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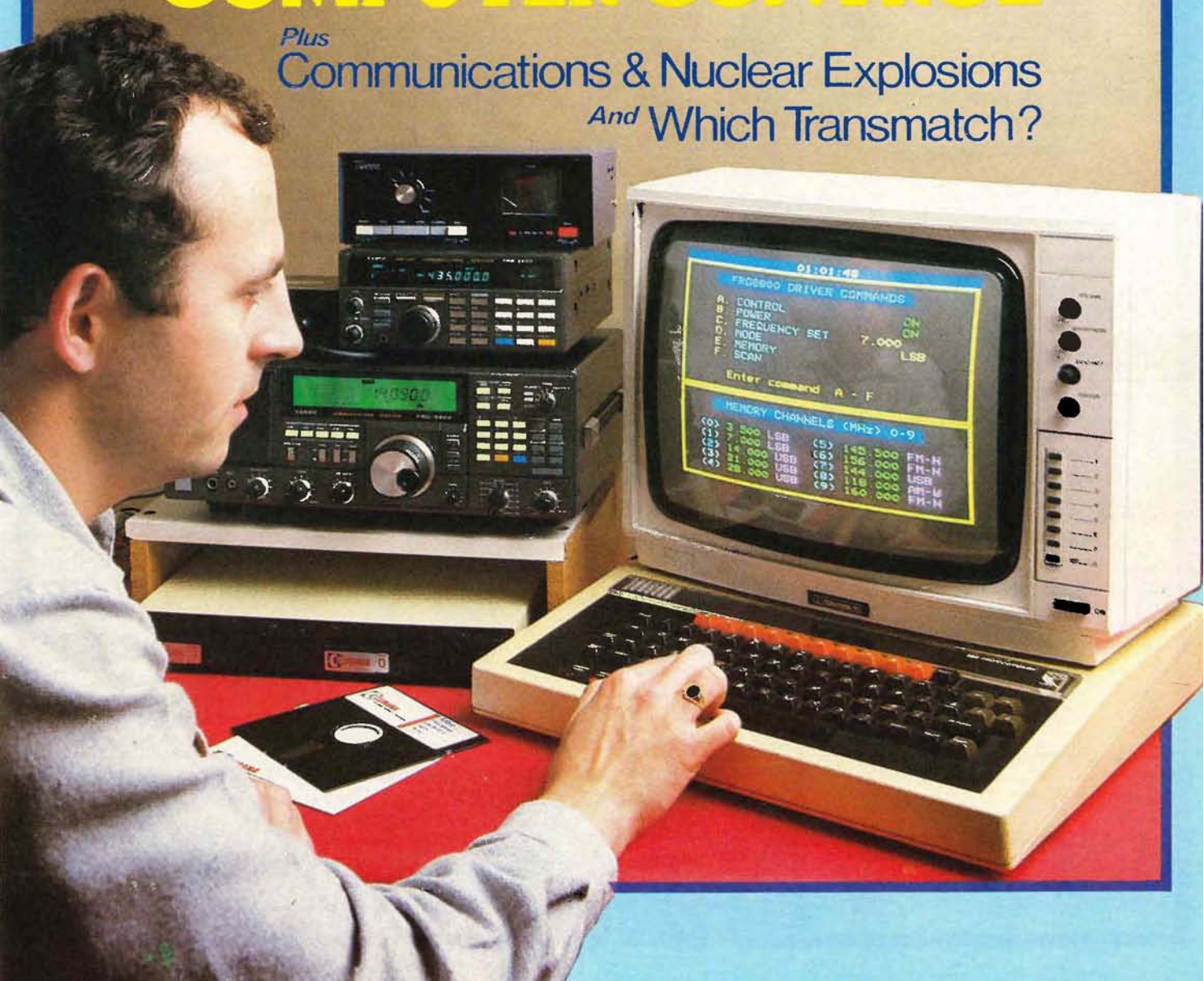
Practical Wireless

THE RADIO MAGAZINE

Amateur Radio Under COMPUTER CONTROL

Plus
Communications & Nuclear Explosions
And Which Transmatch?



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SP40	Mobile External Speaker	16.46	(1.00)
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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	

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TONO (G series)			
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2M130G	2m, 10-15W in, 110-130W out, preamp	159.00	(2.50)
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MICROWAVE MODULES			
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LPM 432 1 50	70cm, 1W in, 50W out, preamp	197.00	(2.50)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	197.00	(2.50)
LPM 432 10-50	70cm, 10W in, 50W out, preamp	167.00	(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	30-430MHz 20/200W	41.50	(1.50)
WELZ			
SP15	1.8-160MHz PWR/SWR	49.00	(1.50)
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)
SP600	1 8-500MHz PWR/SWR	106.00	(1.50)
TOYO			
T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(1 50)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(2.50)
SX200	VHF/UHF Scanner	299.00	(2.50)
SX400	VHF/UHF Continuous Coverage	598.00	(2.50)
AOR2001	VHF/UHF Continuous Coverage	378.01	(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	P.O.A.	(—)
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)
IC790D	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)
SI NA 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	199.90	(2.50)
GLNA 433e	70cm Pre amp	79.90	(2.50)
TVVF 144a	2M Transverter	239.90	(7.50)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	29.90	(1.50)
FL2	Multi-mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	33.90	(1.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
DC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

Tono 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	329.00	(2.50)
MICROWAVE MODULES			
MM2001	RTTY to TV converter	189.00	(2.00)
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	1650.00	(—)
SP980	Speaker	79.95	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	170.00	(5.00)
FC700	Tuner	119.00	(2.00)
FT77s	10w. version	449.00	( )
FMU77	FM Board for FT77	28.35	(1.00)
FT757	HF Transceiver	829.00	( )
FC757	Auto A.T.U.	290.00	(2.00)
FP757HD	Heavy Duty PSU	200.00	(2.00)
FP757GX	Switched Mode PSU	180.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	349.00	( )
FT290	With Mutek front end fitted	379.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
MMB11	Mobile Bracket	31.45	(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	10.19	(1.00)
YM49	Speaker Mike	20.30	(1.00)
FT230	2m 25w FM	269'00	( )
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	225.00	( )
FT209R	NEW 2m H/Held/C/W FNB3	269.00	(—)
FT208	2m H/Held	209.00	(—)
FT708	70cm H/Held	189.00	(—)
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	24.90	(1.00)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	869.00	(—)
430/726	70cm Module for above	295.00	(2.50)
FRT7700RX	A.T.U.	49.85	(1.50)
MH1B8	Hand 600 8pin mic	17.65	(1 00)
MD1B8	Desk 600 8pin mic	74.75	(1.00)
MF1A3B	Boom mobile mic	19.95	(1.00)
YH77	Lightweight phones	15.70	(1.00)
YH55	Padded phones	16.10	(1.00)
YH1	L/weight Mobile H/set-Boom mic	15.70	(1.00)
SB1	PTT Switch Box 208/708	18.00	(1.00)
SB2	PTT Switch Box 290/790	17.25	(1.00)
SB10	PTT Switch Box 270/2700	17.25	(1.00)
QTR24D	World Time Clock	34.50	(1.00)
FF501DX	Low Pass Filter	31.45	(1.00)
NEW MODELS			
FRG8800	HF Receiver	559.00	(—)
FRV8800	Convertor 118-175 for above	90.00	(1.00)
FT703	70cm H/Held	P.O.A.	(—)
FT709	70cm H/Held	P.O.A.	(—)
FT270R	2m 25W F.M.	349.00	(—)
FT270RH	2m 45W F.M.	399.00	(—)
FT2700R	2m/70cm/25W/25W	559.00	(—)
FRG 9600	60-905MHz Scanning RX	475.00	(—)

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

9502B	3 core Lighter Duty	69.50	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	22.95	(1.00)
Welz	2 way 'n' Skts	41.90	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1 00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(1.00)
T100	100W Dummy load	35.20	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	69.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)
ALTAI	KDM6 Dip Meter	68.60	(1.50)
TAU	SPC3000 HF Tuner	349.95	(5.00)

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NEXT MONTH

SEPTEMBER '85 ISSUE

WEATHER SATELLITES

What's up there?
Beginning a new series by Terry Weatherley G3WDI.

SAFEGUARDING THE GLA-1000 LINEAR AMPLIFIER

ON SALE 2 AUGUST

PW COMMENT

FOLLOWERS of Steve Birkill's recent series *Satellite TV—the Ultimate DX* will be interested to hear that a relaxation of the licensing rules governing the reception of TV programmes from low-powered satellites was announced in parliament on May 23. Currently, six English-language programmes can be received in the UK from low-powered satellites.

So far as reception in individual homes is concerned, the only licensing requirement is a special Wireless Telegraphy Act licence for satellite reception, which will cost you £10.00. Application forms are available from the Radio Regulatory Division, Department of Trade and Industry, Room 513, Waterloo Bridge House, Waterloo Road, London SE1 8UA. In most circumstances, planning permission for the antenna dish will be required.

The relatively high cost of the antenna dish and the rest of the receiving system at present is likely to keep the number of private installations down, but at least this relaxation is a step in the right direction.

With this issue, the price of your copy of *PW* goes up to £1.00. We've tried to put off the evil day, knowing how short money is for so many of you, but could resist our own economic pressures no longer. We feel that *PW* still represents the best value for money among the UK radio enthusiast magazines, and we have plans to increase that value still further in the autumn. Watch this space! **G3GSR**

the TRIO two metre base station, the TS711E.

Several weeks have passed since I took delivery of my own TRIO TS711E. The Japanese home market model has returned whence it came and I am using the version designed specifically for the UK market. The rig is perfection epitomised. For todays two metre operator any base station with less facilities and performance then the TS711E would be far from acceptable. The TS711E's receiver performance in sensitivity and in its ability to reject unwanted adjacent signals is outstanding. I'm not talking about test equipment figures though undoubtedly these will soon be published. My own on air operating with the rig has enabled me to hear what I previously couldn't.

The transceiver covers the 2 metre band from 144 to 146 MHz in FM, USB, LSB and CW modes. When switched to the auto position the rig correctly selects mode according to frequency, a great advantage to the blind operator. Simple up/down frequency shift is provided both on the transceiver front panel and microphone.

IF shift is available, an essential when considering todays crowded 2 metre band. For more penetrating transmitted audio when working DX speech processing can also be switched in.

The TS711E has two separate VFO's and forty channels of memory. Each memory remembers frequency, operating mode, simplex or repeater shift and whether or not a tone burst is to be included. Frequencies stored in memory can be readily transferred to either VFO A or B. The VFO can be either free running as for SSB or CW operation or electrically switched to a "click" stop where it changes frequency in 12.5 or 5 kHz steps. The two VFO's can quickly be put on the same frequency, an aid when checking the position of a strong adjacent signal with one VFO whilst remaining on your operating frequency with the other.

Frequency scan on VFO can be either between or outside user set limits. On memory the transceiver can either scan the entire memory contents or be instructed to look at those frequencies of a particular mode. The TS711E has a timed hold on an occupied channel.
Both priority channel and the immediate recall of your local net frequency are possible with the TS711E.

For those with failing sight or a blind operator the TS711E 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.), other rigs just bleep but, when fitted with the VS1 optional board, a digitally encoded girls voice will announce both frequency and where applicable, whether the rig is switched to repeater shift.

TS711E 2 metres £768.00 carr £7.00

TS811E 70 centimetres £895.00 inc. VAT carr £7.00

also on seventy, the TS811E.

The Directors and Staff of
Lowe Electronics
have pleasure
in inviting you, your wife and family
to their 1985 open day
to be held on Saturday 17th August.

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AR 2001,
a VHF & UHF monitoring & surveillance receiver.

The AR2001 is ideal for VHF/UHF monitoring and surveillance. Having FM narrow, FM wide and AM the AR2001 receives amateur radio, television sound and broadcast FM, VHF and UHF airband and the new legal FM CB transmissions.

The AR2001 monitor offers low cost, high performance receiving facilities over the frequency range 25-550 MHz (no gaps).

All normal reception modes are included, and a wide variety of scan and search facilities under microprocessor control, make the AR2001 a versatile tool for many applications . . .

General off air monitoring
Spot frequency monitoring/measurement
Selective multi frequency analysis
Spectrum surveillance
Detection of unwanted transmissions
(Bug hunting)
. . . and much more!

Frequency coverage is continuous from 25 to 550 MHz, in selectable increments of 5, 12.5, or 25 KHz, and modes of AM, FM (wide), or FM (narrow). Any mode can be used at any frequency or channel spacing.

Typical measured sensitivity for FM (narrow) is 0.25 microvolts or less, for 12dB SINAD, with comparable performance on the other modes. The sensitivity is maintained at any frequency between 25 and 550 MHz.

Twenty memory channels are provided, with easy keyboard entry and recall. Each memory channel stores frequency and mode information without any restrictions. The memories can be recalled manually, or may be automatically scanned in sequence for unattended monitoring.

The complete 25 to 550 MHz range can also be scanned, in 5, 12.5 or 25 KHz steps and a further facility is the ability to search between two user programmed limits with high to low or low to high searching.

A comprehensive search facility between two user designated frequencies is included. Two speeds of search are available as is the receiver's ability to scan frequencies from low to high or high to low. So that nothing is missed a delay function can be switched in to cope with the slight pause between transmissions when listening to a two way simplex conversation. Carrying on the receiver's ability to miss nothing memory channel 1 holds the priority frequency which is monitored at 2 second intervals.

Front panel readout of information is by liquid crystal display, which shows frequency, mode, channel number, frequency increment, delay engaged, etc.

A crystal controlled real time clock is provided in the AR2001, and time readout is also by the liquid crystal display.

Power requirements for the AR2001 are 12-14V dc at .3-.5A, and a suitable 230V/12V power supply is included with the set, as is a power lead to allow operation from a battery or other power source.

AR2001 Monitor ..... **SPECIAL PRICE £345.00** inc VAT carriage £7.00

specification.

Receiver coverage	25 to 550 MHz	
Receiver sensitivity	Narrow band FM	0.3 uV (12 dB SINAD)
	Wide band FM	1.0 uV (12 dB SINAD)
	AM	0.5 uV (10 dB S/N)
Receiver selectivity	NFM +−7.5 kHz at 6 dB	
	+−20 kHz at 70 dB	
	WFM +−50 kHz at 6 dB	
	+−250 kHz at 60 dB	
	AM +−5 kHz at 6 dB	
	+−10 kHz at 70 dB	
Number of memory channels	20	
Receiver circuitry	PLL synthesizer/high level DBM with up conversion	
I.F.	1st 750 MHz, 2nd 45.03 MHz, FM (wide) 5.5 MHz, FM/AM 455 kHz.	
Antenna Connector	50 ohm BNC	
Audio output	1 watt at 10% distortion	
Power requirements	12/14 volts DC at 300-500 mA	
Display	Liquid crystal	
Dimensions	138mm wide × 80mm high × 200mm long	
Weight	1.1 Kg	

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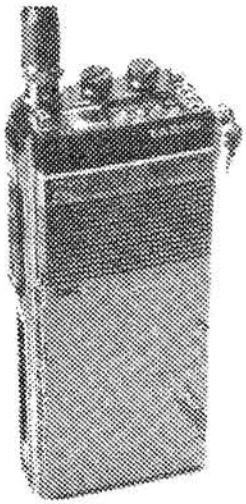


FT203R/FT703R

The FT203R/FT703R is packaged in a lightweight, high-impact plastic case, providing, comfort and convenience with high durability. The small size is made possible by using chip components.

Thumbwheel frequency selectors (with 5KHz up button) plus standard repeater shift. Volume and Squelch controls are on the top panel along with jacks for the antenna (BNC), external microphone and earphone.

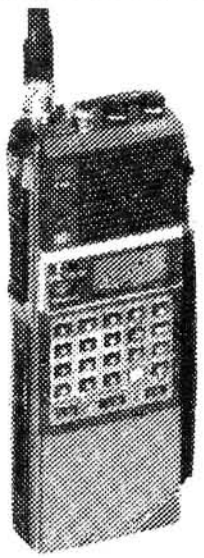
With the optional external YH-2 Headset, the internal VOX system provides voice-actuated transmit/receive switching, for "hands free" operation when mobile or walking. (As FT209R).

Also included is an S/PO meter for monitoring of relative power output and signal strength. (As FT209R).

The FTE-2 1750Hz Tone Burst Generator, which is standard, is activated manually by a button on the side of the FT203R. (As FT209R).

A range of slide-on Nicad packs or AA-cell cases provides the optimum power source for your needs (As FT209R).

144-146MHz	430-440MHz
–10KHz (+5KHz)	10KHz (+5KHz)
Supply: 5·5-13V DC	Supply: 5·5-13V DC
IF's: 10·695-0·455Hz	IF's. 21·6-0·455MHz
Selectivity. ±6KHz @ –6dB (2:1SF)	Selectivity: ±12KHz @ –6dB (2:1SF)



FT209R/FT709R

The FT209R/FT709R with two 4-bit CPU's and a lithium backed RAM offers features far beyond anything yet conceived, in a package smaller and lighter than any previous CPU-controlled transceiver.

Ten memory channels allow storage of either standard +/– shifts, or independent Tx and Rx frequencies for any split/repeater shift on any channel, with touch-key reverse or simplex on either frequency. Scanning capabilities include step-programmable full or partial band memory bank priority scanning etc.

Battery life is greatly extended with a programmable power saver which activates the receiver momentarily at programmable intervals.

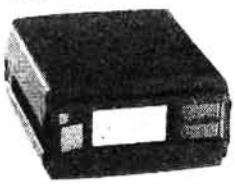
Nineteen soft rubber dual function keys provide greater control than ever, yet operation remains easy: the keypad is carefully arranged, colour-coded and most commands are one-touch operations.

Fat ¼" LCD digits are complemented by ten memory and nine special function indicators showing status at a glance.

144-146MHz	430-440MHz
25/12·5KHz	50/25KHz
Supply: 6-15V DC	Supply: 6-15V DC
IF's 10·7-0·455MHz	IF's: 21·6-0·455MHz
Selectivity: ±7·5KHz @ –6dB (2:1SF)	Selectivity: ±15KHz @ –6dB (2:1SF)


FBA5
CELL CASE


FNB3
10·5V NiCd Pack


FNB4
12·5V NiCd Pack


NC9C/NC18C
Slow Charger


PA3
DC Adaptor


YH-2
Mic Headset (Vox)


MH-12A2B
Speaker Mic


CSC (Series)
Soft Case


MMB-21
Mobile Bracket


NC-15
Quick Charger

MODEL, SUPPLIED CELL, POWER OUTPUT (Hi/Lo), CASES, DIMENSIONS

FT203R	FT703R	FT209R	FT709R	FT209RH
1·5/0·2W*, c/w FBA5 CSC6 65W, 34D, 153H mm	1·5/0·2W*, c/w FBA5 CSC6 65W, 34D, 153H mm	1·8/0·2W*, c/w FBA5 CSC10 65W, 34D, 168H mm	1·8/0·2W*, c/w FBA5 CSC10 65W, 34D, 168H mm	2·3/0·3W*, c/w FBA5 CSC10 65W, 34D, 168H mm
2·5/0·3W, c/w FNB3 CSC6 65W, 34D, 153H, 482gms	2·5/0·3W, c/w FNB3 CSC6 65W, 34D, 153H mm, 480gms	2·7/0·3W, c/w FNB3 CSC10 65W, 34D, 168H, 512gms	3·0/0·3W, c/w FNB3 CSC10 65W, 34D, 168H mm, 555gms	3·7/0·4W, c/w FNB3 CSC10 65W, 34D, 168H, 512gms
3·5/0·4W, c/w FNB4 CSC7 65W, 34D, 172H, 430gms	3·5/0·4W, c/w FNB4 CSC7 65W, 34D, 172H, 435gms	3·7/0·4W, c/w FNB4 CSC11 65W, 34D, 186H, 520gms	4·0/0·4W, c/w FNB4 CSC11 65W, 34D, 186H mm, 570gms	5·0/0·5W, c/w FNB4 CSC11 65W, 34D, 186H mm, 520gms

BATTERY AND CHARGER OPTIONS

FBA5 Battery Case Only
9V* 6 "AA" Dry, 7·2V 6 "AA" NiCd
FNB3 NiCd Pack 10·8 volts, 425mAh
NC9C (15 hours), NC15 (1 hour)
FNB4 NiCd Pack 12·5 volts, 500mAh
NC18C (15 hours), NC15 (1·5 hours)

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Frequency Modulation (FM-F3-G3E)
Variable Reactance linear modulator
Sensitive quality, 2K ohm condensor mic
±5KHz Max Dev, 16KHz max bandwidth
Transmitter spurious output –60dB

Large Range of Accessories available
Supplied with YHA14A/YHA44D helical antenna and appropriate soft case
Sensitivity: 0·25µV for 12dB sinad
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A.F. Output: 450mW into 8ohms @ 10% THD

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D3000286	Curtis Keyer	£33.35
DCTONE	DC Power Cable	£11.50
RAMTONE	Non-volatile memory board	£14.95
FMUTONE	FM unit	£48.30
XF8 9KA	6KHz Am filter	£19.95
XF8 9KCN	300Hz CW filter	£19.95
XF8 9KC	600Hz CW filter	£19.95
XF10 7KC	800Hz CW filter	£18.40
FTV107R	Transvertor (main frame only) 2 band capability	£49.00*
WMTONE	Workshop Manual	£15.00
PARTONE	Parts List	£10.00
FT77	Transceiver 8 band mobile multimode 100 watts	£479.00
FT77S	Transceiver 8 band mobile multimode 10 watts	£449.00
MRKT77	Calibration market unit option	£10.75
FMUT77	FM Board option	£28.35
AMUT77	AM Board option	£23.35
FP700	Base station external power supply speaker	£170.00
FC700	Antenna tuner	£119.00
XF8 9KC	600Hz CW filter	£19.95
MMB16	Mobile mounting bracket	£15.70
FV700DM	Digital V.F.O.	£220.00
FTV700R	Transvertor main frame only	£135.00
50TV	6m Transvertor module All models FTV	£125.00*
70TV	6m Transvertor module All models FTV	£130.00*
144TV	2m Transvertor module All models FTV	£170.00
430TV	70cms Transvertor module All models FTV	£299.00*
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FC757AT	Automatic antenna tuner – Ham bands	£290.00
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MMB20	Modbile mount for FT757GX	£20.70
FIF611‡	Computer interface for PC6001 (NEC)	£48.70
FIF65(A)‡	Computer interface for Apple II	£60.95
FIF80(A)‡	Computer interface for PC8001 (NEC)	£122.65
FIF232C‡	Computer interface RS232C	£64.80
TST757	Technical Supplement FT757	£8.50
FT980	Transceiver General Coverage Rx Amateur Tx	£1,650.00
D3000286	Curtis Keyer	£33.35
SP980	External speaker with audio filter	£79.75
SP980P	External speaker with phone patch	£105.00
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XF8 9HC	600 Hz CW filter	£33.35
XF8 9GA	6KHz Am filter	£33.35
D410004	Interconnect lead FT980 to FC757AT	£32.95
TST980	Technical Supplement FT980	£8.50
FL2100Z	Linear 160-10M (9 band) 1·2KW P.I.P	£739.00
FRG7700	Receiver 0·15-30·0MHz AM CW SSB-FM	£385.00
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MEMG7700	Memory option	£74.75
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FRV7700A	Convertor 118-130, 130-140, 140-150MHz	£75.00*
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FRV7700C	Convertor 140-150, 150-160, 160-170MHz	£75.00*
FRV7700D	Convertor 118-130, 140-150, 70-80MHz	£75.00*
FRV7700E	Convertor 140-150, 150-160, 118-130MHz	£75.00*
FRV7700F	Convertor 150-160, 160-170, 118-130MHz	£75.00*
WMRG7700	Workshop manual FRG7700	£9.00
FRG8800	Rx 0·15-30·0MHz AM/CW/SSB/NBFM	£559.00
FRV8800	Convertor 118·175MHz	£90.00
FRVWFM	Module for wide band F.M.	T.B.A.
FRG9600	60-905MHz Scanner FM (WB+NB) AM (W+N) SSB	£475.00
PA4C	DC Power Supply (240V AC)	T.B.A.

FT203R	Tx/Rx Thumbwheel, 2M, 1·5W c/w FBA5	£195.00
FT203R	Tx/Rx Thumbwheel, 2M, 2·5W c/w FNB3	£225.00
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FT703R	Tx/Rx Thumbwheel, 70cm c/w FNB3	£259.00
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FBA5†	7·2/9V cell case only (6×AA)	£8.80
FNB3†	10·8V NiCd Pack (425mAH)	£36.40
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CSC7	Soft carrying case (FNB4)	£8.45
FTS7†	Sub Audio Tone Board (replaces FTE-2)	£29.90
YH21	Headset (PTT via vcx)	£15.70
MH 12A2B†	Speaker microphone	£18.80
MMB21†	Mobile hanging bracket	£8.05
PA3†	Charger/eliminator for 12V DC	£18.00
NC9C†	Charger mains (FNB-3)	£9.60
SMC8-9AA†	Charger mains (13 Amp style)	£8.80
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FT209R	Tx/Rx "Keyboard" 2M, 2·7W c/w FNB3	£269.00
FT209R	Tx/Rx "Keyboard" 2M, 3·7W c/w FNB4	£275.00
FT209RH	Tx/Rx "Keyboard" 2M, 2·3W c/w FBA5	£245.00
FT209RH	Tx/Rx "Keyboard" 2M, 3·7W c/w FNB3	£275.00
FT209RH	Tx/Rx "Keyboard" 2M, 5·0W c/w FNB4	£280.00
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FT709R	Tx/Rx Keyboard, 70cms c/w FNB3	£289.00
FT709R	Tx/Rx Keyboard, 70cms,, c/w FNB4	£295.00
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CSC11	Carrying Case (FBN4)	£9.95
FT208R	Tx/Rx Handheld, 2M, 2·5W, Keyboard	£209.00
FNB2	Nicad Battery Pack	£24.90
FBA2	Battery patck sleeve (fits FNB2)	£3.85
FBA3	Charging sleeve (for use with FT207 acc)	£5.00
SMC8.9AA	Slow charger (13A style)	£8.80
NC9C	Slow charger	£9.60
NC7C	Base Master	£34.65
NC8C	Base Master with quick charge and PSU	£64.80
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SMCFLC5	Heavy duty leather case	£25.30
FTS32	Tone squelch unit	P.O.A.
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WMT208	Workshop Manual FT208	£9.00
WMT708	Workshop Manual FT708	£9.00
FT690R	Transceiver 6M 2·5W multimode synthesised	£289.00*
FT290R	Transceiver 2M 2·5W multimode synthesised	£349.00
FT790R	Transceiver 70cm 1W multimode synthesised	£299.00*
SMC2·2C	Nicad cell, 2·2 A/hr 'C' size	£2.70
NC11C	Slow charger (180mA)	£11.50
SMC8C	Slow charger (220mA) (13A style)	£10.35
MMB11	Mobile mount	£31.45
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YM49	Hand 600, 7 pin, speaker/mic	£20.30
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YD148A	Stand 600/50K, 4 pin	£28.35
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SP55	External Mobile speaker	£14.95
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*Special offer limited stocks.
‡Matches FT980 and FRG8800
†Accessories for FT209 also.

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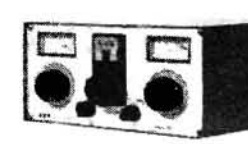
YR901	Local Loop Unit	£19.00
FT901	Warc Mod Kit	£20.00
FT901	Counter Unit	£95.00



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FRG-9600

The FRG-9600 all mode scanning receiver covering 60 through 905MHz continuously, with 100 keypad programmable memory channels.

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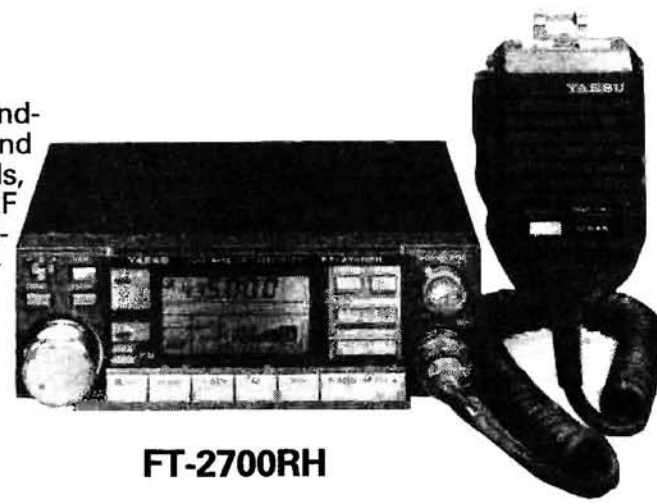
Yaesu CAT System provides a direct control link to the cpu allowing operators with personal computers to add virtually unlimited customized control functions.

12VDC, using the optional PA-4B/C AC adapter from the AC line.

£475.00

FT-2700R 2M and 70cm Dual Bander. True full duplex cross band working. Dual receiver front ends, local synthesisers, IFs and Tx RF stages. Two 4-bit microprocessors. Ten memories. Programme mem scanning. Reverse repeater. Priority function. 25W continuous either band. Full duplex or simplex. Distinctive graphical two colour PO/S meter. Optional voice synthesiser. **£559.00**



FT-2700RH

FT-270R/RH

2m FM Transceiver. Dual 4-bit microprocessors. Dual VFOs. Ten memories. Programmable band scan limits. Priority function. Two scan modes, fixed (6 sec's) or carrier controlled scan resume. High visibility back lit LCD, 5mm digits. Unique aluminium die cast ducted heat sink.

Power outputs: FT-270R 25W and 3W, FT-270RH 45W and 5W (fan assisted cooling).

Optional voice synthesiser.

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FT209RH FROM £245.00
FT709R FROM £28.00

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FT203R FROM £195.00
FT703R

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All mode base station. Inbuilt AC power supply. Three modules can be installed at once for cross band operation or pushbutton band selection. 70cm module includes GaAs FET preamp. HF module for 21, 24.5 and 28MHz (make your 726R into a Five Bander). Dual VFOs, tuning 20Hz/Step or local channel steps. Speech processor for SSB and for CW optional 600Hz Narrow filter. IF shift/width. Eleven memories (Store mode as well as band). Scanning. Programmable limited band scan. Priority Function. Full duplex cross band (with sattelite IF unit fitted). Independent tuning/mode and meter functions for Tx/Rx. Dual meters. Seven digit display plus two digit clarifier display. AGC. Noise blanker. RF gain tone/squelch for all modes. Continuously adjustable power, 10w full output. **£869.00**

ALL MODE HF COMPUTER AIDED TRANSCEIVER

- Gen. coverage receiver.
- 12 memory channels. • LSB, USB, CW, AM, AFSK, FM. • Two VFOs.
- Personal computer compatible.
- Tuning steps. 10Hz. 5KHz. + 500KHz (Band). • Centre zero meter.
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- Power out SSB. CW. 100w(PEP) AM 25w, FM. FSK 50w.
- IF notch and Audio peak filters. **£1650.00**

FT-980

FRG-8800

FRG-8800. All band all mode Gen coverage receiver. 150kHz to 30MHz. Large liquid crystal display. 100Hz frequency resolution. S/SINPO "bar graph" type indicator. 21 button keypad. 12 internal memories and multi function scanner. AM, SSB, CW and FM. Wide and narrow bandwidths. All mode data/freq can be stored in mem's. Selectable AGC rates. Two 24 hr clocks. 8-bit CPU. Three scan modes. Yaesu CAT system comparable with most personal computers. Programme scanning.

FRV-8800 optional VHS converter (mounts inside) adds 118MHz to 173.999MHz coverage to the 8800 with full frequency readout.

FRV-8800 £90.00 **£559.00**

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AE

ICOM GREAT SETS...

IC-735, The Complete HF Radio

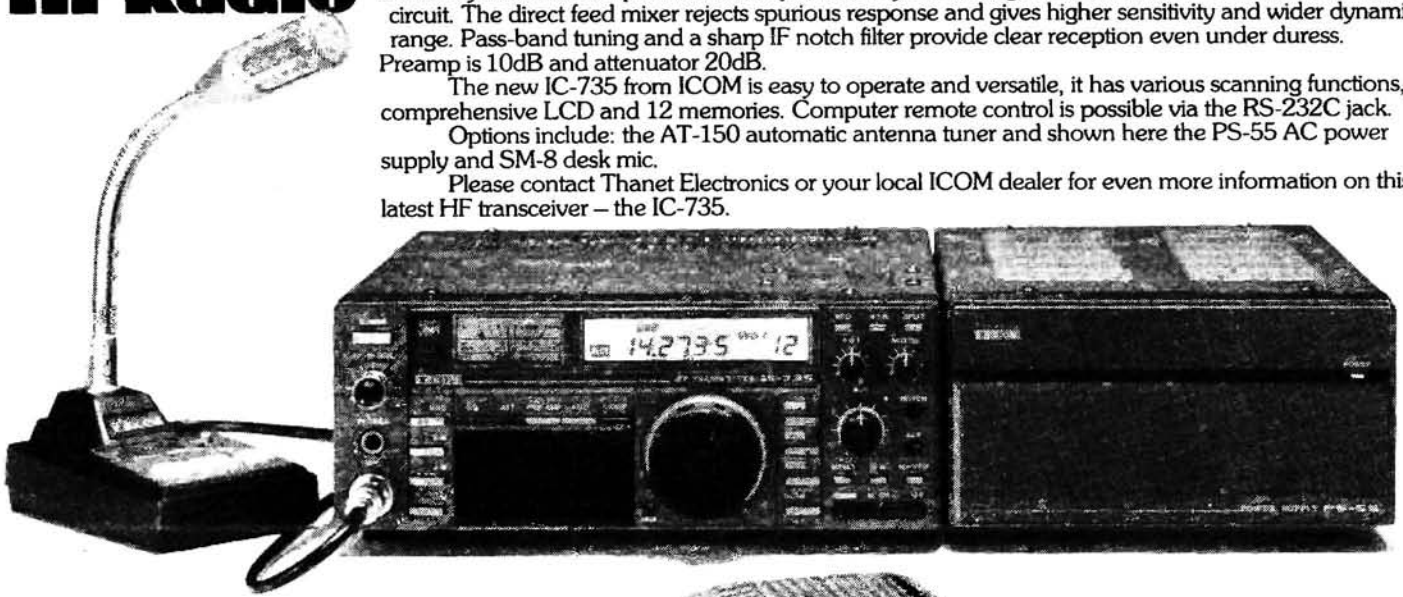
This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC-735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100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

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

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. A great future is predicted for the IC-3200E.

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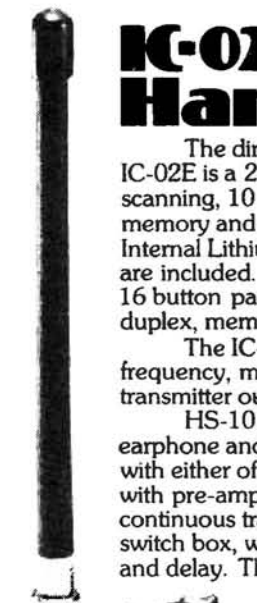
GREAT VALUE



IC-02E, IC-04E Handheld

The direct entry microprocessor controlled IC-02E is a 2 meter handheld, features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions.

HS-10 Headset also available, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.

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 a 24 hour answering service.

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Authorised Icom dealers in the UK

Alexian Electronics Ltd. Edinburgh, 031-554 2591.
Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585.
Arrow Electronics Ltd , Chelmsford Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
Dressler (UK) Ltd., London (S. Harrow). 01-558 0854.
D.W. Electronics, Widnes Cheshire, 051-420 2559.
Hobbytronics, Knutsford Cheshire, 0565-4040. Until 10pm daily.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics. Co. Cork, Ireland, 01035321 632725.
Radio Shack Ltd., London NW6, 01-624 7174.
Scotcomms, Edinburgh, 031-657 2430.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043
Reg Ward & Co. Ltd., S.W. England, 0297-34918.
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.

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2 metre Yagis.
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10144 – 10 element, 11.4dBd gain £37.00.
15144 – 15 element, 14dBd gain £49.00.
Order now while stocks last.

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We don't just sell Yaesu or Trio or Icom – we sell them all, so its for you, our customer, to decide – perhaps with our advice if you require it which rig is best for your purpose.

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Peter G4KKN will be pleased to welcome you with the customary cup of Brenda's coffee, and the freedom to wander round the shop to select and try out the masses of equipment at your leisure.

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OUR PRICE £449

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Also — 1KHz/100Hz on SSB
Interface for computers
Video output

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100w multi mode transceiver
Gen. cover. RX
FM & CW narrow, fitted

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Dual Band FM 2M and 70cms
Full Duplex Operation
Aesthetically pleasing LCD Display/'S' Meter
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Optional Voice Synthesiser
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'+' '−' Repeater shifts with reverse facility
10 Channel Memory
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One piece diecast centre chassis
50(H) × 150(W) × 168(D) mm

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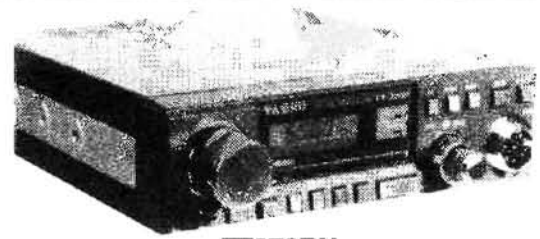

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Fully synthesised 2M FM Transceiver
45W (RH), 25W (R) Power Output
Dual VFOs
Optional Voice Synthesiser
1MHz/25kHz/12½kHz Steps
10 channel memory
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Memory Priority and Programmable Memory Scan
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17 Function LCD Display, LED 'S' Meter
One piece diecast alloy chassis
(Fan assisted cooling on 45W model)
140mm W × 40mm × 180mm D

£349

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FRG8800	With VHF Module	£559
FT757GX	H.F. Gen. Cov. Transceiver	£779
FC757AT	Auto Tuner	£259
FP757HD	Power Supply	£269
FT726	With 2M Module	£799
ICOM		
IC751	H.F. Transceiver	£1,229
IC745	H.F. Transceiver	£869
ICR70	Gen. Cov. Receiver	£589
ICR71	Gen. Cov. Receiver	£675
IC271	VHF Base Station	£689
IC471	UHF Base Station	£789
KENWOOD/TRIO		
TS940	H.F. Transceiver	£1,595
TS430	H.F. Transceiver	£695
R2000	Gen. Cov. H.F. Receiver	£469
R600	Gen. Cov. H.F. Receiver	£275
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200	16.47	2.36
250	19.92	2.77
350	24.64	2.84
500	30.69	3.10
750	41.28	3.70
1000	55.65	4.20
1500	71.79	5.95
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350	24.64	2.84
500	30.69	3.10
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2000	86.38	5.50
3000	121.14	O/A
6000	240.19	O/A

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6	3	8.07	1.70
8	4	9.43	1.86
10	5	10.31	2.05
12	6	11.43	2.15
16	8	13.62	2.33
20	10	18.33	2.86
30	15	22.79	2.85
60	30	46.69	4.50
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3	6	18.68	2.52
5	10	33.34	3.36
6	12	42.38	3.68
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2	4	9.12	1.94
3	6	10.87	2.01
4	8	14.80	2.28
6	12	18.91	2.39
8	16	26.75	2.89
10	20	31.74	3.29
12	24	37.99	3.36

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3	6	13.96	2.10
4	8	15.91	2.31
5	10	20.11	2.36
6	12	22.95	2.78
8	16	32.26	3.20
10	20	37.55	3.57
12	24	43.28	3.68

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Sec V	A	Pri	P&P
3-0-3V	.2	3.26	.96
6×2	1A×2	3.62	1.30
9-0-9	.1	2.72	.96
9×2	0.33×2	2.53	.96
8-9×2	.5×2	3.53	1.30
8-9×2	1A×2	4.48	.96
15×2	.2A×2	2.53	.96
12-0-12	.05	3.21	.96
20×2	.3×2	3.55	1.30
20-12	.9	4.34	1.70
15-20×2	1A×2	5.88	1.70
15-27×2	.5A×2	5.07	1.50
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1	2	4.64	1.48
2	4	7.34	1.68
3	6	8.50	1.95
4	8	10.15	1.99
5	10	12.55	2.10
6	12	14.20	2.30
8	16	19.00	2.39
10	20	21.92	2.48
12	24	24.36	2.63
15	30	27.96	3.20
20	40	37.42	5.14

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3000	75.22	5.90
5000	113.11	O/A

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1000	35.43	3.97
2000	63.49	4.76
3000	91.14	O/A

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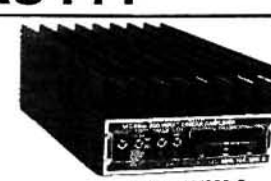
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The 1984 Girl Technician Engineer of the Year

Barbara MacDermott, age 24, a Senior Integration Engineer from Hatfield, Hertfordshire, has won the 1984 Girl Technician Engineer of the Year Award. At a ceremony in London, earlier this year, Air Commodore H. F. Renton CB, ADC, Director of the Women's Royal Air Force, presented her with the prize of £250 and an inscribed rose bowl. A special award of £100 was presented to Karen Andrews, 23, a Hardware Development Engineer from Coventry, the runner-up in this nationwide competition.

Barbara, who is currently engaged in engineering design and co-ordination, with responsibility for specific projects, is employed at British Aerospace, Dynamics Group at Hatfield, Herts. Her career enthusiasm stems from her aeronautical interest coupled with the wide-ranging challenges that arise from the many engineering disciplines associated with her work. Barbara's past achievements include being chosen as the British Aerospace First-Year Technician of the Year in 1978, and later gaining a Duke of Edinburgh's Gold Award.

This award, which is sponsored by the Caroline Haslett Memorial Trust and the Institution of Electrical and Electronics Incorporated Engineers, aims to focus attention on electrical and electronic engineering as a worthwhile professional career for women.

For details of the Award and how to nominate candidates for the 1985 award, contact: *The Institution of Electrical and Electronics Incorporated Engineers, 2 Savoy Hill, London WC2R 0BS. Tel: 01-836 3357.*

WAB AGM

The Annual General Meeting of the Worked All Britain Awards was held at Drayton Manor on Sunday 12 May 1985, when some 70 members were present.

The Awards Manager in his report, stated that 670 awards had been made in the current year and that book sales had been very good.

The Treasurer reported that £250 had been donated to RAIBC and £100 to QTI Letters of thanks had been received.

Thanks were expressed to G3UQT and G4IAR who resigned from the posts of Secretary/Awards Manager and Treasurer respectively. Both had held these posts for the past five years.

The Officers and Committee for the coming year will be, G3UQT President, G4IAR Secretary/Awards Manager, G4EOF Contest Manager, G4GEE Treasurer, G3ABK, G4FQO, G4HPU, GW4OFQ, and Maurice Williams representing s.w.l.s, and G4KSQ.

Membership is open to any licensed amateur or s.w.l. upon the purchase of a book. These are obtainable from G4KSQ, QTHR on receipt of £4.00 plus £1.00 for p&p Cheques etc. should be made payable to The Worked All Britain Awards Account.

Transatlantic DX on 144MHz

The West Kent Amateur Radio Society are mounting an expedition to a favourable location on the west coast of Eire to attempt the first direct transatlantic contact on 144MHz.

The group will leave the UK on Saturday 24 August and return on Sunday 8 September, during which time it is hoped that by using their considerable skills and with a little assistance from their sponsor's product, a well known lager, their transmissions will reach where other's transmissions have not reached before.

For further information, contact: *Nigel Peacock G4KIU, 64 Cleveland, Tunbridge Wells, Kent TN2 3NH. Tel: (0892) 33586.*

Portable Peril?

If you have recently purchased an electric drill or similar motor driven mains powered hand tool, take note of the following incident reported to *PW* by a concerned radio amateur.

The equipment in question was a lightweight sander and had been fitted with the latest r.f.i. suppression components, as demanded by EEC regulations. The sander performed exceedingly well and after an initial trial run was unplugged from the wall socket and the lead coiled in—all quite normal until a finger contacted the pins of the, by now, trailing 13A plug. A far from modest "jolt" was received, coupled with some disbelief—surely the equipment had been disconnected for nearly a minute? Out came the shack multimeter, which verified that some 230V, discharging initially at 40mA existed across the plug pins, even though approximately 60 seconds had elapsed after its removal from the wall socket!

To someone with a heart condition, or up a ladder etc., the effects of this form of electrical shock could result in more than bruised muscles.

Investigations at the retailers resulted in checks being made on the remaining stock—all exhibited the same characteristics and were immediately withdrawn from sale and the manufacturer informed. The suspect items were collected, tested and pronounced to be **within** specification, which allows for a 0·1μF capacitor within the filtering network. However, the manufacturer has subsequently authorised modifications to be made, which reduce the capacitor discharge time to the point where residual charge is removed very rapidly. The remaining question is, how many more of these tools are now in circulation?

Radio Boat Trip

The Crofton Society, a branch of the Kennet and Avon Canal Trust, who run the world's oldest working steam engine and The Narrow Boat Jubilee, announce another Amateur Radio Boat Trip. The outing, on Sunday 4 August, will leave Wootton Rivers (near Marlborough, Wilts.) at 2.00pm for a four hour trip to Crofton Top Lock and back. A licensed bar will be available and the crew will consist of radio amateurs.

Tickets are limited and cost £2.00 for adults and £1.00 for children, and are bookable through: *G1CEI, 11 Mull Close, Oakley, Basingstoke, Hants. Tel: (0256) 781540.*

Expeditions

Attention all award chasers! Two operators from Wales will be activating the rather rare Universal Locator square IO78 (the old QTH square XS) in the north of Scotland from 14 to 28 July 1985.

Under the callsign GM4VVX/A, Clive O'Hennessy GW4VVX and Steve Jones GW6TGX will be devoting a considerable amount of their family holiday time to provide activity, principally on 144MHz but also on 3·5 and 7MHz, to cover WAB NC50.

Operating on 144·333MHz for the v.h.f. band and on the h.f. band via WAB nets most evenings, these chaps plan to make the most of the opportunity and plan to fire-up transmissions from 0600UTC (GMT) for a few hours in the morning and between 1600 and midnight at the other end of the day. Should enhanced propogation conditions occur, continuous operation is intended—thank goodness for their sympathetic XYLs.

To arrange spot skeds, the chaps would also like to hear from active amateurs located in IO78, please contact: *Clive O'Hennessy GW4VVX. 3 Bryn Lane, Pontllanfraith, Blackwood, Gwent NP2 2PG. Tel (0495) 224587.*

The Square Bashers Expedition Group from South Wales are planning to visit XJ Square (The Lizard, Cornwall) during August and hope to take advantage of the Perseids meteor shower.

As in previous years, the group will be operational on 144MHz, 430MHz, 1·3GHz and 2·3GHz, but with the addition of 70MHz and perhaps some of the other microwave bands (homebrew permitting).

The regular operators GW3NYY, GW4LXO, G8TFI and GW8TVX will be there, plus one or two others. It is hoped to use the special event callsign GB2XJ.

Further details from: *Richard Hope GW8TVX, 75 Priors Way, Dunvant, Swansea, West Glamorgan SA2 7UH.*

Crossband

We are indebted to Ian Abel G3ZHI for a copy of a recent letter sent to him by the Department of Trade and Industry, which settles two frequent points of argument about UK Class B Amateur Radio Licence conditions. We quote:

"1. When a Class B licensee operates the station of a Class A licensee under his direct supervision, then the terms and conditions of the Class A licence prevail. It therefore follows that the Class B licensee can send Morse code from the Class A licensee's station (using the Class A callsign) under these circumstances.

2. There has been a lot of confusion over whether a Class B licensee can work crossband v.h.f.-h.f., and you will be interested to know that a press release is shortly to be issued which clarifies the position. Essentially, it is perfectly in order for a Class B licensee to receive an h.f. transmission from another licensed amateur station and to respond by transmitting on frequencies for which he/she is licensed to transmit."

Can I Help You!

Are you the secretary, organiser or general dog's-body of your local radio club or any other group whose functions may interest readers of *PW*? If so, let me know and I will endeavour to publicise your rally, get-together, whatever, through this column.

Special Event Stations

Orkney Viking Venture is the name given to a series of camps for Ranger Guides to be held in Orkney between 20 and 30 July 1985, as part of the celebrations to commemorate the 75th Anniversary of the founding of the Girl Guide movement.

One site is at a croft cottage at Orphir (WAB HY30) overlooking Scapa Flow, from where licensed Ranger Guides will be operating the special event station GB2OVV on the h.f. bands (s.s.b.) and 144MHz (s.s.b. and f.m.).

Further information from: *GM6WPA or GM3IBU, both QTHR.*

The Reading and District Amateur Radio Club will be organising the special event station GB0RAR (Reading Amateur Radio) between noontimes of Saturday and Sunday 17 and 28 July 1985, and will be active on all h.f. bands, plus 144MHz and 430MHz.

The venue is to be the foyer of Shire Hall, Berkshire County Council HQ, Shinfield, Reading, Berkshire, which is easy to find and a large free car park is available.

GB0RAR will differ from the normal special event station, in that the operators are to be sponsored via the number of contacts they make, to raise funds for charity.

For further information, contact: *Andrew Barrett G8DOR, Chairman RARC, 38 Haw Lane, Bledlow Ridge, Bucks.*

No Licence Required

The Department of Trade and Industry have asked us to publish a note to owners of metal detector/pipefinder equipment, that operate within the schedule governing these instruments. It reads:

"Users of metal detectors/pipefinders are reminded that since 1 January 1981 it has not been necessary to have a radio licence to use this equipment. The only conditions applying to the use of metal detectors are those contained in the Schedule to the Wireless Telegraphy (Exemption) Regulations 1980 (SI 1980 No 1848) which relate to frequency ranges—field strength and spurious emissions. The use of metal detectors must not cause undue interference to other wireless telegraphy apparatus."

The DTI also point out that the exemption from Wireless Telegraphy Act licensing of metal detectors does not absolve users in any way from the need to obtain permission to enter, search and dig land and to keep off protected archaeological and other sites.

Department of Trade and Industry, Waterloo Bridge House, Waterloo Road, London SE1 8UA. Tel: 01-275 3000.

Rallies and Events

The McMichael Amateur Radio Society, in conjunction with the Burnham Beeches RC, the Chiltern ARC and the Maidenhead and District ARC, is staging the third annual Home Counties Mobile Rally at the McMichael Sports and Social Club, Bells Hill, Stoke Poges, Bucks. on Sunday 21 July, starting at 11.00am.

There will be masses of attractions for the radio amateur, plus general interest stalls, fairground attractions and children's rides to keep all the family entertained. Refreshments will be available, as will a CAMRA beer tent.

The British Amateur Electronics Club will be holding their 20th annual Electronics Exhibition at the Shelter, The Esplanade, Penarth, South Glamorgan, over two weeks from Saturday 13 July to Saturday 27 July, but will be closed on 15, 16, 18, 22, 23 and 25 July.

Incidentally, for members of BAEC, the *Hon. Sec., John Margetts,* has moved to *53 High Oaks Close, Locks Heath, Southampton SO3 6SX.*

COMMUNICATIONS & NUCLEAR EXPLOSIONS

by M. J. Darby

If any country is attacked by nuclear weapons, the effects of the heat flash, nuclear radiation, blast and fall out on living things will doubtless produce a state of unprecedented chaos in the region beneath the detonation and in the surrounding area, the size of this area depending on the bomb yield.

In such a situation one may imagine that the telephone combined with amateur and other radio operators would be vital, while power supplies will be required for numerous purposes. Much is known about the probable conditions in such a situation, but much less is known about the fact that in certain circumstances virtually all radio and electronics equipment will be rendered useless. This has vast implications; even if one tries to start a vehicle employing semiconductor ignition or semiconductors for other purposes (as is the case in more and more modern cars), they will be unlikely to operate. To add further problems, in the circumstances to be discussed all power supply lines and telephone systems are likely to fail.

The area over which radio, telephone and other communications may fail can be as great as a whole continent and it seems likely that power supplies over a similar area may also be tripped into the off state, just as a thunderstorm can trip the circuit breakers in a local region and disconnect the power for a short or long period.

Communications Black-out

This article looks into the reasons why communications and power black-outs can occur, reviews briefly why relatively little has been known about the phenomena until recently and discusses some of the ways in which equipment can be protected so that it is more resistant to the effects produced by certain nuclear explosions.

A communications black-out over an area such as a whole continent can be caused, as far as we know, by a single nuclear explosion of adequate size outside the earth's atmosphere. This explosion may be at such a high altitude that little, if any, damage occurs on the ground other than to electronic equipment and to power line supplies.

Let us consider the basic physics of the formation of the intense electric and magnetic fields over such a vast area which can do far more damage to electronic, telephone and similar equipment than the normal effect of an atomic explosion on buildings, people and living things.

Although a number of processes combine to form the intense fields, by far the major cause arises from gamma radiation generated above the atmosphere. An enormous amount of energy is liberated in a nuclear explosion. In the case of a fairly large bomb of the equivalent of one million tonnes of TNT, the energy released is of the general order of around 10^{14}kJ. This produces an intensely hot fireball at a temperature of perhaps ten million degrees Celsius with an internal pressure of well over a million times the normal atmospheric pressure at the surface of the earth.

A substantial fraction (perhaps one-thousandth) of the energy released by the explosion appears as prompt gamma rays, although further gamma rays are produced by the radioactive material formed after the termination of the explosion itself. The prompt gamma rays carrying an energy of perhaps 10^{11}kJ for a 1 megatonne bomb spread in all directions with the speed of light. As shown in Fig. 1, a large fraction of them strike the upper atmosphere where they undergo collisions with electrons in the air and knock electrons out of atoms of the air by the Compton[1] effect.

The electrons are very light and move rapidly through the rarified air at nearly the speed of light, but the heavy positive ions formed from the remaining parts of the atom move much more slowly simply because they are heavy. The negative electrons are thus separated from the positive ions in the upper layers of the rarified air and this results in enormous voltages being generated. The explosion itself may occur at any altitude from about 30km upwards, although for altitudes above about 1000km the proportion of gamma rays reaching the earth's atmosphere is reduced. The bomb itself may be either a fusion bomb in which heavy atoms such as uranium-235 or plutonium-239 split into lighter atoms. In either case communications blackouts can be produced, although the thermonuclear weapons are usually designed to produce the larger energy releases and therefore the more widespread disruption of communications, etc. The majority of the effects which generate the intense fields due to the formation of enormous voltages occur at an altitude of some 30km.

The energy associated with the high voltages at some 30km altitude may be around one thousandth of the energy of the gamma radiation striking the upper air, so a fraction of perhaps one millionth of the energy released by the explosion appears as an intense electro-magnetic pulse over a wide area of the earth's surface. The energy of this pulse may total around 10^7 to 10^8kJ per megatonne over a wide area and this is adequate to produce rapidly rising electric fields of an intensity of the order of some 50kV/m at their peak.

The electrons in the upper atmosphere move with nearly the speed of light, so this results in the electric field at the surface of the earth rising very rapidly in time. Indeed, the peak occurs only about 10ns after the start of the pulse. This corresponds to a power level of nearly 10^{18}W, but the pulse is quite short, declining by a factor of perhaps five times in 1μs and disappearing almost completely within 100μs. All of these figures are approximate ones for a 1 megatonne explosion.

Alternatively one may say that there is a peak power level of a few megawatts per square metre (or thousands of times the power of bright sunlight) for a very short time over a huge area of the earth.

Although nuclear explosions at any altitude or even underground generate some electro-magnetic pulse energy, it is explosions just outside the atmosphere or where there is some other asymmetrical factor (such as the surface of the earth) which produce the greatest effect. If an explosion occurs at a moderate height in the atmosphere, the various parts of the electro-magnetic field tend to compensate one another at considerable distances, so the effect is much more localised than explosions above the atmosphere.

The Damage

In the presence of an electro-magnetic field of the order of 50kV/m, almost any type of semiconductor device which is not exceptionally well shielded is likely to be destroyed even though the pulse only has a nanosecond duration. It does not matter whether the device is being used or not at the time of the occurrence of the pulse.

Let us first consider the case of a typical small-signal transistor. When fields from an electro-magnetic pulse suddenly appear, the leads are often long enough to pick up the 1mJ or so of energy required to permanently destroy the transistor. If the transistor is connected in a circuit, even if the circuit is not connected to any form of antenna, enough energy will be picked up in most cases to destroy the transistor. Even if the transistor is mounted in a completely screened metal box without any small gaps where the high frequency components of the pulse could gain entry, the transistor could easily be destroyed by energy picked up by a connection such as a mains lead, an input or output socket. Much protection can be given to the device by enclosing it in a screened container and placing transient suppressors at every connection made to the outside of the box; the transient suppressors used must act extremely rapidly owing to the fast rise time of the pulse and are normally gas-filled tubes specially designed for the purpose.

Power transistors are not damaged quite so easily, a field of perhaps ten times the minimum required to damage a small signal transistor being needed to ruin a power transistor. Thermionic valves are nearly a million times as resistant to electro-magnetic pulse damage than transistors and tend to resist energy levels as great as a joule. Components such as coils, including iron-cored transformers and electric motors, are still more resistant and may remain undamaged even if they absorb levels approaching 1MJ.

On the other hand, the highly complex v.l.s.i. chips such as microcomputers are even more susceptible to damage from electro-magnetic pulses than small transistors. It has been estimated that energy levels as low as 1μJ or perhaps even less are adequate to destroy complex microchips. Microwave diodes are also extremely susceptible to electro-magnetic field damage at energy levels down to well under 1μJ.

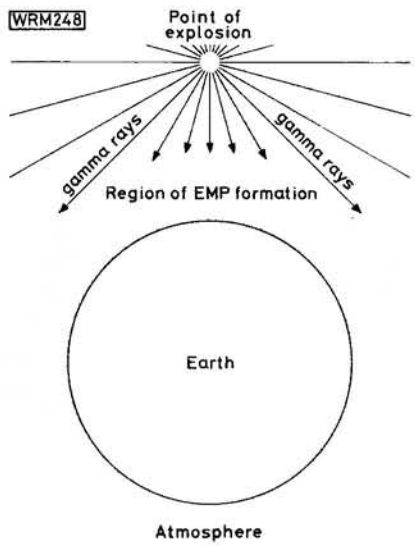


Fig. 1

In 1976 a Soviet MIG-25 fighter aircraft was flown to Japan by a defector. Investigators were extremely surprised to find that this most modern aircraft not only had a body shell designed to form a screen which shielded all the onboard radio communications and electronic equipment, but the radio equipment employed subminiature thermionic valves! It is believed these were employed rather than the more modern semiconductor devices so as to provide a greater resistance ("hardening") against nuclear electro-magnetic pulses.

Electronic microcircuits are widely used in modern telephone equipment. Telephone lines readily pick up electro-magnetic pulses from nuclear explosions and it is only to be expected that a nuclear explosion above the atmosphere will be able to put the whole of a nation's telephone system out of action. Indeed, the whole network in a continent the size of Europe could be put out of action just at the very time when it is most needed.

Nuclear weapons have doubtless been designed for the specific purpose of creating the greatest possible electro-magnetic field intensity over an area to deprive it of communications and mains power supplies. The affected country would then be at a very severe disadvantage if attacked by nuclear or by non-nuclear weapons.

In the power line systems, it is well known that lightning strikes can cause tripping of the system protective devices and severe electrical storms can cause considerable disruption of electricity mains supplies. However, this is a relatively local effect, so one can easily imagine the problems which occur when a nuclear generated electro-magnetic pulse causes the power supplies over a whole continent to be tripped into the off state! The nuclear pulse field intensities are likely to be considerably greater and shorter in duration than lightning pulses.

Concept Development

The biological and other effects produced by the explosion of nuclear weapons have been widely discussed, but it is only recently that the electro-magnetic pulse hazards have been evaluated to any great extent. The reasons for this are rather interesting.

The existence of electro-magnetic fields from nuclear explosions and of the possible damage has been known for many years. Indeed, it has been reported that scientists predicted some effects before the first nuclear explosion in a desert in 1945 and the actual test caused the failure of certain instruments. Much of the information is classified, because of the hazards posed to a nation, but theoretical estimates were made in 1954, and in 1956 tests were carried out to try to ascertain whether the magnetic fields resulting from a nuclear explosion would be likely to cause the detonation of magnetic mines in the area affected by the pulse.

It was not until the 1960s that much attention was given to the damaging effects of the nuclear electro-magnetic pulses partly because all the equipment previously used had employed the relatively resistant thermionic valves and partly because the other terrible consequences of nuclear explosions had fully captured the attention of almost all investigators. In addition, the early explosions occurred at the top of a tower or, in the case of the only two nuclear explosions yet used in actual

warfare, in the middle atmosphere where electro-magnetic pulse effects are quite localised and relatively insignificant compared with other effects.

Not until 1958 did the US carry out high altitude tests at 43km and at 77km above the earth's surface to measure the effect on ionospheric phenomena and communications. The two major nuclear powers agreed to stop tests in 1958, but resumed in 1961. When the US exploded a thermonuclear test weapon above Johnson Island in the Pacific Ocean in 1962, it took some time before scientists appreciated that the failure of street lamps at Hawaii some 1300km distant and other electronic failures could be attributed to the effects of the explosion.

The US prepared to carry out tests above the atmosphere to measure the electro-magnetic field intensity on the surface of the earth, but shortly before the test equipment was ready, the US became a signatory of an atmospheric nuclear test ban. It is reported that this nation is still keeping the equipment ready to carry out nuclear electro-magnetic pulse measurements if ever the test-ban treaty should be terminated.

Simulators

Except for the limited facilities provided by underground testing, as far as is known no extensive measurements have been made of the electro-magnetic effects produced by nuclear explosions. However, the testing of military equipment for electro-magnetic pulse hardening is of such vital importance to the large nations that equipment has been made available at enormous cost to generate high intensity, rapidly rising pulses which simulate the nuclear generated pulses.

The first simulators could accept only single components, since the cost and complexity of a simulator rises sharply with its container size. Now the US has a simulator which can hold a B-52 bomber for testing: the pulses are generated by discharging two 5MV pulses into suitable transmission lines which surround the aircraft. Britain has three simulators at AWRE (Atomic Weapons Research Establishment), Aldermaston.

Hardening

Although equipment can be hardened against electro-magnetic pulses so that it is much more resistant to the effects of the pulses,. this is very expensive. This hardening is only likely to be partly effective and much depends on the magnitude of the explosion and the distance of the equipment from it. For reasons of cost, only military equipment is likely to be given the most thorough hardening against nuclear electro-magnetic pulses. One can replace semiconductor devices with thermionic valves, but this is not normally necessary and would be quite impractical in the case of the complex v.l.s.i. devices employed in computers. The most important military computers in Switzerland have been placed under the Alps to protect them from electro-magnetic pulses. since this was felt to be more economical than providing adequate protection in any other way.

Small items of equipment can be hardened, at least to some extent, more economically than larger items or items coupled to long lines. One cannot bury a complete mains power network or telephone network economically at a depth which would provide adequate protection against nuclear electro-magnetic pulses. Vital military communications channels may employ fibre optics which themselves do not pick up electro-magnetic pulses (although the transparency of the fibre can apparently be affected by the pulses for a limited time).

Pulse Weapons

It seems certain that nuclear electro-magnetic pulse generating weapons could be designed to throw the civilian telephone system of a nation out of action, especially in the case of a small nation. Such a civilian telephone network carries much built-in redundancy (that is, many circuit paths which can be used to connect two points of the network), but although military channels can be especially hardened to resist electro-magnetic pulses, the amount of redundancy is likely to be far smaller than in the civilian network.

Satellites

Even satellite communications are liable to be affected by nuclear generated electro-magnetic pulses. The gamma rays produced by an explosion in space can give rise to electro-magnetic pulses by interactions within the satellite and thus damage delicate microcircuits, etc. in the spacecraft. In addition, satellites can be blown to pieces by means of the so-called "hunter-killer" satellites.

Redundancy

The USA is believed to have responded to this problem by building a high redundancy into its much-used satellite communications systems. It does this by placing a small transmitter-receiver pack for military purposes only aboard many of its satellites which have a different primary purpose. It would be very difficult, if not impossible, for any nation to destroy all of the satellites having these transmitter-receiver packs.

Thus it seems unlikely that the US will be unable to transmit by satellite a message to any of its forces—perhaps even a message to launch a nuclear retaliatory attack.

An implication

One of the problems created by the generation of electro-magnetic pulses is that of having time to decide whether you are under nuclear attack whilst you still have the capacity to communicate with the vehicles (including submarines) which would launch a counter attack.

If you detect a vehicle moving from the direction of a potential enemy into your air space at an altitude of about 40km, it may well be designed to produce electro-magnetic pulses to put your communications systems out of action before a proper nuclear or other attack is launched by the enemy. You may therefore be tempted to launch a full scale retaliation before the possible electro-magnetic pulse generating weapon has exploded—with all the dangers such a trigger-happy situation implies for both sides.

Vital

Clearly it is vital to any nation that its Command, Control and Communications systems (C^3) for military purposes are not destroyed in the first seconds of an attack by a nuclear electro-magnetic pulse weapon. Military equipment hardening is therefore of vital importance, so that communications with and control over military forces can be maintained.

The electro-magnetic pulse from nuclear explosions is a vital factor of which all military leaders of the future must be fully aware and which may profoundly affect the progress of nuclear bargaining and, if the worst should ever occur, of nuclear war. ●

1) The Compton Effect is the elastic scattering of photons by electrons

WHICH TRANSMATCH?

by Tony Smith G4FAI

A previous article in *PW* (A Versatile ATU, April 1983) described the author's low power version of the "Ultimate Transmatch". This design, by Lew McCoy, W1ICP, first appeared in *QST*, journal of the American Radio Relay League, in 1961 and several versions were included in subsequent annual issues of *The Radio Amateur's Handbook*, published by ARRL.

The design became a standard, several commercial versions were produced and many amateurs constructed their own units. All gave sterling service over the years, doing exactly what was required of them—matching the transmitter output to a wide range of transmission line impedances. It would be no exaggeration to say that most users were highly satisfied with the performance obtained.

The 1981 *Handbook* introduced a new version, by Doug DeMaw, W1FB, known as the SPC (series/parallel/capacitance) Transmatch, which at first was judged by several writers to be merely the original transmatch "hooked up backwards". Appearances were deceptive however and debate on the respective merits of the two designs became quite heated!

DeMaw wrote to *QST* in July 1980 stating that the original transmatch was in effect a classical *T*-network which, under some transformation conditions, would degenerate into a high-pass network giving rise. in worst case conditions. to possible TVI and other forms of harmonic interference, if a low-pass filter was not used between the transmitter and the transmatch.

The SPC had been developed by him in an effort to maintain a bandpass type of response under all load conditions. He claimed a significantly better harmonic attenuation and a wider frequency coverage (particularly l.f.) for the same component values. He included details of a test, using a spectrum analyser, showing the response characteristics of a commercial Ultimate and of an SPC version, at 15MHz. The Ultimate's response at the second harmonic was down 11dB with the third harmonic down only 4dB, from the carrier frequency. The SPC response showed the second harmonic down 22dB and the third down 28dB.

QST published a response from McCoy in March 1981, pointing out that the FCC required a minimum of 40dB harmonic suppression from a transmitter's final amplifier stage. With 1000 watts output the second harmonic would only measure one tenth of a watt and the Ultimate "would knock that down at least 10dB more to one hundreth of a watt". Anything else, he claimed, would really be "gilding the lily".

Next on the scene was Walt Maxwell, W2DU, who in August 1981 produced a detailed analysis of both circuits. The half of the dual-section capacitor, in shunt with the input of the Ultimate was not only useless in the impedance matching function, he said, but actually caused a slight degradation in efficiency. He nevertheless found that the Ultimate did attenuate harmonics at all frequencies except the one at which it performed its intended impedance match. The harmonic mis-match was not too great though and he found that the addition of C4 in the SPC version increased the suppression of harmonics quite substantially.

The 1983 edition of the *Radio Amateur's Handbook* puts the matter quite tactfully. "Some Transmatches, such as the 'Ultimate', can exhibit a high-pass response (undesirable), depending upon the transformation ratio they are adjusted to accommodate. In a worst case condition the attenuation of harmonic currents may be as low as 3 to 6dB. Under different conditions . . . the attenuation can be as great as 20 to 25dB. The 'SPC Transmatch' . . . was developed to correct for the sometimes poor harmonic attenuation of the . . . Ultimate. The SPC . . . maintains a band-pass response under load conditions of less than 25 ohms to more than 1000 ohms (from a 50 ohm transmitter). This is because a substantial amount of capacitance is always in parallel with the . . . inductor. In comparison . . . at high load impedances . . . the Ultimate . . . will have minimal effective output capacitance in shunt with the inductor, giving rise to a high-pass response."

Modify the Ultimate

The author's QRP version of the Ultimate was devised in 1981—in blissful ignorance of the furore raging on the other side of the Atlantic. This unit has given highly satisfactory service and at the power levels used (typically 2–10 watts) the question of harmonic suppression has not been a particularly worrying issue. However, some of the other advantages claimed for the SPC did seem attractive and it was decided to modify the QRP unit without changing the component values or layout in any way.

This proved to be a very simple modification. Three wires only were broken and re-routed as shown in Table 1. Constructors who made up the original unit to the layout suggested will find that the existing wires will suffice for the new connections. On the front panel, the capacitor controls marked INPUT and OUTPUT are reversed, and should be re-marked accordingly.

TABLE 1

Break connections from	Remake connections
S1a to frame of C1	S1a to C2
Top of C1a to L1	Frame of C1 to L1
C2 to S1b	Top of C1a to S1b

Modifications to convert the PW QRP transmatch of April 1983 to an SPC transmatch. Layout and component values of the original unit remain the same. See Fig. 2

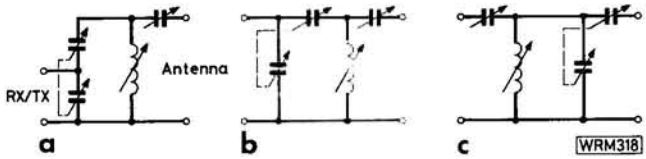


Fig. 1: (a) Original Ultimate Transmatch circuit. (b) Original circuit redrawn to show it is essentially a T-network with a shunt input capacitor. (c) The SPC Transmatch circuit. Re-alignment of the original components can give improved performance in some circumstances

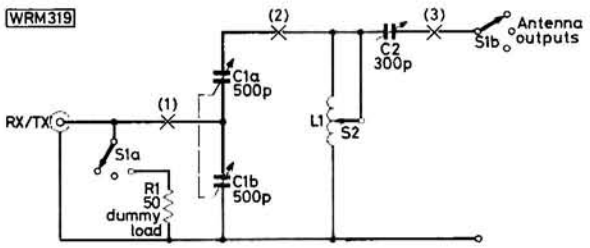


Fig. 2: Outline circuit of QRP Transmatch from *PW*, April 1983. Breaks to be made at points (1), (2) and (3)

There are several differences to be noted immediately the modified unit is brought into use. The number of coil tappings used for a given frequency are noticeably lower, supporting the claim that an inductance to cover the 3·5MHz band (80m) in the Ultimate circuit will extend to top band in the SPC. Tuning of the SPC is somewhat sharper than in the Ultimate because of the higher *Q* of the circuit, and it is necessary to re-tune more often to obtain complete band coverage in some cases. Slow-motion drives on both capacitors would be a help, especially where there is a considerable mis-match to cope with, but these are not absolutely necessary with the QRP version.

Results

In terms of performance, there seems to be no difference between the two circuits. The author's loop antenna functions equally well with either. Signals and reports are received at much the same level, on all bands, as before. Without appropriate test equipment, one must accept the assurance, given by the designer and his supporters, that the SPC keeps harmonic radiation down to a greater degree than previously.

This is, undoubtedly, a matter of some significance for higher power stations, but for a QRP operator there seems to be no real reason to abandon his tried and trusted Ultimate Transmatch. However, a constructor making a new unit could seriously consider the SPC. The layout and components from the previous article are quite suitable, although the main coil need only have half the number of turns. The switching for top band would not be necessary, but it would make for easier operation if slow-motion drives were fitted to the capacitors.

The tone of some of the debate on this matter has been quite acrimonious. It has been suggested that, in effect, the Ultimate is an out-dated and discredited design. The same could be said of Marconi's earliest radio equipment, but of course that is no way to describe it. Many inventions make a significant contribution to a particular aspect of technology, and give years of satisfactory service until some improvement makes a good design even better. There is no dishonour in that. We should be grateful to W1ICP for his work in pioneering the transmatch, and be pleased that W1FB found a way to improve it. ●

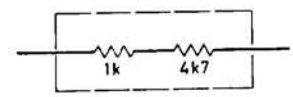
If you are an aspiring RAE candidate or just feel like testing your knowledge of amateur radio these multiple choice style questions will fill your needs. The questions are typical of those appearing in both the RAE papers, but they are not taken from these papers. For the answers, together with explanatory notes to help you, please turn to page 44.

Paper 2 Section 2. Electrical Theory—effective resistance in series circuits

Question 6–1

What is the effective resistance of these two resistors?

Q7



- ☐ **a.** 1kΩ
- ☐ **b.** 3·2kΩ
- ☐ **c.** 5·7kΩ
- ☐ **d.** 10kΩ

Paper 1 Section 1. Licensing Conditions—inspection

Question 6–2

Who has the power to inspect the Radio Amateur's station?

- ☐ **a.** a police officer with a warrant signed by a magistrate
- ☐ **b.** a Customs and Excise enforcement officer
- ☐ **c.** a person acting under the authority of the Secretary of State
- ☐ **d.** a member of the Government Communications Inspectorate

Paper 1 Section 1, Licensing Conditions—interference

Question 6–3

The Amateur Licence states that the radiation of harmonics and other spurious emissions shall be suppressed to such a level that

- ☐ **a.** they cause no undue interference with any wireless telegraphy
- ☐ **b.** they are 90 decibels below the peak envelope power
- ☐ **c.** they are not detectable by test equipment maintained at the station for this purpose
- ☐ **d.** they do not affect properly maintained radio or TV equipment

Paper 1 Section 1. Licensing Conditions—temporary premises

Question 6–4

How long can you operate from a /A address without informing the Local Radio Investigation Service Manager?

- ☐ **a.** 1 week
- ☐ **b.** 4 weeks
- ☐ **c.** 3 months
- ☐ **d.** 1 year

Mods

No.33
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.

SX-200

I have received dozens of letters from readers asking about modifications for the SX-200 scanner. Most requests are for frequency extension, which unfortunately is not possible. Following a visit to Garex, the importers of this model, I have several mods which are worth passing on. Peter Longhurst G3ZVI at Garex has had several years of experience of servicing this set and he has kindly given me a list of some of the alterations that can be carried out to improve the performance of some models. He does, however, suggest the use of a good quality soldering iron and solder sucker because plated-through holes are used extensively by the manufacturers.

RF Head

Mod 1 gives improved v.h.f. sensitivity and is applicable to sets that have the serial numbers 0123xxxx, 1013xxxx and 1063xxxx. Start by removing both the outer covers of the unit (make sure that you unplug the speaker leads from the rear of the set when taking the top cover off). Then remove the battery cover and undo the screws that secure the r.f. head. Lift off this head but take care not to damage the wiring loom which remains connected. Now locate R39 and R54 (1kΩ), remove them and replace them with 470Ω resistors. Next locate C59 and change it from 15pF to 5pF. Re-assemble the set and this mod is now done. No further adjustment should be necessary. The board and components are shown in Fig. 1.

Microphony

Mod 2 applies to sets with the serial numbers 0123xxxx and 1013xxxx. The problem of microphony usually shows up at frequencies above 108MHz and is easily cured. Simply solder the sub-v.c.o. screening cover at two of the twist lugs as shown in Fig. 4. Do not apply too much solder as this could make subsequent removal difficult.

Synthesiser Noise

Some of the early production models have a tendency to suffer from excessive synthesiser noise, but this can be cured just by moving some of the wiring. The first two mods (3a and 3b) refer to models with the serial numbers 0123xxxx and 1013xxxx.

(a) If there is a buzz on the audio that affects all frequencies, this is usually caused by interaction between the keyboard and volume control wiring. The answer is to separate the wires and re-tie the loom as shown in Fig. 4.

(b) If there is a buzz on the audio that is only noticeable at frequencies between 140 and 180MHz, this is usually caused by interaction between the back-up battery live lead and the 140–180MHz v.c.o. To cure this, re-locate the live lead as shown in Fig. 4. To do this it may be necessary to remove the v.c.o. box, in which case be careful with the multiway connectors.

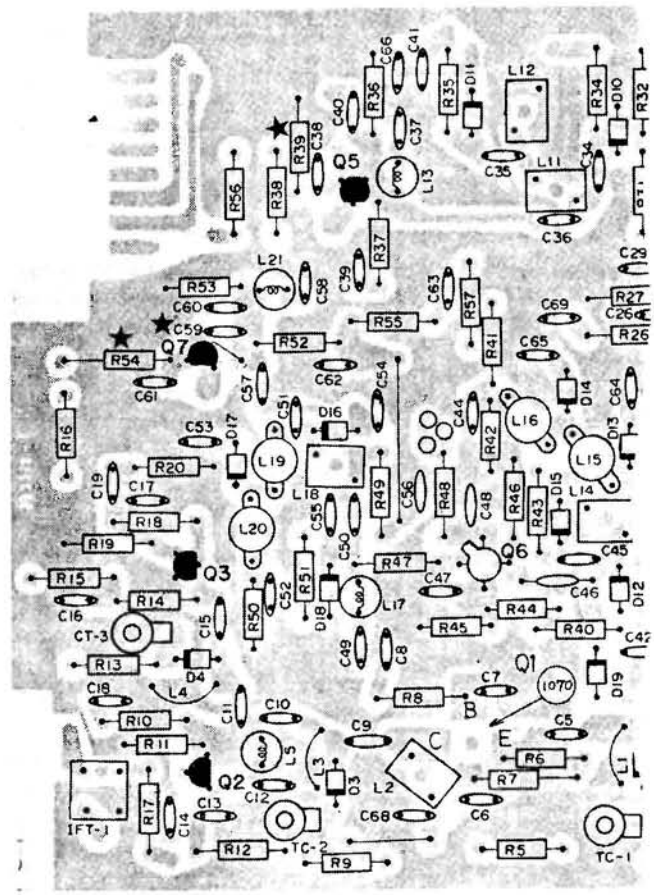


Fig. 1

(c) The battery back-up live lead radiates a considerable amount of noise and it may be worthwhile carrying out another minor mod to reduce this. One is to fit 22nF disc ceramic capacitors across the terminals of the battery holder and from live to ground where the battery lead lands on the p.c.b. under the r.f. head. It will be necessary to remove the head to do this. If the battery lead runs around the main loom along the side of the set, it should be shortened. Remove the batteries and disconnect the wire at one end. Re-route it straight across the set from back to front. Solder a scrap of stiff wire to the top of the sub-v.c.o. box and bend it into a clip to hold the shortened battery lead in place.

(d) The v.c.o. tuning line has been known to cause problems. Two noise suppression components (R178 and C1222) have been altered several times over various production batches in an attempt to optimise their performance. The preferred configuration is shown in the diagram. To change these components it will be necessary to remove the r.f. head.

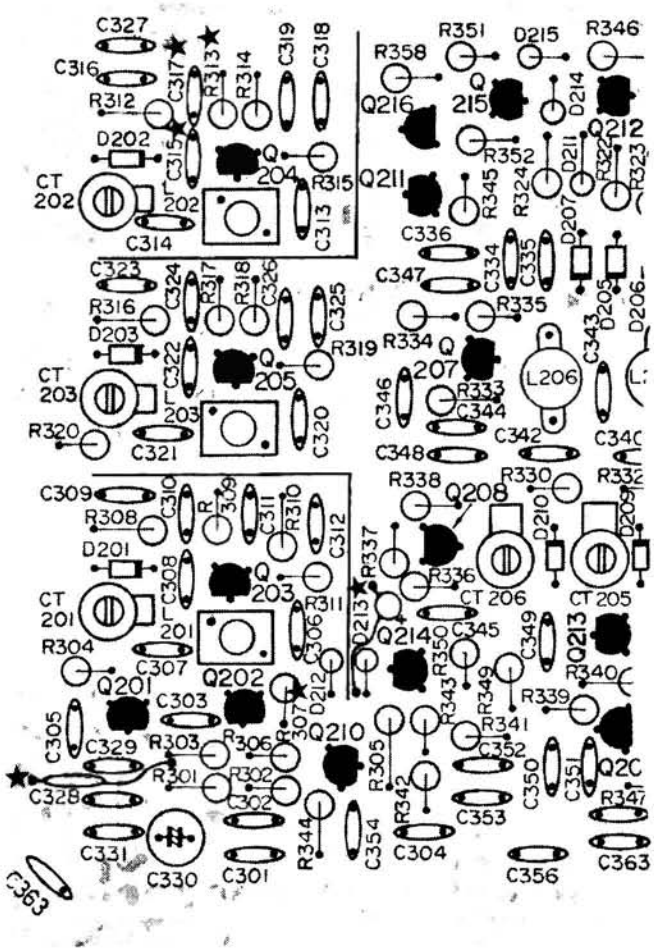


Fig. 2

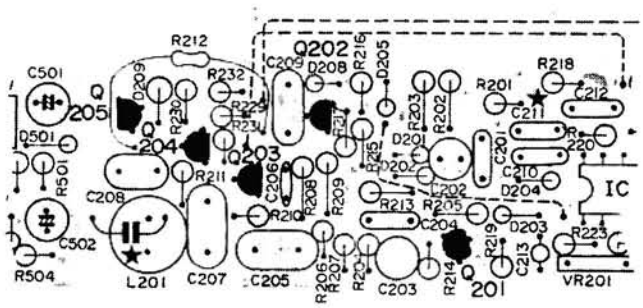


Fig. 3

VCO Modifications

The following mod (Mod 4) gives an improvement to stability in the 140 to 180MHz range. First remove the v.c.o. box by undoing the three small screws and unplugging the looms. Then change C315 and C317 from 4pF to 7pF (or 6·8pF). Change R313 from 1kΩ to 560Ω. When they have been changed, run some molten wax around the components—candlewax will do.

Remove R307 (47kΩ) and fit a ferrite bead over the longer of the two leads. Replace the resistor but turn it through 180 degrees, i.e. put the short lead in the hole previously occupied by the long one.

On the underside of the board, fit 4·7µF 16V tantalum capacitors in the positions shown in the diagram (Fig 2).

Replace the v.c.o. box and re-align as follows. Set the receive frequency to 180MHz and connect a digital voltmeter to the VC line (Fig. 4). Adjust CT202 for 11V. Then set the receive frequency to 140MHz and adjust L202 for 0·8V. Repeat the adjustments of CT202 at 180MHz and L202 at 140MHz until there is no further change.

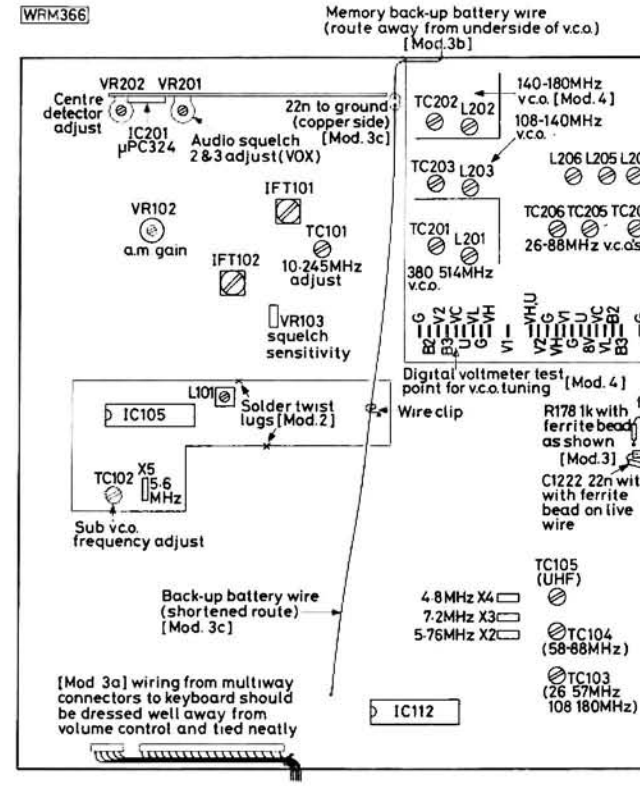


Fig. 4

Scan Control PCB

The VOX operation and audio filtering can be improved by changing C211 to 270pF and fitting a 33nF polyester capacitor from the junction of L201/R211 to ground. This component should be fitted to the underside of the board and clearance must be checked when the board is re-fitted. To check the operation of the VOX, set the SQUELCH switch to position 3, program in any convenient frequency, connect a signal generator which has been set to this frequency, set the MODE switch and the generator to FM (3kHz deviation) and turn the SQUELCH control until it is fully open. Then reduce the deviation to 200Hz and adjust VR201 until the receiver just mutes. Check that the mute opens when the deviation is increased to 500Hz. If you do not have a signal generator, set VR201 so that the receiver mutes on an unmodulated carrier but readily opens when modulation is present. Many thanks, Peter, for all this useful information.

Pass it on...

If you have a mod that you would like to pass on or if you have a request for a mod that you would like to carry out, please write to me at this address: R. S. Hall, Practical Wireless, Room 204B, Hatfield House, Stamford Street, London SE1 9LS.

Radio Wave

Part 7 by F. C. Judd G2BCX

The most common mode of propagation for v.h.f. and u.h.f. DX operation, usually referred to as "tropospheric", is brought about by complex weather conditions, so complex in fact that a fairly comprehensive knowledge of meteorology is necessary to fully understand the subject in its entirety. Basically, however, it is because of certain weather conditions that refraction occurs within layers of air in the lower part of the earth's atmosphere and radio waves at v.h.f. and u.h.f. are bent back to earth. These waves would otherwise travel in a straight line from the point of origin only to disappear into outer space since they are not reflected or refracted back to earth by the higher ionospheric F layer.

Whilst certain tropospheric conditions allow much longer distances to be covered than would be possible under "normal" conditions, this only holds good for frequencies above about 50MHz. There is some doubt as to whether transmissions in the frequency range 25 to 50MHz are propagated by tropospheric refraction but it has been considered a possibility. Note: The "troposphere" extends to about 15km above the surface of the earth and climatic conditions affecting the surface occur within this dense layer. At the upper level, convection currents turn over and move horizontally at speeds of several hundred kilometres per hour—the jet streams exploited by supersonic aircraft. There are other modes of v.h.f./u.h.f. propagation that will be dealt with later.

Tropospheric Propagation

Refraction of very high frequency radio waves takes place when air masses become stratified into regions with differing dielectric constants and if the boundary between two masses of air is sharply defined, then waves arriving at grazing angles may be directly reflected or refracted (gradually bent) so that they travel back towards earth. **Temperature inversion** is the most common cause of tropospheric refraction. With "normal" conditions the temperature in the lower atmosphere decreases at approximately 3 degrees per 300 metres of height at a constant rate but if this rate decreases further for some particular reason. then a temperature inversion may occur allowing v.h.f./u.h.f. wave bending to take place.

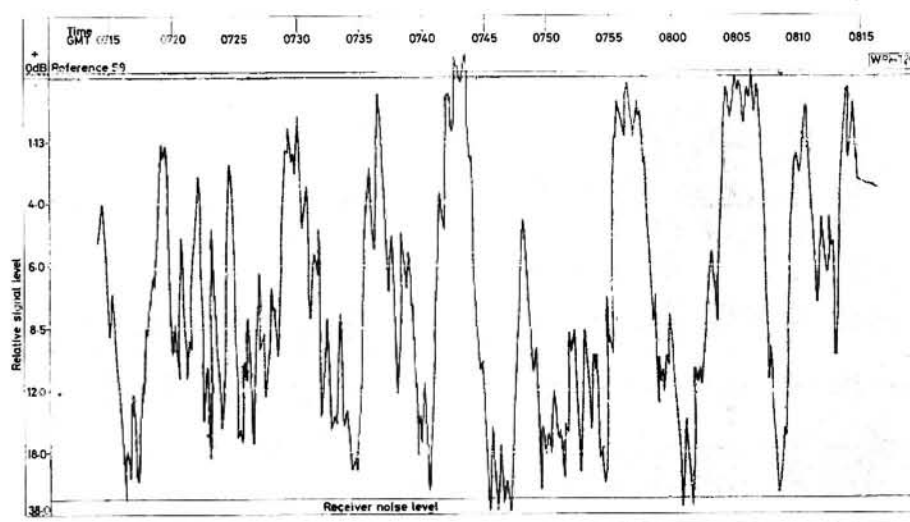
Temperature inversions are sometimes referred to by names related to the cause of their occurrence. For example there is **dynamic inversion** which takes place when a warm air mass overruns a colder air mass. Another is known as a **subsidence inversion** and this occurs when a sinking air mass becomes heated by compression. The so called **nocturnal inversion** is brought about by rapid cooling of surface air at the end of the day, after sunset. There is also **cloud layer inversion** caused by air above a cloud becoming heated by reflection of the suns rays from the top surface of the cloud. Sharp transition in water vapour content of the atmosphere can also cause reflection and refraction of radio waves at v.h.f. and u.h.f. Such inversions produce a change in the refractive index of the atmosphere and although the air masses themselves may move over large areas, they can retain the refractive characteristics for a considerable time. A condition of this nature may prevail for hundreds of kilometres along a more or less stationary front and at heights varying from a few metres to several kilometres. The resulting so called "lift" conditions or tropo-openings produced by temperature inversion and refraction occur mostly during the summer months and the autumn.

The atmospheric conditions that produce refraction are rarely stable for any considerable period and the strength of received signals may vary over a wide range. The best conditions for stable propagation usually prevail in the early and late evening and again just before sunrise, lasting sometimes until mid-day but more often than not falling off before this time. It is worth noting that a tropospherically propagated wave generally maintains its original polarisation although it is well known that horizontal polarisation normally provides the best overall results.

Indication of Tropospheric Openings

During the presence of an anti-cyclone is generally the time when warm air overrides a mass of cool air. Refraction conditions may then prevail and v.h.f./u.h.f. communication ranges will often be extended to several hundred kilometres. At the onset of a "lift condition" strong signals from greater than normal working distances will be noticed but often with fairly rapid fading as in Fig. 7.1. This is

Fig. 7.1



Propagation

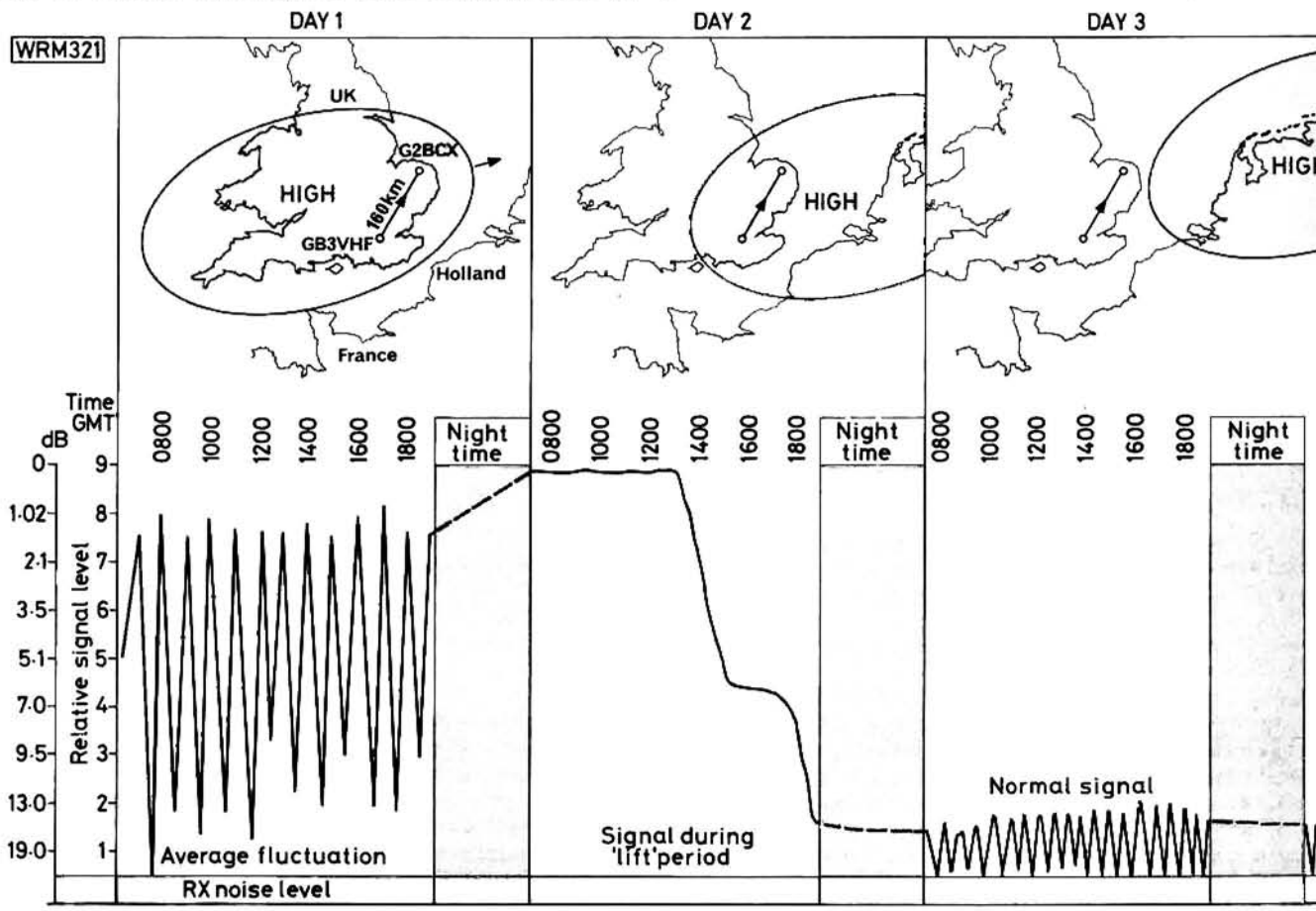
followed by a period during which the signals tend to retain an almost constant strength. The "weather" clue to a probable opening is the approach of a high pressure region, or one actually present over the country, or even partially so. Barometer readings will be fairly high and the weather itself generally fine and warm. A sudden but rather small drop in barometric pressure is often an indication of a more or less imminent opening. Full weather maps shown on TV weather forecasts are an obvious source of information for the position and movement of high pressure regions.

Other indications, well known to v.h.f./u.h.f. enthusiasts are interference to British TV by continental TV transmissions and reception at good strength of continental f.m. broadcast stations (f.m. band 88–108MHz) although this does not necessarily mean that the opening will be extended to either the 144 or 430MHz amateur bands. Reception of signals from distant v.h.f. or u.h.f. radio beacons and repeater stations that are not normally heard is another and probably more reliable indication. The latter is usually obvious by the chaotic situations a "lift" can create with repeater stations operating on the same channels.

Some idea of the build-up of a typical tropo-lift condition may be obtained from Fig. 7.2 which has been based on hourly chart recordings of signals, similar to those in Fig. 7.1 from the GB3VHF radio beacon at Wrotham in Kent. This is about 160 kilometres distant from the authors QTH in Norfolk and is normally received at about S1 to S2 with rapid fading.

First there is the appearance of a high pressure region crossing the Southern part of the country in the section marked "Day 1" and although the signals rise to a fairly high level (S9) they fade rapidly to almost zero. Refer to Fig. 7.1 for short term sampling. It is thought that signal fluctuations of this nature are due to the discontinuities in the area where temperature inversion is taking place and which are probably caused by variations in the turbulence of the atmosphere in the near surface layers. No observations were made at night time but by the beginning of "Day 2" Dutch and German stations operating on 144MHz were being received at great strength with little or no QSB. It is worth noting that beam tilting during a lift condition will often produce a quite dramatic increase in signals (both ways). Tests in this respect have revealed an angle of 10 to 20 degrees upward from horizontal to be about optimum.

Fig. 7.2



Atmospheric Ducts

Where there are large areas of water and particularly in the tropics, temperature inversions occur almost constantly at heights of 30 metres or less. The boundary of such inversions is generally well defined and v.h.f./u.h.f. waves travelling horizontally are trapped by the refracting layer and constantly bent back to earth. The air layer and earth form what might be regarded as the ceiling and floor of a channel along which the waves are guided and which may follow the curvature of the earth for some distance far beyond the normal optical/radio horizon.

If a duct has a refracting layer only a very few metres above the surface of the earth, the lowest frequency that will be propagated may be in the GHz range. However, certain dielectric characteristics and the height of the layer will allow the propagation of transmissions at much lower frequencies, i.e. in the v.h.f. region. In other words there may be a "critical frequency" for propagation. One of the features of ducting is that receiving and transmitting antennas must be within the upper and lower limits of the duct, that is, inside it, otherwise there will be no propagation. Ducts of nature can also be formed between two layers of air above the surface of the earth and which will also propagate waves for long distances. Again, transmitting and receiving antennas must be physically within the duct. Wave polarisation appears to make no significant difference so far as signal strengths are concerned.

Auroral Propagation

During abnormal auroral activity in the polar regions, a special form of wave propagation is often possible at frequencies above 28MHz by using the auroral curtain as a reflector. It is during magnetic storms that auroral activity extends further down in latitude from the Northern polar regions or up from the Southern polar regions. When such conditions prevail transmitting and receiving antennas must be directed towards the appropriate polar region even though the stations operating may be some distance apart laterally. This mode of propagation is illustrated in Fig. 7.3.

Communication paths of considerable distance between stations East and West of each other are possible with v.h.f. but auroral propagation produces a rapid flutter on signals which make it difficult to copy f.m. or s.s.b. modulation. The preferred mode of transmission is c.w. Propagation by reflection from the auroral curtain occurs more often in the higher mid-latitudes in the Northern hemisphere and in reciprocal latitudes in the Southern hemisphere but may continue day and night for periods of several days. The best times for this mode of propagation are during the months of March and September and although it may occur at other times, is less likely during December and January.

Sporadic E (Es)

The formation of sporadic E clouds at a height of about 100 kilometres was dealt with in a previous article (Part 2). However, it has been recently mentioned that there is now some doubt as to whether sporadic E is in fact responsible for the propagation of v.h.f. and that there may indeed be some other medium as yet undiscovered.

The m.u.f. of intense Es clouds is a function of ionisation density but the highest frequency at which waves arriving at an oblique angle can be propagated is not really known, although there have been reports that frequencies as high as 200MHz have been used successfully. The possibility of propagation at 144MHz is not high but single hops of over 1600km have been reported. This assumes that sporadic E is the medium. It is also believed that propagation via more than one Es cloud is possible thus increasing the potential

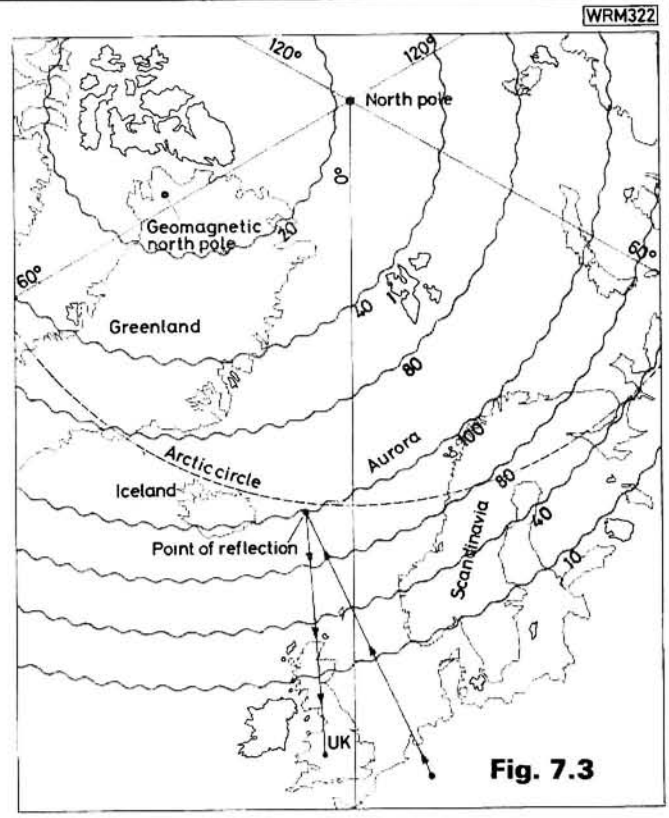


Fig. 7.3

working distance. Sporadic E occurs mostly during the Summer and early Autumn.

Meteor Trails

A meteor entering the upper atmosphere releases a large amount of energy when its initial high speed is slowed down by friction with the air. Some of this energy produces ionisation along the path taken by the meteor and even a small one can ionise a region several metres in diameter and more than a kilometre in length. A small ionised region of this nature may only refract signals for a duration of a few seconds. Prolonged and intense showers of meteors sometimes allow longer periods of communication in the 28 to 50MHz range providing the trail is about midway between stations making use of this mode of propagation. Whilst communication via meteor trails may afford an interesting study it is by no means reliable as a propagation medium.

Part 8 will conclude this series with ionospheric and tropospheric "scatter" modes and a brief look at groundwave propagation although this latter is little used by radio amateurs except during the daytime at the lowest amateur frequency band allocation of 1·8 to 2MHz.

Amendment

In Part 5 (June *PW*) it was stated that during daylight hours ionospheric propagation at 3·5MHz would be via the E layer and an example of coverage from a low height antenna was based on this (Fig 5.2B). In fact this would apply more to the 1·8–2·0MHz band as E layer reflection normally extends to about 3MHz. The example given would however apply to propagation at 3·5MHz in the event of the formation of a large sporadic-E cloud.

The normal E region ionisation increases rapidly after sunrise, reaching maximum at midday (GMT) and can in fact absorb energy from lower frequency transmissions as does high level D region ionisation. Relatively long distance communication on 3·5MHz is normally via the F layer but can be effected by inter-layer reflection, i.e. between E and F layers.

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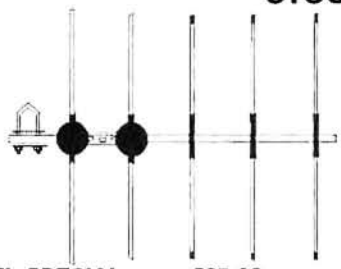

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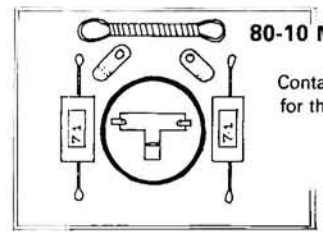

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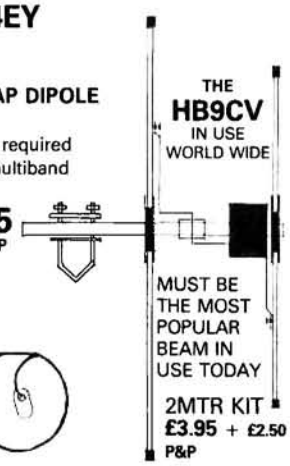

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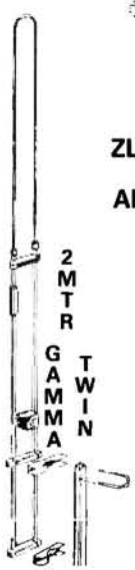

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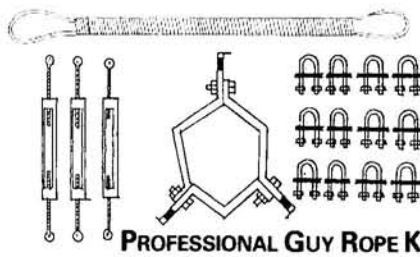

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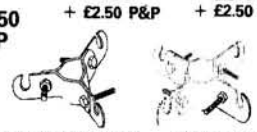

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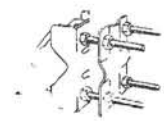

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SPECIFICATIONS

INPUT VOLTAGE	240 VOLT AC 40VA maximum
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ROTATION	:360° + 5°/-0° with mechanical stop
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ROTATION TORQUE	:220kg-cm (192 lb-in) minimums
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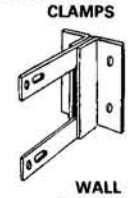

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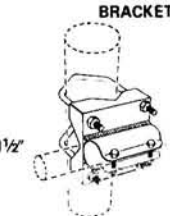

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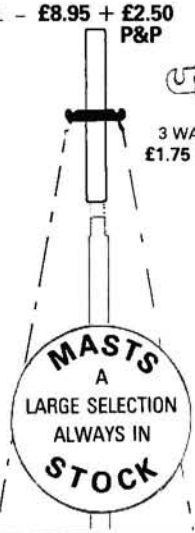

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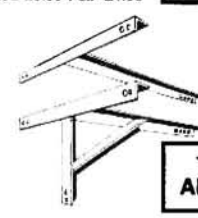

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by V. J. Copley — May G3AAG

Do you want a rare cactus plant, a new three-piece suite or a set of re-treads for your car? It is all there. For five dollars entrance fee you can visit the world's biggest ham convention, flea market and exhibition. Well, the Dade Radio Club of Florida claim that it is the biggest. Dayton would probably dispute the claim. Anyway, unless you are Sebastian Coe I doubt if you could visit every stand in one day.

The Tropical Hamboree took place at the Flagler Dog Track on February 2 and 3. I think the Chairman, Evelyn Gauzens W4WRY, can be proud of this spectacular event in the Ham calendar. Five heavily armed police were in attendance to check that the goodies were paid for and to apprehend "snatchers".

My feet gave out at the end of the first day so I cannot really report in full on the two days. The average British ham riding the tide of rising mortgages and the falling pound would have drooled at the piles of other people's cast-offs. I managed to pick up some brand new wide-spaced variables and ceramic switches for that new antenna tuner.

New Equipment

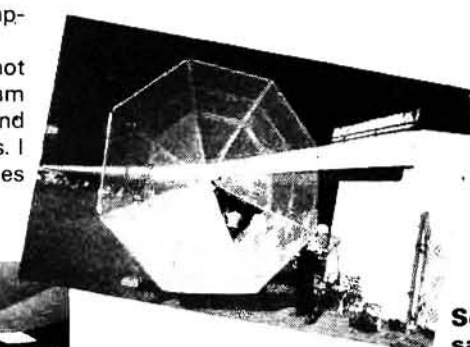
Strangely, Yaesu were not represented although most of the other Japanese manufacturers were present with all their black boxes. Of course, with the poor old pound almost at par with the dollar there were no bargains in new equipment once you had paid the import duty. The prices would be about the same as in the UK. Reported elsewhere and extensively advertised, the AEA Doctor DX was being exhibited. After having written the device off as a silly gimmick I managed to get in the driving seat, and became converted.

Always come prepared, seems to be the motto of these visitors

There was not a lot of equipment which UK amateurs will not have already seen, either advertised or at our own Hamfests. However, one box particularly attracted my attention. The Shackmaster, manufactured by Advance Computer Control Inc., I had not seen before. The leaflet says . . ."Take your shack with you—anywhere—through remote control over the air or over the phone". Shackmaster is your personal v.h.f./u.h.f. repeater and interfaces a v.h.f./u.h.f. transceiver with your h.f. station. Whilst mobile, or using a handheld or even a public telephone you can, they say "Fire up your rig, punch in a frequency, tune around . . . go to transmit . . . all with touch tone commands. Yes, swing your beam if you want. Synthesised speech tells you the S-meter readings". From my mobile h.f. station I actually worked a station operating out of his New York Office during his lunch hour. He was remotely controlling his home station well out in the suburbs using a TH-21AT handheld. It's not quite my scene but may be the solution for those plagued by the planning officer. Set up your tower, five-element mono, linear and transceiver in a friendly farmyard. Sit in your semi in Acacia Avenue with nothing more than a TV looking antenna on the chimney and work the world. Before you get too enthusiastic you should scan the UK licensing regulations.

VHF/UHF/SHF

Dishes and multi-elements abounded. Unfortunately the AMSAT demonstration was a failure since so many visitors were using handhelds the downlink was QRM'd. Likewise the satellite TV demonstration seemed to be inhibited by the operator's inability to set his dish up with the plus or minus $\frac{1}{2}$ degree necessary. Between 143 degrees west and 69 degrees west there are already twenty geostationary satellites in position. In Miami you have a choice of 138 TV channels and the February magazine listing the programmes for the month is thicker than my telephone directory. It's not all bad. Most nights you have a choice of twenty odd movies. Many recent releases. Even if you are not a box addict there is bound to be something to interest you as I found out whilst staying with a friend whose dish was inconspicuously hidden amongst the palm trees. The quality was superb.



Setting up for the satellite TV demo

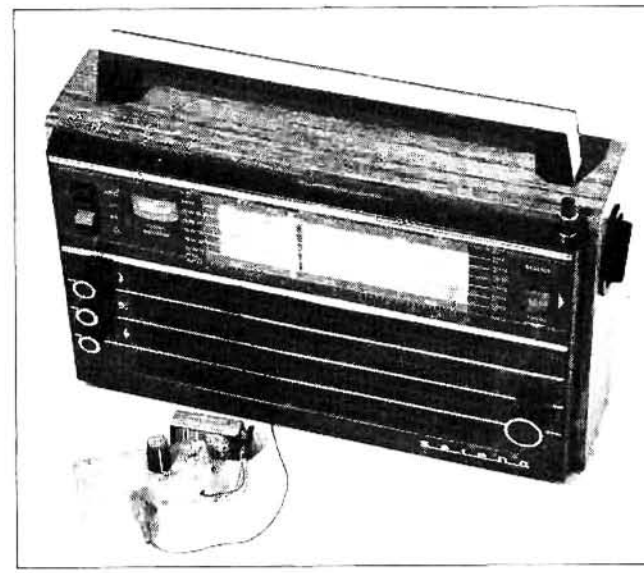
Bargains

I was told that the secret is to hang onto your dollars until near closing time when those who were there in the hope of raising funds to meet the down payments on the new piece of equipment they had set their heart on were getting desperate and prices would tumble. You have to be fit to stay the course! Impossible to describe the range of "junk" going cheap. I saw a 20kW 50 ohm dummy load the size of two filing cabinets, a drum of 1in coaxial cable the size of those you see in the high street laying an electric service to a new housing estate. Circuit boards with dozens of i.c.s were going for a dollar a throw.

Well worth the jet lag.

AN ADD-ON BFO

Commercial s.s.b./c.w. adaptors seem to be in short supply so Michael Corke G8RJQ has devised this simple add-on.



There are many low-cost, multi-band portable receivers available that cover not only the normal short-wave broadcast bands but also one or more of the amateur h.f. allocations. The vast majority of amateur transmissions at h.f. use single-sideband (s.s.b.) or Morse code (c.w.) which pose problems for the would-be listener whose receiver is not equipped for these modes.

The simple design presented here provides details of a 450–470kHz beat frequency oscillator (b.f.o.) which re-introduces the suppressed carrier and allows normal a.m. detection, resulting in clear reception of s.s.b. and c.w.

A block diagram of the typical "domestic" superheterodyne type receiver is shown in Fig. 1. Normal broadcast signals are converted to the i.f. (455kHz) and demodulated by the a.m. detector. Switches S1a and S1b are introduced to route the signal via the product detector, which consists of a diode detector/mixer network. The mixer is also provided with an input from the b.f.o. stage which results in a demodulated output ready to feed the audio amplifier stage of the receiver.

Circuit

The circuit of the b.f.o. is shown in Fig. 2 with a suggested p.c.b. layout alongside. There are several alternative methods of producing L1, either wind your own using a 7mm diameter coil former and 40 s.w.g. wire or use a ready-wound Toko inductor assembly. The p.c.b. layout will accommodate both variations. It is important to connect the windings in the correct sense otherwise the b.f.o. will fail to oscillate. Capacitor C3 is already fitted inside the specified Toko coil. For the home-wound coil C3 will be 270pF and is fitted onto the p.c.b.

Setting Up

Setting up is quite straightforward. Set the variable capacitor C5 to half-mesh and with the output lead in close proximity to the body of the receiver, adjust the slug of L1 to zero-beat with a normal broadcast transmission (Radio Moscow, etc.). Lock the slug to prevent any frequency shift due to vibration effects. You can now use C5 to fine tune u.s.b./l.s.b. and c.w. transmissions in conjunction with the receiver's own tuning control. With practice this is easily done and providing the unit is firmly mounted in a well-screened box and fed from a stable supply, such as a PP3 battery or well-smoothed mains p.s.u., it will give excellent stability.

Good DX and happy hours of listening. ●

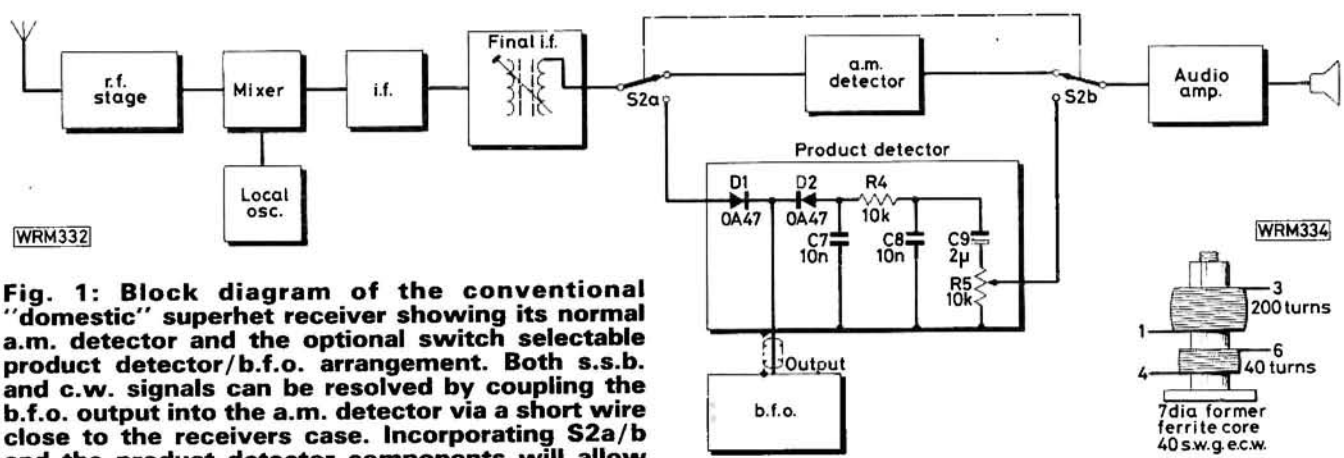
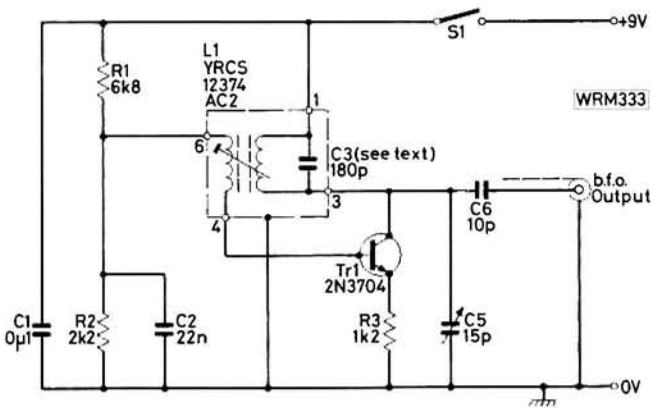
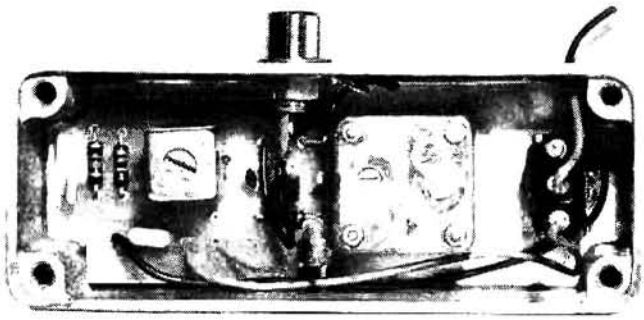


Fig. 1: Block diagram of the conventional "domestic" superhet receiver showing its normal a.m. detector and the optional switch selectable product detector/b.f.o. arrangement. Both s.s.b. and c.w. signals can be resolved by coupling the b.f.o. output into the a.m. detector via a short wire close to the receivers case. Incorporating S2a/b and the product detector components will allow more precise control of the signal





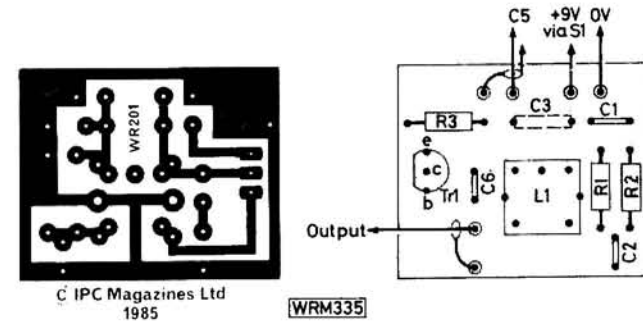


Fig. 2: The circuit diagram and full size p.c.b. track pattern/overlay of the b.f.o. The unit must be built in a screened metalic enclosure

Many of the components for this simple project can be found in the traditional "junk box". As an example the variable capacitor C5 can be salvaged from a cheap oriental radio and used with a suitable series capacitor to bring the final capacitance down to the required 15pF. Alternatively you can use a Jackson C804 air-spaced type. The coil can be home-wound if you feel capable of handling 40 s.w.g. wire! However, the Toko coil assembly specified is only around 60p new and you may even have a suitable one in your box. To cut costs even further a p.c.b. is a luxury for this project and the various components can be soldered together in a "birds nest" type of construction around the coil former. However, you must still fit it inside a metal screening box.

£8

BEGINNERS

★ components

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Carbon Film ¼W 5%

1·2kΩ	1	R3
2·2kΩ	1	R2
6·8kΩ	1	R1
10kΩ	1	R4†

Potentiometer

10kΩ	1	R5†

Capacitors

Min. Ceramic

10pF	1	C6
270pF	1	C3 (see text)
10nF	2	C7†, C8†
22nF	1	C2
0·1µF	1	C1

Variable (See text)

15pF	1	C5

Semiconductors

Diodes (Germanium)

OA47	2	D1†, D2†

Transistors

2N3704	1	Tr1

Coils

Toko YRCS 12374 AC2 1 L1 (C3 = 180pF internal) or 200turns + 40turns 40 s.w.g. enam. copper wire on 7mm dia. former with ferrite slug (See Fig. 1).

Miscellaneous

Printed circuit board (see text); Min. switch s.p.s.t. (S1); Switch d.p.d.t. (to suit receiver) S2; Metal box; Knob; Coaxial socket.

Component references with the † symbol are used in the optional Product detector stage, shown in the block diagram Fig. 1. These components are not required for the basic proximity coupled version.

Letters

Amateur Band Occupancy

Sir: I have read with great interest the article 3·5/7MHz Amateur Band Occupancy in the April 1985 issue, and congratulate *PW* on airing this subject. However, although I am sure that many of us regret the influx of so many more "commercial" and Defence transmissions into the shared 3·5MHz band during the present "sun-spot minimum" period, I feel the picture painted in your article is excessively gloomy and does not distinguish accurately the difference between the broadcast intruders between 7·0 and 7·1MHz and the legitimate if often thoughtless operation of point-to-point services between 3·5 and 3·8MHz. There are also questions that need to be answered in respect of your spectrum analyses.

1: There are no "authorised" broadcasting stations, as such, between 7·0 and 7·1MHz. The problem is that for many years China was excluded from the United Nations and its agency the International Telecommunication Union. When China became a member of ITU and later participated in WARC 1979, that country reserved the right to continue operating broadcast stations in this part of the spectrum until a new table of h.f. broadcast assignments is agreed. In theory, at least, we should one day see the shifting out of the band of Radio Peking, and the accompanying jammers. Unfortunately, Albania (Radio Tirana) is still not a member of the ITU—but who knows what may happen one day?

2: Despite this, I do not believe that there is any time of the day when it is not entirely possible to have 100 per cent c.w. contacts in the gaps between these powerful intruding stations. The statement that they may each spread over 20kHz suggests that the filter shape and dynamic range of the receiver used to make your measurements may be seriously affecting your results. It is well known that receivers of limited dynamic range are virtually useless on 7MHz.

3: I find it difficult to believe that the power of the Commercial and Service stations operating in the shared 3·5MHz band is of the order of 50 to 100kW. Nowhere in the original article is the relationship between dB and S-meter scale, reference 1μV, defined. The IARU recommended figure is 6dB per S-point.

(Ed: A fuller explanation appeared in the article S-meters: fact or fiction? *July 1985 PW.)*

4: As on 7MHz, I cannot believe there are many times of the day when 3·5MHz becomes impossible to use, at least on c.w. Certainly not in the late afternoon and evening period suggested in the article. There are always gaps.

5: A more valid complaint would be that many commercial and Service stations spend many hours "idling" to try to keep their channel occupied and so discourage others from using it. There is little doubt that many commercial stations now seal and occupy "clear" channels (using spectrum analysers and panoramic displays) other than the frequencies registered with the International Frequency Registration Board. This is largely a consequence of the use of frequency synthesisers providing the ability to transmit on any frequency. Amateurs are fortunate in being legally able to tune v.f.o.s—this is not true of commercial stations.

6: It hardly helps our case when, if your article is correct, amateurs are operating above 3·8MHz with powers up to 3kW or so, in flagrant breach of their licences. Before we complain too much let us make sure our own noses are clean.

7: Finally, it is stated that 3·5MHz was once an "exclusive" amateur band. My memory only goes back to the mid-1930s, but I cannot recall any such period. In fact, at that time newcomers were granted only the 1·8, 7 and 14MHz bands (and even on these the UK insisted on "guard bands"). 3·5MHz required a special permit and (like 1·8MHz) was very much a "shared" band. Since those spacious days we have lost frequencies and have to put up with such nuisances as the "Woodpeckers"—but we have not arrived at the situation where we need to consider either 3·5 or 7MHz as unusable, at least by those of us who believe in narrow-band modes of transmission.

Pat Hawker G3VA

The author of the article 3·5/7MHz Amateur Band Occupancy replies.

Thanks to Mr Pat Hawker for his letter. I will attempt to answer his queries.

1: I did not say that there were "authorised" stations (non-amateur that is) operating in the 7MHz amateur band. "It would appear that as far as the 7MHz band is concerned, there is no protection from interference by unauthorised services, either".

2: Whilst I agree that at certain times it is possible to have uninterrupted QSOs on both the 3·5MHz and 7MHz bands, it still remains that when certain ionospheric conditions prevail the non-amateur stations, especially those in the 3·5MHz band, can be received at such strength as to cause excessive QRM, particularly when they choose to deliberately jam amateur radio QSOs taking place on an otherwise previously chosen clear frequency. This fact, together with the callsigns of offending stations, has been dealt with in a separate report recently sent to the Department of Trade and Industry. Many amateurs who regularly operate on the 3·5MHz band will confirm such incidents which are becoming all too frequent.

3: One cannot relate typical S-meter readings to a given reference such as 1μV at the receiver input because (a) S-meters are notoriously non-linear and few, if any, comply with any particular standard or reference, regardless of recommendations by the IARU, etc. In any case, an S-meter never indicates peak 1 levels because of its inertial characteristics. It was, therefore, thought prudent to operate the receiver without a.v.c. and to measure the peak to peak amplitudes of signals at the i.f. output, i.e. the signals still in r.f. form before normal detection. A calibrated laboratory grade oscilloscope was used for measurement.

4: I have already mentioned that there are times when reasonable operation on the 3·5 and 7MHz bands is possible with minimal interference.

5: Apart from deliberate interference by non-amateur stations, I am well aware of the practice by service stations, etc., who keep frequencies occupied for long periods by continuously sending of the letter "V" or similar, also "non-sensical" m.c.w. and c.w., i.e. series of non-meaningful dots and dashes as well as random letters repeated over and over again by RTTY stations. I repeat that my analysis of occupation was "typical" of conditions that frequently prevail all too often and sometimes for long periods.

6: With regard to radio amateurs operating outside the band, I agree, as mentioned, that we should at least keep our own house in order. However, operation outside the 3·5MHz band and the 7MHz band has been in evidence for a long time. No doubt both the RSGB and the licence

authorities are, or have been aware of this, and the fact that a large group of licensed UK radio amateurs, also RSGB members (since they discuss articles, etc., in the magazine *Radcom*) operate on and around 6·5MHz (s.s.b.) as also do amateurs in other countries, notably France and Italy. These stations can be heard regularly over the weekend periods and more recently on weekdays as well.

7: I agree that we have shared the 1·8 to 2MHz band quite amicably with official ship to shore stations and others for many years and whilst the 3·5 to 3·8MHz band was allocated on a shared basis, little or no problems have arisen in respect of interference until recently, i.e. until the new amateur licence schedule came into operation. The radio amateur service is still regarded as primary on the 3·5 to 3·8MHz band. Unfortunately, "clause H" in the new schedule provides an excellent loophole for almost total occupation by non-amateur stations. The levels of interference to radio amateurs frequently surpasses the QRM from Russian, American and British OTH radar systems that wander about over almost the whole of the h.f. spectrum from around 6 to 28MHz.

Whilst the 3·5 and 7MHz bands may not be totally unusable yet, there may come a time when even narrow band transmission modes by radio amateurs may prove to be ineffective. It has been stated by a certain government department that the armed forces have absolute priority on all allocated amateur bands as and when they choose. My source of information on this "point" cannot be revealed, as I have no wish to operate /A from the Tower of London for a few years! It is interesting to note, however, that services and/or commercial stations are already operating in the 14MHz band as well.

PW REVIEW

Dressler ara30 Active Receiving Antenna

Since we mentioned this antenna in our new products feature (*PW* May 1985, page 49) we have had a sample on extended trials, with very satisfactory results.

The ara30 consists of two units. The "business end", the antenna itself, is an 8mm-diameter, 1·23m-long whip mounted on top of a 65mm-diameter by 180mm-long aluminium tube which houses the amplifier/matching circuitry. The amplifier uses a low-noise f.e.t.—CATV transistor—push-pull amplifier line-up to achieve a claimed 10dB gain with good intermodulation performance and a low noise figure. The design frequency range of the antenna is 200kHz–30MHz, with limited performance up to 100MHz.

Stainless-steel, worm-drive clips are provided to clamp the antenna to a mast of up to 55mm diameter. Signal output (and power input) is via an SO239 ("u.h.f.") socket recessed into the base of the unit. Although in this position it is protected from falling rain, I feel that it is vulnerable to rain carried by updraughts, a fairly common thing near roof-tops, where the unit will most likely be mounted. The SO239 and its mating PL259 plug are not waterproof, and should be covered with pvc tape or fitted with a protective sleeve for long-term reliability when installed out-of-doors. The same criticism could be levelled at the amplifier base-plate, which is only a sliding fit in the aluminium tube, with no attempt at weatherproofing.

The ara30 comes with 8m of coaxial cable fitted with a crimped-on PL259 plug at each end. Though this is nice in some ways, it means that you cannot thread the cable through small holes for installation, without cutting one of the plugs off and then replacing it with a new one. Nor can you fit a protective plastics sleeve over the plug.

As mentioned earlier, the power needed for the masthead amplifier (11–15V d.c. at 100–140mA nominal) is fed up the signal coaxial cable by use of a small interface unit at the receiver end. A suitable wall-plug a.c. mains adaptor unit is provided, though this is intended for European 2-pin sockets, causing problems in UK 13 amp 3-pin outlets unless a shaver adaptor is used.

But enough of the moans—this antenna really works. It even works well propped up in a corner of the room, which is where I used it for a while. Obviously the higher (and the further from noisy mains wiring and TV receivers) that you can get it, the better, but it performs well in the loft too, and that would get around any problems with weatherproofing and objecting neighbours too! In comparative tests against a long-wire antenna of some 10 metres length, the active antenna gave equal or better strength signals every time, right down to the bottom end of the long-wave broadcast band. Intermod performance among the evening chaos on the 7MHz (7·1MHz) broadcast band was very creditable.

If you're an s.w.l. with very limited space for antenna erection, it would be well worth considering the ara30. It is, of course, for reception only. If used with a transceiver for listening, some safeguards against accidentally keying the transmitter would be a good idea.

The complete ara30 system as described costs £90.00 including VAT from **Dressler (UK) Ltd, 191 Francis Road, Leyton, London E10, telephone 01-558 0854,** to whom we offer our thanks for the loan of the review sample.

Geoff Arnold

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AMATEUR RADIO UNDER COMPUTER CONTROL

Part 1 by Ronald Alpiar

It almost seems that hardly any hobby is immune from the influence (cynics will say the insidious influence) of the home computer. Recent interest in programed coding and decoding of RTTY signals shows that amateur radio is no exception. But is RTTY the only way in which the amateur can harness his radio equipment to the computer? By no means!

Of course the professional is no stranger to the subject of computer controlled radio communication: but what about the amateur?

In providing concrete and positive answers to this question we shall here concentrate our minds on one particular radio, and one particular home computer: The Icom R70, and the BBC Model B. However the underlying principles apply more generally. The requirements are two: a computer fitted (as are most) with a USER PORT, and a receiver controlled by its internal micro which the user can conveniently access. Radio manufacturers, keenly aware of market forces, are increasingly tending to fit access sockets to provide external control of receiver operation.

The Icom R70 is in fact one member of a family of Icom equipment, all of which are fitted with a computer compatible "ACCESSORY SOCKET" (the ACC), allowing external control of most of the equipment's functions A whole new world of exciting possibilities opens up by suitably interfacing the R70's ACC, and the BBC–B's USER and ANALOGUE IN Ports.

In this series I shall explain the functions of the ACC pins, and how to connect them to the BBC–B's Ports. Data transfer between the two units is under a strict handshaking protocol, which will next be explained.

The Icom R70 is a receiver rather than a transceiver (i.e. it can receive but not transmit) and covers the 0–30MHz h.f. band—in which most of the long distance amateur radio activity takes place (with apologies to v.h.f. enthusiasts whose range of communication is usually more limited).

Unlike other members of the Icom range, the R70 ACC logic levels are mainly t.t.l. This means that (apart from two minor exceptions) direct connections between ACC and USER PORT pins will work—without any need for awkward level-changing electronic interfaces. Thus connecting the radio and the micro demands only modest electronic skills.

The ACC Socket

From the close-up view of the ACC (Fig. 1.1) we see that there are 24 pins, though some of them are unconnected spare locations. A special matching plug is available from the radio supplier, with a set of contact pins which can be positioned as required.

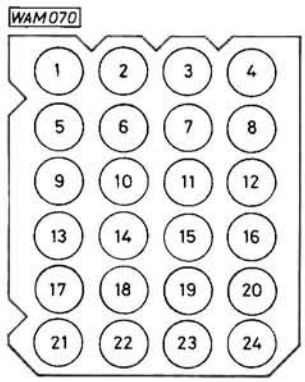


Fig. 1.1: The layout of the pins for the ACC connector situated on the rear panel of the Icom R70 receiver

Pin	Function
1	8V available when squelch is closed
2	13·8V when power switch is ON
3	When grounded set is mute
4	Output from RX detector stage
5	NC
6	NC
7	NC
8	Ground
9	NC
10	TRVA converter control input
11	TRVB converter control input
12	Reference voltage output for band switching
13	Input/output for external band switching
14	NC
15	NC
16	Input for DBC signal
17	NC
18	Input for RC signal
19	Output for $\overline{DV}$ signal
20	Input for RT signal
21	Input/output DB1
22	Input/output DB2
23	Input/output DB4
24	Input/output DB8

Table 1.1: Summary of the functions of the ACC pins for the R70 receiver

A summary of the functions of the ACC pins is given in Table 1.1, and may be used as reference: a detailed description of those pins which concern us follows:

Pin 1: "Squelch" is a control which instructs the receiver to ignore all signals weaker than a given setting (the squelch level). This is particularly useful in eliminating background noise when scanning a range of frequencies. The squelch is said to be "closed" when signals being received are below the squelch level, and the voltage on pin 1 is then 8 volts. If any signal stronger than the squelch level is detected, then the squelch is opened, and the voltage on pin 1 falls to zero. The voltage on this pin can easily be made t.t.l. compatible by scaling it by a factor of 5/8. Thus scaled the result can be fed to any input pin of the USER PORT, indicating a YES/NO condition for reception of signals at the given frequency and squelch level.

Pin 4: This pin outputs the audio component of any detected signal; its amplitude is in the range 0–300mV r.m.s., depending on the strength of the incoming signal. Like pin 1, this is not t.t.l. compatible. However the output has two important uses—

(i) It can be fed directly to a tone-decoding unit (e.g. RTTY)

(ii) Suitably rectified and scaled it can be fed to the ANALOGUE IN Port of the BBC–B micro. It can thus provide any controlling program with information of signal strength at the current frequency of reception. Furthermore this output is independent of the gain setting of the receiver, and so can be taken as an absolute measure of received signal strength.

Pin 8: This Ground pin should be connected to the USER PORT Earth pins to ensure that both units are operating at a common earth level.

Pins 16–24: Unlike pins 1 & 2, the remaining pins which concern us here are all t.t.l. compatible. That is their voltage levels are 4·5–5 volts for ON, and 0–1·4 volts for OFF. This is completely in accord with the levels on the BBC–B micro USER PORT. However pins 21 to 24 appear to have a very limited "sinking" capacity.

This means that whilst the USER PORT pins float up to about 5 volts when declared as inputs, corresponding ACC output may be too weak to lower their potential to below 1·4 volts when outputting an OFF condition. Strictly speaking buffer drivers should be used to cure this condition. But fortunately we shall here only consider outputting to ACC pins 21–24, and hence simple wire connections will do nicely.

Pin 16: This DBC (data bus controller) line has two different functions:

(i) A 50 millisecond pulse is used initially to alert any radio equipment connected to the bus to the fact that the controller (in our case the BBC micro) wishes to communicate—rather like your telephone bell. But then, given several receivers on the bus, how do you avoid them **all** answering your call? The answer is, as in the case of the telephone network, each subscriber has a different and unique number—though in our case this is called an "address"—which is present on ACC pins 21–24. You can thus think of all equipment on the data bus being initially "asleep": all are woken up on receipt of a 50ms pulse on the DBC. Each unit then examines the contents of its data pins 21–24. If their contents are not its own "address" the unit goes back to sleep: otherwise it remains alert for further signals

(ii) After the initial alert, an ON condition on the DBC tells the receiver to expect four new bits of data on pins 21–24.

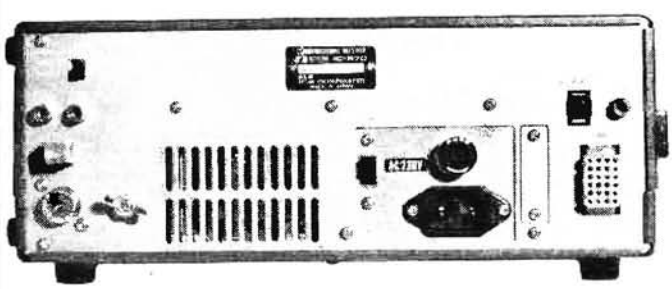
Pin 18: This is the Remote Control pin input to the R70 receiver. When set ON (i.e. 5 volts) the receiver will accept signals from the ACC control pins: otherwise they will be ignored. When pin 18 is set ON it is important **not** to fiddle with the receiver's tuning controls, since this is liable to utterly confuse the tiny microprocessor and result in the equivalent of a "crash". Normality can then be restored only by deadstarting the radio—i.e. switching it completely off for 2 seconds.

Pin 19: This is the Data Valid pin $\overline{DV}$, and is output from the radio when it has received a valid pattern of bits on pins 21–24. Note the overline on $\overline{DV}$. This is equivalent to a logic NOT: so that the voltage on the pin is LOW, or OFF when valid data has been accepted, and HIGH or ON at all other times. When sending a stream of data to the bus, it is most important to ensure that $\overline{DV}$ has dropped to the LOW level after sending each 4-bit byte, and before sending anything else down the bus.

Pin 20: The Remote Trigger is set ON by the controller to indicate that a new byte of data is now present on pins 21–24. It is also used to indicate to the radio that the controller is ready to receive a new byte of data—however, as discussed earlier, this need not concern us here.

Pins 21–24: Unlike the BBC–B micro (but similarily to many hand-held computers) the R70's internal microprocessor is a 4-bit machine, hence the earlier reference (not intended to be derogatory) to the radio's "tiny microprocessor"! However, *multum in parvo,* this micro admirably, if somewhat leisurely, does all that is asked of it Icom labels the 4 bits by the corresponding power of 2 that they represent—whereas it is more usual to label data bits from low to high 0, 1, 2 . . . Thus to represent the number 15 (or hexadecimal &E), logic levels of pins DB1, DB2, DB4 and DB8 should be 0, 1, 1, 1 respectively.

This example was not selected at random: for &E happens to be the address to which the R70 uniquely responds—its own personal "telephone number".



This photograph shows the rear panel of the Icom R70 receiver. Note the ACC socket is situated in the bottom right-hand corner of the panel

OUR COVER PICTURE

The display on the monitor screen was produced by a program written by Norman Dilley G8YBT to control the Yaesu FRG-8800

ACC Pin	BBC-B Pin	Notes
1	AP 15	Squelch scaled down to 1·8V to ANALOGUE PORT pin 15—channel 0
4	AP 5	Detector stage, full wave rectified
	AP 12	smoothed and scaled to 1·8V to ANALOGUE
	PORT pins 5 & 12:	ground & channel 2
8	AP 8	Ground to ANALOGUE and USER PORT
	UP 5	grounds
16	UP 8	DBC line to bit PB1
18	UP 1	RC tied to 5V for remote control
19	UP 10	DV to bit PB2
20	UP 12	RT to bit PB3
21	UP 14	ACC 4-bit data line
22	UP 16	mapped onto the upper 4 bits
23	UP 18	(i.e. the top "nibble") of
24	UP 20	the BBC User Port byte

Table 1.2: The suggested pin interconnection enabling the BBC-B micro to be connected to the IC-R70 receiver. Note all BASIC procedures that will be given in Part 2 will assume this configuration

Connecting the Receiver and the Computer

From the preceding section we see that we have to deal with:

(i) The Ground line (pin 8)
(ii) Two non-t.t.l. outputs from the receiver (pins 1 & 4)
(iii) One remote control pin to the receiver fixed at 5 volts (pin 18)
(iv) Seven t.t.l. control and data pins (16, 19–24)

Of the many different possible interconnection schemes, that illustrated in Table 1.2 has been selected as being fairly simple. All BASIC procedures in the following parts assume a Table 1.2 configuration. Referring then to Table 1.2—

Pins 1 & 4: Initially these need not be connected at all: you will still be able to scan frequencies, change receiving modes etc., without any reference to the resulting reception. However when these pins are interfaced to the ANALOGUE IN port far more sophisticated computer-receiver interaction is possible. As neither pin is precisely compatible with ANALOGUE IN port input, some simple interfacing is required, as is suggested in Fig. 1.2.

Pin 18: This pin tells the receiver that it is to be remotely controlled: a convenient 5 volt potential is available from pin 1 of the USER PORT.

Pins 16 and 19–24: These 7 t.t.l. compatible lines can be mapped onto any 7 of the 8 USER PORT data bits—with one to spare. The suggested scheme leaves USER PORT pin PB0 spare, and maps the 4 ACC data lines to the upper 4 bits of the USER PORT. Deciding which USER PORT pin is to be left spare is something of a problem. For instance if you wish simultaneously to control the receiver **and** receive and decode RTTY signals one USER PORT pin must be reserved for RTTY input: but which one? It depends on your RTTY software and is not necessarily PB0, nor can it always easily be changed to PB0 (the guts of RTTY programs being usually in assembly language). In such circumstances the scheme of Table 2 must be interpreted with some flexibility.

Interconnection hardware consists of:

(i) The special ACC plug, with leads soldered to the required ACC
(ii) USER PORT IDC plug and ribbon cable
(iii) ANALOGUE IN Port plug
(iv) I recommend a standard 12-way terminal block plug and socket between the BBC–B micro's plugs and the ACC plug. This allows you to disconnect the receiver and use the BBC–B ports for other purposes without fiddling around blindly under the micro and probably disturbing other cables.

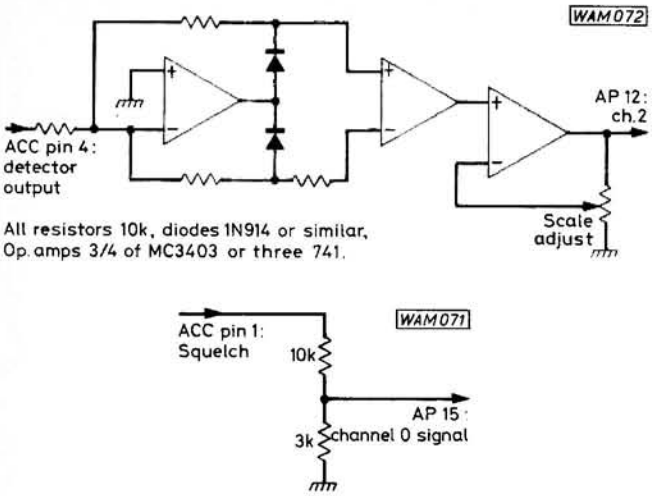


Fig. 1.2: The suggested analogue interfaces for Pin 1 (top) and Pin 4 (above) making them compatible with ANALOGUE IN on the BBC–B

Sending Data to the Receiver

First, we must answer two questions: **what** instructions may we send to the receiver, and **how** should these be sent?

What? The R70 is programmed to accept only four types of instruction; Address, Mode, VFO and Frequency.

We have already mentioned the **Address** instruction. In the case of the R70 this must be "&E" (i.e. 15) and all other addresses are ignored. Any packet of instructions must start with this correct Address.

The receiver is capable of operating in 5 or 6 different **Modes**: together with their instruction codes these are:

AM	Amplitude Modulation : code 8
USB	Upper Sideband : code 0
LSB	Lower Sideband : code &B (i.e. 11)
CW	Continuous Wave (i.e. Morse signals) : code 6
RTTY	Radio Teletype, frequency shift modulated: code &C (i.e. 12)
FM	Frequency Modulation: the latter seems to have been an afterthought, since it is available only as an optional extra, and appears to have no specific instruction code.

The receiver contains two independent VFO (variable frequency oscillators) known as VFO A and VFO B. This terminology is most confusing. So VFO A and VFO B may best be thought of as two independent internal memories within the R70, each containing a single frequency to which the receiver may be tuned. However under computer control the effective number of frequencies which could be remembered is several thousands! Nevertheless since protocol demands that one of the two v.f.o.s be activated in remote control, we shall henceforth assume that we are always using VFO A. The instruction code for VFO A is (wait for it!) &A.

The final type of instruction tells the R70 what **Frequency** it is to tune to. Frequencies are expressed in MHz in the range 0–30. Six digits must always be transmitted in the frequency instruction, even when there are leading or trailing zeros. Thus the frequency 2·77MHz is transmitted to the R70 as 0, 2, 7, 7, 0, 0.

A valid instruction packet to the R70 must always contain exactly 9 items:

Address	(i.e. &E)
Mode	(i.e. 0, 6, 8, &B, or &C)
VFO	(which we shall always transmit as &A)
F1–F6	(the 6 required frequency digits, each being a digit 0–9)

The R70's front panel includes a digital display of Mode, VFO and Frequency, which always reflects the most recent valid instruction packet received from external control (i.e. in our case from our BBC micro).

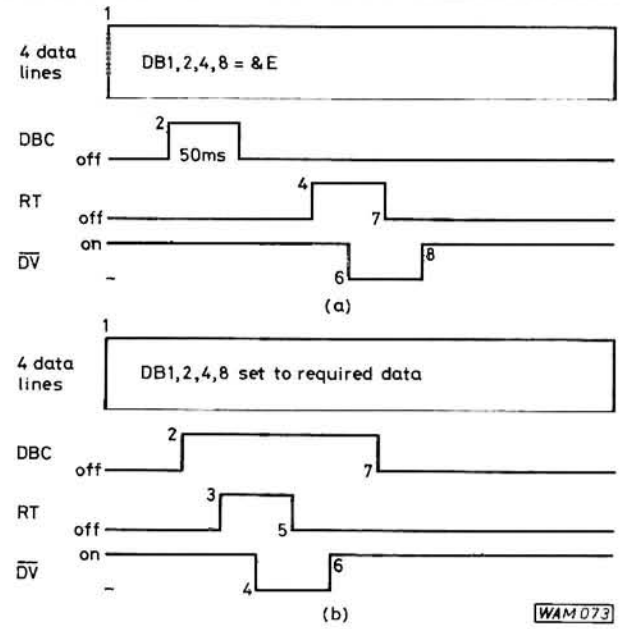


Fig. 1.3: (a) Sending the address and (b) sending the data

How? It's no good passing data to the R70 any-old-how: each transfer takes place under strict rules of protocol designed to ensure that both units understand exactly what is going on. That's why, over and above the 4 data lines, 3 additional lines (DBC, RT and $\overline{DV}$) are provided to control data transfers: technically the conversation which takes place over these control lines is called "handshaking".

There are two slightly different protocols, one for sending the initial address (&E) to the R70, the other for sending each of the 8 following data items.

The initial status of the control lines should be:
DBC is set OFF by the controller
RT is set OFF by the controller
$\overline{DV}$ is set ON by the R70—indicating no data present

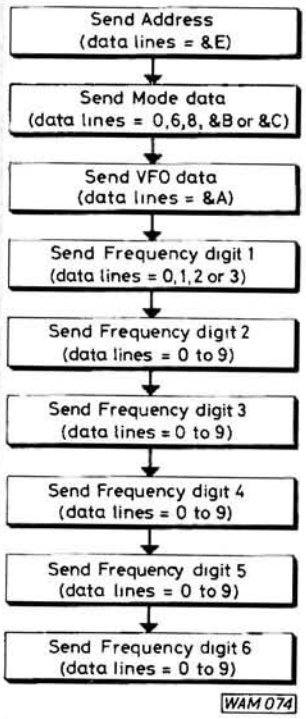
(i) Sending the address Referring to Fig. 1.3(a) the rules for sending the initial address are

1. Set pins DB1,2,4,8 to &E
2. Turn the DBC line ON for 50 milliseconds, then off again: this 50ms pulse alerts any receiver on the bus that an initial address is coming
3. Wait 10ms for this signal to be digested
4. Set RT ON
5. The receiver will now examine the contents of DB1–DB8, and if they are valid (i.e. =&E) will acknowledge by setting the $\overline{DV}$ line OFF: so
6. Wait until $\overline{DV}$ line is OFF (if it is not OFF in a few milliseconds the address has been rejected as invalid)
7. Acknowledge that you have noted the $\overline{DV}$ is OFF, by turning RT OFF
8. The receiver will then acknowledge this confirmation by resetting $\overline{DV}$ ON again—ready for further data transfer.

This is a somewhat simplified version of what actually takes place. We have omitted to mention the fact that the receiver resets the data lines to zero and then to its own address again between steps 3 and 5. But since we are here contemplating only one receiver on the bus, this is irrelevant.

(ii) Sending data items Now referring to Fig. 1.3(b), the rules for data are

1. Set pins DB1,2,4,8 to the required value 0–15
2. Turn the DBC line ON
3. Turn the RT line ON
4. Wait until the $\overline{DV}$ line turns to OFF, indicating that the data on pins DB1–8 has been accepted as valid
5. Turn the RT line OFF
6. The receiver replies by turning the $\overline{DV}$ line ON again ready for any further data item
7. Turn the DBC line OFF again, restoring the initial status.



◀ Fig. 1.4: Sending a complete package of information of the IC-R70 review

The front panel of the Icom R70 receiver

(iii) Sending a complete package A complete package of Address, Mode, VFO, and Frequency information being sent to the R70 is shown in Fig. 1.4. There is one complication: if the frequency is to be changed by more than 1MHz the entire identical package has to be sent **twice**, with at least a 1·5 second interval in between. This is because "band" changes (i.e. changing from say 15MHz to 16MHz) require complex alteration of the input filters, each of which has a 1MHz acceptance bandwidth—which takes time.

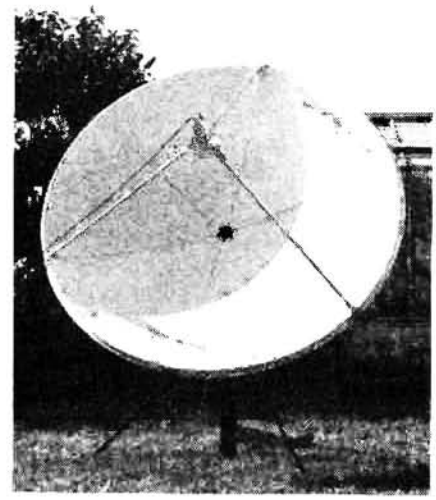
Part 2 will deal with the BASIC procedures for sending instructions to the IC-R70 receiver

Satellite TV Equipment

With the recent liberalisation of low-powered satellite TV reception announced by the UK government, together with the rapid increases in satellite based TV transmissions, the demand for suitable receiving equipment is now becoming apparent.

Satellite Technology Systems Ltd of Bristol have introduced a wide range of reception equipment designed for both the commercial and domestic satellite TV installation. The accompanying photographs show three of these items. Fig. 1 shows the STS 18000 which includes the 1·8m aluminium petal dish, complete with steel polar mount. This device, in conjunction with the recommended scalar ring type feedhorn, will provide a typical gain of 45·4dB at 11·45GHz. The F/d ratio is 0·44 and the quoted figure of merit is 20·91. All-up weight of antenna, feed support and mount is 67kg and the current price is £699 inclusive of carriage (plus VAT).

For use in conjunction with the appropriate feed-mounted low noise amplifier the STS R11-500 is a fully tuneable i.f. receiver covering the range 430–930MHz (shown in Fig. 2). Signal strength and tuning meters are incorporated together with adjustable audio offset (6–7·8MHz).

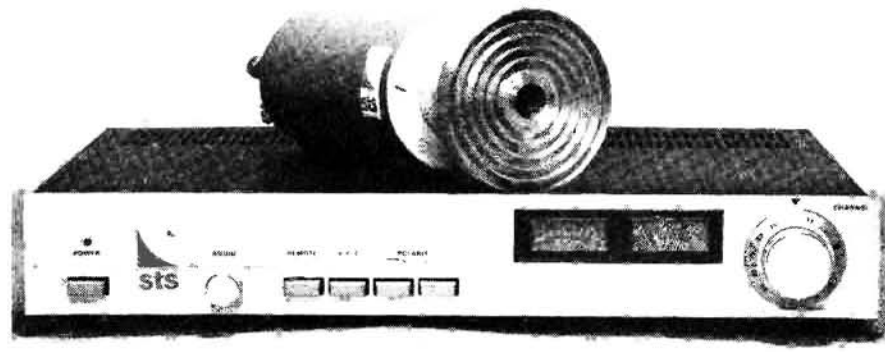


◀ Fig. 1

Outputs are provided for basic audio/video or remodulated up to u.h.f. Channel 36 for use with an existing TV. Additional internal facilities allow bandwidth adjustment to suit the current multi-standards, output for driving an external stereo sound processor and feed polarity changing (where applicable). The STS R11-500 is available at £399 inclusive of carriage (plus VAT).

For further details of the numerous products now available, contact: *Satellite Technology Systems Ltd., 3 Thicket Road, Staple Hill, Bristol BS16 4LW. Tel: (0272) 573878.*

Fig. 2 ▼



Versatile Printer for PCs

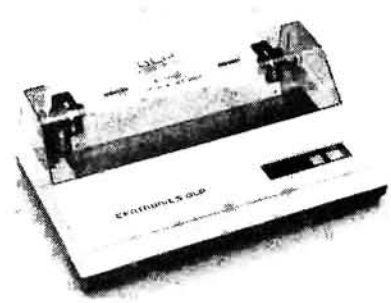
A new professional standard, competitively priced series dot matrix printer is now available from STC Electronics Services, suitable for the home computer enthusiast.

Entitled the Centronics GLP (Great Little Printer), it is completely portable weighing 3kg and measuring 333 × 191 × 70mm.

Principal features include a print speed of 50c.p.s. (draft printing; near letter quality printing at 12c.p.s.; character pitch of 5, 8·5, 10 and 17c.p.i.; high resolution pin-addressable and IBM PC block graphics; and an operating noise level of less than 60dBA.

Other variations offer a choice of enlarged, emphasised and double strike print modes, as well as subscript and underlining capabilities. In addition, two copies besides the original may be obtained.

The printer can be interfaced with a wide range of commonly used PCs, requiring only a connecting cable to a Centronics parallel interface or a single unit incorporating the parallel interface plus the RS232.



The Centronics GLP which costs £221 plus VAT and £3.00 p&p, is available from: *STC Electronics Services, Edinburgh Way, Harlow, Essex CM20 2DE. Tel: (0279) 26811.*

Instrument Case

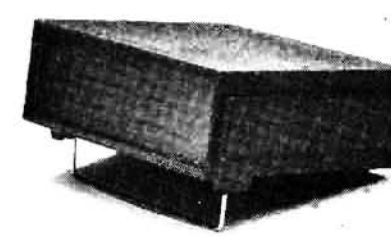
A new injection-moulded instrument case is now available from Eclipse Technology Ltd. This light-weight, sturdy ABS unit measures 215mm wide × 229mm deep, and is adjustable to heights of 51 or 76mm.

Designed to accept a combination of vertical and horizontal p.c.b.s, it is complete with a metal tilt stand, rubber feet and blank aluminium front and back panels.

With its attractive modern styling strength and versatility, the Eclipse bench case is ideally suited as an enclosure for instrumentation, telecommunication peripherals and for a wide variety of electronic projects.

Owners of instruments from the "Meteor" range from Black Star Ltd. will recognise this design and may be particularly interested in housing their own projects in the same suite of cases.

Priced at £19.55, which includes VAT and carriage, the Eclipse Bench Case is available from: *Eclipse Technology Ltd., 4 Stephenson Road, St. Ives, Huntingdon, Cambs. PE17 4WJ. Tel: (0480) 62440.*



Products

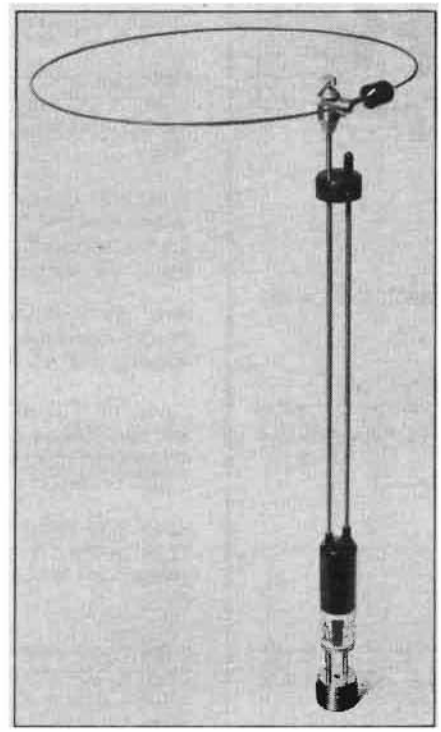
Versatile Mobile Antenna

R. Withers Communications inform me that following many months of development work by Antenna Research Manufacture, based in Devon, they are now marketing a new versatile antenna called the ARM Multi-P6+.

Basically, the Multi-P6+ is a free space antenna designed to operate without a ground plane/radial system. Principally intended for 144MHz v.h.f. band mobile operation, it may be readily adapted to cover 430MHz and above by reducing the length of radiating elements.

Matching to 50Ω unbalanced systems with a variety of radiating element formats is achieved around a fully adjustable λ/4 stub section. The basic kit allows five different antenna structure formats to be realised, starting with the stub section which will radiate as a λ/4 vertical, adding one element converts it to a λ/2 vertical, then with the added element turned down through 90° produces a directional λ/2 horizontal format—that's three.

Returning to the stub section and fitting the loop element vertically, provides a directional loop antenna, and



with the loop in the horizontal plane produces omni-directional characteristics similar to the familiar "halo" type antenna—that's the five.

By adding a further optional element and coupler to the λ/2 format, a directional 2 × λ/2 centre-fed horizontal colinear can be formed.

All conductive elements of the Multi-P6+ are made from high-grade stainless steel and the various formats are easily assembled using the Allen key supplied. To mount the antenna, a single 10mm stud is fitted under the base unit, suitable for bolting to gutter mount brackets. The use of mobile mag mounts is not recommended.

The basic Multi-P6+ costs £34.50 plus £2.50 p&p, with the optional colinear element and coupler costing a further £4.75. It is planned to send further details of operating notes, ideas and extras for the system, as soon as they become available.

R. Withers Communications, 584 Hagley Road West, Oldbury, Warley B68 0BS. Tel: 021-421 8201/2/3.

If you please

Please mention this column when applying to manufacturers or suppliers featured on this page.

Please Note!

A number of our advertisers have asked us to advise readers that the prices of imported products are likely to change from month to month.

The reason behind these changes is fluctuating international exchange rates. So, readers are therefore advised that they would do well to check prices with suppliers prior to sending off orders.

SSTV Converters

Robot (U.K.) Ltd., specialists in SSTV, phone line TV and image processing systems, has recently introduced two new single frame SSTV converters, entitled the 450C and 1200C. The 1200C has been selected for use in an amateur radio experiment from space, on board the Space Shuttle Flight 51-F, scheduled for launch in July 1985 (providing the flight programme permits).

The new colour converters provide single frame transmission of colour images that are black and white compatible and offer sharp, clear, colour picture quality.

Both models permit either transmit or receive operation, in any of the 8 black and white or colour formats, plus multiple pictures may be stored in the memory.

Interfaced to a home computer, most kinds of image transformation, storage and recall, processing or graphics are permissible. Alternatively, images may be permanently hard copied via a printer.

Additional features include: automatic fine tuning; six selectable 6-bit memories (three 4-bit memories on 450C); 256 pixel × 240 line display (1200C); 128 pixel × 120 line display, 240 line compatible (450C); 262 144 colour combinations (4096 with 450C); full screen display (4 × 3 aspect ratio); 8-bit parallel computer interface; accepts colour or black and white composite video; and RGB composite or r.f. modulated video output.

Both of these fully expanded and innovative units represent probably the most comprehensive SSTV converters available to the radio amateur, are priced inclusively at £845 (450C) and £1,395 (1200C), and are available ex-stock from: *Robot (U.K.) Ltd., Building 33, East Midlands Airport, Castle Donington, Derby DE7 2SA.*

multiple choice... multiple choice... ANSWERS multiple choice... multiple choice...

Are you cheating? If you are reading this page before page 23 then you are. Please turn to page 23 for the questions.

Question 6–1. Answer-c.

To find the effective resistance of two resistors in series like this we add their values. We must take care with the units for these two:

k stands for kilo, which means thousand
1kΩ + 4·7kΩ = 5·7kΩ

Question 6–2. Answer-c.

Clause 10 of the Licence:

"The Station, this licence and the Log shall be available for inspection at all reasonable times by a person acting under the authority of the Secretary of State."

Question 6–3. Answer-a.

Non-Interference is dealt with in Clause 4 (1) of the Amateur Licence:

"The apparatus comprised in the Station shall be so designed, constructed, and maintained and used that the use of the Station does not cause any undue interference with any wireless telegraphy."

Question 6–4. Answer-b.

The Amateur Licence states that the station may be operated

"at any premises (hereinafter called 'the temporary premises') or any location (hereinafter called 'the temporary location') for separate periods none of which shall exceed four consecutive weeks." (Clause 1 (1) (ii)).

"When the station is used at the temporary premises the suffix '/A' shall be added to the callsign." (Clause 9 (1) (b)).

Kindly Note

PW Triambic Keyer—February 1985

The p.c.b. track pattern for this very popular project WAD 280* contained an error which, whilst not appearing to effect operation of the majority of units (including our own prototype!), should be corrected if you have not been able to get your version going. The simple cure is to add a jumper wire between the track from IC1 pin 4 to IC4 pin 5. Stockists of *PW* p.c.b.s now issue the correct p.c.b. which is coded WAD280** and shown in its corrected form in the *PW* publication *Introducing Morse.*

Swap Spot

Have two channel chart recorder with ten rolls of paper. Would exchange for two sets of Pye Pocketfones (type PF1) or 12V TV camera. Tel: 0634 35179 (Medway) *X311*

Have Pye model MM 3-valve mains wireless, early 30's. Would exchange for Leak TL12 plus amplifier (wanted for spares) late model grey chassis. Lee. Neuaddlwyd Isaf, Lampeter, Dyfed SA48 7RE. *X313*

Have high quality racing bike with accessories, 531 frame etc. Worth over £400. Would exchange for general coverage receiver, v.h.f. scanner, BBC micro, 144MHz transceiver or even hi-fi unit. Ricky. Tel: Dartford 92833. *X314*

Have some old valves, electronic tubes and other equipment. Would exchange for w.h.y. 30 Southlake Crescent, Woodley, Reading. Tel: 691220. *X324*

Have Trio TS130S, 5-band mobile G-whip, s.w.r./power meter and mic. Would exchange for 144MHz portable/handheld (multi-mode if possible) with cash adjustment. Martin G4RDU. Tel: 0942 729516 (Leigh). *X328*

Have a Realistic DX100L, 5-band general coverage receiver, 150kHz–30MHz. Would exchange for Trio 9R59DS receiver, or similar, or 144MHz receiver. Tel: Coventry 502700 after 6pm. *X331*

Have Video tape cassette model Sanyo VTC5150 Beta. Would exchange for any decent h.f. TX/RX. Video bought Dec 1984 and hardly used, in excellent condition. J. Cavanagh, 190 Liverpool Road, Huyton, Liverpool, Merseyside L36 1RJ. *X349*

Have RTTY equipment: Teleprinter, tape reader, tape puncher all in one unit under silent cover Creed 444. Working with ST5 terminal unit (solid state) transmit and receive on v.h.f. and h.f bands 45 and 50 bauds. Also have a pair of walkie talkies for 28MHz 4 watts with charger and NiCads. Would exchange for engineering tools, welder (oil cooled transformer), power saw, 4 jaw chuck up to 7in diameter, small fly press, face plates, etc. N. Fagg. 113 Bute Road, Wallington, Surrey SM6 8AE. Tel: 01-669 1480. *X378*

Have Heathkit SB1 02 RX/TX 180W p.e.p., in perfect condition, including power supply and mic. AR88 l.f. in good working order, values £200 and £55 respectively. Would exchange for Belcom LS102L, Racal frequency counter to match RA17L, Tono 550 RTTY-c.w. reader. Tel: 0908 314095 (Milton Keynes). *X350*

Have Kodak M60 silent 8mm projector, screen and films, Texet portable photocopier, Waltham music centre (tape needs attention). Would exchange for 430MHz transceiver or 144MHz beam and rotator, w.h.y G1MQW. Tel: Nottingham 580996. *X401*

Have Pye Cambridge converted to 144MHz, fitted with RO (TX and RX) crystals. Would exchange for 144MHz r.f. switched pre-amp or h.f. signal generator or l.w. rotator with cash adjustment. Paul McGowan. 11 Ore Bank Road, Cardenden, Fife, Scotland KY5 0JF. Tel: 0592 720306 (after 4.30pm). *X417*

Have Codar PR30 preselector, as new. Would exchange for 144MHz a.t.u. LAR or similar. Also have Ferguson Colorstar 26in all transistor TV, sliding door, legs, v.g.w.o. Would exchange for a communications receiver in g.w.o, w.h.y. Aldridge. Tel: 01-200 3825. *X496*

Have Heathkit oscilloscope in good condition and perfect working order. Would exchange for a handheld or portable scanner/monitor covering air band and/or 144MHz amateur band. Will accept faulty equipment needing slight attention but no junk. Andrew. Tel: 0484 711619 (Brighouse). *X529*

Have Trio 9000 144MHz multimode. B09, SP-120, PS-20 base colinear, rotator, beam, mobile mount, 7/8 whip and gutterclip. Would exchange the lot for FT-77, TenTec Argosy II or similar. Sue G0AMF. Tel: 0323 898515 (Seaford, Sussex). *X532*

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PW REVIEW

CTX80/CVF80 3·5MHz band low power transmitter & v.f.o. kit

The QRP amateur radio scene world-wide seems to mean many things to many people. It can be the thrill of making successful contacts with a couple of watts of r.f., it can be the fun of making simple transmitters and receivers, it can be the joy of getting on the air without TVI rearing its ugly head. Whatever the fascination, to me the thrill is that of operating homemade equipment.

C.M. Howes Communications of Vigo near Meopham in Kent have offered the home construction enthusiast an ever increasing range of kits for a variety of purposes. Receivers for the 1·8, 3·5, 7, 10 and 14MHz bands are well catered for and it was only a matter of time before a simple crystal controlled QRP transmitter kit was produced. This kit, the CTX80 for the 3·5MHz band, is the first of three types which will be produced for the most popular bands.

A further addition to the range is the CVF80 v.f.o. kit which has been designed to allow full v.f.o. operation of the CTX80 and to allow the same v.f.o. to drive a companion direct conversion receiver such as the Howes DcRx range.

Although QRP transmitter or transceiver construction has been offered in kit form by larger manufacturers before it has been expensive and in some cases complex in construction.

Howes offer a simple transmitter and v.f.o. in the CTX80 and CVF80 kits which are very attractively priced at £12.95 for the CTX80 and £9.30 for the CVF80. Both kits can be purchased made up at a slightly higher price but to me this spoils the obvious fun of home construction. Incidentally £0.60 should be added to those prices for post and packing costs.

One particularly nice thought with the CTX80 kit is the inclusion of a crystal in the 3·5MHz band which allows the keener types to build the kit and get it on the air in about three hours straight from the box. The frequency chosen is 3·579MHz which ardent QRPers will recognise as the American Colour TV subcarrier crystal and as a busy frequency under daylight conditions but noisy at night. This is no great problem as the kit allows for up to three HC18U crystals to be fitted onto the printed circuit board.

Specifications

The CTX80 can deliver up to 5 watts of r.f. power to the antenna of which the worst case hamonic, the second, is some 40dB down on the main carrier. This r.f. output power is adjustable down to zero output which is a useful feature bearing in mind that most QRP awards allow only a maximum of 2 watts r.f. output. The nominal supply rail required is 13·5 volts with the key down current consumption being in the region of 500mA.

A sensible feature is the use of a BD135 as the power amplifier output device which is a fairly tough output transistor hence the Howes statement that the p.a. stage will survive a bad match. Although a v.s.w.r. of 2:1 is recommended the kit has been tested with both open circuit and short circuit load conditions and the p.a. has been found to survive. Needless to say some of my own efforts to produce power amplifiers in this class have not been so successful.

A simple resistor and capacitor key click filter has been provided which is effective although the keying is maybe a little too soft. This however is only a personal point of view, preferring hard keying myself to get through band noise and general QRM.

The CVF80 is a v.f.o. module which tunes the range of 3MHz to 4·5MHz, with a tuning capacitor of 50pF, in 300kHz segments. Provision is made for independent receiver tuning, i.r.t., which allows the v.f.o. to be moved off the transmitted frequency whilst receiving. This is to prevent the v.f.o. from being heard on the station receiver during receiving periods which would obviously prevent incoming signals from being heard, bearing in mind the v.f.o. runs continuously. The same i.r.t. system can be used as i.r.t. in the normal way if the CVF80 is used as part of a 3·5MHz band direct conversion receiver along with the CTX80 kit and the DcRx kit. Full instructions are given on utilising these modules.

The i.r.t. allows a swing of 4kHz total variation, a typical figure was found to be plus or minus 1·5kHz. Two outputs are provided, each independently buffered, giving around 3 volts peak-to-peak across a load impedance greater than 1kΩ. This feature provides output to either the transmitter and direct conversion receiver module or to the transmitter and a frequency counter in a v.f.o. and transmitter set up.

An unusual feature is the f.m. facility which allows for the v.f.o. to be used in another application such as the drive v.f.o. for a v.h.f./f.m. transmitter or maybe an RTTY application. Frequency shift keying, f.s.k., is obtained by keying the i.r.t. switching circuit.

With f.m. use up to 8 volts peak-to-peak audio can be fed into the v.f.o., however this has not been tried by the author as he has no intention of using f.m. on the 3·5MHz band!

The supply rail can be anything from 10 volts to 15 volts although this will cause a frequency variation of some 100Hz or so over this range. To prevent supply rail voltage variations from changing the operating frequency Howes have included a simple series regulator transistor in the supply rail. This is a further nice thought, experience shows that when a transmitter and its v.f.o. share the same supply rail there is always a tendency for the signal to chirp or change frequency as the maximum current is drawn by the power amplifier from the power supply.

Circuitry

Whilst the CTX80 transmitter is entirely conventional in its circuitry the CVF80 has one or two unusual features. Let us look first at the CTX80.

Transistor Tr1 is a crystal oscillator with the crystal connected between Tr1 base and earth, output from a coil in its collector circuit being fed to the next stage. Transistor Tr2 is an emitter follower which offers a low impedance feed into the base of the driver transistor Tr3 via a power control potentiometer VR1. The collector circuit of Tr3 has a wideband transformer coupling energy into the power amplifier stage Tr4. Keying is carried out in the emitter circuit of Tr3 and a small key click filter is made up of a series resistor and capacitor combination.

Transistor Tr4 collector circuit consists of a dual π network giving both impedance matching and harmonic attenuation to the signal before it is passed to the antenna circuit.

The CVF80 v.f.o. unit consists of a Hartley oscillator using a tapped inductor in the gate of Tr3 with its output feeding Tr4 which is a source follower. Output from the

source follower is fed to Tr7 and Tr8, which are two buffers, and provide isolation for the signal being fed to the CTX80 and either the DcRx receiver or a frequency counter. Transistor Tr9 provides a simple regulator circuit supplying 8 volts or so to the v.f.o. This will prevent changes of frequency due to variations in the supply rail to the v.f.o. The same regulator circuit feeds this stable supply to the i.r.t. circuit which is unusual.

The i.r.t. potentiometer is fed from the 8 volt stable source and the amount of i.r.t. is determined by the setting of the slider of this potentiometer. To give a "dead spot" around slider centre (i.e. a small range over which there is little or no change of i.r.t. frequency) two current source transistors are used, Tr1 and Tr2.

These two devices act rather like the "crossover distortion" biasing arrangements in an audio push-pull transistor amplifier. Simply, they allow for a less critical setting for zero offset when the i.r.t. potentiometer is at a central position.

Transistors Tr6 and Tr7 provide i.r.t. switching and if required frequency shift keying. By either earthing one connection or applying 12 volts to another connection the i.r.t. can be switched on or off.

Frequency modulation can be obtained by feeding audio into a varicap diode, actually it is a simple power diode, to deviate the carrier.

Howes have obviously spent a lot of time to put every feature into, what at first sight might seem like, a simple v.f.o. A lot can be done with it, v.f.o. operation, f.s.k., f.m. plus its use to feed a counter or direct conversion receiver mixer.

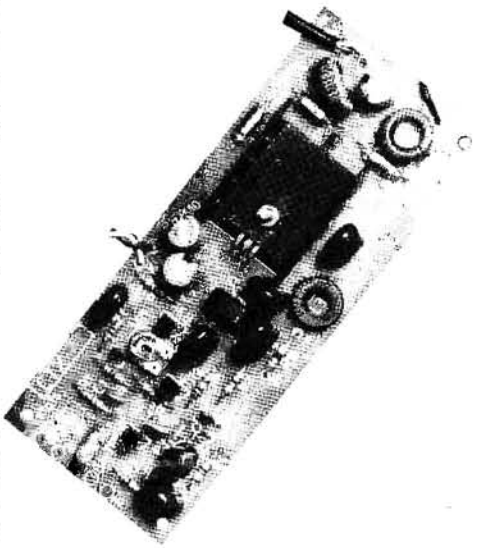
Components and Construction

In the various talks the author has given to Radio Clubs around the South East of the UK the most frequently heard comment when home construction is mentioned is "nothing I build ever works, I'm all thumbs when it comes to soldering irons and screwdrivers". That in itself is a sad statement coming from radio enthusiasts and perhaps reflects our attitudes to amateur radio today.

With the Howes kits, certainly with the CTX80 and CVF80, there is every chance of success. Both kits use good quality printed circuit board, ready tinned, and the resistors and capacitors in the kit are of excellent quality. I found that only the most basic tools are needed for the kits, a soldering iron of about 30 watts with a fine tip, a small pair of side cutters, some long nose pliers, the odd screwdriver and a small trimming tool for either of the inductors.

There is a small slug tuned inductor in both the transmitter and the v.f.o. kit and a novel way of winding a slug tuned coil is shown in the instructions—if you want to find out what it is, buy the kit!

The instructions themselves are clear and concise but do not give step by step details for fitting each component, this causes no problem, the printed circuit boards have component detail, i.e. R1, R2, C1, C2 printed on them. You just fill the holes up until you run out of components. Forget about the colour code, well don't forget really, even the colour banding of the individual resistors is given against the component fitting and check list. Howes really seem to have done everything to make construction an ease and a pleasure.



Results

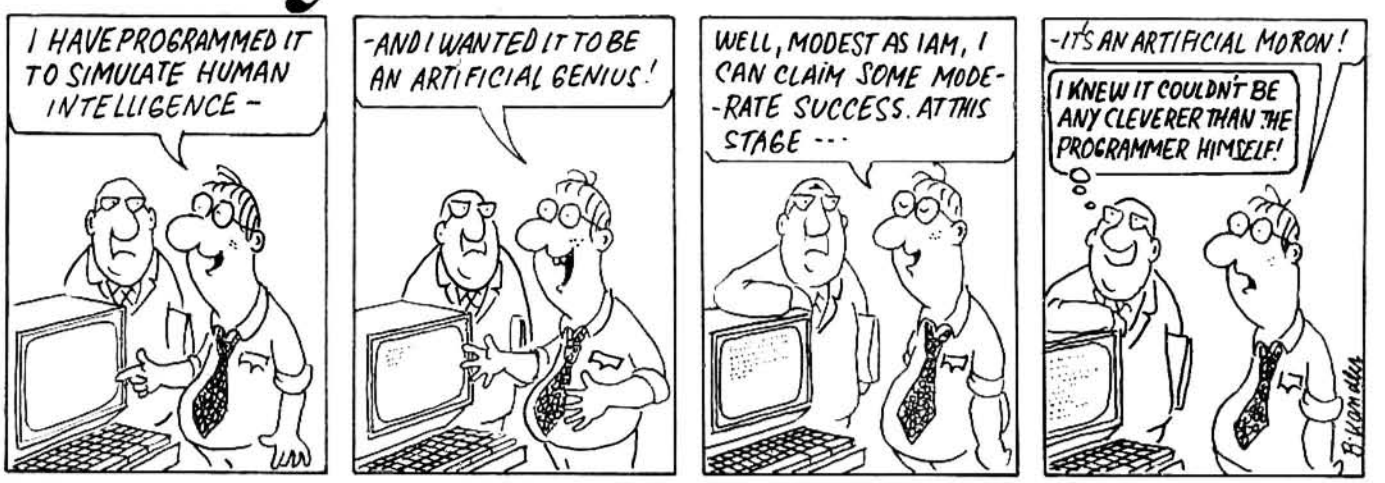
Many reviewers end a review with a great long list of DX worked soon after the new rig was purchased or constructed Tales of W7, W6, the odd JA all make good reading. With the CTX/CVF80 rare DX may be a little more difficult but at least you will be able to make your mark on the band. In two weeks I was able to work stations around Europe with ease under both daylight and night-time conditions. All you need to remember are the golden rules of QRP operation, listen first, check no big signal is lurking around the frequency you want (it's a big cold world, sometimes even the most ardent QRP operator can get stamped on by some high power station with cloth ears). Keep your calls short, if you must send CQ try and do so around the recognised QRP frequency of 3·560MHz, only use a three by three CQ/callsign combination. Remember long CQ calls are boring to someone waiting to answer you, if you keep your calls short and "snappy" you have a far better chance of ensnaring a station in your QRP "trap". It is usually far better if running low power to "tail-end" a QSO already in progress.

What is "tail ending"? This refers to the practice of hearing a QSO in progress and then calling either of the stations when they have finished transmitting. The signal $\overline{SK}$ being sent when both stations have ended their QSO.

So there you have a useful little QRP transmitter and v.f.o. combination, easy to construct and use, it can be fitted into a cabinet of your choice. The QRP gang look forward to working you on the 3·5MHz band.

Colin Turner G3VTT

Benny



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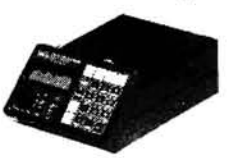

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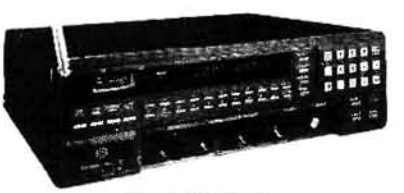

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Secretaries of newly-formed clubs are cordially invited to send in information on their clubs, including meeting days and time and venue. A calendar of forthcoming events would also be welcome, remembering that about six weeks' notice is required if an event is to appear in the appropriate issue of *PW*. A list of forthcoming deadlines appears at the end of this feature. All information should be sent to me **DIRECT** and not to *PW* at Poole.

CLUB NEWS

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

Acton, Brentford & Chiswick ARC: G3IIU George Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3. Antennas form the subject for discussion on Tuesday, July 16, at 7.30pm, the Chiswick Town Hall, High Road, Chiswick, London W4.

Alyn & Deeside ARS GW3TZR: G. C. Cook GW4RKX on (0244) 660066. A d.f. hunt is scheduled for July 8 and the summer recess is from July 28 to August 31. Club usually meets alternate Mondays at 8pm at the Shotton Social Club, Shotton Lane, Shotton, Deeside.

Antrim & District ARC GI4SIW: Brian Sheepwash GI4KIS, 204 Donore Crescent, Antrim, NI. This club meets at the Railway Bar, Antrim, and is desperately in need of new members. More from Brian.

Axe Vale ARC G8CA: Bob Newland G3VW on Lyme Regis 5282. Venue is the Cavalier, West Street, Axminster, at 7.30 on the first Friday of the month. There will be a family picnic in Charmouth Forest on July 5.

Borders ARS: Mrs S. P. Jones G1IUK on 0289 305465. First and third Fridays at the Tweed View Hotel, Berwick-on-Tweed, at 8pm.

Bridgend & District ARC: T. C. Morgan GW4SML, 4 Rhiw Tremaen, Brackla, Bridgend, Mid-Glam. First and third Fridays at the YMCA, Bridgend, for a 7.30pm start.

Brighton ARC: Peter Turner G4IIL on Brighton 607737. The meeting spot is the Seven Furlong Bar, Brighton Racecourse, alternate Wednesdays at 8pm.

Bristol ARC G3TAD: D. Gully G4YOC on Bitton 4116. Get along to the YMCA, 6 Park Road, Kingswood, Bristol, every Tuesday at 7.30pm, with RAE tuition and Morse code classes.

North Bristol ARC G4GCT: Ted Bidmead G4EUV on 0272 691685. At the Self-Help Enterprise, 7 Braemar Crescent, Northville, every Friday from 7pm. With a member now an op at Portishead Radio, a visit to the station is on the cards.

South Bristol ARC G4WAW: Len Baker G4RZY on 0272 834282. It's "Work a G1 on c.w." evening on July 10 run by G4XED, plus a DXTV session with Ron Gardner on the 17th. On the 31st the lecture will be on ATV by G4ZBL. Meets every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch.

Cheltenham ARA G5BK: Tim Kirby G4VXE on 0242 36723. First and third Fridays in the Stanton Room, Charlton Kings Library, C'ham. Going h.f. mobile will be dealt with by G3TSO on July 5 and there is the possible visit to the Madley satellite station on August 2.

Cheshunt & District ARC G4ECT G6CRC: Roger Frisby G4OAA on 0992 464795 "Get your equipment working" is the order of the day on July 10 when test gear will be available. On the 24th it's portable time on the 144MHz band on Bass Hill Common, Broxbourne. A junk sale is down for August 7. Every Wednesday at 8pm, Church Room, Church Lane, Wormley.

Chester & District RS: Alan Warne G4EZO on Chester 40055. Meets at the Chester RUFC, Vicars Cross, Chester, at 8pm. July 9 sees a surplus equipment sale, while on the 16th there is a treasure hunt with an early start at 7pm. July 23 has members talking on a DX trip to the Orkneys. On to the 30th and a "Rig on the Air" evening. Code classes by G4MOU at 7.15pm before the main meetings.

Chichester & District ARC: C. Bryan G4EHG on C'ter 789587. The Fernleigh Centre, 40 North Street, C'ter, at 7.30, the first Tuesday and third Thursday, with club net on S11 Wednesdays at 7pm. Between July 9/13 and 16/20 the club will be running GB2CHI for C'ter Festivities at the Guildhall Priory Park. It's off to the Sussex Mobile Rally on Sunday, July 14.

Colchester Radio Amateurs: F. R. Howe G3FIJ on 0206 851189. Looks like the first and third Thursdays at the Colchester Institute, Sheepen Road, C'ter, at 7.30. On July 21 the Anglian Mobile Rally will be held at Stanway School starting at 10am, a Sunday.

Coulsdon ATS G4FUR: Alan Bartle G6HC on 01-684 0610. Second Monday and last Thursday at St Swithins Church hall, Grovelands Road, Purley, Surrey, at 8pm. July 8 is quiz time, competing with the Wimbledon & District ARS. Morse code tuition features on the last Thursday of the month.

Cray Valley RS G3RCV G8FCV: B. Rowe G4WYG, 28 Malyons Road, Hexstable, Swanley, Kent. The Christchurch hall, Eltham, second and third Thursdays of the month, but on July 13/14, Saturday and Sunday, GB0DAN will be run by the club on all h.f. and v.h.f. bands from the Danson Park Show. A night-on-the air is planned for August 1, the first Monday in this case.

Dartford Heath DF Club: Peter Sharman G8DYF on Greenhithe 844467. Pre-hunt Tuesday meetings are held at the Horse & Groom, Leyton Cross, Dartford Heath, Dartford, Kent, starting at 9pm, the next being on July 23, followed by August 6.

Dunstable Downs RC: Phil Morris G6EES on D'stable 607623. Foregathers in Room 3, Chews House, High Street South, D'stable, Beds, with the next meet on July 19 with a talk entitled "Awash in Norfolk".

Ealing & District ARS G3UUP G8UUP: Anton Berg G4CSR on 01-997 1416. Tuesday evenings at 7.30, the Northfields Community Centre, 71a Northcroft Road, Ealing, London W13.

Echelford ARS: Peter Coleson G4VAZ on Sunbury 83823. This is a change of secretary for the club which meets on second Monday and last Thursday of the month at the hall, St Martins Court, Kingston Crescent, Ashford, Middx. Club nets on Sundays at 10am on 1·985MHz and Wednesdays at 8pm on 144·575MHz f.m.

Flight Refuelling ARS: D. Wilkes G8ZLH (0202) 570894. July 7 is a natter-nite on technical topics, G6JAT and G6JIX have a demo organised of a TV colour OB van for the 14th. July 21 is G3YGF on e.m.e., microwaves and troposcatter, then G4WHO deals with SSTV in his technical rambles on the 28th.

Fylde ARC: J. Whitehead G4CSA on Lytham St Annes 737680. Normally meets at the Kite Club, Blackpool Airport, first and third Tuesdays at 7.45pm, but on July 16 there is a visit to the Police HQ at Hutton to see their communications department, meeting at Hutton at 7pm prompt.

Gordano AR Group: John Davies G3LJD, 27 Down Road, Portishead, Bristol. Fourth Wednesday of the month at 8pm, the Ship, Redcliffe Bay, Portishead. Operating procedures and techniques is the subject for a talk on July 24, a special event station being set up for the Portishead Flower Show on July 26/27, that is a weekend.

Grimsby ARS G3CNX: George Smith G4EBK on Grimsby 887720. Meets at the Cromwell Social Club, Grimsby, at 8pm, every Thursday. A treasure hunt is scheduled for July 11, with a d.f. hunt on the 18th. The chat on the 25th concerns BC band s.w.l.ing.

Havering & District ARC G4HRC G8HRC: Dudley Gray G1HTQ on Hornchurch 41532. Gets together every

Wednesday at 8pm, the Havering Arts Centre, "Fairkytes", Billet Lane, Hornchurch, Essex. G3EUR will be dealing with s.w.r. problems on July 17 and G4ZTR will give a talk on the 31st, subject unknown.

Holyhead & District ARS: Mrs B. Anzani, c/o HADARS, 12 London Road, Holyhead, Anglesey, Gwynedd, N. Wales. This new club seeks new members and they may be in time to join the club's expedition to the Skerries island with a special event station during the last week of July. The lighthouse there goes automatic next year. Meetings on "alternate" Sundays at the Forresters Arms, Kingsland Road, Holyhead, so contact the sec for details.

Horsham ARC: Peter Head G4LKW on Horsham 64580. First Thursday of the month at 8pm at the Guide HQ, Denne Road, Horsham.

Hull & District ARS: C. North G4PEP on 0482 77249. Meets at the West Park Recreation Centre, Walton Street, Hull, every Friday at 8pm. The club also runs an RAE course on Tuesday evenings.

Ipswich RC G4IRC: Jack Toothill G4IFF on 0473 44047. Open to all with amateur or allied subjects interest. Second and last Wednesdays at the Rose & Crown, 77 Norwich Road, Ipswich, at 8pm, with code classes on the other Wednesdays if the room is vacant, next session being on July 10. A d.f. hunt is featured for July 31. Note, a special event station will be organised for the Ipswich Carnival on Saturday, August 10.

Isle of Man ARS: Anthea Matthewman GD4GWQ on 0624 22295. Main meetings Mondays at 8pm, the Howstrake Hotel, Harbour Road, Onchan, and note that this is a change of venue. On Tuesdays it's at the Peveril Court Hotel, Ramsey, and Thursdays at the Tynwald Inn, St Johns, ending with Friday meets at the Perwick Bay Hotel, Port St Mary.

Kidderminster & District ARS G4GXP G6KRC: A. F. Hartland G8WOX on K'minster 751584. New members being sought, or take along a friend, to the Aggborough CC, Hoo Road, K'minster, at 8pm. Next meet on July 9 when Tom Douglas G3BA talks of radio and the Burma Road.

Lincoln SWC G5FZ G6COL: Pam Rose G4STO c/o City Engineers' Club, Central Depot, Waterside South, Lincoln. It is Morse code test time on July 17 at the club when a rep of BT will be in attendance to take the test. Outside amateurs are invited to contact Pam if they want to go along for a test. Otherwise the club meets at 8.15, third Wednesday of the month at the above QTH.

Maltby ARS: Ian Abel G3ZHI on Rotherham 814911. Fridays at 7pm, Church Buildings, Church Lane, Maltby. G4BVV will describe a cheap QRP transceiver for the h.f. bands on July 12 and there will be a d.f. hunt on the 19th. The early days of amateur radio will be dealt with by G3ZHI on the 26th. A junk sale is planned for August 9.

West Manchester Radio Club G4MWC G6FSA: T. Chapman G6YIO, c/o Astley & Tyldesley Miners' Welfare, Meanley Road, Gin Pit Village, Astley, Tyldesley. Club meets every Wednesday at 8pm at the above address. They have two rallies planned this year, on August 18 at Haydock Park Racecourse and November 24 at Pembroke Halls, Walkden, Greater Manchester. More details from G6YIO.

Medway ARTS G5MW G8MWA: Tony Faram on 0634 578647. Fridays at St Lukes Church Hall, King William Road, Gillingham, Kent.

Merion ARS: Ken Judge GW4KEV, Tyddyn Mawr, Arthog, Gwynedd., Meets at the Dolserau Hall Hotel, Dolgellau, at 7pm on the first Thursday of the month. Visiting amateurs more than welcome, particularly on August 1.

Midland ARS: Norman Gutteridge G8BHE on 021-422 9787. The club has received a notice to quit from its HQ at Broad Street, Birmingham, due to redevelopment, so contact the sec for latest details.

Newbury & District RS G3WOI: M. J. Fereday G3VOW on Newbury 43048. Second Tuesday of the month at the Newbury Technical College. July 9 has an illustrated talk entitled "From Berkshire to Box 88".

ARC of Nottingham G3EKW G6CW G8IUT: Ian Miller G4JAE on 0602 232604. Ian is the new secretary. Thanks to Jim G4PJZ, last sec, who has had to stand down. Thursday evenings at 7.30pm, Sherwood CC, Mansfield Road, N'ham. There is a d.f. hunt on the 144MHz band on July 11 and another on the 25th. G4IRX will deal with oscilloscopes and their calibration on July 18.

Oldham ARC: John Midgley G3SAO on 061-652 6529. John is the new secretary of the club which meets every Monday at 8.30pm, the Wheatsheaf Hotel, Derker Street, Oldham.

Greater Peterborough ARC G4EHW: Frank Brisley on 0733 231848. Normally fourth Thursdays at 7.30pm, Southfields Junior School, Stanground, but this month a surplus equipment sale is scheduled for July 18 due to school term finishing.

Plessey Christchurch ARC: Geoff Longman G6WQU, c/o Plessey, Christchurch, Dorset BH23 4JE. A fully equipped shack is offered and the Plessey S & SC is nearby. Meetings expected to take place on first Thursday of the month. A call on S20 to G6WQU/P from 7pm onwards may help you find the spot on meeting evenings.

Poole ARS G4PRS: Phil Dykes G4XYX, 68 Egmont Road, Poole, Dorset. Another newcomer to the column with sec Phil, a regular contributor to the DX Bands feature. Meetings held on the last Wednesday of the month at Poole College. The college is closed during the summer so a programme of outside events is in full swing; details from Phil.

Preston ARS: George Earnshaw G3ZXC on 0772 718175. A newcomer to this column, the club meets at the Lonsdale Club, Fulwood, starting at 7.45pm. Informal meetings on July 18 and August 1, with planning for the Preston Rally at the Lancashire University on Sunday, August 25 very much in mind. Details of the rally from G3DWQ on 0772 53810.

Reading & District ARC: Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading, Berks. Alternate Tuesdays at 8pm, the White Horse, Emmer Green, Reading, with a talk on receiver front-end parameters and their measurement on July 9. On July 23 final arrangements will be discussed for the special event station GB0RAR at the exhibition at the Shire Hall on Sat/Sun, July 27/28.

Rhyl & District ARC GW4ARC GW4ARC: Melfyn Allington GW1AKT on Nantglyn 469. First and third Mondays at 7.30pm, the Mona Hotel, Market Street, Rhyl. On July 15 Basil O'Brien G2AMV will give a talk on the RSGB, and there is a d.f. hunt on August 5.

St Helens & District ARC: Alan Riley G6MXT on 051-430 9227. Every Thursday at 7pm, the St Helens Information Technology Centre, Water Street, St Helens, with access to electronics and computing labs. Special event station GB2STH will be active on July 25/26/27 at the St Helens Show.

Skelmersdale & District ARS G4SME G6TKY: Gordon Crowhurst G4ZPY on 0704 894299. Remember the new venue is the Beacon Park Golf Club, at 8pm on Thursdays, alternating with lectures and natter-nights.

Southdown ARS G1KAR G3WQK: R. Wilson G1BAB on Seaford 890234. First Mondays at 8pm, the Chaseley Home, Southcliff, Eastbourne, and at the clubrooms of the Wealdon District Council offices, Vicarage Fields, Hailsham, on Tuesdays and Fridays with courses running on the Tuesdays at 7.30pm.

Southgate ARC: R. F. Snary G4OBE, 12 Borden Avenue, Enfield, Middx. All meetings at St Thomas' Church Hall, Prince Georges Avenue, Oakwood, London N14, on the second Thursday of the month.

Spen Valley ARS: G3SVC Tim Clough G4PHR on Mirfield 499397. Thursdays at the Old Bank WMC, Mirfield, at 8pm. Judging for the Swindon Cup will take place on July 11 by Mike North G4EZV, presumably for homebrew equipment.

North Staffs ARC G4BEM: David Morgan G6MLI on 0782 332657. Each Monday at 8pm, Harold Clowes CC, Dawlish Drive, Bentilee, Stoke-on-Trent. New faces most welcome.

Stourbridge & District ARS G6OI G6SRS: Malcolm Davies G8JTL on Lye 4019. The meeting spot is the Robin Woods Centre, School Street, off Enville Street, Stourbridge, at 8pm on first and third Mondays of the month.

Stratford upon Avon & District ARC: David Boocock G8OVC on S-on-A 750584. Second and fourth Mondays at 7.30, the Bearley Radio Station, Bearley, near Stratford. July 8 is RTTY and AMTOR time with G3WHO lecturing, and on the 22nd it's Technical Topics and the results of the member's construction competition. Note: there will not be any meetings during August. From September 9 there will be a new meeting spot at the Baptist Church, Payton Street, S-on-A. but more details later.

Stroud ARS G4SRS: P. R. Giney G1DCT, Prencott, Harley Wood, Nailsworth, Stround, Glos. Formerly the South Cotswold ARS, this group now

meets at Nelson School, Stratford Lodge, Stroud. Contact the sec for more details.

Mid-Sussex ARS G3ZMS: C. R. Cook G1FRF on 07918 2937. During school term times the club meets at Marle Place, Burgess Hill, every Thursday evening with a full programme of events.

Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam, Surrey. Third Friday at 7.30pm, the Downs LT Club, Holland Avenue, Cheam. Nets on Tuesdays 10.30am 3·7MHz s.s.b., Thursdays 8pm 144·390MHz s s.b. and Sundays at 10.30am on 144·5MHz f.m. Arthur Milne G2MI will be talking to the club on amateur radio in the early days on July 19. There is a possibility that members will be visiting the Chalkpits Museum, near Arundel, on Saturday, July 27, to see the collection of radio equipment there.

Swindon & District ARC: Dave Ineson G4ZAZ on Swindon 37489. Thursday evenings at 7.30, Oakfield School, Swindon.

Thornton Cleveleys ARS: Elizabeth Milne G4WIC on 0253 821827. Mondays at 7.45pm, at the 1st Norbeck Scouts HQ, Carr Road, Bispham, Blackpool. On July 10 a visit to the Red Rose radio station in Preston, be ready by 7.30pm. There is a video show on the 22nd and a construction project clinic on the 29th. Other Mondays are informal on-the-air occasions.

Three Counties ARC: K. D. Tupman G6WWE on 0730 66489. Alternate Wednesdays at 8pm, the Railway Hotel, Liphook, Hants. A rep from *PW* will be talking on antenna topics on July 10 and QRP home construction is the subject for G4RCY on the 24th.

Vale of White Horse ARS: Ian White G3SEK on Abingdon 31559. First and third Tuesdays in the upstairs clubroom of the Waterwitch, Cockcroft Road, Didcot at 7.30pm. A reminder of the AGM on August 6.

Verulam ARC: Hilary Claytonsmith G4JKS on St Albans 59318. It's the RAFA HQ, New Kent Road, off Marlborough Road, St Albans, second and fourth Tuesdays at 7.30pm. A lecture on radio test equipment by a rep from Marconi Instruments is down for July 23. All visitors most welcome.

North Wakefield RC: Mike Leonard G4VJM on (0532) 852875. Carr Gate WMC, Lawns lane, Wakefield, at 7.30pm every Thursday. On July 11 a demo of AMTOR is promised by G3PSM. August 1 is down as a night-on-the-air affair.

Walsall ARC G4HLL: Linda Prince G6HZI on 0922 32607. The Forest Comprehensive School, Hawbush Road, Bloxwich, Walsall, is the spot every Wednesday at 8pm, with new members welcomed. Morse code classes are held regularly.

Willenhall & District ARS: John Perkins G4LWI on 0902 782036. Gathering spot is the Saracens Head, Bloxwich Road South, Willenhall, W. Mids, every Wednesday at 8pm.

Wimbledon & District ARS G3WIM: George Cripps G3DWW on 01-540 2180. Venue is the St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19. Second and last Fridays of the month at 8pm, with a break for refreshments, and new members and visitors most welcome. However, on Monday, July 8 it's quiz time at the Coulsdon club. Kites are the subject for David Kinsella on July 12, and on to the annual camp at the Barwell Estate, Chessington, Sy, from July 27 to August 3, with continuous activity on just about all bands from GB0WIM.

Winchester ARC G4ZPT: Robert Stone G4FPC on W'chester 64747. Club meetings at the Log Cabin, Stockbridge Road, W'chester, every third Saturday at 7.30pm, with regular Morse code classes. On July 20, G2DBT will give a talk on homebrew AR equipment. There are no meetings during August.

Wirral ARS G3NWR: Cedric Cawthorne G4KPY on 051-625 7311. For the moment it's the Parish Hall, Heswall, on first and third Wednesdays at 7.45pm, but a search for a new venue is on. Member's problems will be dealt with on July 17.

Wirral & District ARC G4MGR G8WDC: Gerry Scott G8TRY on 051-630 1393. Second and fourth Wednesdays at the Irby Cricket Club, Mill Hill Road, Irby. Other Wednesdays are natter-nights at local pubs, all at 8pm. On July 10 there will be a talk and demo by the Wirral Raynet Group, with a d.f. hunt on Sunday, July 14, starting at the Heswall lay-by, with a "revenge" d.f. hunt on the 31st for the G8PMF Rose Bowl.

Wisbech & District AR & E Club: P. W. Frampton G6NNK, Fencroft, Summerfield Close, Wisbech, Cambs. A special event station will be at the Wisbech Annual Rose Fair Parade on Saturday, July 6, with a camera on one of the floats transmitting pictures back to base.

Wolverhampton ARS: Keith Jenkinson BRS84269 on 0902 24870. On July 9 a discussion on "What's so bad about CB" chaired by G8YFA and on the 16th a demo of RTTY and AMTOR by G1DIL. So, every Tuesday at 8pm, the W'hampton Electricity Sports & Social Club, St Marks Road, Chapel Ash, W'hampton.

Worcester & District ARC: Derek Batchelor G4RBD on W'cester 641733. First and third Mondays of the month at 8pm, the Oddfellows Hall, New Street, W'cester. On August 5 G4ERP will give a talk on contesting.

Worksop ARS: Mrs C. S. Gee G4ZUN on Worksop 486614. A new venue at the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop, and a new meeting day, Tuesdays instead of Thursdays. So a clean sweep all round! On July 9 it's conversion time, m.w. radios to Top Band and there is a Barbecue in Culumber Park on the 13th, a Saturday. On the 23rd G3XXN shows slides of an AR holiday in Scotland. A bus trip to Scarborough ends the month, but note the d.f. hunt on August 6.

Worthing & District ARC: Roy Jones G4SWH, POB 599, Worthing. Meetings each Wednesday from 7.30pm in the Lancing Parish Hall, South Street, Lancing, W. Sx. Info from sec or club nets on Tuesday at 8pm 3·725MHz s.s.b., Sunday at 11am on 7·07MHz s.s.b. and at 7.30pm on S21 f.m.

Yeovil ARC G3CMH G8YEO: Eric Godfrey G3GC on 0935 75533. The RSGB's Regional Rep will visit the club on July 11 and on the 18th G3MYM will ponder take-off angles of signals at sunspot minimum. He will also talk on the subject of s.s.b. on August 1. The club meets each Thursday at the Recreation Centre, Chilton Grove, Yeovil, at 7.30pm.

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

ON THE AIR

AMATEUR BANDS

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

by Eric Dowdeswell G4AR

An interesting letter from **Colin Hollister G4SQQ** of Bristol who, although a reader of *PW* for a number of years, considers himself a beginner in amateur radio. He studied for his RAE at home and did his Morse code practice at the Bristol ARC, and got operating procedures practice on the club's FT-101Z. He bought a well-used KW2000 and worked a bit of DX on c.w., but eventually came under the influence of QRP, joining the G QRP Club. He built the famous OXO three-transistor rig for 14MHz c.w. and has worked all round Europe as well as the USA and Canada using a half-wave dipole.

He has also built the *PW* Teme, 7 and 14MHz QRP rig and is getting the CTX/DCRX80 kits from C. M. Howes for the 3·5MHz band. For the newly-licensed amateur or would-be amateur, Colin recommends, first, to spend as much time listening as possible, including putting a suitable receiver in the car, and secondly, joining a local radio club to make use of the advice and facilities available. Good advice which I strongly endorse.

General

The Cray Valley RS annual contest takes place this year between 1800Z Saturday September 7 and 1800Z on the 8th, but only 18 hours logging is allowed for single operator stations. Multi-ops can use the 24 hours. The two sections are 'phone and c.w. on all h.f. bands excluding the WARC bands, and, quite rightly, the rules say that the practice of logging a series of contacts made by one station is deprecated. Hence the same station cannot be logged more than five times on each band in the "station worked" column. Call areas of the USA, Canada and Australia count as separate countries.

Log sheets are available from Owen Cross G4DFI, 28 Garden Avenue, Bexleyheath, Kent, in exchange for a large stamped/addressed envelope. Entry deadline is October 28. It is worth remarking that *PW* readers usually appear near the top of the winners listing, so have a go this year even if you have never entered a competition before.

Smiths Industries RS, in conjunction with the Gloucester and Cheltenham clubs, will be running a special event station GB2CV at the Cheltenham Racecourse, Prestbury Park, Glos., from Saturday July 27 until Wednesday July 31. This station will be operative on the occasion of the 6th Citroen World Meeting organised by the "2CV GB" club, and expects to be on all h.f. bands plus the 144 and 430MHz bands. Another possibility is RTTY, SSTV and ATV operation. Special QSL cards provided by Citroen will acknowledge QSOs and s.w.l. reports. Further information from Roger G8UJG on 0242 672175.

Hamfest '85 will be held at the Flight Refuelling Sports & Social Club, Merley, near Wimborne, Dorset, on Sunday August 11. The QRP fraternity will be operating a station with, hopefully, the callsign GB4QRP, and running a display of QRP gear, mostly home-brew. A lot of outside help is wanted, not only to run the station but for the many other jobs involved, like log keeping and antenna erection. Offers to Phil Dykes G4XYX, 68 Egmont Road, Poole, Dorset.

The Basingstoke ARC will be running a course starting in September this year which is aimed at taking students up to RAE level by May next year, and that assumes no prior knowledge of the subject. The course will comprise 28 weekly sessions, 7.30 to 9.30pm, with the day of the week to be decided. More details from the secretary, D. A. Burleigh G4WIZ, 14 Winchfield Gardens, Tadley, Basingstoke, Hants.

GB4MGB was put on the air by the Havering & Daventry radio clubs between May 3 and 5. Located at the Silverstone Grand Prix circuit in Northamptonshire, the station celebrated the International gathering of the MG Car Club.

Two stations were running, one on v.h.f. on the 144MHz band and one on h.f., mostly on the 3·5MHz band. With a temporary set-up, the stations were active from around 8pm on the Friday, and even with low power to a modest antenna system the v.h.f. station was kept busy until 2.30 in the morning.

The stations were on the air using improved systems by lunchtime on Saturday. The v.h.f. set-up was an FT-225RD with 4CX250 p.a. to a 12-element home-brew beam at 2m. On h.f. the inevitable FT-101 was used into a long wire, one end of which was attached to scaffolding above the track.

On v.h.f. some 250 contacts were made, covering most of England and including contacts with GW, GM and GI. A similar coverage was achieved on h.f. with conditions being very changeable, even for the h.f. bands.. At times, the pile-up of stations calling resembled a good contest!

Those amateurs who were operating the station still managed to take some time off to watch various races and demonstrations of MG cars on the circuit.

Of course, all contacts will receive the special QSL card via the bureau.

Aurora

"At 1603GMT on April 21 I was working in the shack when up popped GM1BLC/P who had a very heavy auroral signal and was working G stations further north than me with 5/9A reports. This station was located between Glasgow and Edinburgh in IO75PW (XQ80d). With me the station peaked at 5/5A on a beam heading some 10° east of true direction. During the period 1603 to 1800 many s.s.b. and c.w. signals were heard, GM6LNM (XP07e) GM1AXJ (IO87FN/YR33g) and GI4OMK on c.w.," writes **John Fell G0APl** from Poole. G1KHN reported to John that the Sunday afternoon event was quite mild and probably the second phase of the main event which produced QSOs from Northern G into OZ/LA/SM and SP during late Saturday until 0300GMT on the Sunday morning.

DX Bands

In spite of the continued sinking of the sunspot minimum the 21MHz band seems to have come to life again, even if only occasionally, but the 7MHz and 3·5MHz bands continue to bear most of the DX traffic. Even VS6 has been heard on 3·5MHz as early as 2100Z.

Alan Brooks (Basingstoke, Hants) lives in hospital accommodation but got the ok to put up a 15m-long wire between blocks, but the QRM from electrical apparatus seems to be pretty horrific. He uses an Eddystone 730 but no a.t.u. On 7MHz he found just OY4DWO on the Faroes plus EA9MY (QSL POB 412, Melilla), ZS3BI, EA8AKN, 5H3RC and KH6WWU on 14MHz.

From Leiston, Suffolk, **Dick Stanbridge BRS31879** writes to say that his son is G3RHU who still has one of my ST2AR QSL cards from his s.w.l.ing days in 1960! Dick runs a Trio R2000 with AT1000 a.t.u. plus Datong active antenna AD370. Dick is about the only reader to come up with a c.w. log these days. Around 1·85MHz he logged RA9QBX and UT5AB on c.w. at 2130Z. Only catch of note, on 3·777MHz,

was ZL4AP, on s.s.b. On to the bottom end of 7MHz and TI2KD, VR6TC for a nice one on Pitcairn Island, and ZL2ANR all s.s.b. with FM4CT on c.w. On 14MHz it was just 9M2DC on s.s.b of any note, but on c.w. Dick caught KL7HPR at 0750Z, HP1AC, HI8LGS, VE7FJV and KH6AK on Hawaii.

Bob Parsey (New Malden, Sy) stuck to s.s.b. over five bands with JY9MG on 3·5MHz, then on 7MHz CM7KR (QSL POB 1, Havana), FM5BH (QSL W3HNK), HH7PV and PY0FG on Fernando de Noronha. XT2BR heard on 14MHz can be found via POB 116 (Ouagadougou). The 21MHz band came alive with A4XRS, JY9CL (QSL G3MUL), J28AG, ZD7CW, 3B8CA, 3D6BP and 9M2FD. The 28MHz band even produced Z21GN, typical of the north/south openings that still appear sometimes. Bob uses an FRG-7700 with a.t.u. and a 60m-long, end-fed wire about 5m off the ground.

In Porth, Mid-Glam, **Tom Blamey BRS87461** stuck to 14MHz with his Trio R600 receiver, Amtech 200 a.t.u. and an inverted-L random length wire. His catches included EA6KZ, CT3EB, 4Y4FR, 5H3HM, 5Z3ZC and 5Z4DU, plus VP9CH. Do have a look at the other bands, OM, if your spare time permits; there is plenty of DX to be found on 7 and 3·5MHz as other logs show.

M. Dunn BRS86500 of Grimsby runs a Realistic DX160 with a 40m-long wire antenna and managed to cover four bands in his search for DX. On 3·5MHz he got 7X2LS (QSL POB 84, Bouzarea, Algiers), VS6DO at 2130Z (QSL K4CIA), YI1BGD at 2000Z. Up to 7MHz and A71AD in Qatar, 6W1KA, V44KF (QSL POB 173, St. Kitts). A nice prefix on 14MHz was SV2KD, 9H4A on Gozo Island, and A4XRS On 21MHz it was just 9U5JB on the southern path.

In Northiam, E. Sx, **Norman Henbrey BRS28198** runs an FRDX-400, FRG-7700, Mizuho a.t.u. and a 40m-long wire plus a TA31JR rotary dipole. Norman did well on five bands, all on s.s.b. 3V8PS was logged on 1·8MHz, on to 3·5MHz and A4XJF, FM5WS and KL7U for a nice one. the 7MHz band produced CE3RY, CP6EN, HH7PV, VE7EDU and YC2DNT. TR8DR, TU2JU, XT2BR and 3X0HAB appeared on 14MHz Lastly, on 21MHz VQ9YR, ZS3GB, 3B8CA and 5H3HM.

Our QRP expert **Brian Field G4XDJ** of Billingham, Cleveland, has been busy making a v.f.o. for his QRP OXO transmitter, but in the meantime runs his *PW* Severn rig with 1W output on c.w. on the 7MHz band which he finds noisy at times. He is starting to erect a half-wave delta loop in the hope of working the USA! On 7MHz he worked OK3ZFM, SM6KMD, OE5BCM, YU1WD, F6EIV, LA4CW, IK4DRU, SP6CYX, UC2LCV, Y21XH, UR2QD and GV0ISO. Incidentally, Brian's brother is G4SKX with whom he has a sked most nights.

Don Hardman G4VAK of Mansfield, Notts, compares the results obtained by a recent special event station GB0MRS in Mansfield, using an FT-101 with 100W to a dipole antenna, and his own station using 10W from a Shimizu SS105S and a 14MHz dipole in his loft. He found that, in general, his signal reports were only one S-point down on GB0MRS and wonders what sort of attenuation he is getting from the concrete tiles on his roof. If the tiles are dry I imagine the attenuation is very low since concrete is a fair insulator, but when they are wet I should think the attenuation goes up appreciably To sum it up, Don remarks "QRP rules"!

I have nicked a small news item from the RAIBC's excellent journal *Radial*. If you want to know whether the 3·5MHz band is open for DX, check on the BBC's relay station at Kranji, Singapore, on 3·915MHz between 1500Z and 1745Z and again between 2200Z and 2300Z.

Phil Dykes G4XYX down in Poole, Dorset, stuck to 28MHz QRP as is his wont and found mostly Europeans virtually every day, probably by sporadic-E he surmises, plus the odd PY and a few weak Africans. His modified CB rig with 10W p.e.p. of s.s.b. into a dipole raised CT1TM, DF1OM, EA3EGM, EA6MR, HA8XX, OK2BTI, OZ6HY, SP2BNJ, UB5DCR, Y24NG and YU3CK with many other QSOs in these countries. His "gotaways" included 6W1CK and C53CR. He still blames lack of activity rather than conditions for what has become a very quiet band.

From Oadby, Leics, a report from **David Richardson** who uses an FRG-7 and a 70m-long wire. David has taken his RAE and is quite confident of success. We certainly hope so! On 7MHz just one catch of note, 8R1RPN. On 14MHz a different story with C53FE, CP5AI, DU1DBT, HP1XXO, HZ1AB (QSL K8PYD), TR8DR, VU2DK, 9M2FZ and A4XRS.

Logs are invited from readers and don't forget the c.w. logs. Keep an ear open on **all** amateur bands at the appropriate time of day or night and let me know what you hear.

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

As many of you will already know from the July issue of *Practical Wireless,* Charles Molloy died suddenly in April. His sad passing was a great shock to everyone.

Geoff Arnold has asked me to take over the monthly Medium Wave and Short Wave Broadcast Band articles in *PW* from this issue and I am anxious to ensure the continued popularity of this series, which Charles has run for many years. Your valued listener reports form an essential part of this continued success. Please send all reports to the address given above.

For those of you who are new to Medium Wave DXing, it may be of interest to consider the propagation side of m.w. broadcasting for a few moments. Just about all m.w. transmitting stations operate in the band 525–1605kHz and each one is designed to provide an adequate signal-to-noise ratio (about 40dB) in a given "Service Area". The noise may be from both man-made and natural electrical sources and is present everywhere—more so in cities and towns than in rural areas (up to 20dB difference).

The signal may arrive at the receiver by two routes. One follows the contours of the ground and is called the "ground wave" and the other, via the ionosphere and called the "sky wave". A vertical antenna system (often a mast radiator) at the transmitter provides a good ground wave signal during the day.

The D, E and F2 layers of the ionosphere at 85, 110 and 300km above the earth's surface affect the sky wave. During the day the ionised D layer absorbs the sky wave and the ground wave provides adequate coverage and signal-to-noise ratio. At sunset the D layer quickly disappears and the E layer then reflects the sky wave signals, enabling them to be heard over medium distances.

For most broadcasters, the result of both ground and sky wave arriving at the receiver from their transmitter is a reduction in the "Service Area", since fading and distortion result when the two signals meet out of phase. Much research and money has been spent by some broadcasters in an attempt to overcome this problem, by designing "anti-fading" radiators. (The BBC have had these at Brookman's Park and Weedon near Daventry.)

Some broadcasters use the sky wave to provide a service area at night beyond the ground wave range, e.g. Radio Luxembourg on 1440kHz.

After sunset the E layer gradually deionises to reach a steady night-time low level and signals can then pass through the E to the F2 layer. When darkness is present throughout a long path the sky wave signals can be reflected by the F2 layer to produce DX from across the Atlantic. At sunrise the signals rapidly fade out as the D layer re-forms and the ground wave signal is once again only present.

Seasonal changes also occur because the hours of darkness are longer in winter than in summer. Many years ago I obtained a little instrument, sold by EMI Sales and Service, and called "Fisk Solariscope" which shows the areas of the world in darkness and where the sun is setting and rising, for each month of the year. I wonder if any reader also has one of these?

Local Radio DXing

When the D layer disappears at sunset and the E layer reflects the sky wave signals, this is then the best time to start looking for DX local radio stations.

In order to assist you in hearing some of these stations, I am including a list of BBC m.w. local radio transmitters this month. As you will see, a number of them operate on the same frequency so a directional

receiving antenna will be needed. The ferrite rod antenna in your portable may be used but a more useful device is the loop antenna, provided your receiver is suitable. This is detailed in the *PW* publication *Out of Thin Air*—still available.

Please send your local radio DX reports to me for inclusion in this series.

Transatlantic DX Heard

A very impressive list of transatlantic m.w. DX has been sent along by **Bill Kelly** of Belfast, who listens at all hours of the night. He says that a good opening did not occur every night—in fact, some nights no DX was heard at all. So, for those of you who are just starting to explore the world of m.w. DX, don't give up easily; it may not be your set—just conditions! From the USA Bill's list includes WMRF—the "Memory Station" from Boston—on 1510kHz. Bill heard WMRF on two nights at about 0215 and one night at 0515. They have sent along a QSL letter, together with the banner depicted herewith. The station specialises in bringing back memories of past events.

Reception of WTOP on 1500kHz was good enough for Bill to hear a programme about breast cancer and eye cataracts and also news items from all the States at 0255! This station was heard on two further nights during the month.

WGAR from Cleveland, Ohio, on 1220kHz has sent a QSL to Bill. This station, received several times during the last few months, can usually be heard around 0245. Rather earlier, at 0055, Bill picked up WQXR on 1560kHz from New York. Another one from New York was WHN on 1050kHz at 0320.

From Newfoundland, Bill logged CJYQ, St. John's, on 930kHz at 0220 and CBGY, Bona Vista, on 750kHz at 0200 with News in English.

Local Radio	Transmitter	Frequency (kHz)	Max e.r.p. (kW)
R. Bedfordshire	Bedford	1161*	0·08
	Luton	630	0·3
R Bristol	Mangotsfield	1548	5
	Taunton	1323	1
R. Cambridgeshire	Cambridge	1026	0·5
	Gunthorpe	1449	0·1
R. Cleveland	Stockton	1548	1
R. Cornwall	Bodmin	657	0·5
	Redruth	630	2
R. Cumbria	Carlisle	756	1
	Whitehaven	1458	0·5
R. Derby	Burnaston	1116	1
R. Devon	Barnstaple	801	2
	Exeter	990	1
	Plymouth	855	1
	Torbay	1458	1
R. Furness	Barrow	837	1
R. Guernsey	Guernsey	116	0·5
R. Humberside	Hull	1485	1·5
R. Jersey	Jersey	1026	1
R Kent	Hoo	1035	0·5
	Littlebourne	774	0·7
	Rusthall	1602	0·25
R. Lancashire	Oxcliffe	1557	0·25
	Preston	855	0·5
R. Leeds	Farnley	774	0·5
R. Leicester	Freeman's Common	837	0·7
R. Lincolnshire	Lincoln	1368	2
R. London	Brookman's Park	1458	50
R. Manchester	Ashton Moss	1458	5
R Merseyside	Wallasey	1485	2
R. Newcastle	Newcastle	1458	2
R. Norfolk	Postwick	855	1
	West Lynn	873	0·25
R. Northampton	Northampton	1107	0·5
R. Nottingham	Clipstone	1584	1
	Trowell	1521	0·25
R. Oxford	Oxford	1485	0·5
R. Sheffield	Sheffield	1035	1
R Shropshire	Shrewsbury	756*	1
R. Solent	Bournemouth	1359	0·25
	Fareham	999	1
R. Stoke-on-Trent	Sideway	1503	1
R. Sussex	Bexhill	1161	1
	Brighton	1485	1
	Crawley	1368	
R.WM	Langley Mill	1458	7
	Sedgley	828	0·2
R York	Fulford	666	0·5
	Scarborough	1260	0·5

*May not yet be in service—please report.

South America has also been heard on three nights with an excellent signal from Radio Globo, Rio de Janeiro, on 1220kHz at around 0130—the programme on two occasions being a football match!

Margaret Sadler of Morley, near Leeds, has been checking the band with her Grundig Satellit 1400 receiver during the evening. Among the stations heard was Radio Sweden on 1179kHz with a programme in English at 2345. According to my information, this station is Hoerby and runs 100kW.

A look around the band here, between 2000 and 2100UTC, resulted in Radio Moscow on 1494kHz, Beltem (Belgium) on 1512kHz—this station has an s.w.l. programme in English on Wednesday evenings at 2015 approximately; Radio Vatican on 1530kHz—listen for their signature tune at 2029; and Switzerland from their Sarnen station on 1566kHz.

Radio Finland has sent along its latest frequency schedule and I notice two English programmes each day at 1930 and 2100UTC. They transmit on 558kHz and 963kHz and also on 254kHz from 0230–2200.

SW BROADCAST BANDS

Reports as for Medium Wave DX, but please keep separate

by Brian Oddy G3FEX

In the May issue, the question of Add-on Digital Read-out was raised and, in general, it was shown that this is not a simple addition to most receivers. For those with back issues of *Practical Wireless,* page 73 of the December 1983 issue gave block diagrams of how this could be implemented in some receivers.

So, if a digital read-out cannot easily be fitted, how else could one be sure of the frequency being received?

World Standard Frequencies

Very accurate Standard Frequency Signals are transmitted by a number of short wave stations throughout the world. The most well-known of these are MSF (UK) and WWV (USA). The MSF reference is available on 2·5MHz, 5MHz, 10MHz, and the WWV on 2·5MHz, 5MHz, 10MHz, 15MHz and 20MHz.

The signals can, of course, be used to check the accuracy of the calibration of a receiver simply by tuning them in (reception conditions permitting) and noting the position of the dial pointer.

Crystal Calibrator

A much more useful method is to make use of a simple 1MHz crystal oscillator rich in harmonics. The signals produced by the oscillator will be spaced 1MHz apart over the entire range 1 to 30MHz or beyond and may be "zero beat" with the standard signals on 5, 10, 15, or 20MHz using a small trimmer in the oscillator crystal circuit. These 1MHz marker signals will then have high short-term accuracy and may be used to check the calibration of the receiver dial every 1MHz throughout its range. By routing the 1MHz signal via a simple divider chain, signals at 500kHz, 100kHz, 50kHz, 25kHz, 10kHz or 5kHz could be selected to provide high-accuracy markers. By noting the position of these marker signals it would be easy to locate any required frequency to the nearest 5kHz, which is very handy since most s.w. broadcast stations are spaced 5kHz apart.

Using integrated circuits a simple unit could be built around a 1MHz HC6U crystal. Use a 7400 for the oscillator and three 7490 for the divider chain, see Fig. 1.

Heterodyne Wavemeter

Another frequently-used instrument is known as a heterodyne wavemeter. This consists of a 1MHz sub-standard crystal oscillator (c.o.) and a highly stable variable frequency oscillator (v.f.o.). The signals generated by each oscillator are fed into a mixer stage. At certain settings of the v.f.o. an audible beat note is present at the mixer output when harmonics of the c.o. and v.f.o. mix together. These points can be used (when adjusted to zero beat) to calibrate the v.f.o. The resultant calibration

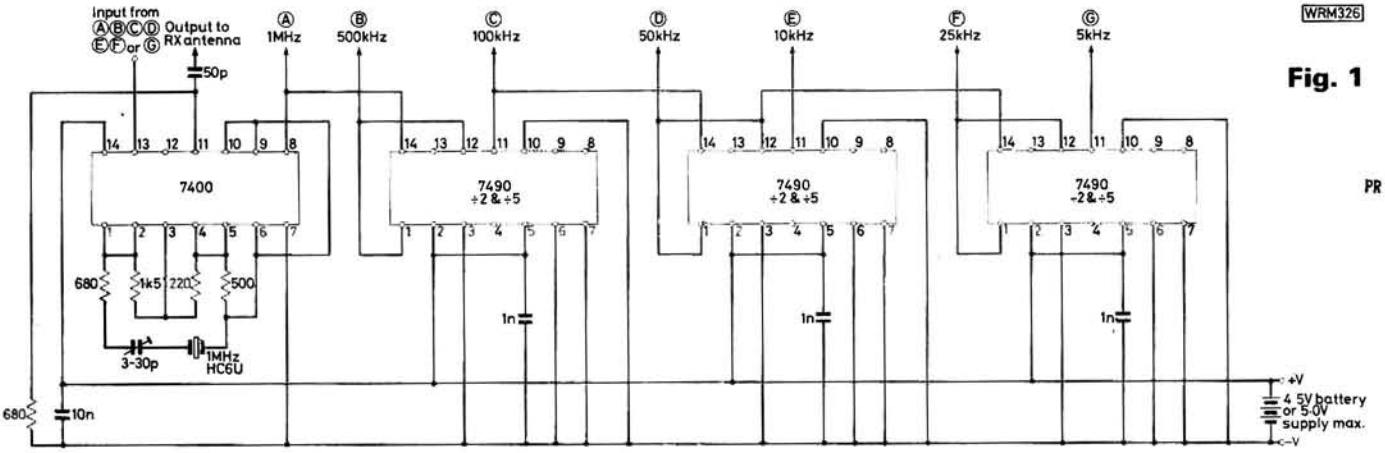

Fig. 1

points are recorded in a calibration book as "crystal check-points". A small corrector trimmer in the v.f.o. circuit allows the calibration to be corrected against these settings each time the instrument is used.

Overall accuracy will depend on the 1MHz c.o. being set up correctly and this may be achieved by using a trimmer across the crystal to zero beat it against MSF or WWV.

The v.f.o. signal may be used to provide a marker signal at any desired frequency, see the block diagram in Fig 2.

An instrument such as this may be purchased fairly cheaply as Government surplus and is known as a BC221 or LM14. When purchasing one, **make sure that the original calibration book is supplied with the unit and check the interior condition, if possible, for any signs of corrosion.**

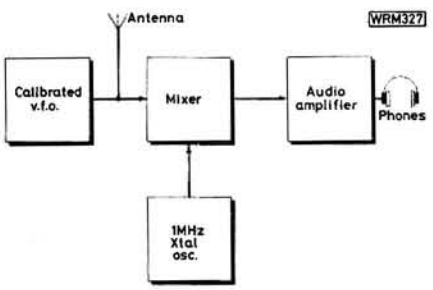

Fig. 2

Counter and VFO

If a digital frequency counter is already available, this can easily be used to measure the frequency of a simple variable frequency oscillator or signal generator. The v.f.o. can be zero beat against the incoming signal in the receiver and the frequency read off the counter. Make sure that the oscillator is operating at its fundamental frequency and not a harmonic of a lower frequency.

Conditions on 25 and 21MHz

The low sunspot numbers are certainly adversely affecting the 25MHz (11m) and 21MHz (13m) bands. While many of you may not have these bands available on your receiver (marked 11m and 13m on a simple receiver scale), no doubt some of you will be interested in what is happening

WGAR in Ohio sent in by Bill Kelly

there, and for those with full coverage communication receivers perhaps you can confirm my findings.

A detailed look at the 25MHz band during April indicated that only three stations were audible most mornings; these were R. Moscow 25·620MHz, BBC 25·650MHz and RFI (France) on 25·820MHz R. Moscow and RFI were usually very weak signals. By May, the only signal heard regularly was BBC on 25·650 between 0900 and 1300 UTC. One just has to ask "Who is receiving these signals?" If you have a suitable receiver and antenna, wherever you are, can you please send me a report of your reception of the 25MHz band.

On the 21MHz band, many signals are present during the morning and afternoon. A few of the stronger ones are the United Arab Emirates signals from Dubai on 21·605 and 21·695MHz 1000–1500 hours; Radio Nederland on 21·485MHz 0830–0925UTC from their transmitter in Madagascar; Radio RSA South Africa on 21·535 with a transmission in English to Europe at 1300UTC; and Radio Moscow on 21·585MHz from 0900UTC.

A considerable number of stations are still being jammed on the 21MHz band.

By late afternoon, many of these stations have left 21MHz and, by evening the band is relatively dead in the UK. There have been a number of disturbed days due to solar storms (see the solar reports by Ron

WMRE in Boston sticker

Radio Derby sticker

Ham in *PW*) when signals have been very poor and noise level very high.

Conditions on 17 and 15MHz

The 17MHz (16m) and 15MHz (19m) bands are still providing plenty of interesting signals. For those of you interested in receiving Radio Australia in the UK in the mornings around 0830UTC good signals can be heard on 17·715 and 17·830MHz. Radio New Zealand is changing its name to Radio "New Zealand International" and a whole new transmitter system of higher power may be operational by the time you read this. New frequencies are 17·705MHz and 15·150MHz—please let me have your reports and comments on these signals.

Radio Canada International (RCI) put in their usual good signals on 15·325MHz. Don't miss their *SWL Club* programme on Saturday evenings at 2130.

Radio Finland have sent along their schedule for 31 March–29 September 1985. They can be heard on 15·115MHz at 0830 and at other times and frequencies during the day. Family Radio can be heard on 15·035MHz at 2150UTC via their transmitter in Taiwan. (This was heard at 2155UTC on 15·055MHz on 10 May —could they have made a mistake?) The Voice of Greece operates on 15·630MHz at 0900UTC with a transmission to Australia, but is a good signal in the UK. Israel is a very strong signal on 15·585MHz at 2130UTC with news in English. Radio Norway International can be heard on 15·230MHz at 1000 and on 15·265 at 2058. NBC with news from the USA is heard at 2100 on 15·430MHz and Voice of America (VOA) with news at 2100UTC on 15·410 and 15·445MHz. Austria is on 15·270MHz at 1030UTC and Radio Swiss International on 15·570 at 2100UTC with news in English. HCJB Quito, Ecuador, is always a good signal—their *DX Party Line* s.w.l. programme is full of interest at

2130UTC on 17·790MHz. Radio Moscow uses numerous frequencies—try 17·665, 17·680, 17·700, 17·775, 17·815, 17·850, 17·880, 15·110, 15·125, 15·135, 15·150, 15·210, 15·280, 15·320, 15·420, 15·455, 15·490, 15·510, 15·520 and 15·530! Overseas listeners wishing to hear BBC transmissions could tune to 15·070MHz or 15·255MHz.

Whilst conditions have sometimes been disturbed on these bands, due to solar activity, in general signals are very good from most parts of the globe, 15MHz providing many strong signals late at night in the UK. It is interesting to note how many broadcasting transmitters are now operating on "out-of-band" frequencies which have not yet been agreed by international conferences.

The frequencies used by broadcasting stations in the h.f. spectrum are allocated under agreements drawn up by the International Telecommunication Union (ITU) located in Geneva. The ITU is an agency of the United Nations and no less than 157 countries make up its members. In 1979, the agreed broadcasting band limits were as shown in the table below for the 6–25MHz bands (49–11m). Other bands are also allocated, i.e. 5MHz (60m)*, 4MHz (75m), 3·3MHz (90m)* and 2·4MHz (120m)*. Note: * = Tropical bands for use in tropical zones.

The World Administrative Radio Conference for h.f. broadcasting met to discuss the extension of these limits and the ITU has not yet implemented the extensions. However, many broadcasters can now be heard in the "out-of-band" limits shown in Table 1, presumably because the allocated 1979 bands are overcrowded—no doubt the transmitter power rise has not helped the situation either. It is a pity that many of the ITU frequencies are wasted by jamming.

Band (m)	Band (MHz)	ITU 1979 agreed limits	Limits of "out of band" signals actually heard in UK
11	26	25·600–26·100	
13	21	21·450–21·750	21·450–21·810
16	17	17·700–17·900	17·570–17·995
19	15	15·100–15·450	15·010–15·650
25	11	11·700–11·975	11·500–12·165
31	9	9·500–9·775	9·025–10·040
41	7	7·100–7·300	7·010–7·450
49	6	5·950–6·200	5·880–6·215

The 13MHz band

One band not detailed in the ITU 1979 list is the 13MHz band. Proposals are to introduce a band 13·600–13·800MHz. Checks on this band show that Radio Moscow regularly uses the following frequencies: 13·645, 13·665, 13·680 and 13·705.

The 11, 9 and 6MHz Bands

These bands continue to provide the bulk of the signals heard on the h.f. bands. Look for the strong signals from Peking on 11·500MHz with News in English at 1900UTC and other programme content at 2100UTC.

All-India Radio has English programmes and news on 11·620MHz from 1900UTC. Vatican Radio can be heard on 11·740MHz at 1400UTC and 9·640MHz at 1500UTC.

From "down-under", Radio Australia is a good signal from 1800–2000UTC on 6·035MHz and signals from New Zealand International on 9·600 may by now be heard—reports, please. Transworld Radio, Monte Carlo announces 9·500MHz as its frequency but is on 9·495MHz from 0800UTC. It can also be found on 6·215MHz at 0800 and 1845. The Voice of Vietnam is a strong signal on 10·040 at 2045 in English. Voice of America on 6·040MHz at 0700UTC gives news from the USA. For overseas readers, BBC can be heard on 12·095MHz, 9·405MHz, 6·180MHz, 5·975MHz and other frequencies during much of the day.

For Radio Finland look on 11·755MHz 0345–1930; 9·560MHz 0400; 9·665MHz at 1600 and 6·120MHz 0345–2200. Radio Sweden International is on 9·615MHz at 1300. ORF Austria 12·015 at 1400. Prague can be found on 11·990 at 0900 and 9·605 at 1400. Please send your reports for inclusion in the September issue to the new address given under Medium Wave heading, by the 15th of the month.

VHF BANDS

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

by Ron Ham BRS15744

"Solar activity has revived," writes **Ted Waring**, Bristol, and that, readers, is our main theme this time. After a long period of minimal activity, your reports about band conditions associated with the various sunspots provide another good example of just how much influence the active sun can have over terrestrial radio communication.

Solar

On April 21, despite finding the 14MHz band somewhat dead, **Margaret Brownlow** G4LCU managed a rather special QSO whilst operating GB2CPM at Chalk Pits Museum, Amberley. At 1445 she worked VE8RCS, Fig. 1, the Polar Amateur Radio Club, in Alert some 450 nautical miles from the North Pole. The signals were watery and Margaret learnt that a solar flare and an aurora had manifested, probably making the QSO possible.

In view of that QSO, I was not surprised to find that at midday my radio telescope had recorded solar noise at 143MHz. I also recorded a few bursts from the sun on the 23rd and a noise storm on the 24th.

There is little doubt in my mind that the group of sunspots, observed and drawn by **Patrick Moore**, Selsey, at 0715 on the 24th, Fig. 2, were responsible for these abnormal conditions. At 1500 on April 22 **Cmdr. Henry Hatfield**, Sevenoaks, using his spectroheliosсope, observed an active plage and a small flare among the smaller spots in the group. Ted Waring counted some 14 sunspots on the same day.

At 0930 on the 26th Henry located a minor flare and two plages, so he was not surprised when his radio telescope recorded a solar noise storm. There were many individual bursts of noise, sometimes violent, at 136MHz between April 24 and 26 inclusive. The storm on the 26th sent my recording pens full scale as soon as the sun came into the beamwidth of my telescope's antenna.

During the afternoon of the 28th **Gerry Brownlow**, operating GB2CPM, heard a strong but watery signal from JW6BDH in Spitzbergen on 14MHz, which suddenly faded out after some 30 minutes.

"There was a brilliant aurora on the night of April 20/21," writes **Ron Livesey**, Glasgow, auroral co-ordinator of the British Astronomical Association. He received visual reports from his section contributors in the Faroe Islands, Nova Scotia, Scotland and Ulster and radio reports from Andy Stevens, Edinburgh and H. A. Snip on the Dutch weathership *Cumulus*. The magnetometers used by both David Pettitt and Ron were very active about this time as well. Ron also learnt that a radio blackout occurred, affecting the frequency range 3·5 to 30MHz around 0928 on the 24th.

Fig. 1

Thanks to an early warning **Andy Stafford** G4VPM, Paignton, made his first auroral QSOs with GM4IPK and GM4PPT on 144MHz during the afternoon of April 21.

Ted Waring reports counting 12 sunspots on May 8 and 10 on the 12th. "The spots on the 8th were in two groups of 6, one in the west and the other on the east side of the sun's disc," said Ted. Patrick Moore also plotted the progress of the spots between the 8th and 10th, Fig. 3.

WRM329

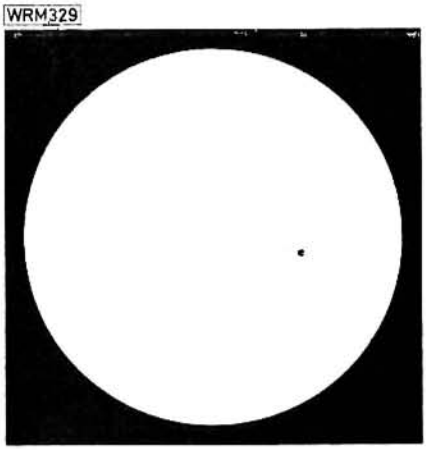

Fig. 2

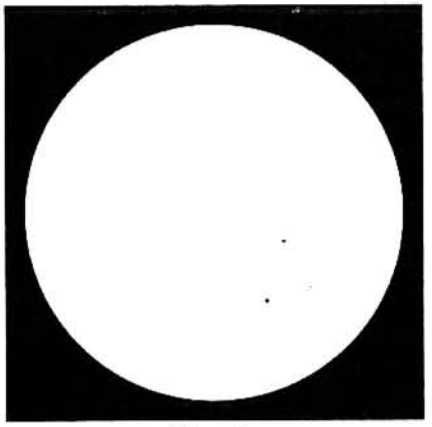

Fig. 3

Again these are no doubt the cause of the individual bursts of radio noise and the mild noise storm that I recorded from the sun between May 12 and 14 inclusive.

The 28MHz Band

"28MHz seems to have jumped into life again, mostly Es (sporadic-E), but also some F layer propagation as well," writes **Dave Coggins**, Knutsford. He received signals from the Canary Islands on April 30, Poland and the USSR on May 1, Germany and Italy on the 3rd, France and San Marino on the 6th and then Norway and Hungary on the 11th. In Belfast, **Bill Kelly**, using a NRD515 communications receiver and long-wire antenna, reports openings to Europe around 1500 on April 29 and 0930 on the 30th. From Storrington, **Fred Pallant** G3RNM logged stations from Argentina, Greece and Spain between 1721 and 1813 on the 30th and Scandinavia and the USSR at 1740 and 1755 respectively on May 1.

"On April 29/30 there were brief sporadic-E openings when stations from EA, HG, OZ, YU and 4X4 were heard," writes **Norman Hyde** G2AIH, Epsom. He adds, "The opening on May 1 was fantastic, particularly to eastern Europe, when stations from Czechoslovakia, Finland, Germany, Hungary, Scandinavia and the USSR were heard or worked on both f.m. and s.s.b. It lasted from 0940 to 1330 when the band went dead." Norman also identified short periods of sporadic-E on May 2, 3, 9 and 11.

Listening to the c.w. end of 28MHz as practice for his forthcoming exam **Filip Rogister** ON1BRL logged stations from EA, DF, HG, LA, RA, SM and SP—all during the first few days of May. Gerry Brownlow heard the 28MHz band open up again to Europe during the afternoon of the 12th.

Propagation Beacons

After the quiet of the past few months it was good to read the change in style as letters came in. Norman Hyde reports hearing a new South African beacon ZS1LA together with ZS1CTB on May 4. Like other contributors, **Chris van den Berg**, The Hague, also logged ZS1LA and suggests that the beacon ZS1STB is now operating under this call. From the combined logs, I see that ZS1LA was heard on April 20, 26 and 30 then May 2, 3, 4 and 7.

Gordon Pheasant G4BPY, Walsall, even went portable to get some of his beacon reports on May 9. He used the ICF-2001 on Felixstowe cliffs and heard EA6AU for the first time this season.

John Coulter, Winchester, says that he has now received a QSL card from the Cheshunt Radio Club acknowledging his report on 9L1FTN. John also kept an ear open for the beacons on 14·100MHz and heard CT3B, OH2B, 4U1UN and ZS6DN almost daily between April 16 and May 11 and 4X6TU daily from April 16 to 27.

Whilst on holiday in Suffolk, Gordon Pheasant used an IC-505, muTek preamplifier and a wire dipole for listening on the 50MHz band. Although his dipole was slung between the picture rails in a downstairs room, he heard signals from G6NB, G3NOX and G3ZIG on May 5. To his surprise he heard GM4FZH at 559 calling CQ on 50·112MHz and GM3WOJ replying on s.s.b. Between 0550 and 0625 on the 6th, Gordon heard a short "ping" of signal, via meteor scatter, of about one second duration every two or three minutes from the 50MHz beacon GB3SIX. "The poor antenna set-up seems to discriminate in favour of m.s.-type signals," said Gordon after hearing a lot of pings of carriers and positive idents from G3ZIG and GM4FZH, between May 6 and 9.

Norman Hyde is now receiving on the 50MHz band with a half-wave dipole feeding a home-brew converter into his TS-130S receiver. At the time of writing he has heard 28 of the 100 authorised stations, a consistent signal from the RSGB HQ beacon GB3NHQ and meteor trail reflected signals from GB3SIX on several occasions.

The RSGB 144MHz band beacon at Wrotham GB3VHF (144·925MHz) was a consistent 539 signal at my QTH between April 15 and May 14 and Chris van den Berg heard it during the good tropo conditions on April 21 and 24. Dave Coggins is now active on the 430MHz band and, with his 48-element beam currently just 3m a.g.l., is receiving signals from the Yorkshire 430MHz band beacon GB3MLY 432·910MHz, on a daily basis.

"At present I am also monitoring the 28MHz band beacons with a vertically polarised 2-element quad antenna at 6m a.g.l. and it's super for bringing in that weak DX," writes Dave. His report, along with those from Chris van den Berg, John Coulter, **Len Fennelow**, Wisbech, Norman Hyde, Billy Kelly, **Ted Owen**, Gordon Pheasant and Filip Rogister were used to compile the monthly chart of beacons heard, Fig. 4. It is interesting to note on the chart the concentration of beacon signals, heard in an area ranging from Ireland to Holland, between April 26 and May 7. I wonder, was the active sun the cause?

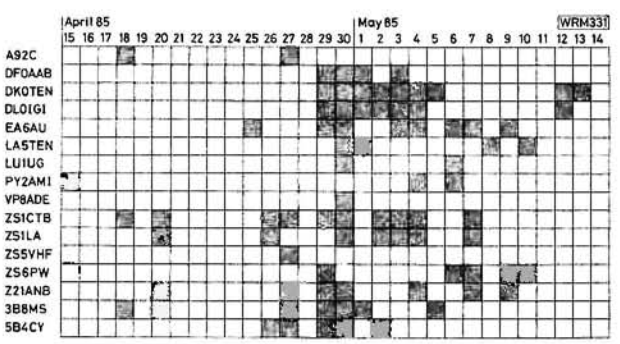

Fig. 4

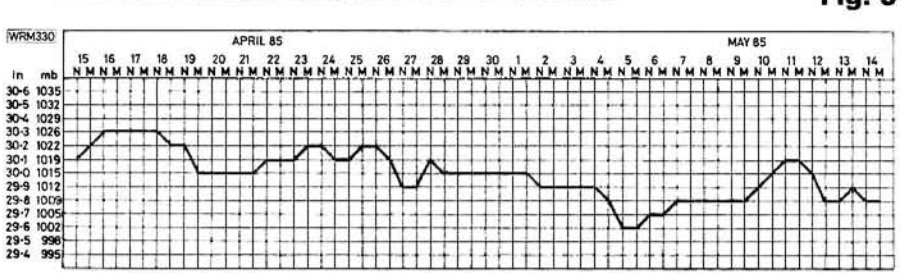

Fig. 5

Tropospheric

The atmospheric pressure, measured at my QTH with a Short and Mason Barograph, was predominantly above 30·0in (1015mb) between April 15 and May 1. From May 2 to 14 it was mainly below this line, Fig. 5. Although v.h.f. conditions were about average throughout the period, reasonable improvements were experienced periodically between the 16th and 24th, with a minor tropospheric opening on days 23 and 24. "The low pressure during the first half of May has not helped DX,"

remarked **Harold Brodribb**, St. Leonards on Sea. Andy Stafford tells me that up to May 11 his v.h.f./u.h.f. score for 1985 is 32 QTH locator squares, 43 counties and 10 countries on 144MHz and 18 squares, 19 counties and 7 countries on 430MHz.

While modifying his antenna system, Dave Coggins plans to use Slim Jims on 144MHz and 430MHz for beacon work and an 8-element Yagi on the 144MHz band for the c.w. and s.s.b. sections of the band. His 430MHz band listening his month has included signals from Cheshire, Staffordshire and Yorkshire.

Bill Kelly received signals from stations via the repeaters in Berwickshire GB3SB (R2) on April 17, 18, 23 and 24, Caernafon GB3AR (R4) on days 17 and 18 and Stockport GB3MN (R2) on days 18 and 24.

Band II

Harold Brodribb keeps a regular watch on Band II and on most days during the month prior to May 12, he received signals from France Culture on 98 and 99·9MHz and Frequence Nord on 94·7 and 95·5MHz. Then during the improved conditions on April 22 he added programmes from Belgium and Holland to his list. I used the v.h.f. radio section on my Plustron TVR5D, with its own telescopic antenna, on the Sussex Downs at midday on April 17, 19 and 24 and heard several strong signals from France between 94 and 102MHz From home on the 20th and 24th I heard a variety of Dutch, French and German stations, plus a few inter-station "warbles", with a few signals around 0800 on the 25th.

Simon Hamer, New Radnor, heard a whole range of signals during the evening of 24th. Signals identified were BBC local radio stations Kent, London and Norfolk, ILR stations Broadlands, Invicta Sound, Mercury, Pennine, Severn Sound and Southern Sound and BBC Radio 4 from the Channel Islands. "The new BBC local Radio Shropshire is putting in a very nice signal here on 96MHz," writes Simon. Bill Kelly, using a Grundig 3000 receiver and a 2-element vertical beam, heard Radios City, Clyde, Preston and Red Rose on April 14 and 15, BBC Radio Cymru and Lancaster and ILR Westland on the 16th, BBC Radios Carlisle and Cumbria on the 18th and ILR stations Humberside and Manchester, BBC Cumbria and Lancaster and RTE 1 early on the 24th.

TELEVISION

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

by Ron Ham BRS15744

Having seen his first sporadic-E opening on May 8 **Neil Purling** from Hull writes, "I can think of no better way of starting my DXing career than with a picture from the USSR". Well, I hope that by the end of the 1985 sporadic-E season you may well have seen pictures and/or testcards from Iceland to Moscow and Scandinavia to Spain.

Report from India

During the tropospheric disturbances on March 6, 8, 10, 12, 22, 23, and 29, **Major Rana Roy**, India, received pictures in Band III from Bahawalpur (Ch. 10), Faislabad (Ch. 6), Lahore (Ch. 5) and Rawalpindi (Ch. 8). He managed to identify an announcer from Rawalpindi (Fig. 1), an advert (Fig. 2), a caption from Rawalpindi (Fig. 3) and a test card from Lahore (Fig. 4). Some of the pictures were in strong colour and among the items he saw were classical Indian music and various commercials. Rana also saw an American film called *Hunter*, a programme about poultry farming and news read by Ms Shaista Zaid.

Amateur (Fast Scan) TV

"There's a lot of ATV activity in Bristol and several stations are active on the 1·3GHz band including G4ZQF, G8GLQ and G8VPG. Several others, including myself, are able to receive television pictures on the 1·3GHz band," writes **Len Eastman** G8UUE, Bristol.

On the subject of receiving ATV pictures, especially in the 430MHz band, **Peter Lincoln** in Aldershot said, "I have copied G3MPS, a local operator transmitting on the ATV frequency, by tuning my Hitachi 4in black and white receiver at the low end". Peter also received G3MPS by tuning his Panasonic receiver to the bottom end of the u.h.f. range and he has learnt that some other Japanese TV sets will do the same.

Narrow Band TV

"The first public demonstration of narrow bandwidth television was given at the 11th annual convention of the Narrow Bandwidth Television Association, held at Trent Polytechnic on April 27," writes **Norman Reynolds**, London. He added, "The incoming signal on 144MHz band f.m. was received by Jeremy Jago and me and the 32-line image, sent by G3PVH, was displayed on an oscilloscope display unit". Norman pointed out that the demonstration showed the viability of using simple mechanical equipment to send and display viewable and moving n.b. pictures within the normal bandwidths of amateur frequencies and, it is hoped to encourage further interest from the amateur radio fraternity. Details about the NBTA are available by sending an s.a.e. to their chairman, Doug Pitt, 1 Burnwood Drive, Wollaton, Nottingham NG8 2DJ.

Sporadic-E

"A superb Band I opening on May 1, it started just before midday and lasted about 3 hours, with a test card from Austria on Ch. E2 48·25MHz and several channels were carrying the May Day parade from the USSR," reports Len Eastman. He is looking forward to the current sporadic-E season because, now that the 405-line transmitters have left Band I, he can look for DX on Ch. E2 which was impossible while Wenvoe was on the air. During the month prior to April 25, Len saw bursts of pictures on Chs. E2, 3 and 4 and toward the end of last season, he received captions (Figs. 5 and 6), cartoons (Fig. 7) and a presenter (Fig. 8) all in colour from Poland on Ch. R1 49·75MHz. Let's hope we see something similar this season Len and give your JVC CX610GB some more work.

In New Radnor **Simon Hamer** watched ice skating on Ch. R1 on April 17 and the London Marathon on Ch. E2 on the 21st. At 1500 on April 29, **Gordon Pheasant**, Walsall, received a test card on Ch. E3 55·25MHz, from Yugoslavia scribed JRT Belgrade. He also saw a programme showing lions on Ch. R1. Simon Hamer received a test card from Sweden TV1 Sverige on April 30. On May 1 he saw the May Day parade, with one of the generals being interviewed on Chs. R1 and 2. Both Gordon Pheasant and Len Eastman received the Austrian test card labelled ORF FS1 on Chs. E2, 3 and 4 on May 1. During the same event, **Harold Brodribb**, St Leonards on Sea, saw people dancing on Ch. R2 59·25MHz.

Around noon on the 2nd I received several bursts of pictures and test cards from Poland on Ch. R1. For about an hour after 0800 on the 3rd I watched a programme, sometimes in colour, about boating followed by a YL announcer with the DDR ident caption. Simon Hamer received a programme from Italy RAI on Ch. I1 on May 3. On the 5th, at about 0800, there was a mixture of signals—a programme about horses, the Austrian ORF FS1 test card and a caption that looked like MYSTKA, all between Chs. E2 and R1.

Neil Purling, using an experimental wideband dipole in the loft feeding a Triax preamplifier, saw his first DXTV at 0840 on May 8 During the following few hours he received test cards from Germany and Sweden on Ch. E2. At midday, on Ch. R1, a Russian clock appeared followed by the HOBOCTN caption behind their news reader. He also saw a programme which included scenes of Russian tanks and soldiers and views of the Kremlin.

At 0950 on May 11 Harold Brodribb saw fading pictures on Ch. E2. Early in the following afternoon he received intermit-

Fig. 1

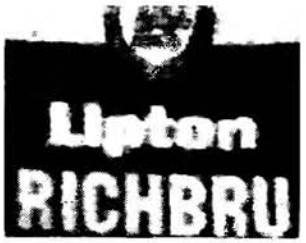

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

tent pictures with cyrillic letters on Ch. R1 and football results from Italy on Ch. Ia (53·75MHz).

Tropospheric

During the improved tropospheric conditions between April 18 and 24, Harold Brodribb received pictures from Belgium and France in Band III and negative pictures from France on the u.h.f. Chs. 48, 51 and 54. Simon Hamer just logged TDF Canal Plus in Band III on the 24th.

SSTV

"Not much to report with no DX being copied," writes Peter Lincoln for the month prior to May 13 and adds, "On May 6, the band was busy all afternoon, F3RT had several QSOs and stations from DL, HA and I all made an appearance".

Between 1800 and 1823 on May 7, using a Trio 2000 communications receiver and a Sinclair Spectrum computer, with Scarab Systems software, for receiving slow scan television signals on 14·230MHz, I received strong pictures from I8GMG, working an ON and among his captions I copied were, "I AM VERY PLEASED FOR QSO", "RST 599", "PSE KKK" followed by a map of Italy showing his QTH. Earlier I saw the captions "TEST SSTV" and "GOOD AFTERNOON MY FRIEND". Although QRM and QSB were a problem during the afternoon of May 13, I saw the following captions, "TNX FOR CALL", "QTH NICE", "WX VY BAD", "A LOT OF RAIN" Fig. 9, and "BYE BYE". The caption in Fig. 9 was produced using an Alphacom 32 printer connected to the Spectrum.

SPACE & SATELLITES

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

by Pat Gowen G3IOR

Satellites in Shadow

As you read this column, the RS series of satellites will be experiencing some 34 minutes of total darkness each 120 minute orbit. This is brought about by the interpositioning of the earth between part of the satellites orbits and the sun. Consequently the charge to the batteries from the solar panels is reduced to some 70 per cent of normal. This will mean that the Radio trio will only be on for some two days per week until they start to see full sunlight again on 18 August 1985. This eclipse period started with just a few seconds of shadow at 1025UTC on June 2, building up to its present maxima in the first week of July, and ceasing after some 77 days, before which the batteries will have been served with enough power to permit full time operation once again.

Not only does the eclipse reduce power availability, but it also reduces the battery temperature, and as NiCad cells have a negative temperature voltage co-efficient, greater power is used and less of what is available is fed in as charge. One way out of this problem is to try to keep the battery as well charged as possible by limiting use, so that the available solar power is trying to charge an already charged battery. thus giving additional heating by I^2R losses at the batteries.

Our keener RS enthusiasts may wish to follow the eclipse effects by observing some of the telemetry, and decoding it to show the values of temperature and voltage over time. The following frames will be of interest:

Prefix letter(s) "D" or "ED" is the battery voltage, obtained by multiplying the figure value by 0·2 to give true voltage.

"O" or "EO" is the charge current of the battery in milliamps, found by the formula 20 x (100–n) where n is the number value.

The channels prefixed "NO", "NG" and "NU" (or "RO", "RG" and "NU" if under command) show the 1st, 2nd and 3rd solar panel temperatures respectively in degrees Celsius and can be read by the formula 2·7 (n–26) where n is the number value sent.

"NS" (or "RS") is the temperature of the on-board equipment, and has the decoding formula 0·8 (n–5) to give its temperature in C, whilst "NW" (or "RW") is the temperature of the hermetically sealed section, and can be decoded by 0·8 (n–10) to give its Celsius temperature.

Watch for the channel commencing with "MO" or "WO" which is a small on-board heater to control the environment within the satellite, as this could confuse some of your temperature readings. If it is on, the heating power (in watts) is given by n x 0·1.

A Million Satellites

The v.h f. bands, both amateur and commercial, were packed with almost continuous signals from the far ends of Europe from May 4 to 6, as many micro-meteorites hit the top of earth's atmosphere and burned out to produce ionised tracks giving excellent meteor scatter (m.s.) propagation.

These natural satellites came from Halley's Comet in its 75 year elliptical solar

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FM Receiver (with PIN RF c/o)	70FM05R5	68.75	48 10
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Receiver 6 Channel Adaptor	70MC06R	25.95	18.80
Synthesiser (2 PCB's)	70SY25B	91.60	65.35
Synthesiser Transmit Amp	A-X3U-06F	36.40	24.30
Synthesiser Modulator	MOD 1	9.10	5.75
Bandpass Filter	BPF 433	6.95	3.65
PIN RF Switch	PSI 433	7.90	5.60
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500mW to 10W	70FM10	48.10	38.50
3W to 10W	70FM3/10	27.05	21.05
10W to 40W	70FM40	78.60	60.20
Combined Power Amp/Pre Amp (Auto Changeover)	70PA/FM10	63.50	46.10
500mW to 3W (Auto Changeover)	70FM3B	T.B.C.	T B C
75cms Linears			
500mW to 3W (Straight amp, no changeover)	70LIN3/LT	31.40	23 10
3W to 10W (Auto Changeover)	70LIN3/10E	47.20	35.70
1W to 7W (Auto Changeover)	70LIN10	50 15	37.40

★ ★ ★

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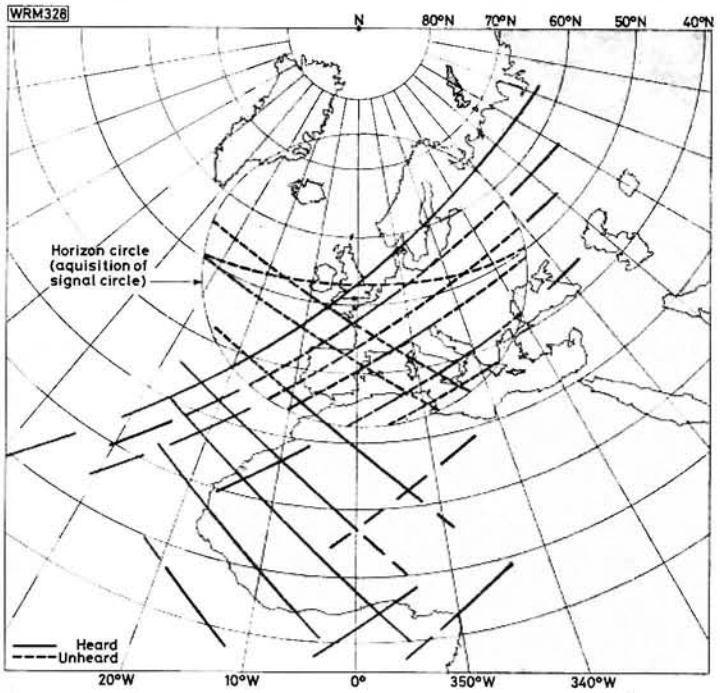

Fig. 1

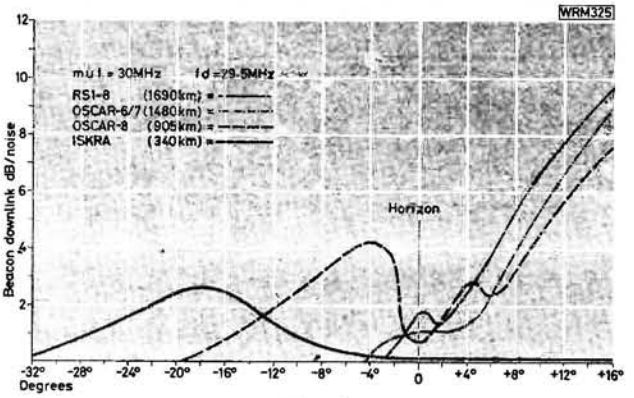

Fig. 2

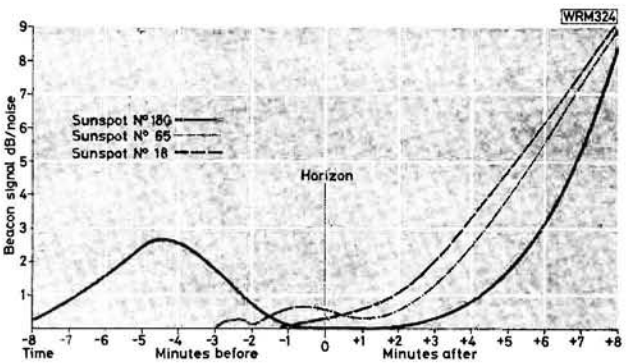

Fig. 3

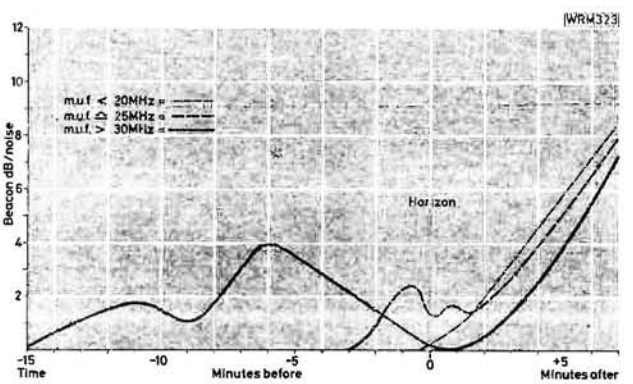

Fig. 4

orbit. At each visit, the sun heat melts the ice up to 2 metres deep, and liberates the gritty dust particles which are distributed along the orbital path of the comet by light pressure and the solar wind. In addition to m.s., excellent sporadic-E (Es) propagation followed, and it is one of several good theories that Es is brought about by fine meteor dust falling into the near E layer.

John Branegan, GM4IHJ has computed that repeat phenomena should occur on October 20 this year as earth crosses the outgoing Halley track just ahead of the actual comet, and again on 4/5 May 1986 as we go through the incoming track six months after the passing of the comet.

Arsene

F3HK reports that the French group, with the help of Universities, schools and many radio amateurs, have now almost completed the building stage of their satellite. Constraints have meant the abandoning of the proposed 10GHz beacon, and the kick-motor has had to be started again from scratch. The digital transponder will not be aboard, so there will be no "flying mailbox". Of course digital communications can take place on the provided linear transponders. Launch with AMSAT Phase IIIc, now appears unlikely, but it is hoped that the spacecraft will fly on the second ARIANE IV mission later in 1986. The prime Mode B 435 to 145MHz transponder will have the passband split into four segments, each with its own a.l.c. system, to help overcome the "alligator" menace of QRO uplinkers.

A second Mode F transponder will have a 430MHz band uplink with a 10GHz band downlink, and beacons on the 145MHz, 435MHz and 1269MHz bands are planned. They will carry phase-shift keying telemetry with updated stored messages, and will give a continuous carrier for Doppler observations when unmodulated.

The final orbit proposed will be a slightly elliptical equatorial drifter, with an apogee of 36 000km and a perigee of 20 000km, at an inclination of close to 0 degrees. It will take some two months from launch to stabilise and test, after which period it will be generally available to all.

OSCAR—10

The dreaded apogee eclipse starting August 5 and continuing until December 2 will mean some drastic pruning of operational time in order to maintain the battery and temperature. From August 1, the transponders will be off from mean anomaly (m.a) 30 to 189, on Mode L from m.a. 190 to 206, and on Mode B from m.a. 207 through perigee to m.a. 29. This may mean employing the monopole antennas, with a marked loss of gain, but with the satellite much closer to us, so DX will be far less but signals reasonably good still, with little spin-modulation. The tilt angle will be 15 degrees + or −, the former benefitting the northern hemisphere, the latter the southern.

Shuttle Shuffle

NASA, ARRL and AMSAT reports indicate that the plan for the comprehensive activity on the July 15 SPACELAB-2 STS-51F *Challenger* shuttle mission (see SSTV on STS page 75 May 1985 *PW*) will have to be modified, due to problems that have arisen with cargo now preventing mounting the antennas in the cargo-bay as planned. A window system therefore has to be employed (as on STS-9), and as full visibility of a deployed satellite is required for at least the first three and a half days of mission elapsed time, no antenna can be positioned there, as this would interfere with the clear view necessary to permit full observation.

Not only does this mean restricted antenna radiation and coverage on the 145MHz band, but severe limitations are placed upon the dimensions of the 29MHz band antenna, all of which mean modifications to the earlier intentions. It will now be necessary to drop the plans for the 29MHz band altogether, but at least some twenty

opportunities for direct 145MHz band contacts using a downlink of S22 (145·550MHz) should arise with **Dr. Tony England W0ORE**, though mainly restricted to schedules pre-arranged with school and club stations, with a few random contacts as time and limitations permit. If your club, school, University station etc., wishes to apply for a schedule with the mission, write to ARRL, 225 Main Street, Newington, Connecticut, USA.

The SSTV transmissions will also come down on S22 f.m. (+/– Doppler shift) and will be sent as a single Robot frame of 12-seconds scan high definition colour for 36 seconds, followed by a 12-seconds duration 8-second scan of medium definition colour that will be black and white compatible. Including the c.w. identifier, each transmission will last 80 seconds before repetition. Both the amateur video camera looking out of the porthole, and the NASA camera underslung in the cargo bay will be used, mainly the latter to give a freeze frame from outer space. The patch insignia (logo) will be sent frequently to aid line-up of an easy-to-identify picture. **Dr. John David Bartoe W4NYZ**, also hopes to find the time in a very busy schedule to be able to operate.

AMSAT will operate a mission station from the Goddard Spaceflight Centre at Greenbelt, Maryland, callsign WA3NAN, on 14·290MHz ±QRM that will provide continuous mission update and operational opportunities, and will relay the shuttle audio.

From 40 000 applications, WB2MBW, XYL of WB2VAT (both AMSAT members) has been shortlisted as a likely future lady teacher-astronaut on the shuttle programme, so even more amateur space opportunities may evolve.

HF Satellites

Radio amateurs were the first to track the first artificial satellite SPUTNIK-1 on 20MHz, and found that it could be heard well below the radio-horizon, and even over the antipodes. This was thought to be due to the fact that the orbit placed the spacecraft below the F2 maxima, hence giving conventional ionospheric reflection. Later OSCAR spacecraft, well above the F2 layer, were also found to be giving excellent signals from their 29MHz beacons when they were theoretically well out of range, but only rarely was it possible to access the transponders via the 145MHz uplink. The curve for the RS-8 29·5MHz beacon at high, medium and low m.u.f. levels for mean overhead passes from the south-west is shown in Fig. 2.

Despite the very low signal level, the 21·002MHz UOSAT OSCAR-9 also manifested excellent sub-horizon characteristics, particularly when the sunspot number was elevated as shown in Fig. 3. This was co-incident with high attenuation when the spacecraft was at low angles of elevation, due to the interpositioning of the angularly increased densely ionised layers.

The manifestation is a function of the satellite height also, as can be seen by Fig. 4, which shows the occurrence of sub-horizon strength with various satellites when the m.u.f. is close to the signal source frequency. ISKRA, the first 21 to 29MHz communication satellite was frequently heard well when it was sub-horizon, and often not heard when it was well above as can be seen by the tracks in Fig. 1.

This means that despite the current sunspot minima, the forthcoming Mode K on the coming RS launch may extend the range of the 1500km orbit considerably, and permit contacts well outside the limiting range of the current Mode A transponders. To date, only six satellite DXCCs have been issued, four in the USA, and two in the UK (G3IOR and G6RH). Many stations have worked the ninety or so countries that are in range, and will be anxiously awaiting the opportunity provided by the December 1985 launch to achieve their long awaited award.

A comprehensive paper on the full propagational h.f satellite characteristics is published by the Institute of Electrical Engineers, pages 18–22, *Aspects of High-Frequency Communications Satellites*, P. J. A. Gowen, Conference Publication Number 245, "HF Communication Systems and Techniques", and includes many references for those interested in the full story.

ACSB

Readers will recall reading of the advantages to be found with this system in the April issue of *PW*. Project Oscar, who donate all proceeds to AMSAT, and have pioneered many helpful campaigns in the past, are now offering Level 1 printed circuit boards for the system, one for the TX providing compression and equalisation, and one for the RX providing de-equalisation and expansion. Two IRC's and a self-addressed envelope will provide details if sent to Project Oscar, ACSSB 1, 15 Valders Lane, Watsonville, California 95076, USA.

DX News & Shorts

FB8XC, HZ1HZ (Crown Prince Ahmed Zaidan, QSL N7RO), are now on OSCAR-10. GD4CUO worked 630 QSOs, 32 US States, and 32 DXCC Countries on the Isle of Man Oscar DXpedition. DL1CF and ON7HP have WAS OSCAR-10. W0CA will be giving mid-week OSCAR-10 bulletins on the H2 channel. ARRL have offered a $10 000 donation matching fund for future AMSAT satellite funding. The AMSAT lab at the Goddard Space Flight Centre is being returned to NASA, and AMSAT Manager N2CF is now leaving for an ARRL post. Nominations, from five AMSAT members or a member society, for the election of candidates for the AMSAT Board of Directors should be lodged with AMSAT by July 31.

Satellite Information Nets

To help readers keep up to date with short-term topical information, here is a list of the main nets that provide update of the many happenings on the satellite scene, which you are welcome to partake in or merely monitor.

AMSAT-UK Net: Sundays, 1015 local time, 3·780MHz. Net Control: Ron G3AAJ, or Richard G3RWL on each last Sunday of the month.

AMSAT International Net: Sundays, 1800UTC, 21·280MHz. Net Control: Rip WA2LQQ; Wray W8GQW, or N4HY. (Note: Propagation is very poor at this time, and the net will be temporarily suspended until the path is effective again.)

AMSAT International Net: Sundays, 1900UTC, 14·282MHz. Control as above. Propagation more dependable than on

Thanks to NASA, AMSAT and KA9Q for the information in the chart

Satellite	OSCAR 9	OSCAR 10	OSCAR 11	RS 5	RS 7	RS 8
Epoch Time	85052·15431026	85055·81351891	85051·22662318	85054·26819137	85056·23688768	85033·43517227
Inclination	97·6206°	26·0672°	98·2082°	82·9602°	82·9565°	82·9573°
RAAN	37·2521°	151·3504°	118·2460°	6·8376°	1·2332°	20·5848°
Eccentricity	0·0002079	0·5990479	0·0012191	0·0009750	0·0020829	0·0020315
Arg. of Perigee	355·7450°	351·0336°	229·5884°	311·2350°	228·1513°	43·9804°
Mean Anomaly	4·3844°	1·8484°	130·4257°	48·7873°	131·7764°	316·2868°
Mean Motion (r.p.d.)	15·26989174	2·05855313	14·61945915	12·05058932	12·08691800	12·02953923
Decay Rate (r/d²)	1·47e⁻⁰⁵	−2·9e⁻⁰⁷	−2·5e⁻⁰⁷	4e⁻⁰⁸	4e⁻⁰⁸	4e⁻⁰⁸
Epoch Rev	18752	1281	5194	14018	14084	13743
SMA (km)	6859·921	26105·553	7062·113	8033·815	8017·699	8043·191
Anom. Period (min)	94·303223	699·520444	98·498856	119·496231	119·137070	119·705333
Apogee (km)	483·318	35365·985	704·723	1675·415	1667·942	1691·543
Perigee (km)	480·465	4089·032	687·504	1659·749	1634·542	1658·863
Beacon (MHz)	145·825	145·810	145·826	29·451	29·501	29·502

21MHz. If you have information to pass, be on the net frequency in the previous thirty minutes to permit the net to start on time.

AMSAT-UK Information Net: Mondays, 7.00pm local time, 3·780MHz ±QRM. Net Control: Ron G3AAJ.

AMSAT-UK Information Net: Wednesdays, 7.00pm local time, otherwise as above.

AMSAT-European Net: Saturdays, 1000UTC, 14·280MHz ±QRM. Net Control: Nico PA0DLO. (Note: As Nico may be out of skip to UK stations, pass your information via LZ1AB, SV1DO, DL1CF, SM0NBJ, UA3CR, OH6EH, or any member you can reach.)

SPUTNIK Net: Saturdays, 1500MSK, 14·290MHz ±QRM. Net Control: Leo UA3CR, secondly Alex UB5MGW. (Note: The basic language is Russian, but translation is on hand.)

.Nets and Broadcasts take place on OSCAR-10 on either the H2 or ACNF frequencies, 145·962 or 145·957MHz according to the mutual satellite availability (see earlier issues on this topic). It is **always** worth monitoring the ACNF frequency, where much information is exchanged and topics of space interest are aired on a regular basis. Regional AMSAT-UK nets occur regularly on 144·280 s.s.b. and the 145MHz f.m. simplex channels; for full information s.a.e. to G3AAJ.

RTTY

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

by Ron Ham BRS15744

A new radio society has been formed in south Hampshire called, the Amateur Radio And Computers Club and their aims are to promote the increasing use of computers in the field of amateur radio and to encourage digital communications, such as AMTOR, RTTY and Packet radio. At present they meet bi-monthly at the Crown public house, Bishops Waltham, Hants, but regular monthly meetings are planned for the Autumn. One of their members, Mark Johnson G4ZRT, has written a sophisticated ASCII mailbox programme for the BBC micro which has been given to club members and is proving very popular. Since the club's formation, there has been so much ASCII/Packet activity on the data frequency 144·675MHz, that it has been decided to also use 144·525 and 144·550MHz for data traffic in their area to help relieve the congestion. Further details are available from the AMRAC secretary, Trevor Tugwell, 50 Maybridge, Fareham, Hants, or telephone 04895 81032.

BARTG members, **Ann** and **Nigel Babbage** G4YKK and G1DZB, West Molesey, enjoy using RTTY, mainly on 144MHz with a FT480R and FT726 and sometimes on h.f with a FT101ZD. Among their data equipment is a modified ST5 terminal unit, a Tono Theta 550 communications terminal, a Creed 444 printer and a Sinclair Spectrum computer with Scarab Systems software.

During April, **Peter Lincoln,** Aldershot, found the 14MHz band RTTY frequency (14·090MHz) active on most days to Europe plus a few openings to the far east. "CT2CQ and the ZS6CC mailbox were regular users of the band and I have received signals from the USA in the late afternoons and the ARRL news bulletin around 2200GMT", writes Peter. He also copied signals from A92DU, a new one for him and he is keeping his fingers crossed for confirmation. Between midnight and 0100GMT on May 11, Peter read good signals from stations in Chile, Costa Rica and Venezuela and earlier on the 10th, 9V1VS was his best DX. He also reports that TG9HH was on quite often using 75 baud CCIT and usually copied very well and during a quick listen at 1400 on the 12th he logged a 9K2. Currently, Peter is trying out a RTTY programme, supplied by Mike Farrington G8CNB, on his Sharp MZ-700 computer and says that it works very well and is easy to tune. "Mike hopes to have programs available soon for AMTOR and Packet radio," said Peter, who would like a chat with anyone using Sharp MZ80 or 700 computers in connection with amateur radio. You can telephone him on 0252 317870.

Len Fennelow G4ODH, Wisbech, is equipped with an updated FRG 7700 communications receiver, FRT 7700 a.t.u., a variety of wire dipoles and a Tono communications terminal for reading AMTOR and RTTY signals on all bands, from 3·5MHz through to 28MHz. His RTTY log, in conjunction with my own, was used to prepare our monthly band analysis of countries heard on RTTY, Fig. 1. During the same period, Len, received AMTOR signals from stations in England, Germany and Switzerland on 3·5MHz and Chile, England, Germany, Italy and Switzerland on 14MHz. The immaculate letter and detailed log which I received from Len was prepared on a BBC micro with an Acorn view processor and stored on disc. Unlike 14MHz, the 21MHz band was open occasionally and between us we copied signals from Brazil, Chile, Germany, Israel, Oman and Venezuela around 21·090MHz.

According to a count up in my log for the period April 15 to May 14, German stations led the field on the 3·5MHz band and the Italians dominated 7MHz and 14MHz and among the special callsigns I copied were, A4XRS saying, "THIS IS THE HQ STATION OF THE ROYAL OMANI ARS" and "WELCOME TO DF3UM AUTO-RESPONSE SYSTEM" on 14MHz and "ON6AR THE CLUB STATION FOR ANTWERP RADIO AMATEURS" on 3·5MHz.

Country	Prefix	Band (MHz) 3·5	7	14	21
Alaska	KL7, WL7			X	
Austria	OE		X	X	
Balearic Is.	EA6			X	
Belgium	ON	X		X	
Brazil	PY				X
Canada	VE			X	
Canary Is.	EA8			X	
Ceuta & Melilla	EA9			X	
Chile	CE				X
Cyprus	5B4			X	
Czechoslovakia	OK			X	
England	G	X	X	X	
Finland	OH			X	
France	F		X	X	
Germany	DF, DJ, DK, DL	X	X	X	X
Gozo & Comino	9H4			X	
Greece	SV			X	
Holland	PA		X		
Hungary	HA		X	X	
Israel	4X4			X	X
Italy	I		X	X	
Malta	9H			X	
Mauritania	5T5			X	
Mauritius	3B8			X	
Norway	LA			X	
Oman	A4X				X
Poland	SP			X	
Portugal	CT1			X	
Rumania	YO			X	
Sardinia	IS0			X	
Sicily	IT9			X	
Spain	EA			X	X
Sweden	SM			X	
Switzerland	HB9	X	X		
USA	K, W1–9			X	
USSR	UA,UB,UT,UZ			X	
Venezuela	YV			X	X
Yugoslavia	YU			X	

Fig. 1

NEXT MONTH

Watch out for Part 1 of a series on weather satellites by Terry Weatherley G3WDI

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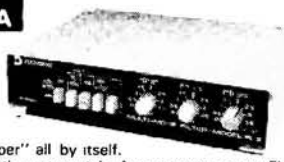

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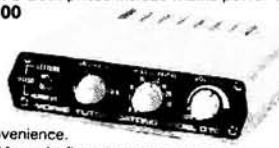

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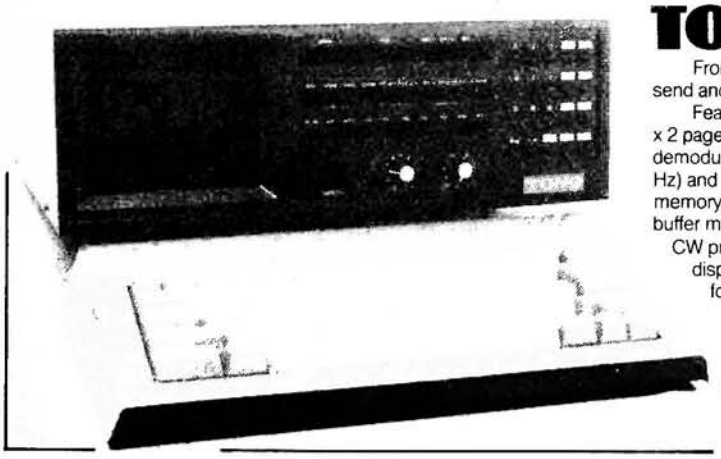

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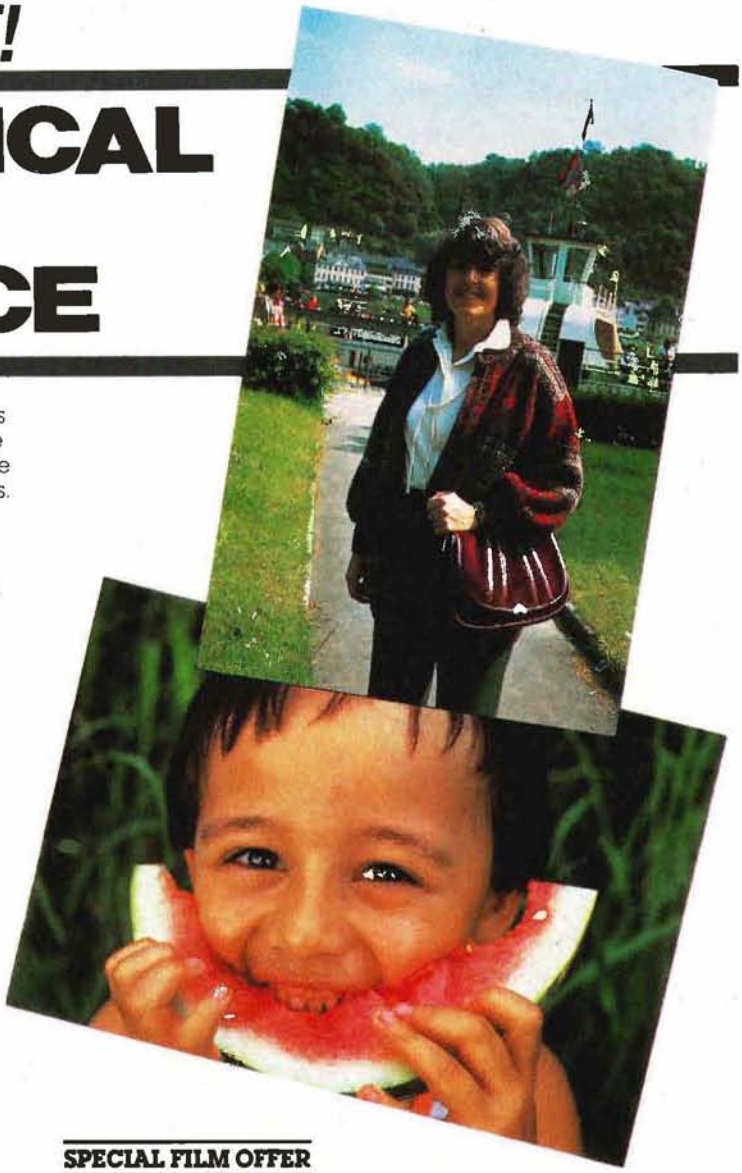

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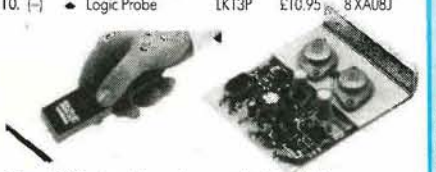
2. (2)		75W Mosfet Amp.	LW51F	£15.95	Best E&MM
3. (4)		Car Burglar Alarm	LW78K	£7.49	4 XA04E
4. (3)		Partylite	LW93B	£10.95	Best E&MM
5. (5)		U/sonic Intrudr Dtctr	LW83E	£10.95	4 XA04E
6. (9)		8W Amplifier	LW36P	£4.95	Catalogue
7. (7)		Light Pen	LK51F	£10.95	12 XA12N
8. (8)		Syntom Drum Synth.	LW86T	£12.95	Best E&MM
9. (6)		Computadrum	LK52G	£9.95	12 XA12N
10. (–)		Logic Probe	LK13P	£10.95	8 XA08J



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