. While these events were in progress, Rana received pictures, mainly from the USSR. Amongst these were a children's programme (Fig. 5), captions (Figs. 6 and 7), newscasters (Figs. 8 and 9), part of a feature film and a programme presenter (Fig. 10) on Ch. 2.

"June 3 was a wonderful day, full of DX signals from Russia," said Rana. He noted a clash of signals between a discussion programme on Calcutta TV and a war film from the USSR, on Ch. 4 on July 7.

SSTV

Peter Lincoln, Aldershot, found the 14MHz SSTV band quiet during the month prior to July 12, although he did receive some pictures from European stations. Very often when he scanned the band he found nothing on this mode.

During a similar period, **Alan Taylor** G1MSA copied pictures from France, Germany, Italy, Spain and Sweden. He also saw captions like, "MY QTH TURIN", "DK9KC", "EA2IO" and "I1CEL". Between June 15 and July 14, I logged a QSO on 14MHz between DK8SV and F9FU and received a test transmission from F6AGY, CQs from DX1XE and I think I2II (Fig. 11). Both Alan and I use Spectrum computers with Scarab Software for decoding the SSTV signals and we use Sinclair and Alphacom printers respectively

TVDX SEEN

Fig. 1

	Albania	Austria	Czechoslovakia	Denmark	Finland	Germany	Hungary	Iceland	Italy	Norway	Poland	Portugal	Rumania	Spain	Sweden	Switzerland	USSR	Yugoslavia
David Appleyard (Uppsala)		X				X			X							X	X	
Mike Bennett (Slough)				X	X	X	X	X	X	X		X		X	X		X	X
H. Brodribb (St Leonards on Sea)		X	X						X	X		X		X	X	X	X	X
Keith Chaplin (Leicester)	X		X			X	X		X	X		X		X	X	X	X	X
Dave Coggins (Knutsford)		X	X			X		X	X	X		X		X	X	X	X	
Ian Davidson (Carmarthen)				X		X					X			X	X		X	
Ron Ham (Storrington)			X				X	X	X	X	X				X		X	
Simon Hamer (New Radnor)	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X
Rodney Hayman (Pontypridd)			X			X				X				X				
Philip Hodgson (Stamford)					X	X											X	
Fraser Lees (Rugmer)	X	X	X		X			X	X	X	X	X		X	X		X	X
Gordon Pheasant (Walsall)		X	X		X	X	X		X	X	X	X		X	X	X	X	X
Neil Purling (Hull)		X	X		X	X	X		X	X	X	X		X	X		X	
Alan Taylor (Coventry)						X	X	X	X	X	X	X		X	X		X	

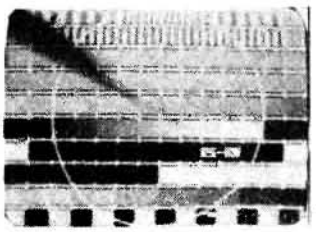


Fig. 3

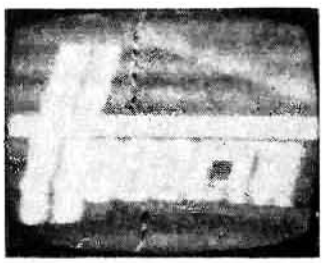


Fig. 4

Fig. 5

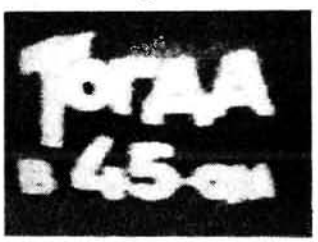


Fig. 6

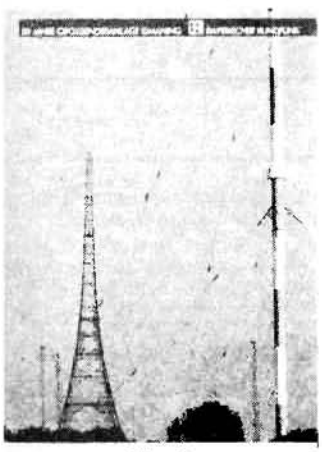


Fig. 2

Fig. 7

Fig. 8 ▲

Fig. 9 ▶

Fig. 10 ▲

Fig. 11 ▶

Don't forget to send in your TVDX reports by the 15th of the month

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

An interesting letter from **John Ratcliffe** of Southport, Queensland, Australia, details his experiments to discover the best low noise receiver suitable for long and medium wave reception.

His latest receiver is a home-built, two-transistor, double reflex circuit, plus an antenna Q-multiplier design from an old *PW* (July 1965). The noise performance of this set is so low that on good nights in January he can hear the BBC long wave transmission on 200kHz. However, static from local electrical storms tends to be at its worst then. He says the signal may not be heard for a week or two and then reappears. His best reception was on top of a local mountain, situated 40km from the nearest power line! Here, the absence of noise was remarkable.

It is the enthusiasm of people like John that makes this a great hobby!

DX Report

(Note: all frequencies in kHz, times in UTC = GMT.)

Transatlantic DX: Bill Kelly of Belfast says that conditions for transatlantic DX have deteriorated, and most of the stations heard have been weak and suffering from fading.

From the USA Bill received WGAR 1220, located in Cleveland, Ohio during three nights between 0230 and 0330. With football and baseball commentaries from Pennsylvania WCAU 1210 was heard on two nights. Signals from New York WHN 1050 and WQXR 1560 heard between 0200 and 0230 were disappointingly weak. WBAL from Boston 1090, was received on one night but was alongside an unidentified Arab station which made reception difficult.

Signals from Newfoundland were noticeably absent but from South America Radio Globo de Mundo in Brazil 1220 put in an appearance at about 0330. This station was also received by **Paul Logan** of Co. Fermanagh.

Graham Powell of Pontypridd, using his Grungid Satellit 1400SL receiver, did manage to hear Newfoundland CJYQ 930 at 0158 one night and also noted a station on 1512 at 2340 from S. Arabia which he thinks was on an extended schedule for Ramadan.

Other DX

A very warm welcome to **Chris Hughes** of Helston, Cornwall, who is new to m w DXing. He reports hearing Manx Radio 1368 at 2115 but says that "reception was rather poor, with a lot of other stations in that area—still, it was readable and I think it qualifies for a DX tag in my log" Well, so do I, Chris, for you say you only have a very simple portable receiver with internal antenna. I note that, in commom with many newcomers, you are having a few problems with receiver dial calibration. The "Newcomer" article in the September *PW On the Air* may help you to convert metres into kilohertz. Why not attach a paper scale to the receiver dial and then record the known frequencies of stations heard, for this will help you find your way around the band more accurately.

André Newall of Twickenham also heard the Manx Radio station but later, at 2309. André listens to Radio Luxembourg 1440 in the evenings via the sky wave signal from the E layer of the ionosphere (see m.w. *On the Air* in August *PW*) and other stations such as Deutschlandfunk, Cologne 1269 at 0001 and RTE 2 Dublin 1278 at 2220. Paul Logan reports that several French stations have been well received at his location, namely, Bordeaux 1206 at 0641, Blois 1377 at 0650 and Toulouse 945 at 1755 He also logged Intercontinental de Madrid 918, RTI Milano 900 and Sudwestfunk 1017kHz.

My thanks to **Patrick Healy** of Cork for advising me that Radio Sweden have had a new transmitter in operation on 1179kHz since May of this year. Also thanks to **Michael Murray** of St. Ives, Huntingdon, who is Secretary General of the European DX Council, for sending along details of this new transmitter at Sölvesborg. Apparently, this will have an output of 600kW when fully operational and, at present, they are transmitting a European service in French, German, Swedish and English. From September there will be a daily service at 1800; however, this may change due to propagation conditions. The 100kW Höerby station has now closed down **Simon Hamer** of New Radnor says he has been hearing long wave signals on 191kHz from Radio Sweden in English at 2030 and says these are in parallel with the Solvesborg transmitter. Simon reports that

Area	Company	Transmitter	Frequency (kHz)	Max e.r.p. (kW)
Aberdeen	North Sound Radio	Nigg	1035	0·78
Ayr (with Girvan)	West Sound	Symington	1035	0·32
Belfast	Downtown Radio	Knockbreckan	1026	1·7
Birmingham	BRMB Radio	Langley Mill	1152	3·0
Bournemouth	2CR	Fern Barrow	828	0·27
Bradford, Huddersfield & Halifax	Pennine Radio	Tyersal Lane	1278	0·43
		Vicars Lot	1530	0·74
Brighton	Southern Sound	Southwick	1323	0·5
Bristol	Radio West	Mangotsfield	1260	1·6
Bury St. Edmonds	Saxon Radio	Great Barton	1251	0·76
Cardiff	CBC	Hadfield Road	1359	0·2
Coventry	Mercia Sound	Shilton	1359	0·17
Doncaster	Radio Hallam	Doncaster	990	
Dundee/Perth	Radio Tay	Greenside Scalp	1161	0·7
		Friarton Road	1584	0·21
East Kent	Invicta Sound	Littlebourne	603	0·1
Edinburgh	Radio Forth	Colinswell	1548	2·2
Exeter/Torbay	Devon Air Radio	Pearce's Hill	666	0·34
		Occombe	954	0·32
Glasgow	Radio Clyde	Dechmont Hill	1152	3·6
Gloucester & Cheltenham	Severn Sound	Little Shurdington	774	0·14
Gt Yarmouth & Norwich	Radio Broadland	Brundall	1152	0·83
Guildford	County Sound	Peasmarsh	1476	0·5
Hereford/ Worcester	Radio Wyvern	Breinton	954	0·16
		Cotheridge	1530	0·44
Humberside	Viking Radio	Goxhill	1161	0·35
Inverness	Moray Forth Radio	Tarbat Ness	1107	1·5
Ipswich	Radio Orwell	Foxhall Heath	1170	0·28
Leeds	Radio Aire	Morley	828	0·12
Leicester	Leicester Sound	Freeman's Common	1260	0·29
Liverpool	Radio City	Rainford	1548	4·4

Area	Company	Transmitter	Frequency (kHz)	Max e.r.p. (kW)
London— General & Entertainment	Capital Radio	Saffron Green	1548	97·5
London—News & Information	LBC	Saffron Green	1152	23·5
Luton/Bedford	Chiltern Radio	Lewsey Farm	828	0·2
		Kempston	792	0·27
Maidstone & Medway	Invicta Sound	Hoo St. Werburgh	1242	0·32
Manchester	Piccadilly Radio	Ashton Moss	1152	1·5
Newport (Gwent)	Gwent Area Broadcasting	Christchurch	1305	0·2
Northampton	Hereward Radio	Kings Heath	1557	0·76
Nottingham	Radio Trent	Trowell	999	0·25
Peterborough	Hereward Radio	Gunthorpe	1332	0·6
Plymouth	Plymouth Sound	Plumer Barracks	1152	0·32
Portsmouth	Radio Victory	Farlington Marshes	1170	0·12
Preston & Blackpool	Red Rose Radio	Longton	999	0·8
Reading	Radio 210	Manor Farm	1431	0·14
Reigate & Crawley	Radio Mercury	Duxhurst	1521	0·64
Sheffield & Rotherham/ Barnsley	Radio Hallam	Skew Hill	1548	0·74
		Ardsley	1305	
Southend/ Chelmsford	Essex Radio	Rayleigh	1431	0·35
		Bakers Wood	1359	0·28
Stoke	Signal Radio	Sideway	1170	0·2
Swansea	Swansea Sound	Winsh-Wen (Jersey Road)	1170	0·58
Swindon/West Wilts	Wiltshire Radio	Blunsdon	1161	0·16
		Naish Hill	936	0·18
Teeside	Radio Tees	Stockton	1170	0·32
Tyne & Wear	Metro Radio	Greenside	1152	1·8
Wolverhampton & Black Country	Beacon Radio	Sedgley	990	0·09
Wrexham & Deeside	Marcher Sound/ Sain-Y-Gororau	Farndon	1260	0·64

a five minute English News bulletin (Mon–Sat) can be heard on Radio Denmark 1062 at 0630.

Paul Logan has found that his long wave reception has been much improved since he removed the 13m wire antenna connected to his Shirasuna XF900 receiver! He noted Europe No. 1 185 at 1515, Monte Carlo 220 at 1520, France-Inter 165 at 1808, RTA Algiers 254 at 2017, RTL Luxembourg 235 at 2141 and Radio Azilal Morocco 209 at 2250.

Local Radio DX

This month I have included an Independent Local Radio station list to help you find the DX. This list, together with the BBC list given in the August *PW On the Air*, provides a complete guide.

ILR, West Sound, Ayr, Scotland, request reports on their signal on 1035kHz. They will QSL. Send reports to David Macliver, Engineering Dept., West Sound, P.O. Box 290, Ayr, Scotland KA7 3BE.

D. Wright of Telford reports that BBC's Radio Shropshire and Radio Bedfordshire (transmitter sites at Luton on 630 and Bedford 1161kHz) are now operational. **William Lee** GW1JOS of Anglesey has been busy local radio DXing; among the stations noted in his log are BBC Radio's Derby 1116, Newcastle 1458, Sussex–Brighton 1485 and ILR Pennine 1278, Aire 828, Tay 1161 and Radio 210 1431. Paul Logan's log included BBC Radio Solent and ILR Essex 1431. A very comprehensive log from André Newall mentioned Norfolk–Postwick 855, Merseyside 1485, Devon–Barnstaple 801 and numerous other BBC Local Radio stations and also ILR stations including Mercia Sound 1359 and Pennine 1530.

Books

Dial Search by George Wilcox is a listener's check list and guide to European broadcasting—a most useful reference booklet for the newcomer or old-timer. This is available from George Wilcox, 9 Thurrock Close, Eastbourne, East Sussex BN20 9NF—£2.75 incl. post (UK) or £3.00 incl. post (Europe) or 15 IRCs.

SW BROADCAST BANDS

Reports as for Medium Wave DX, but please keep separate

by Brian Oddy G3FEX

For the newcomer s.w.l.: Anyone new to short-wave listening may decide to use a book listing short-wave broadcast stations and their frequencies as their guide to selecting a particular station and then be disappointed to find that it is inaudible. They may also jump to the conclusion that their set is faulty! In fact, unlike local medium-wave broadcast signals, most short-wave broadcast stations may only be heard at certain times and on particular frequencies during any twenty-four hour period.

To appreciate why this is so, it is first necessary to understand how electromagnetic waves travel from a distant transmitting antenna to arrive at the listener's location.

One of the routes taken by the waves is along the surface of the ground and is called the **"ground wave"**. It is this ground wave signal which is used by medium-wave and long-wave broadcast stations to provide a reliable daytime service area. However, at short wavelengths, the ground wave signal only exists close to the transmitting antenna because, as the frequency is increased, the ground wave is rapidly attenuated.

The other route taken by the waves is upwards and outwards into the sky and space, and is called the **"sky wave"**. It is this sky wave signal which makes short-wave listening possible. The ground and sky wave signals leaving the transmitter antenna at 300 000 000 metres per second in concentric spheres of E and H fields (as discussed last month), are shown in Fig. 1.

As the sky wave signal travels outwards it passes from our atmosphere through the stratosphere to reach the **ionosphere**, which is a region consisting of layers of ionised gases. Here, oxygen, nitrogen and nitric acid are ionised by the action of X-rays and ultra violet radiations from the sun and, since the radiation and position of the sun is constantly changing, it follows that the ionosphere is also changing, by day, night and seasonally. Sun spots, which follow an 11-year cycle, and solar storms also cause changes to occur.

The layers are termed D, E, F1 and F2 and have the following characteristics:

Layer	Approx height of layer above the earth	Ionised State of Layers
D	60–80km	Maximum at noon: Zero at Sunset
E	120km	Maximum at noon: Minimum at midnight
F1	200km	May combine with F2 and varies with time of day
F2	300–400km	Varies with time of day, season and sun spot cycle

The ionosphere's "F" layers act rather like a mirror in the sky and reflect and refract the short-wave signals back to earth—see Fig. 2.

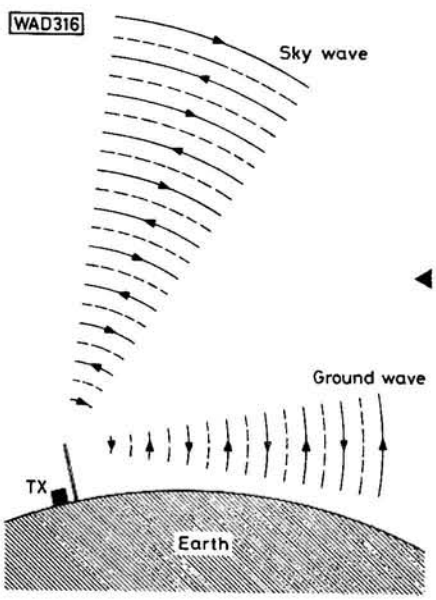
Signals above a certain frequency do not return to earth but pass through the layers into outer space. The upper frequency limit for reflection to take place is usually below 30MHz. A "skip zone" exists where signals cannot be heard—this is in the area between the transmitter and the point where the reflected signal from the ionosphere returns to earth. The angle of transmitted signal is important: a low angle signal results in long distance reception (7 degrees is typical for long paths) but a higher angle is needed for nearer locations. Multiple reflections can take place between the ionosphere and earth, to give world-wide coverage.

All this may sound complex—and I can assure you it is! Fortunately for the listeners it is up to the broadcast engineers to worry about skip distances, transmission frequencies and angles of radiation, etc. Generally speaking, their expertise will ensure that the signal will be as clear as possible in their chosen target area!

So how does the listener make use of all this? The answer lies in the use of up-to-date schedules obtainable from most broadcasters throughout the world. These detail the best frequencies and times to use and the target areas concerned. New schedules are brought out four times a year, namely in March, May, September and November, to account for seasonal changes. Some organisations publish listening guides which may also be helpful, see *Practical Wireless* for July 1985 for details of the *International Listening Guide*, for example. Readers of *PW* also send along their logs of stations heard for publication in this series and these may be of great help to you, too.

If you would like to know more about the ionosphere I suggest you read *Radio Wave Propagation* by F. C. Judd, which commenced in the January 1985 issue of *PW*.

WAD316



◀ Fig. 1

WAD317

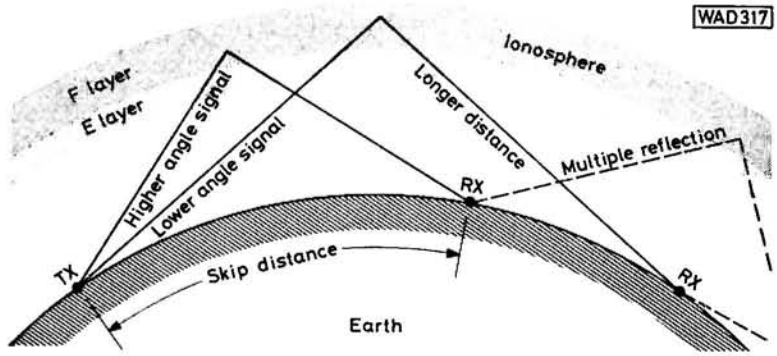


Fig. 2 ▶

Conditions on 25 and 21MHz

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

Conditions on the 25MHz (11m) band have remained poor and the only signal heard on a regular basis has been the BBC World Service on 25·650 between 0900 and 1330. I would be especially interested to hear how well s.w.l.s who live in Africa receive this service.

Bill Kelly of Belfast on one occasion heard s.s.b. signals on 25·359 at 0830; these were in Russian and may have been Radio Moscow testing. Bill also heard a programme of piano music from Radio Moscow at 0845 on 25·620. When conditions are right, **Podney Sixe** of Camborne, Cornwall, can also hear these signals. He says that Radio Moscow denies using the 25MHz band but these signals appear to be the Russian Home Service from Radio Moscow.

On several days, sporadic-E type propagation has been present and Podney has logged harmonics of several BBC transmitters via this mode. He noted BBC World Service on 23·900 (i.e. fourth harmonic of 5·975, also on 24·180 (4 x 6·045), and on 24·190 (2 x 12·095). He also noted the BBC Arabic service harmonic on 23·360 (2 x 11·680). While this may appear to be due to lack of harmonic suppression at the transmitters, it is important to realise that, despite considerable transmitter filtering and attenuation, weak harmonic signals may still be generated and radiated from high-power installations, e.g. 250kW and sometimes 2 x 250kW in parallel. Podney received harmonics from RFI France on 23·340 (2 x 11·670) at considerable strength and has received a QSL card for the harmonic signal of Radio Bucharest on (2 x 11·775)!! During the period 6–7 July, sporadic-E conditions were present for at least nine hours a day.

Conditions on the 21MHz (13m) band have deteriorated to reach a seasonal low. **Bert Trickey** of Bristol, using his Vega 200 receiver, sent along the only reception report of Radio Japan 21·550 at 1510. He also heard Radio RSA South Africa 21·535. I find that their transmission at 1100 is unacceptable now but the signal peaks up quite substantially by 1400 on most days.

Margaret Sadler of Leeds, **Paul Price** of Merthyr Tydfil and **Peter Mills** of Sherborne, Dorset, have all been receiving the United Arab Emirates signals from Dubai 21·605. This is a good signal for much of the day. Peter Mills has taken up s.w.l.ing again after a lapse of many years and is pleased with his QSL from Dubai. He uses a Selena B210 receiver. Paul Price has been listening to the WYFR programme from Oakland, California, on 21·615 at 1915 and also to Vatican Radio, Rome, 21·725 at 1435.

Podney Sixe says "I have been enjoying the almost hi-fi signals from Radio Berlin International GDR 21·465 and 21·540, with English, 1230–1315". I have also noticed that Radio Deutsch W. Cologne FRG is a good signal on 21·600 at 1300.

Graham Powell of Pontypridd reports a Czech programme from HCJB Quito, Ecuador 21·480 at 1830.

Conditions on 17 and 15MHz

While many signals may be received on the 17MHz (16m) band, I have noticed a steady decline in the strength of signals from Australia. About a month ago, their 17·830 signal was quite acceptable but has now become inaudible and 17·715 is now the only signal to be heard from "down under" in the mornings at around 0800. It is interesting to note that while this transmission is not intended for Europe their 11·910 intended frequency is quite useless here.

At around midnight the 15MHz (19m) signals from Australia can be heard and Paul Price hears these on 15·160 at 2330. A little later, 13-year-old **André Newall** of Twickenham receives them on 15·240 at 0001.

The Radio New Zealand International signals on 15·150 as detailed last month have still not shown up! Just to whet your appetite, **Simon Hamer** of New Radnor has sent along a QSL (Fig. 3) he has received for reception of their signals last November—most attractive, Simon!

Almost all of the stations reported last month are still to be heard. **Chris Hughes** of Helston, Cornwall, who is a "newcomer s.w.l.", adds UAE Radio Dubai on 15·320 at 1630 to the list. Bert Trickey reports this, too, also Radio Sweden 15·345 at 1400. Radio France International 15·360 at 1405 and WFYR Oakland, 15·375 at 2215. André Newall also heard WFYR and noted Radio Canada International 15·325 at 1917. Margaret Sadler heard News from the Voice of Vietnam at 2030 on 15·010 and another new one was Radio Korea, Seoul, S. Korea 15·575 at 2328. **Alan Williams** of Helston, Cornwall, listened to Radio Algiers 17·745 at 2000 on his VEF receiver. Peter Mills heard the Voice of Greece 17·565 at 1840 and Radio Jomahiriyah, Tripoli 15·450 at 1800. He was very pleased to hear the Radio Suriname International 17·755 signal at 1805 which Graham Powell reported last month, and awaits their QSL! This station is asking for reception reports—see new address list below. Paul Price is delighted to have heard KYOI, the "super-rock" station at 15·190 from Saipan, N. Mariana Islands—keep an eye out for this one around 0830, it's quite a good signal most mornings.

The 13MHz Band

Further to my notes in the August issue of *PW* concerning the use of the 13MHz (22m) band by broadcast stations, a most interesting letter has been received from **Bill Stewart** of Lossiemouth, Scotland. He confirms reception of Russian broadcasts on 13·705, 13·755, 13·655 and 13·680 to different target areas and the Voice of Israel on 13·720 (actually 13·723). He mentions, too, signals from Radio Swiss International 13·830, Radio France International 13·850, Radio Moscow 13·840, Radio Canada International 13·820 and Radio Damascus, Syria 13·825. I have no information to suggest that any of these broadcasters actually use the 13MHz band.

I have done a few calculations which suggest these signals are not really on this band at all but are "images" of signals in the 11 and 12MHz bands caused by Bill's National Panasonic DR28 receiver design. Bert Trickey has been experiencing the same type of problem with stations appearing at 10MHz from the 11MHz band due to poor image separation in his Vega receiver. This is a common problem, which I will discuss in the "Newcomer s.w.l." section of this series in the future.

The 11, 9, 7 and 6MHz Bands

Conditions for long-distance reception on the 11MHz (25m) band have deteriorated and Radio Australia 11·910 can no longer be heard at 0800. The 9MHz (31m), 7MHz (41m) and 6MHz (49m) bands remain reliable with plenty of stations to interest the listener. Paul Price logged Radio Damascus 11·625 at 1200, Radio Canada 11·710 at 2310 and Radio Sofia 9·700 at 2330. André Newall heard Radio Budapest 11·910 at 1602, the Voice of Israel 11·655 at 0020 and Radio Sweden 6·065 at 1843. From Bert Trickey's long list, Radio Afghanistan 11·880 at 1910, VOIRI Tehran, Iran 9·022 at 1935 and REE Madrid 5·900 at 2200.

An interesting letter from **Philip Hodgson** of Stamford, refers to Adventist World Radio in Forli, Italy, which commenced operation this year and is pictured in Fig. 4. Listen on 7·240 at 0600 and 6·206 at 2130 for programmes in English (QSL address later).

Margaret Sadler heard news from Havana, Cuba 11·705 at 2200 and Radio Mediterranean, Malta 6·110 at 2230. Interesting station RUV Iceland 9·859 at 1955 was heard by Alan Williams. **Darren Taplin** of Tunbridge Wells found Radio Berlin International at 7·260 at 1645 and Radio Polonia, Warsaw 7·270 at 2230. He uses a DX150A receiver and 5RV inverted "V" antenna.

Radio Australia is still a good signal on 6·035 from 1525 to 2100, says Bill Kelly.

New s.w.l. Chris Hughes heard Radio Tirana, Albania, on 7·065 at 2200. This station operates in the exclusive portion of the 7MHz amateur band. Graham Powell heard TWR Swaziland 9·550 at 1858, Qatar B.S. 9·905 at 1854 and Radio Australia 7·205 at 1700.

Fig. 3: Radio New Zealand QSL card sent in by Simon Hamer

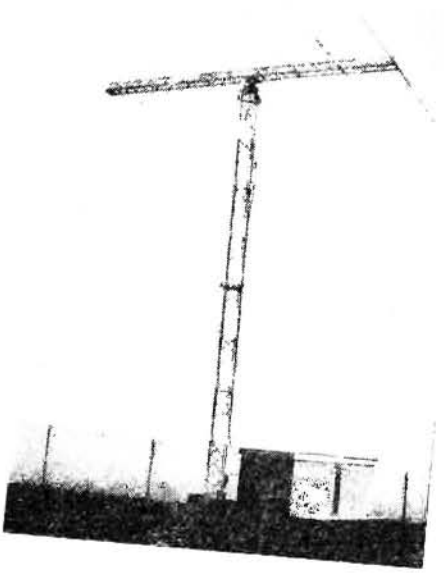


Fig. 4: Adventist World Radio QSL card sent in by Philip Hodgson

The Tropical Bands (60, 75, 90 and 120m)

Much DX is being heard on these bands. **John Parry** (G4AKX) of Northwich, Cheshire, heard Gabon 4·810 at 2000 and Radio Uganda 5·026, a good signal in English at 1850. Darren Taplin found Radio RSA South Africa 3·230 at 0300 and Africa No. 1 4·810 at 1900. Podney Sixe heard Botswana 4·820 every evening!

Margaret Sadler has been busy here, too! She heard all the previous stations, plus Radio Tochira, Venezuela 4·830 at 0220, Ecos del Torbes, Venezuela 4980 at 2320, Radio Nigeria, Lagos 4·990 at 2145, TWR Monte Carlo 5·495 at 0730 and SWABC Namibia 3·270 at 2255!

Graham Powell heard GBC 2, Ghana 3·366 at 2138, R.DIFF TV Burkina, French Upper Volta 4·815 at 2148, SABC 4·835 at 2107, Radio Rumbos, Venezuela 4·970 at 0302, Ecos del Torbes 4·980 at 0255 and, from Costa Rica, Radio Columbia 4·850 at 0454. These were all received on a Grundig Satellit 1400SL plus 9m-long antenna.

Station Addresses

Alan Williams has suggested that each month an address or two be included, which seems a good idea:

Adventist World Radio, P.O. Box 2590, 1114 Lisboa, Portugal (2 IRCs for QSL).

Radio Uganda, Broadcasting Corporation, 2030 Kampala, Uganda.

Radio Suriname International, P.O. Box 2979, Paramaribo, Surinam.

Radio Station KYOI, 1001, Bishop Street, Honolulu, Hawaii, USA 96813.

Books: *DSWCI Tropical Bands Survey.* The 13th edition of this well-known book is now available for 7 IRCs, from: DSWCI, Tavleager 31, DK-2670 Greve Strand, Denmark.

All s.w. broadcast bands DX reports by the 15th please

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West Midlands

Coventry ARS: Robin Tew G4JDO (Coventry 73999). Meets Fridays, 8pm at the Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. September 6 is night on the air, the 13th "are mini-lectures useful" and the 27th is project construction night. Note AGM on October 4.

Mirfield RC: C. Marks G4ZPJ, 63 Alvis Walk, Chelmsley Wood, Birmingham. Meets Wednesdays, 7pm in the club room of the Mirfield CC, Yockelton Road, Lea Village, B'ham.

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

Walsall ARC: Linda Prince G6HZI (Walsall 32607). Meets Wednesdays, 8pm at the Forest Comprehensive School, Hawbush Road, Bloxwich, Walsall. Meetings include Morse tuition.

Wolverhampton ARS: Keith Jenkinson BRS84269 (Wolverhampton 24870). Meets Tuesdays, 8pm at the Wolverhampton Electricity S & SC, St. Marks Road, Chapel Ash, Wolverhampton. September 10 is talk on a club constructional project, the 24th is night on the air and October 1 is the AGM.

Wiltshire

Blackmore Vale ARS: M. R. Bailey, 11 Brines Orchard, Templecombe. Meets 2nd and 4th Tuesday in the Bell & Crown Inn, Zeal. September 10 is Tony Nailer from Spectrum Comms with the company's products and he'll judge the construction contest.

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

Cover Date	Deadline	For events from early
December	Sept 15	November
January '86	Oct 15	December
February '86	Nov 15	January '86

Yorkshire

Pontefract & District ARS: Colin Mills G0AAO (Pontefract 43101). Meets Thursdays, 8pm at the Carleton CC, Pontefract, on the top floor. Informal code classes and get-togethers are 7pm Wednesdays during the winter months. September 12 is the club constructional project and the 19th is G3ZIV and G3HCW on microwave techniques.

White Rose ARS: S. P. Clark G4YEK (Leeds 884481). Meets every Wednesday, 8pm at Moortown RUFC, Moss Valley, King Lane, Leeds.

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RAE MATHS All the practice and testing you need. With comprehensive reference sheet. Tape £9. **For ZX81-16k also.**
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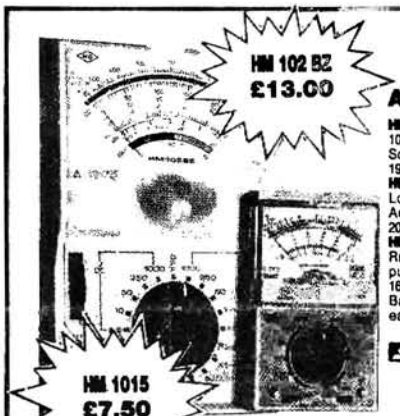

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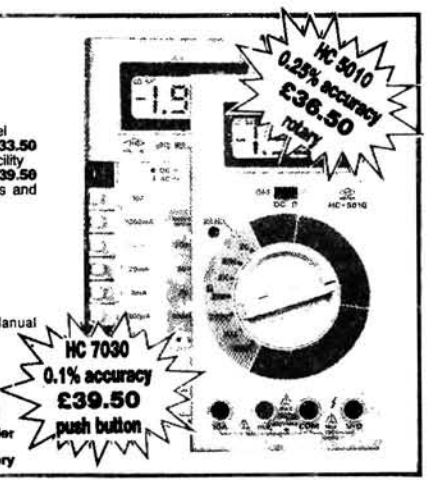

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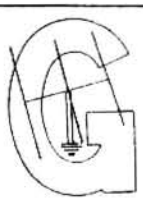

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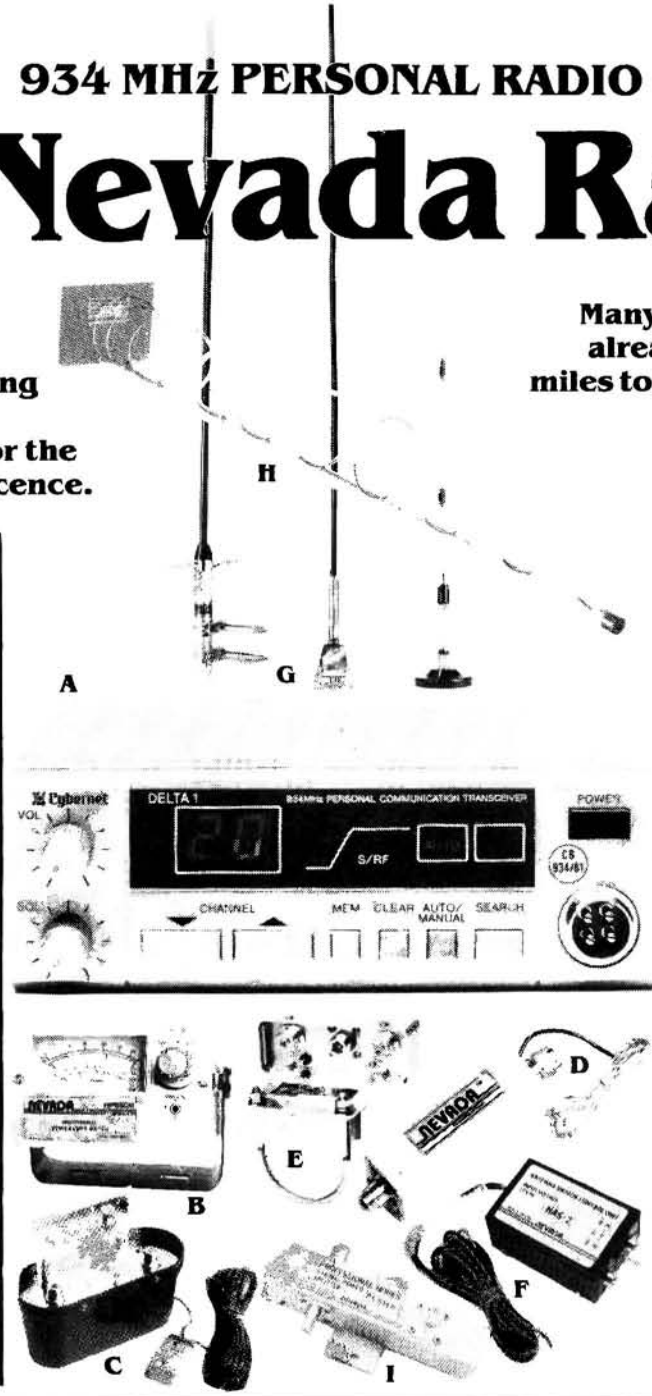

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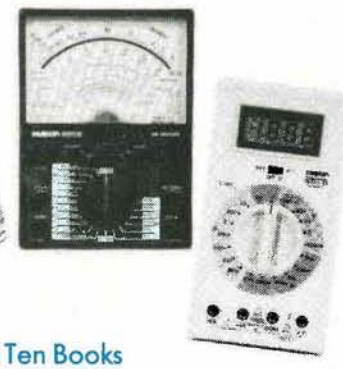

Top Ten Kits

THIS/LAST MONTH			DESCRIPTION	CODE	PRICE	BOOK
1.	(1)	⇔	Live-Wire Detector	LK63T	£2.95	14 XA14Q
2.	(2)	⇔	75W Mosfet Amp	LW51F	£15.95	Best E&MM
3.	(3)	⇔	Car Burglar Alarm	LW78K	£7.49	4 XA04E
4.	(7)	◆	Logic Probe	LK13P	£10.95	8 XA08J
5.	(5)	⇔	U/sonic Intrudr Dtctr	LW83E	£10.95	4 XA04E
6.	(4)	◆	Partylite	LW93B	£10.95	Best of E & MM
7.	(6)	◆	8W Amplifier	LW36P	£4.95	Catalogue
8.	(–)	◆	Noise Gate	LK43W	£9.95	Best E&MM
9.	(9)	⇔	Computadrum	LK52G	£9.95	12 XA12N
10.	(–)	◆	DXer's Audio Processor	LK05F	£9.85	7 XA07H

Over 100 other kits also available. All kits supplied with instructions. The descriptions above are necessarily short. Please ensure you know exactly what the kit is and what it comprises before ordering, by checking the appropriate Project Book mentioned in the list above.

Top Ten Books

1.	(1)	⇔	Loudspeaker Enclosure Design and Construction	WM82D	£3.25
2.	(4)	◆	Mastering Electronics	WM60Q	£4.70
3.	(3)	⇔	Remote Control Projects	XW39N	£2.75
4.	(9)	◆	How to Build Your Own Solid State Oscilloscope	XW07H	£2.10
5.	(5)	⇔	International Transistor Equivalents guide	WG30H	£3.25
6.	(8)	◆	How to Design and Make Your Own PCBs	WK63T	£2.05
7.	(2)	◆	Power Supply Projects	XW52G	£2.10
8.	(–)	◆	Radio Control for Beginners	XW66W	£1.95
9.	(–)	◆	How to Use Op-amps	WA29G	£2.45
10.	(7)	◆	Electronic Synthesiser Projects	XW68Y	£1.95

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