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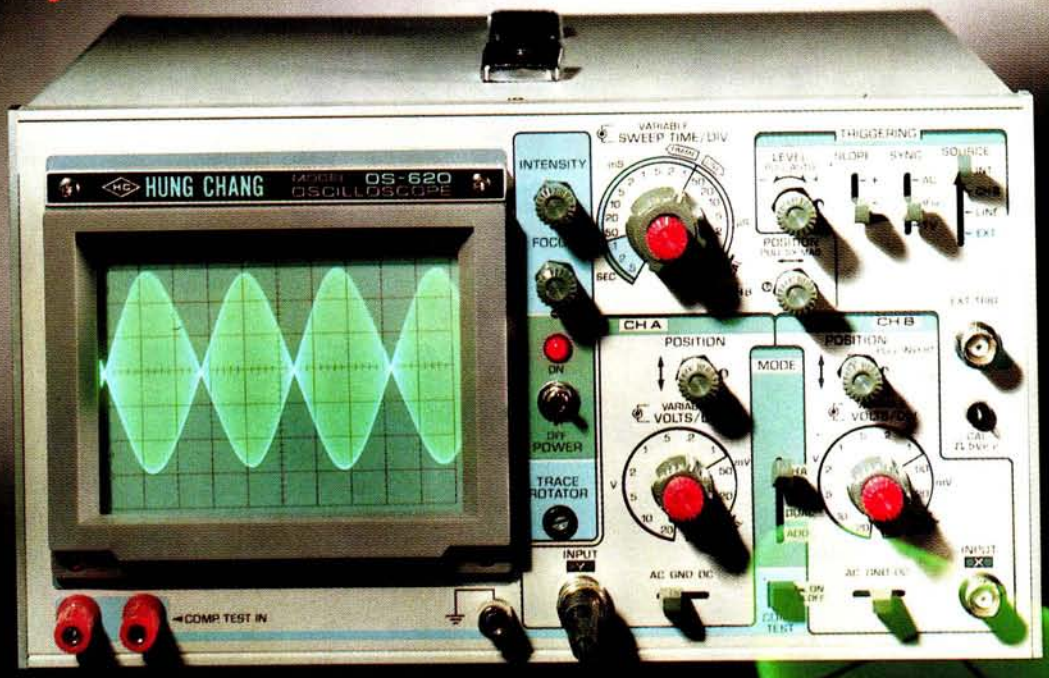
Practical Wireless

The Radio Magazine

READ ALL ABOUT IT... IF YOU LIKE IT, BUY IT

OS-620 Oscilloscope Reviewed, with Scope To Buy With Another PW SPECIAL OFFER



- Also Reviewed IC-751A HF Transceiver
- Build A High-stability VFO
- Read Our Useful Guide To 2m Operating

Reg Ward & Co. Ltd.

1 Western Parade, West Street, Axminster, Devon, EX13 5NY.
Telephone: Axminster (0297) 34918

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1750.00	(—)
SP980	Speaker	110.00	(2.50)
FT767	HF Transceiver	1550.00	(—)
FEX767(2)	2m Module (767)	169.00	(2.50)
FEX767(70)	70cm Module (767)	215.00	(2.50)
FEX767(6)	6m Module (767)	169.00	(2.50)
SP102	Speaker	75.00	(2.00)
SFT290	MkII New Super 290	429.00	(—)
FT290	2m M/Mode Port/Transceiver	379.00	(—)
FT790	70cms M/Mode Port/Transceiver	369.00	(—)
MMB11	Mobile Bracket	37.50	(1.50)
NC11	Charger	10.50	(1.50)
CSC1	Carrying Case	6.50	(1.50)
YHA15	2m Helical	7.50	(1.50)
YHA44D	70cm 1/2wave	12.50	(1.50)
YM49	Speaker Mike	22.00	(1.50)
MMB15	Mobile Bracket	14.55	(1.50)
FT23	2m Mini H/H	223.50	(2.50)
FT73	70cm Mini H/H	243.50	(2.50)
FNB9	Spare Battery Pack (23/73)	25.00	(1.50)
FNB10	Spare Battery Pack (23/73)	30.00	(1.50)
FNB11	Spare Battery Pack (23/73)	46.00	(1.50)
NC.18C	Charger (23/73)	12.35	(1.50)
NC.28	Charger (23/73)	15.40	(1.50)
NC.29	Base Charger (23/73)	53.00	(2.50)
PA6	Car Adap/Charger (23/73)	16.00	(1.50)
MH12A2B	Speaker Mic	27.00	(1.50)
FT727	2m/70cm H/H	425.00	(3.00)
FNB3	Spare Battery Pack	41.00	(1.50)
FNB4	Spare Battery Pack	46.00	(1.50)
FNB5	Empty Cell Case	10.00	(1.50)
FT209R	NEW 2m H/Held/C/W FNB3	P.O.A.	(—)
FT709R	70cm H/Held	P.O.A.	(—)
FT270RH	2m 45W F.M.	299.00	(—)
FT211RH	2m FM 45W	299.00	(—)
FRG9600M	60-950MHz Scanning RX	509.00	(—)
MMB10	Mobile Bracket	10.00	(1.50)
NC9C	Charger	11.50	(1.50)
PA3	Car Adaptor/Charger	21.85	(1.50)
FNB2	Spare Battery Pack	25.00	(1.50)
YM24A	Speaker Mike	27.00	(1.50)
FT726R	2m Base Station	999.00	(—)
430/726	70cm Module for above	349.00	(3.00)
FRG8800	HF Receiver	639.00	(—)
FRV8800	Convertor 118-175 for above	100.00	(2.00)
FRT7700RX	A.T.U.	59.00	(2.00)
MH1B8	Hand 600 8pin mic	21.00	(1.50)
MD1B8	Desk 600 8pin mic	79.00	(1.50)
MF1A3B	Boom mobile mic	25.00	(1.50)
YH77	Lightweight phones	19.99	(1.50)
YH55	Padded phones	19.99	(1.50)
YH1	L/weight Mobile H/set-Boom mic	19.99	(1.50)
SB1	PTT Switch Box 208/708	22.00	(1.50)
SB2	PTT Switch Box 290/790	22.00	(1.50)
SB10	PTT Switch Box 270/2700	22.00	(1.50)
FF501DX	Low Pass Filter	38.50	(1.50)

Linear Amps

TOKYO HI POWER

HL 160V	2m, 10W in, 160W out	244.52	(2.50)
HL 82V	2m, 10W in, 85W out	144.50	(2.50)
HL 110V	2m, 10W in, 110W out	249.00	(2.50)
HL 35V	2m, 3W in, 30W out	76.00	(2.50)
HL 30	2m, 3W in, 30W out	54.00	(2.50)
HL 30V	70cms, 3W in, 30W out	122.50	(2.50)

MICROWAVE MODULES

MML144/30-LS	inc preamp (1/3 w i/p)	98.90	(2.50)
MML144/50-S	inc preamp, switchable	106.95	(2.50)
ML144/100-S	inc preamp (10w i/p)	149.95	(3.00)
MML144/100-HS	inc preamp (25w i/p)	158.95	(3.00)
MML144/100-LS	inc preamp (1/3w i/p)	189.95	(3.00)
MML144/200S	inc preamp (3/10/25 i/p)	269.84	(3.00)
MML432/30L	inc preamp (1/3w i/p)	169.95	(2.50)
MML432/50	inc preamp (10w i/p)	149.50	(2.50)
MML432/100	linear (10w i/p)	334.65	(3.00)

B.N.O.S.

LPM 144-1-100	2m, 1W in, 100W out, preamp	235.00	(3.00)
LPM 144-3-100	2m, 3W in, 100W out, preamp	235.00	(3.00)
LPM 144-10-100	2m, 10W in, 100W out, preamp	205.00	(3.00)
LPM 144-25-180	2m, 25W in, 180W out, preamp	305.00	(3.00)
LPM 144-3-180	2m, 3W in, 180W out, preamp	355.00	(3.00)
LPM 144-10-180	2m, 10W in, 180W out, preamp	355.00	(3.00)
LP 144-3-50	2MN 50W out, preamp	145.00	(3.00)
LP 144-10-50	2M 10W in, preamp	145.00	(3.00)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	255.00	(3.00)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	255.00	(3.00)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	215.00	(3.00)
LPM 432-10-100	70cm, 10W in, 100W out, preamp	395.00	(3.00)
LPM 432-3-100	70cm, 3W in, 100W out, preamp	395.00	(3.00)

SWR/PWR Meters

HANSEN

FS50VP	50-150MHz 20/200 Interval PEP/SWR	106.70	(2.50)
FS300V	50-150MHz 20/200 PWR/SWR	53.50	(2.50)
FS300H	1.8-60MHz 20/200/10W	53.50	(2.50)
FS210	1.8-150MHz 20/200 Auto SWR	63.50	(2.50)
W720	140-430MHz 20/200W	52.75	(2.50)

WELZ

SP10X	1.8-150MHz PWR/SWR	39.95	(2.50)
SP122	1.8-60MHz PWR/SWR/PEP	79.95	(2.50)
SP220	1.8-200MHz PWR/SWR/PEP	67.95	(2.50)
SP225	1.8-200MHz PWR/SWR/PEP	99.95	(2.50)
SP420	140-525MHz PWR/SWR/PEP	59.95	(2.50)
SP425	140-525MHz PWR/SWR/PEP	119.95	(2.50)
SP825	1.8-200-430-800-1240MHz	169.00	(2.50)

TOYO

T430	144/432 120 W	52.50	(2.50)
T435	144/432 200 W	58.00	(2.50)

Scanning Receivers

SX200	VHF/UHF Scanner	325.00	(3.00)
SX400	VHF/UHF Continuous Coverage	645.00	(3.00)
AOR2002	VHF/UHF Continuous Coverage	487.30	(3.00)
HX2000	H/H Scanner	269.00	(3.00)

Icom Products

IC761	New Super HF Transceiver	P.O.A.	(—)
IC751A	HF Transceiver	1465.00	(—)
IC735	New HF Transceiver	949.00	(—)
AT100	100W ATU (751/745)	365.00	(3.50)
AT150	150W ATA (735)	315.00	(3.50)
PS55	Ext PSU (735)	185.00	(3.00)
IC505	50MHz multi-mode portable	459.00	(—)
IC290D	2m 25w M/Mode	542.00	(—)
IC28E	25W FM	359.00	(—)
IC28H	2m 45W FM	399.00	(3.00)
IC Micro	2E New Mini H/H	239.00	(3.00)
IC2E	2m The Original H/H	225.00	(3.00)
IC02E	2m H/H	299.00	(3.00)
IC275E	New 2m 25 Base Stn	1029.00	(—)
IC4E	70cm H/H	285.00	(3.00)
IC04E	70cm H/H	299.00	(3.00)
IC48E	70cm 25W FM Mobile	449.00	(3.00)
IC490	70cm 10W M/Mode	617.00	(—)
IC3200	2m/70 Dual Band FM Mobile	556.00	(—)
IC12E	23cm H/H	428.00	(3.00)
ICR71	Gen Cov RX	825.00	(—)
IC7000	VHF/UHF Scanner	957.00	(—)
AH7000	25-1300MHz Discone	82.00	(2.50)
SP3	Ext Speaker	61.00	(2.00)
CK70	DC Cable (R70/R71)	7.00	(1.50)
EX257	FM Board (R70/R71)	41.00	(1.50)
GC5	World Clock	43.00	(2.00)

HAND HELD ACCESSORIES

AO2	Waterproof Bag all Icom H/H	14.38	(1.50)
BC35	Desk Charger	70.15	(2.00)
BP3	Battery Pack 8.4V (2/4E/02/04E)	29.90	(1.50)
BP4	Empty Battery Case (2/4E/02/04E)	9.20	(1.50)
BP5	Battery Pack 10.8V	60.95	(2.00)
BP7	Battery Pack 13.2V (02/04E only)	74.75	(2.00)
BP8	Battery Pack 8.4V	71.30	(2.00)
CP1	12v Charge Lead BP3/7/8	6.90	(1.50)
DC1	DC/DC converter operate from 12v	17.25	(1.50)
FA2	2m Helical BNC	9.20	(1.50)
FA3	70cm Flexible 1/4Ω Antenna (BNC)	9.20	(1.50)
HM9	Speaker/Mic	21.85	(2.00)
HS10	Head set Boom Mike	20.70	(1.50)
HS10SA	Vox Unit HS10 (02/04E only)	25.30	(1.50)
HS10SB	PTT SW Box HS10	20.70	(1.50)
LC1	Leatherette Case 2E/4E + BP5	6.90	(1.50)
LC3	Leatherette Case 2E/4E + BP3	6.90	(1.50)
LC11	Leatherette Case 02E/04E + BP3	9.20	(1.50)
LC14	Leatherette Case 02E/04E + BP5/7/8	9.20	(1.50)
SS1	Shoulder Strap	10.35	(1.50)

OTHER ACCESSORIES

SM6	600ohm 8P Base Mic	45.00	(2.00)
SM8	1.3K/600Ω 8P Base Mic	82.00	(2.00)
SM10	Comp/Graphic Mike	116.00	(2.50)

SPECIAL OFFERS

YAESU FT209R(3)	WAS £299	NOW £219
YAESU FT209R(4)	WAS £305	NOW £229
YAESU FT709R(4)	WAS £325	NOW £199
YAESU FT757GX	WAS £895	
YAESU FP757GX	WAS £199 } £1188	NOW £895
KENWOOD TH21 2m H/H	WAS £225	NOW £189
KENWOOD TH41 70cm H/H	WAS £268	NOW £218
KDK FM740	WAS £399	NOW £299

Datong Products

PC1	Gen. Cov. Con.	137.40	(2.00)
VLF	Very low frequency conv.	34.90	(2.00)
FL2	Multi-mode audio filter	89.70	(2.00)
FL3	Audio filter for receivers	129.00	(2.00)
ASP/B	r.f. speech clipper for Trio	82.80	(2.00)
ASP/A	r.f. speech clipper for Yaesu	82.80	(2.00)
ASP	As above with 8 pin conn	89.70	(2.00)
D75	Manual RF speech clipper	56.35	(2.00)
D70	Morse Tutor	56.35	(2.00)
MK	Keyboard morse sender	137.40	(2.00)
RFA	RF switched pre-amp	36.00	(2.00)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(2.00)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(2.00)
MPU	Mains power unit	6.90	(2.00)
DC144/28	2m converter	39.67	(2.00)
PTS1	Tone squelch unit	46.00	(2.00)
ANF	Automatic notch filter	67.85	(2.00)
SRB2	Auto Woodpecker blanker	86.25	(2.00)

CW/RTTY Equipment

Tono 550	Reader	329.00	(3.00)

ICS/AEA

PK64	Complete Packet/Amtor terminal	239.00	(3.00)
PK232	Packet/RTTY Terminal	269.00	(3.00)

BENCHER

BY1	Squeeze Key, Black base	67.42	(2.50)
BY2	Squeeze Key, Chrome base	76.97	(2.50)

VIBROPLEX

Iambic Standard		63.33	(3.00)
Iambic Deluxe		78.09	(3.00)
Vibrokeyer Standard		63.98	(3.00)
Vibrokeyer Deluxe		78.09	(3.00)
The Original Standard		73.54	(3.00)
The Original Deluxe		82.74	(3.00)

HI-MOUND MORSE KEYS

HK703	Up down keyer	38.35	(2.00)
HK704	Up down keyer	26.35	(2.00)
HK706	Up down keyer	21.80	(2.00)
HK707	Up down keyer	20.15	(2.00)
HK710	Up down keyer	39.95	(2.50)
HK802	Up down solid brass	109.00	(2.50)
HK803	Up down solid brass	104.50	(2.50)
HK808	Up down keyer	66.95	(2.00)
MK703	Twin paddle keyer metal base	34.50	(2.00)
MK705	Twin paddle keyer marble base	32.78	(2.00)
MK706	Twin paddle key	30.48	(2.00)
STARMASTER	Keyer Unit	54.70	(3.00)
STARMASTER	Keyer Unit CMOS Memory	95.00	(3.00)

KENPRO

KP100	Squeeze CMOS 230/13.8v	109.25	(3.00)
KP200	Memory 4096 Multi Channel	234.55	(3.00)

Kenwood

TS940S	9 Band TX General Cov RX	1995.00	(—)
AT940	Auto/ATU	244.88	(2.50)
SP940	Ext Speaker	87.55	(2.50)
TS930S	9 Band TX General Cov RX	1695.00	(—)
AT930	Auto/ATU	206.03	(2.50)
SP930	Ext Speaker	90.94	(2.50)
TS440	NEW 9 Band TX General Cov RX	1138.81	(—)
AT440	Auto/ATU	144.82	(2.50)
PS50	H/Duty PSU	222.49	(2.50)
TS830S	160-10m Transceiver 9 Bands	1098.00	(2.50)
AT230	All Band ATU/Power Meter	208.67	(2.50)
SP230	External Speaker Unit	66.49	(2.50)
TS530SP	160m-10m Transceiver	927.51	(—)
TS430S	160m-10m Transceiver	974.23	(—)
PS430	Matching Power Supply	173.78	(3.50)
SP430	Matching Speaker	40.81	(2.50)
MB430	Mobile Mounting Bracket	15.80	(2.50)
FM430	FM Board for TS430	48.05	(2.50)
SM220	Station Monitor	343.62	(3.50)
BS8	Band Scope Unit (830/940)	77.00	(2.00)
TL922	10/160 2K Linear	1495.00	(7.00)
TM221ES	2M 45W Mobile FM	317.17	(3.00)
TM421ES	70cm 25W Mobile FM	372.08	(3.00)
TH21	2M Mini H/H	189.00	(2.50)
TH41	70cm Mini H/H	268.00	(2.50)
TH205	2M H/H	215.26	(3.00)
TH215	2M H/H Keyboard	252.13	(3.00)
TR751	2M 25W M/M Mobile	599.00	(—)
TR851	70cm M/M Mobile	699.00	(—)
TS711	2M 25W Base Stn	940.00	(—)
TS811	70cm 25W Base Stn	1094.05	(—)
R2000	Gen Coverage HF/RX	595.00	(—)
VC10	118-174MHz Converter (R2000)	161.94	(2.00)
R5000	NEW General Coverage HF/RX	875.00	(—)
VC20	118-174MHz Converter (R5000)	167.21	(2.00)

HAND HELD ACCESSORIES

BT2	Empty Battery Case TH21/41	11.86	(1.50)
DC21	DC Power Supply TH21/41	25.00	(1.50)
EB2	Ext. Battery Case TH21/41	6.77	(1.50)
HMC1	Headset with Vox TH21/41	32.91	(1.50)
PB21	Nicad Pack TH21/41	24.36	(1.50)
BC6	Desk Charger TH21/41	99.00	(2.00)
SC8	Soft Case TH21/41	11.86	(1.50)
SMC30	Speaker/Mic TH21/4/2600	28.31	(1.50)

ACCESSORIES

MC50	4P Desk Mic	46.08	(2.50)
MC60A	8P Desk Mic	88.22	(2.50)
MC80	Electric Desk Mic	53.98	(2.50)
MC85	Desk Mic Audio Level Comp	99.00	(2.50)
MC43	8P Fist Mic	22.22	(1.50)
MC35	4P Fist Mic	21.72	(1.50)
MC55	Mobile Mic (6br 8p)	52.67	(2.50)
LF30	HF Low Pass Filter	32.26	(2.00)
KX3	Receiver ATU (Mizuho)	67.28	(2.50)
HS6	Lightweight H/phones	24.36	(2.00)
HS5	Deluxe H/phones	37.54	(2.00)
SW100A	SWR/Power Meter 1.8-150MHz	49.50	(2.00)
SW100B	SWR/Power Meter 140-450MHz	49.50	(2.00)
SW200A	SWR/Power Meter 1.8-150MHz	107.99	(2.50)
SW200B	SWR/Power Meter 140-450MHz	107.99	(2.50)
SW2000	SWR/Power Meter 1.8-54MHz 2K	117.17	(2.50)
SWT1	2m ATU	38.18	(2.00)

Power Supplies

DRAE

4 amp	43.40	(2.50)	
6 amp	65.00	(3.00)	
12 amp	86.50	(3.50)	
24 amp	125.00	(4.50)	

BNOS

6 amp	75.00	(3.00)	
12 amp	125.00	(3.50)	
25 amp	185.00	(4.50)	
40 amp	385.00	(4.50)	

Aerial Rotators

KR250	Light Duty	78.00	(3.00)
AR200XL	Light Weight	59.95	(3.00)
AR40	5 core Medium Duty	125.00	(2.50)
KR400	Med/H Duty	139.00	(3.00)
KR500	6 core Elevation	149.00	(3.00)
KR400RC	6 core Medium Duty	169.00	(3.00)
KR600RC	8 core Heavy Duty	219.00	(3.00)
T2X	8 core Very Heavy Duty	499.00	(—)
KR5400	Elevation/Azimuth	279.00	(3.00)
KR5600	Elevation/Azimuth	369.00	(3.50)
KR800SDX	450 Degrees, Medium/Heavy Duty	325.00	(3.50)
KR1000SDX	450 Degrees, Heavy Duty	368.00	(4.00)

Switches

SMCS 2U	2N 50239	18.95	(2.00)
SMCS 2N	2 way 'n' Skts	23.50	(2.00)
Welz	2 way SO239	29.95	(2.00)
Welz	2 way 'n' Skts	49.05	(2.00)
Drae	3 way SO239	15.40	(2.00)
Drae	3 way 'n' Skts	19.90	(2.00)
Kenpro KP21	N2 way Switch	27.00	(2.00)

Miscellaneous

DRAE	Wavemeter	27.50	(2.00)
T30	30W Dummy load	8.50	(2.00)
T100	100W Dummy load	38.00	(2.00)
T200	200W Dummy load	56.00	(2.00)
CT20A	20W Dummy Load PL259	15.95	(2.00)
CT20N	20W Dummy Load N. Plugs	22.95	(2.00)
CT530	100W Dummy Load (500WHmin)	58.99	(2.50)
DRAE	2m Pre-set A.T.U.	14.50	(2.00)

TOKYO HI-POWER

HC200	10-80 HF Tuner	115.00	(2.50)
HC400	10-160 HF Tuner	199.00	(3.50)

CAP CO.

AERIAL TUNERS

SPC300D	1kW PEP	225.00	(6.00)
SPC3000D	3kW PEP	325.00	(6.00)
1-1	Balun	16.75	(1.50)
1-4	Balun	16.75	(1.50)

Transverters

MICROWAVE MODULES

MMT50/28S	10m-6m Transverter	289.80	(3.00)
MMT50/144	2m-6m Transverter	289.80	(3.00)
MMT144/28R	2m-10m 25W O/P	289.80	(3.00)
MMT144/28	2m-10m 10W O/P	139.84	(2.50)
MMT432/28S	70cm-10m Transverter	195.50	(3.00)
MMT1296/144	23cm-2m Transverter	258.75	(3.00)

AERIALS BY:- JAYBEAM – MINIBEAM – HYGAIN – G. WHIP – MET – TONNA

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Practical Wireless
The Radio Magazine

OCTOBER 1987 (ON SALE 10 SEPTEMBER) VOL. 63 NO. 10 ISSUE 967

THIS MONTH

Regular Features

NEXT MONTH

RTTY Tuning Indicator

"Valved Comms Receivers" Hallicrafters Sky Buddy

The PK-232 Terminal Unit Reviewed

Another *PW* Special Book Offer

and

All the usual features

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Advertisement Manager
Roger Hall G4TNT ☎ 01-731 6222

Editor Geoff Arnold T.Eng FSERT G3GSR
Assistant Editor Dick Ganderton C.Eng. MIERE G8VFH
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the KENWOOD **TS530SP** HF transceiver, a ***sensible*** rig.

The TRIO TS530SP HF transceiver is similar to the TS830S in that it also uses a pair of 6146B valves in its PA stage. The transceiver has been designed for the amateur who has no need for the additional facilities that are part of the TS830S but who still requires a high level of performance from his equipment.

The TRIO TS530SP covers the amateur bands from 160 through to 10 metres. Modes of operation are USB, LSB and CW.

Operating from 240 volts AC the transceiver has its own internal power supply.

IF shift is built into the TS530SP to allow the IF passband to be moved around the received signal and away from interfering signals and sideband splatter. Even greater selectivity is achieved when an optional YK88SN (1.8 kHz), YK88C (500 Hz) or YK88CN (270 Hz) filter is installed.

A tunable notch filter is built into the audio system of the TS530SP.

The speech processor in the TS530SP combines an audio compression amplifier with a change of ALC time constant for extra audio punch and increased average SSB output.

To cope with pulse type noise (such as ignition), the transceiver has a noise blanker.

Both RIT and XIT (receiver as well as transmitter incremental tuning) are included to aid operating, XIT being a distinct advantage when calling a station that is listening "off frequency".

TS530SP HF transceiver.....**£927.51 inc VAT,** carriage £7.00.

PRICE REDUCED TO £748
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FREE

Send only £1 to cover postage and packing and we will send you, by return, a FREE copy of the new full colour KENWOOD catalogue which lists the features and specification of every model and accessory currently available. We will also include, FREE OF CHARGE, a copy of our general catalogue which, along with items to enhance your operating, contains much useful information. Finally, to cheer you up, we will add the latest edition of our price list.

solid state perfection the KENWOOD **TS430S** hf transceiver.

For the last four and a half years the KENWOOD TS430S has been a firm favourite with many radio amateurs. Offering excellent performance coupled with outstanding reliability, the transceiver gives instant access to the amateur bands and, at the same time, is a first class general coverage receiver. Key features of the rig are the two digital VFO's, eight memory channels, programmable band scan, IF shift and a notch filter.

The TS430S runs 200 watts input on SSB/CW 160-15 metres; 180 watts on 12-10 metres, in AM mode, it runs 80 watts on all bands. With the FM option fitted the rig runs 100 watts input, again on all bands. The TS430S operates from 13.8 volts DC or from 240 volts AC by means of an optional power supply.

Its modes of operation are USB, LSB, CW and AM. FM is available as an option. Mode selection is easily accomplished by front panel switches with adjacent LED indicators.

In addition to the amateur bands from 160 to 10 metres, the TS430S features a 150 kHz to 30 MHz general coverage receiver. Front panel UP/DOWN switches allow easy selection of the desired amateur band. A MHz step switch provides 1 MHz steps across the entire range of the transceiver and each of the two VFO's is completely tunable from 150 kHz to 30 MHz.

The two digital VFO's operate independently of each other tuning in 10 Hz steps. A STEP switch is provided, use of which increases the tuning step to 100 Hz. An A/B switch is provided to quickly put both VFO's on the same frequency, ideal for checking on the source of QRM without losing the original operating frequency.

Each memory stores frequency, mode and band information, the eighth memory holds receive and transmit frequencies independently so giving simple split frequency operation. A front panel VFO/MEMO switch allows each of the memory channels to be used either as a VFO or as a fixed channel. The TS430S also has memory scan. Not only does the memory hold frequency but the mode also, most useful if a mix of broadcast frequencies has the odd SSB net frequency within it. The hold time for an occupied channel is approximately 2 seconds, a hold switch is provided to interrupt the scanning process.

Programmable band scan is available, the limits of scan being set by memory channels 6 and 7. Again, the hold switch will cancel the scan function.

IF shift enhances listening on todays' busy bands.

A tuneable notch filter is included to give the best interference rejection.

A front panel NAR/WIDE switch allows narrow-wide IF filter selection when the optional filters are installed.

A front panel switch activates the speech processor circuit, with its audio compression circuit and change in ALC time constant, resulting in a marked improvement in intelligibility, accompanied by a marked increase in "talk power".

All mode squelch circuit.

Connections for a transverter are included on the rear panel making the TS430S an ideal driver for 6 metres, two metres, seventy or twenty three centimetres.

PRICE REDUCED TO £748
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LOWE ELECTRONICS LTD.

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

45 watts on 2 metres, the TM221E.
35 watts on 70 centimetres, the TM421E.

The new KENWOOD TM221E and TM421E two metre and seventy centimetre FM mobile transceivers have been specifically designed to condense maximum performance and operating convenience into a compact package. Output power is 45 watts on two metres (TM221E) and 35 watts on 70 centimetres (TM421E). Receiver sensitivity matches the output power of the set and measures an amazing 0.141uV for 12dB SINAD (across 144-146). The figures are those given by Chris Lorek in his recent TM221E review published in the July edition of HAM RADIO TODAY.

Much discussion has taken place recently regarding 12.5 and 25 kHz spaced frequency channels on the two metre band. With the new mobiles channel spacing is not a problem. KENWOOD with their usual attention to detail have made the frequency step user selectable. The steps available are 5, 10, 12.5, 15, 20 and 25 kHz. Once programmed either microphone up/down button or the transceivers front panel knob can be used to step the transceiver across the band. Of course should it be necessary the selected step can easily be changed.

A new orange backlit liquid crystal display gives the transceiver an amazingly clear frequency readout that can be read in the brightest of sunlight.

The transceiver has all essential operating aids. There are 14 memory channels, each of which holds frequency, whether simplex or repeater operation is required and whether or not the tone burst is on or off. Scanning can either be memory with the ability to lock out unwanted channels or band with the scan limits set by the operator. The usual priority channel facility is also included to make sure that no call is missed. As well as showing the operating frequency the display also indicates which of the facilities are being used.

Occasionally a piece of equipment comes along which catches the imagination; the RC10 remote controller/handset for the TM221E and TM421E does just that. Designed to operate with either transceivers or link both together, the RC10 looks more like a cellular radio car phone than a piece of amateur radio equipment.

In fact the RC10 not only looks like a car phone, but as a speaker and microphone are built-in, operates as would a telephone handset. Easily mounted in any car, dashboard or transmission tunnel, the RC10 controls all transceiver front panel functions with the exception of on/off and high/low power selection. The functions controlled by the RC10 are volume, squelch on/off, frequency readout, keypad frequency entry, memory selection and frequency or memory scanning. Full duplex operation is possible when both transceivers are fitted.

From a security point of view it may even be possible to mount the transceivers out of sight and only have the controller on view. Since most thieves now know that a cellular phone is not a saleable item, owning an RC10 may be a wise investment!

Although I have not seen the RC10, I am of the opinion that it will do much more than I have already described. I suspect that it will be possible for the RC10, when used in conjunction with both 2 metre and 70 centimetre transceivers, to operate as a personal repeater. Parked at the top of a multi-storey car park and left unattended, I would not be surprised if you could not talk-in to the installation from another small handheld on 70 centimentres (say a TH41E) and have your transmission re-broadcast at a higher power from the good location on 2 metres. Any reply would be re-transmitted to you on 70 centimetres. Useful and ideal for staying in contact when wandering around town. Helpful also for RAYNET use.

TM221E ..... **£317.30 inc VAT carriage £7.00**
TM421E ..... **£378.00 inc VAT carriage £7.00**

the new dual band transceiver from KENWOOD, the **TW4100E.**

Using the latest in technology, the designers of the TW4100E dual band FM mobile transceiver have achieved increased performance and, at the same time, made operation even easier. The operator can pre-set the transceiver according to the band plan and his preferences. Options available are shift (+, – or duplex), frequency stepping (5, 10, 12.5, 20, 25 or 50 KHz) and repeater shift (600 KHz, 1.6, 5, and 7.6 MHz).

With the KENWOOD TW4100E, not only do you have the normal simplex and repeater modes but crossband duplex as well. Priority channel monitoring takes on a new meaning if the full audio can be heard whilst you are transmitting instead of the usual "bleep" and loss of signal. If you work another amateur who can also simultaneously transmit on one band and listen on the other, and many stations do have this facility, then a telephone style conversation is possible. Anyone who has not experienced duplex operating will soon come to prefer the natural conversation style that is possible.

With the high level of traffic on today's roads, it is essential that a mobile transceiver is easy to operate. KENWOOD engineers have simplified the rig's operation by providing ten memories, each of which will hold information on frequency, simplex or repeater operation and whether or not the tone burst is on or off. By pushing a single button all this information can be transferred to the VFO. Of course the original information is still held in memory for future use. You therefore have ten independent VFOs. KENWOOD's attention to detail is shown by the following additional facility. If having transferred a repeater frequency to the VFO, you move onto an adjacent simplex channel, you can, by the push of two buttons, cancel the tone burst and reset the shift from repeater to simplex. Of course, two more presses of the same buttons restore the facilities.

Linear amplifiers are not needed with the KENWOOD TW4100E! Power output from the transceiver is 45 watts on two metres and 35 watts on seventy centimetres, more than enough to cope with difficult terrain.

The TW4100E has another facility not mentional in the handbook. Not mentioned because unless you are a RAYNET member on an approved operation or engaged on a real emergency, to use the equipment in such a way is outside the compass of the licence as we presently know it.

The facility is that the TW4100E will act as a private crossband repeater. This means that you can park your car in a decent location and wander off into an RF black spot. Armed with a small low power handheld, you can talk back to the TW4100E which, since you left it, has been constantly checking the two pre-set crossband frequencies. Your transmission is received and simultaneously transmitted by the TW4100E on the other band. When a station replies, the message is again simultaneously retransmitted to you. Of course you need to have another amateur in your car to oversee the operation and it must be a recognised RAYNET use. In repeater mode the KENWOOD TW4100E has automatic time-out after approximately three minutes.

The TW4100E has provision for DCL (digital channel link) and DCS (digital code squelch) when the optional MU1 board is fitted.

TW4100E ..... **£699.00 inc VAT,** carriage £7.00

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'Tech Talk' from ICOM

IC-AH2 Mobile Antenna System.

Reduced size yet high performance HF antennas are becoming increasingly popular among today's radio amateurs and ICOM is proudly responding to those needs with a deluxe antenna system. The AH-2. This all band and fully automatic antenna package is especially designed for luxury style mobiling, portable activities such as vacationing, or operating from environmentally sensitive areas such as apartments.

Mobiling in top fashion hasn't been more attractive, and ICOM's "all in one" design boasts numerous advantages over conventional "mixed components" -type setups. Whether pursuing fixed station or mobile activities, the flexibility and convenience of this fully remote controlled and automatically tuned antenna opens new horizons in limited antenna HF operations. Since the AH-2 system is packed with unique features and is a relatively new idea, we would like to discuss its innovative designs in a step-by-set manner.

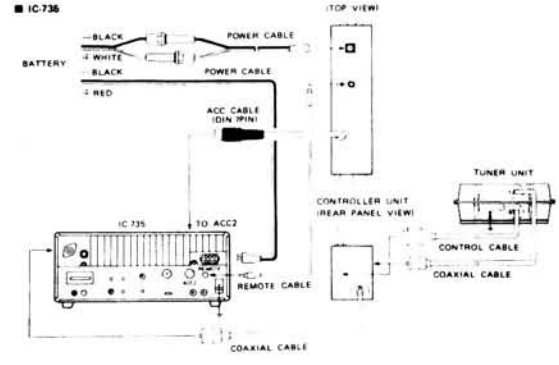
There are five components in the ICOM AH-2 system. The package can be purchased complete or minus the mobile mount and whip for auto of fixed station use as desired. The full system consists of a small rig-attached control unit, a remote actuated and microprocessor controlled antenna tuning unit, an approximate nine-foot stainless steel whip, a universal and heavy duty auto frame mount and an interconnecting cable set.

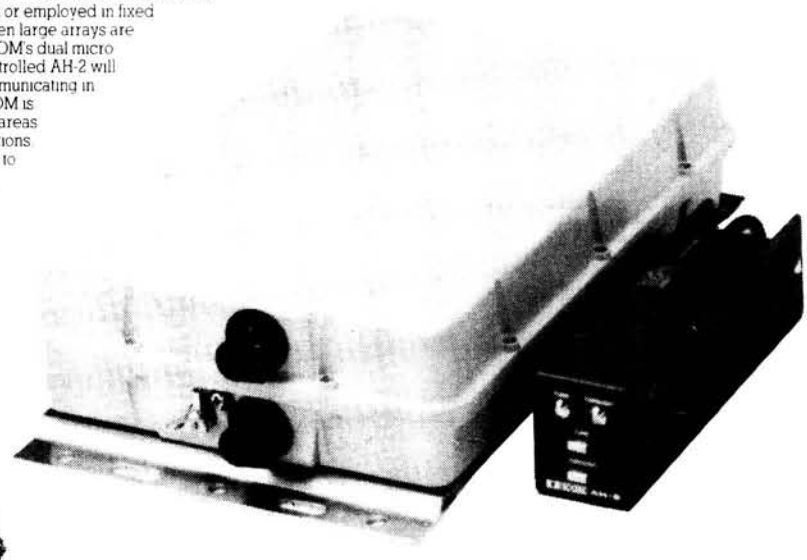
An optional OPC-137 cable interface is available for the IC-751 or IC-745 HF transceivers. When using the system's stainless whip operation on all amateur bands between 3.5 and 30 MHz is possible. When the radiating whip is replaced with a random wire 40 feet or longer 1.8MHz operation is also possible. During operation, you merely select a band and frequency, push the remote unit's "tune" button, and one of over 260,000 LC combinations is digitally selected for optimum transmit antenna performance. Tuning actions require only ten watts of RF power, and the resulting SWR is 1.5:1. Usual tuning time is less than six seconds. The antenna tuning unit's microprocessor stores that LC data in one of eight internal memories so that information is recalled in less than two seconds when the HF transceiver retunes a preselected range. An additional microprocessor in the rig-attached remote control unit handles automatic transceiver tune mode switching and RF power output control.

Notice the tuner's capabilities are used during both transmit and receive. Its four sensors (impedance, phase, forward and reflected power) are designed to optimize both single longwires and whips or random wires shorter than ¼ wavelength, a difficult task for many automatic tuners. Notice, also, the precise use of microprocessor selected fixed capacitors rather than motor driven variables. This overall concept provides superb antenna tuning and the highest possible performance.

The system's whip and mount truly gives new clarity to the terms "universal" and "heavy duty." They can be quickly installed on a TV mast, boat or car. The mount's bracket bolts to an existing hole in an auto's rear frame; a very strong pipe bolts into the bracket, and the antenna's base section bolts to the pipe's remaining end. The pipe's length is fully adjustable to fit various cars. The antenna base section, incidentally, stands 15 inches tall and weighs approximately nine pounds. "Rugged" is truly an understatement!

Whether assembled as an all-band mobile system or employed in fixed station use when large arrays are unfeasible, ICOM's dual micro processor controlled AH-2 will keep you communicating in high style. ICOM is bridging new areas in communications and wants you to enjoy this leading edge in modern technology.





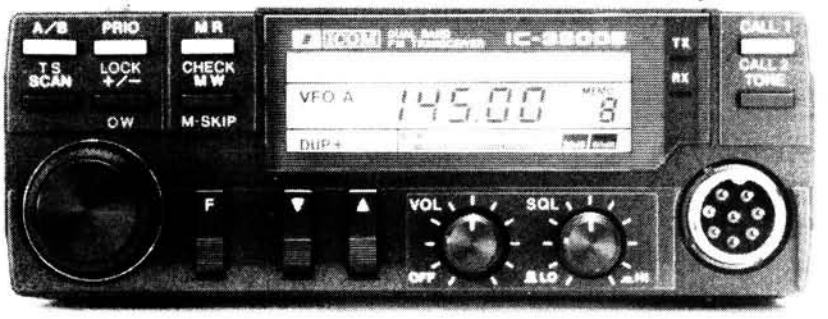
Telephone us free-of-charge on:

HELPLINE 0800-521145.

Mon-Fri 09.00-13.00 and 1400-17.30

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

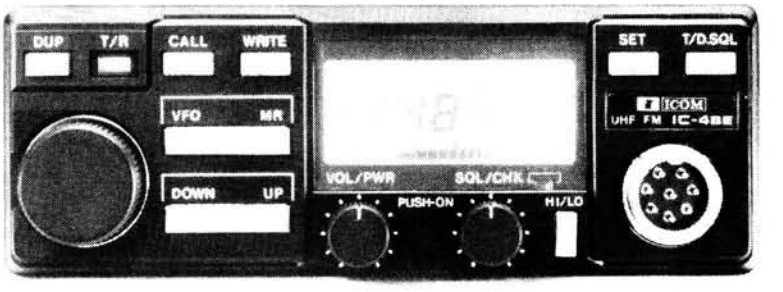
IC-3200E, Dual-band transceiver.



If you are a newly licensed or just undecided about which band to first operate, then the ICOM IC-3200E is just the answer. This is a dual-band (144-146/430-440MHz) F.M. transceiver ideally suited for the mobile operator. The IC-3200E has a built in duplexer and can operate on one antenna for both VHF and UHF, and with 25 watts of output power on both bands (the low power can be adjusted from 1 to 10 watts) you can never be far from a contact whether simplex or 2m/70cm repeater.

The IC-3200E employs a function key for low priority operations to simplify the front panel and a new LCD display which is easy to read in bright sunlight. 10 memory channels will show operating frequencies simplex or duplex, and four scanning systems memory, band, program and priority scan.

IC-48E, 70cm. FM Mini-mobile.



This NEW 70cm. band transceiver is so small that it will fit almost anywhere in your vehicle or shack. Power output is 25 watts or 5 watts low, the IC-48E is supplied complete with an internal loud-speaker. The large front panel LCD readout is designed for wide-angle viewing with an automatic dimmer circuit to control the back lighting of the display for day or night operating. The front panel of the IC-48E is straightforward to make mobile operation safe and easy. The IC-48E contains 21 memory channels with duplex and memory skip functions. All memories and frequencies can be scanned by using the HM15 hand mic provided.

IC-48E options include the PS45 13.8V. 8 amp power supply. SP8 and SP10 external loudspeakers, HS15/SB mobile flexible microphone and PTT switchbox.

Why not try 70 cms as a serious alternative to the 2 metre band, you might be amazed at what can be achieved. For more information contact us or your local ICOM dealer.

ICOM have introduced a range of test meters for the radio amateur. These new models would be a useful addition to any ham shack. The DM10 is a digital pen type volt/resistance meter. The LCD display shows measurement in the range, D.C. volts 0.1mV-500V. A.C. volts 1mV-500V. Resistance 0.1ohm-20M ohm. Its small size (21W x 31H x 161L) makes it an ideal handheld test meter.

The DM20 is a digital pocket type volt/resistance meter. The large LCD display shows measurement in A.C. and D.C. volts 1mV-450V. and resistance 0.1 ohm-200K ohms. This test meter is ideal for portable use, its size (51W x 106H x 10D) making it a useful piece of equipment to carry in your pocket.

The DM500 is the top of the range digital meter. The large LCD display shows measurements in the range, D.C. volts 0.1mV-1000V, A.C. volts 1mV-750V. Resistance 0.1 ohm-20M ohms. DC current 0.1uA-10A. This meter measures 70W x 14H x 34D and is ideal to cope with most applications in your radio shack.

ICOM TEST METERS

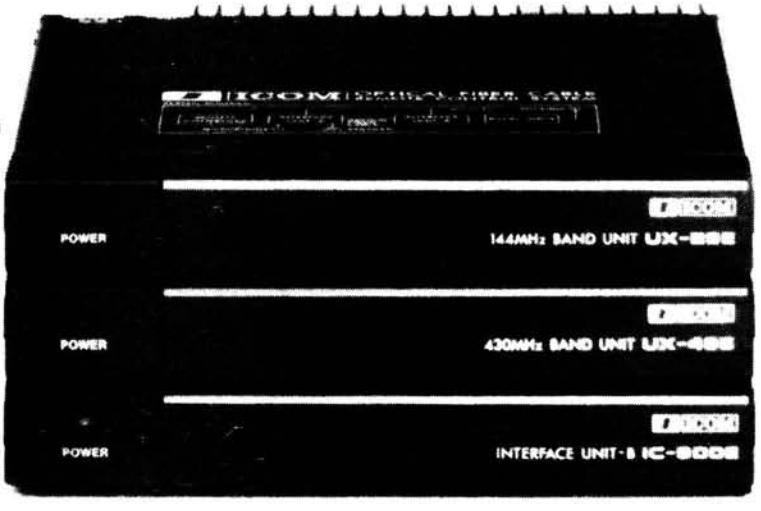
MOBILE MASTERPIECES

IC-900 Super Multiband FM System.

This new addition to ICOM's Ham radio equipment is a multiband FM transceiver system that allows the mobile operator to customize a communications system for his favourite bands. Up to 5 optional band-units can be installed with the IC-900 for instant access to a wide range of frequencies from the 28MHz HF band to the 1240MHz UHF band. Only a small remote controller is necessary for control of all these bands. A flexible optical fibre is used between the Remote Controller and the Interface Unit. The IC-900 has independant, full duplex capability on all bands, providing simultaneous receive and transmit operation. The function display on the Remote Controller shows two separate operating frequencies simultaneously. The IC-900 system transceiver is equipped with 10 fully programmable memory channels in each Band Unit. The system can therefore store up to 50 different memory channels. This revolutionary new concept in Multiband operation is available from your ICOM dealer. Also feel free to contact ICOM (UK) LTD for assistance or information. The IC-900 Multi-band system consists of a Remote Controller, Interface Unit A, Interface Unit B and a series of specially designed Band Units.

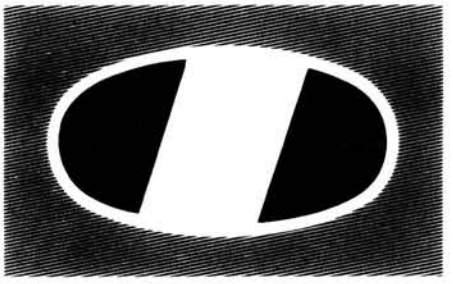
UX19	28—30MHz	10 watts
*UX59	50—54MHz	10 watts
*(No mobile operation allowed in UK)		
UX29	144—146MHz	25 watts
UX29H	144—146MHz	45 watts
UX49	430—440MHz	25 watts
UX129	1240-1300MHz	10 watts

IC-1200, 23cms FM Mobile.



To complete the range of VHF/UHF FM Mobiles this new model is now available for the 23cm Ham band, it is based on similar features to the already existing IC-28E 2m and IC-48E 70 cms mobile units. This Mini-mobile transceiver will fit easily anywhere in your vehicle or shack. Power output is 10 watts or 1 watt low. The IC-1200 is so new we do not even have a picture of it, however, the large front panel LCD readout is designed for wide angle viewing and front panel controls are straightforward to make mobile operation safe and easy. The IC-1200 is a superb example of ICOM's dedication to exploring new communication equipment.

Where to find



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You can find ICOM Amateur radio in use throughout the world. Here in the U.K. ICOM is available from an extensive dealer network across the country. Just visit your local emporium and you will probably find that they are ICOM dealers. Authorised ICOM dealers will provide information on the entire ICOM range of Amateur equipment backed-up with good after-sales service.

If you are a licensed Amateur or short wave listener ICOM have a complete product range from HF to Microwaves to suit your needs. Should you have difficulty in locating your nearest ICOM stockist contact us at the address shown at the bottom of this page.

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- ★ Dual VFO's and 10 Memories (Freq. & Mode)
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FP757HD	Heavy Duty P.S.U.	£239	FAS-1-4R	Remote Antenna SW.	£80
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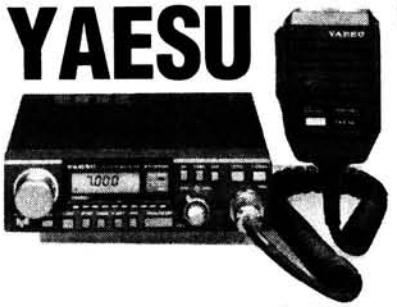

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73 from Dave G4KQH, Technical Manager.

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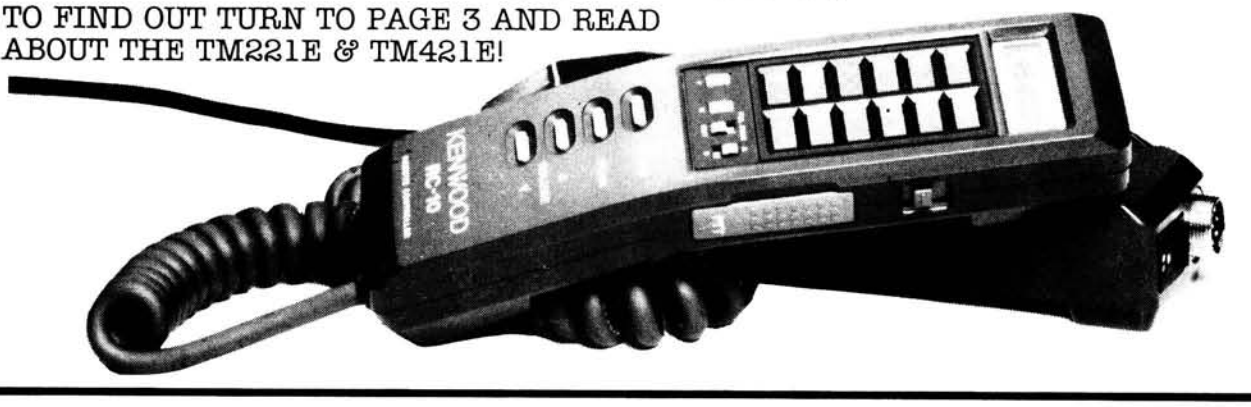
what is a KENWOOD **RC10**?

TO FIND OUT TURN TO PAGE 3 AND READ ABOUT THE TM221E & TM421E!



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

RSGB Expansion?

Eyebrows raised in surprise, I read the letters on QRM at the Morse tests. When I recently sat my test, I was given the option of donning a set of headphones. I decided to chance nothing and wear the 'phones although the outside QRM was fairly low. Was Mr Mayer (July *PW*) offered the choice of headphones and did he take it? In his case it sounds like it would have made the difference between a pass and a fail. I passed with one corrected error during receive.

No, what Mr Mayer suffered from, whatever the reasons, was the c.w. novice's public enemy number one—lapse of concentration. This malady can cost the person reading Morse several or many letters. There is but one cure, and that is forgetting what you missed as quickly as possible and getting on with the rest. Mastering Morse consists of two parts: learning the letters and learning to concentrate. The latter doesn't come easy but the fruit of the labour is sweet!

Now to add some comment and hopefully controversy on another topic; the RAE system. The old written system was replaced by a new one, but it's still an antiquated set-up that has been tinkered about with in an attempt to take the strain of the 80's and the boom in interest in amateur radio.

No, the RAE system is a dud. It smells old and musty. Computer marking—ha! If it takes a computer two months (and that's how long I've waited for my results so far) to mark 80 questions, add the pencil ticks together and come up with a total then let's get back to the horse and cart everybody—it would be a lot quicker!

No, it really isn't good enough, and the answer to it is plain to see. I won't go into lengthy discussions about central bodies with excellent communications from and to local committees. No, I'll just say this. Imagine RAEs every two months. That fail in Part 1 wouldn't be the end of your hobby after all, would it? On the distant horizon I can see Novice licences, or Electrically Competent grades—there are many possibilities. All that has to be done to achieve this amateur's idyll is to hand it all over to the RSGB. If they handle the RAE with the competence of their Morse Test system all would be well, and better than before. It's been proved!

What do you say, RSGB? Do you think you could handle it?

Brian Smith
(non-member RSGB, yet)
Milford Haven, Dyfed

PW COMMENT

Murmurings

A FEW YEARS BACK, we printed several editorials and readers' letters on the subject of the new multiple-choice format of the City and Guilds of London Institute Radio Amateurs Examination. There was much argument about questions posed which had several "right" answers among the options offered, or had no "right" answer, or were simply confusing or misleading.

Since that time, the furore had pretty well died away, and because of this I gained the impression that the questions had reached a more acceptable level of quality. Then, following publication earlier this year of a DTI survey of RAE results, murmurings of discontent among recent candidates have been heard again, and I wonder what the situation really is.

Criticism of the RAE has always been difficult, because of the refusal of the CGLI to allow question papers to be taken away at the end of the examination. Any comment has had to be based either on candidates' recollections of the questions, or on papers smuggled out—neither of them particularly satisfactory methods. In one case reliance is placed on a person's memory of a somewhat stressful occasion, and in the other a magazine faces the CGLI's threat of action for breach of copyright if the questions are reproduced.

I'd be very interested to hear from anyone who's sat the RAE in the past year or so, and what you thought of the paper.

Geoff Arnold

Plaudits

I collected my copy of the August *Practical Wireless* from the bookstall at King's Cross Station on my way to an RSGB Council meeting. Seven hours later, on a hot summer's night, I was on my way home a little tired.

So I took a look in the pages of *PW* and what did I see. A letter from Mr Mitchell. I read it, I know he is wrong, the RSGB is doing a first class job. It's held in great renown by other national societies. If it was not for the Society, UK amateur radio would not be what it is today. Band space has to be won.

Come off the "belly-ache" and do something postive, Mr Mitchell.

Francis Rose G2DRT
(Council Member)
High Wycombe,
Bucks

Playnet?

In his letter in August *PW*, M. J. L. Taylor complains that he feels untrained in the event of a live disaster. It is one of the problems that face many RAYNET groups around the country that they do not know what emergency will arise or when; and yet the controller and his committee have the task of training their group.

A large number of constraints confront a group controller in this regard. In all probability his group live over a fairly wide geographical area, and their work may send them even further afield. Whilst many employers may well be prepared to release personnel in the event of an actual emergency, they would certainly not do so for periodic exercises. The members of the groups are not masochists, but are in RAYNET because they enjoy the sort of activities it undertakes. Exercises that involve passing imaginary messages all day would rapidly become boring to the members of the group. After all, the exercise would have been thought up by somebody and would only be his interpretation of what the thing would be like for real. Training can be achieved without losing out on the fun.

My own view is that operations with the user services in the field are the life-blood of RAYNET training and operators are often under considerably more pressure than during a paper exercise. It is, however, very easy to forget that the fun-run and marathon type operation are a means of training operators in a number of skills that may be needed in a live emergency. Groups should look very carefully at what they are asked to do. I do believe that security patrolling and tasks of that nature have little relevance to RAYNET and should be refused.

Mr Taylor, I wonder how many of your group think as you do? If you have sufficient support, get yourself appointed Group Controller or at least get yourself elected onto the Group Committee. The only way you will be able to change the emphasis of your group's activities is from within. The only effect of writing to *Practical Wireless* will be to prompt letters such as mine. The ball is in your court, Mr Taylor. What are ***you*** going to do about it?

David Whiteman G1ADW
Chessington,
Surrey

Send your letter to the Editorial Offices in Poole, the address is on our Contents page. Writer of the Star Letter each month will receive a voucher worth £10, to spend on items from our PCB or Book Services, or on *PW* back numbers, binders, reprints or computer program cassettes. And there's a £5 voucher for every other letter published.

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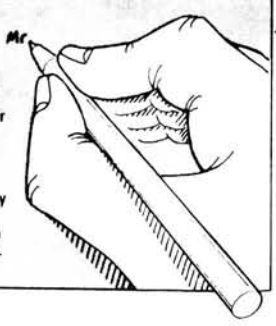

Playnet?

I feel I must answer Mr Taylor's letter in the August *PW* about RAYNET activities. I am a serving police officer with 12 years service, 9 in uniform and now CID. My views on RAYNET are well known locally, and I must point out that I am not exactly their most ardent fan.

Just what does Mr Taylor expect to do? Dive into the nearest telephone box and emerge with his underpants over his tights, IC-2E in hand and rescue all the passengers from the Jumbo crashed at the bottom of his garden? Disaster work is horrible, smelly, gory, depressing and only for the highly trained professionals. I must point out that even the first of these professionals on scene at a major incident do nothing but set up a communications post and pass messages.

Please, carry on with your RAYNET work. I listened to the North East London Group on a Red Cross cycle ride recently and very professional they were too. If you want to "do something" join your local Civil Defence who do the sort of thing you outline, or come and join the professionals—police, fire brigade or ambulance—but don't turn up at a major incident and offer help. The reply from the professionals dealing with it won't be printable here.

Jeff Goodley G6EXF
Doddinghurst, Essex

Appreciation

My article in August *PW* reporting on the Dayton Hamvention criticised the UK dealers in ham equipment for what appear to be very much elevated prices when compared to the USA.

I believe, however, that credit should be given when it is due. I recently flew in to London with a French friend's TS-940S which had been pretty well abandoned by a local dealer who was unable to effect a repair. Lowe Electronics Ltd were most helpful and efficient, carrying out a full repair including some modifications, and getting the set back to me within four days. I have nothing but praise for this organisation. The transceiver had been at the French dealers for four months.

V. J. Copley-May G3AAG
Petersfield, Hants

OUR SERVICES

QUERIES

We will always try to help readers having difficulties with a *Practical Wireless* project, but please observe the following simple rules:

1. We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2. We cannot deal with technical queries over the telephone.
3. All letters asking for advice **must** be accompanied by a stamped, self-addressed envelope (or envelope plus International Reply Coupons for overseas readers).
4. Write to the **Editor, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** giving a clear description of your problem.
5. Only one project per letter, please.

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Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for our more recent projects are available from **CPL Electronics,** and from **FJP Kits** (see advertisements).The **printed circuit boards** are available from our **PCB SERVICE** (see page 1 of this issue).

CONSTRUCTION RATING

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

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

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

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

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Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.30 each, including post and packing to addresses at home and overseas (by surface mail).

Binders, each taking one volume of *PW*, are available price £5.50 to UK addresses, £5.75 overseas, including post and packing. Please state the year and volume number for which the binder is required. Prices include VAT where appropriate.

CLUB NEWS

If you want news of radio club activities, please send a stamped, self-addressed envelope to **Club News, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** stating the county or counties you're interested in.

ORDERING

Orders for p.c.b.s, back numbers and binders, *PW* computer program cassettes and items from our Book Service, should be sent to **PW Publishing Ltd., FREEPOST, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders **must** be drawn on a London Clearing Bank.

Credit card orders (Access, Mastercard, Eurocard or Visa) are also welcome by telephone to Poole (0202) 678558. An answering machine will accept your order out of office hours.

SUBSCRIPTIONS

Subscriptions are available at £14 per annum to UK addresses and £18.50 overseas. For further details, see the announcement on page 31 of this issue. Airmail rates for overseas subscriptions can be quoted on request.

NEWS DESK ... compiled by G4LFM and G8VFH

Welsh Eisteddfod

GB2EC is the callsign to be used by the Newport ARS as part of their preparations for the Royal Welsh National Eisteddfod. This will be held in Newport from 30 July to 6 August 1988.

Various club members will hold GB2EC on a monthly rota from October '87, a total of ten stations. They will activate the callsign on both h.f. and v.h.f.

All contacts will receive a QSL card and awards can be claimed for working GB2EC while held by different operators.

HF
UK stations—8 contacts
European stations—5 contacts
Outside Europe—3 contacts

VHF
Within 100km of Newport—8 contacts
Within 250km of Newport—5 contacts
Over 250km of Newport—3 contacts

As each QSO has a serial number, you must quote these when claiming your award. More information can be obtained for an s.a.e or IRC from:
NARS,
Box 33,
Newport.

GB3ZZ

The Bristol f.m. TV repeater GB3ZZ was switched on at 8.30pm on June 2. Many local papers covered the event, and the photograph shown comes from the *North Avon Gazette*.

Filton Parish Council have been very helpful in providing the site for the repeater for a peppercorn rent and Councillor Bill Brown JP was there to witness the switch on. So was the local MP, Michael Stern (left in the photograph). Roger Worth G4ZQF, the chairman of the Bristol f.m. TV group, is on the right of the picture.

The repeater is on RMT2, input 1249MHz, output 1318.5MHz. To date coverage reports have been received from Bath, Portishead, Chepstow, Stroud and all over Bristol.

PW Marchwood

For all those who have found it difficult to get a case to fit your *PW* Marchwood, you will be pleased to know we now have drawings available to enable you to build your own case.

These are available from the *PW* offices on receipt of a large s.a.e.

Interface Testers

Inmac has just launched a new range of interface testers for trouble-shooting RS232 interfaces.

Top of the range are two Clear Signal Interface Testers, one line powered (£249) and the other battery powered (£309). These show the status of all 25 line simultaneously using a pair of red and green l.e.d.s on either side of the switch for each line. Special switches allow loopback testing and null modem configurations without the need for jumper wires. Both come in a padded case with three compartments for easy storage of other items.

There are three battery powered units which allow for the testing of the most often used RS232 signals. Each has fully-buffered l.e.d.s, spare l.e.d.s for monitoring secondary signals and supply pins on the faceplate for control signal simulation. Prices range from £299 for the Tristate/VOM Tester which can monitor 11 lines and has a built-in d.m.m. to £209 for the Plus Multistate Tester which monitors 12 lines and has a pulse trap.

Two economy models, the Multistate Tester at £129 with twelve line monitoring, and the Mini Tester (£70) which can monitor the four most used lines with two spare monitors both offer full RS232 breakout capability and are line powered.

Further details and free catalogue are available from:
Inmac (UK) Ltd, Westerly Point, Market Street, Bracknell, Berks RG12 1EW. Tel: (0344) 42433.

Can You Help?

A reader has a Hallicrafters SX130 receiver and has tried numerous sources to find a service sheet for this piece of equipment. If you have a copy or know of one and can help him out, please write to:
Harry H. Jones,
90 Britannia Avenue,
Townstal,
Dartmouth,
Devon TQ6 9JT.

Special Event Stations

GB8EAR: Details are a little sketchy but this station will be using 144MHz from Brighton on October 24. It is to celebrate the El Alamein Reunion.

GB8AER: This station will be in the Winter Gardens, Blackpool using 144MHz on October 31. It is being staged on behalf of the RSARS and so they would be especially interested in working RSARS, RAFARS and RNARS members.

GB4EMC: The Southgate ARC are running a station at the Enfield Town Show, Enfield Town Park on September 19 and 20, they will be using all h.f. bands and 144MHz.

Straight Key Day

The HF Committee of the RSGB is keen to support the active use of c.w. on the amateur bands, and to encourage the use of c.w. by newcomers to h.f.

The date for the straight key day is October 10 from 0800–2100UTC on 3.515–3.555MHz. No awards have been planned, but the HF Committee would welcome any comments from operators, particularly on the best "fists" heard during the event. Comments should be sent to Colin Turner G3VTT, QTHR.

It has been suggested that normal QSO information be expanded to include details of the key being used, such as its age and any interesting history. Photographs of keys used would be welcomed by the HF Committee for inclusion in any later write-ups.

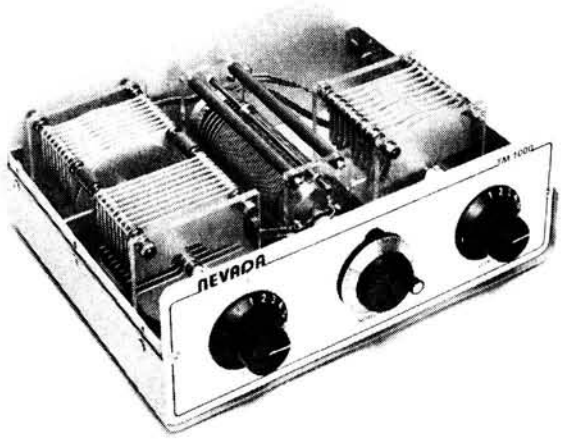
ATU

Details have just come in from Telecomms of a logical addition to their Nevada Professional series of a.t.u. components.

The Nevada TM1000 is a 1kW, all-band a.t.u. which uses the Nevada roller coaster, turns counter and variable capacitor introduced during the past few months.

The a.t.u. is continuously variable over the frequency range 1.8 to 30MHz and uses a transmatch circuit for maximum flexibility and the ability to handle a wide range of antenna impedances.

Telecomms say that they have made great efforts to offer the best possible value for money at a price that the radio amateur can still afford. They have already received enquiries from all over the world, and have sent a sample unit to the Australian Flying Doctor Service where it will be used for emergency communications.



The TM1000 is priced at £125 ready built or £100 in kit form, both prices inc. VAT. Further details from: ***Telecomms, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 662145.***

RAE Courses

Borehamwood: De Havilland College, Elstree Way, Borehamwood. The course starts on September 15 and although the enrolment date has passed try ringing the college on 01-953 6024. You may be interested to know that the lecturer is G. L. Benbow G3HB.

Grappenhall: RAE course started on September 2 at Grappenhall Community Centre, Grappenhall, Warrington. The course is run by G8NRF and G4XQA and there may still be places if you contact them, probably QTHR.

Guildford: Guildford College of Technology, Stoke Park, Guildford. The course starts September 14. The enrolment date has passed, but try ringing B. Purse at the college on 0483 31251.

Hendon: Hendon College is once again offering the RAE course. The classes are Tuesday evenings from 7.30 to 9.30pm. More details from the college on 01-200 8300.

Kidderminster: Kidderminster College, Hoo Road, Kidderminster. The RAE classes start on September 23 at 7pm and enrolment is September 7–9 from 2 to 8pm. Further details from D. Oakley G0DAA on 0562 820811.

Loughborough: Loughborough Technical College, Radmoor, Loughborough. The RAE course starts September 15 with Morse from 6 to 7pm and Theory and Regulations from 7 to 9pm. More from course tutor, Terry Kirk G3OMK, on 0509 215831.

West Manchester: Hulton High School, Longshaw Drive, Little Hulton, Worsley, Manchester. The course is Wednesday evenings at 7.15pm starting at the end of September. Details from course tutor, Jim Brett G6EBR, on 0942 883729.

Stockport: Reddish Vale Evening Centre, Reddish Vale Road, Stockport. Enrolment for both the Morse and RAE courses is September 14, 15 and 17 between 7 and 9pm. Morse classes are Monday evenings from 7 to 9pm. RAE classes are Thursday evenings 7 to 9pm. More details from Dave Wood on 0606 41511 between 12.30 and 1pm.

Wythall: The Wythall Radio Club will be continuing their RAE classes at the club HQ, Wythall House, Wythall Park, Silver Street, Wythall. The course starts in September on Thursday evenings at 7.30pm. The tutor will be Colin G6NPS. More details from Chris G0EYO on 021-430 7267.

PWG Symposium

The first international PWG (Packet Working Group) Symposium will take place on November 7 in the auditoria of the University Clinic of Antwerp. It is being organised by PWG Belgium.

It will be a one day event with lectures concerning specific topics in one of the following fields of packet radio:

New TNC developments and or improvements to existing ones

High-speed MODEMS

Mailbox systems, gateways and digipeaters

Internet links

AX.25 protocol extensions

Miscellaneous . . . concerning packet radio

At the same time, in the surrounding of the UZA-aula, there will be a permanent exhibition of commercial and non-commercial packet radio gear, PWG-kits, publications, computers, etc.

If you would like more details on this event then contact:
W. Wittesaele ON1AWU, PWG Tennisstratt 30, B 9920 Lovendegem, Belgium.

Club Changes

The Maidenhead & District ARC have a new club secretary, his name is Colin and he can be contacted on 0628 25443. The club still meets on the 1st Thursday and 3rd Tuesday at the Red Cross Hall, The Crescent, Maidenhead at 7.30pm.

Improvements to FT-767

The Yaesu FT-767 is an attractive set offering a host of features at an economical price compared to its competition. However, Ray Withers reckons that it is let down by its lack of dynamic range due to synthesiser phase noise.

One solution to the problem is the now familiar Ray Withers one—spend a lot of time in the laboratory developing an add-on modification board to improve the set. This mod is now offered as a standard fitment on all FT-767s sold by R. Withers Communications. The latest surface mount "chip" component technology has been employed to give the required performance and reliability.

The mod improves the dynamic range by up to 20dB, resulting in better DX receiving capability in the presence of heavy QRM—important on today's crowded bands.

If you have an FT-767 which was purchased from RWC you can have the mod fitted for just £49.50 inc return carriage.

Further details from: ***R. Withers Communications Ltd, 584 Hagley Road West, Oldbury, West Midlands B68 0BS. Tel: 021-421 8201.***

BARTG AGM

The date and venue for this year's AGM of the British Amateur Radio Teleprinter Group is November 7 at 1400 in the Churchill Room, London House, Mecklenburgh Square, London WC1.

One of the topics usually discussed at the AGM is the subscription rates for the coming year. So, if you have any comments then the best thing to do is go along.

It's not too late to join for 1987 and get the year's issues of *DATACOMM*. Subs are £7—UK, £10—Europe, £16—Overseas Airmail.

More details and applications to:
Pat Beedie GW6MOJ, Ffynnonlas, Salem, Llandeilo, Dyfed SA19 7NP.

Rally Dates

* = PW/SWM in attendance

September 13: Dunstable Downs Radio Club are holding The National Amateur Radio Car Boot Sale at the Shuttleworth Collection, Old Warden Aerodrome. Open from 10am to 5pm. Admission 50p. ***Phil Norris G6EES on 0582 607623*** can tell you more.

September 13:** The Scottish National Amateur Radio Convention will be held at the Magnum Leisure Centre, Irvine, Ayr. The leisure complex includes restaurant, cafe and licensed bar facilities, as well as water slides, etc., for the junior ops. The PW Tennamast Scotland Trophy for the highest placed Scottish station in the PW QRP Contest will be presented. ***Bob Low GMOECU, QTHR, can tell you more.

September 13:** The Telford Rally will be held at Telford Racquet & Fitness Centre, Telford. Talk-in will be via GB4TRG on S22 and SU8. Doors open 11am (10.30am for the disabled). There will be lectures by MAXPAC on packet radio, G3RZP/G4FNC on linear amplifiers and G3SEK on extra long Yagi antennas. Full catering and bar facilities are available. Morse tests will be available (pre-book with RSGB). There will be a huge flea-market, plus over 100 trade stands. More from ***Martyn Vincent G3UKV on 0952 55416.

September 13:** The Lincoln Short Wave Club call their rally Hamfest '87, and this will be held at the Lincolnshire Showground and Exhibition Centre—6km north of the city on the A15. In addition to the usual stands of interest to the radio amateur they hope to have helicopter rides, model car racing, the police, fire brigade and lots more. There is ample parking, caravans by arrangement, refreshments and a licensed bar with real ale! More details can be obtained from ***Pam Rose G4STO on Gainsborough 788356.

September 20: The annual rally of the Vange ARS will be held at Nicholas School, Nicholas Lane, Basildon. Doors will be open from 10am to 4.30pm. There will be the usual assortment of traders and a car boot sale outside (weather permitting). There is adequate parking at the school and admission is 50p. Please note, only guide dogs can be brought into the main hall.

September 20: The Trafford Rally and Components Fair will be held at Old Trafford Cricket Ground, Talbot Road, Stretford, Manchester. Doors open at 10.30am (10 for the disabled) and the rally closes at 5pm. There is free parking on site for over 700 cars and there will be a bar, tea, coffee and snacks available. Talk-in on S22.

September 27:** The 1987 Harlow Mobile Rally will take place in the Harlow Sports Centre. Doors open at 10am. That's all the details for the moment. More from ***The Harlow & District ARS, Mark Hall Barn, First Avenue, Harlow.

October 4:** The Great Lumley ARES are holding their rally at The Community Centre, Great Lumley, Co. Durham. Doors open 11am. Talk-in on S22, RB0 and GB3NT. Contact ***Keith Watt, 7 Turfside, Leam Lane Est, Gateshead Tyne & Wear for more details.

October 4:** The Welsh Amateur Radio Convention will be held at Oakdale Community Centre, Blackwood, Gwent. See ***Brian GW3KYA on 0495 225825 for more details.

* **October 23/24:** The LARS Committee are holding the Leicester Amateur Radio Show at the Granby Halls again this year. As yet not many details, but contact ***Frank G4PDZ on Leicester 553293.***

November 7/8:** The North Wales Radio Rally will be held at the Aberconwy Conference Centre, Llandudno, Gwynedd. Contact ***Derrick Watts on Colwyn Bay 530041 for more details.

November 15: The Bridgend & District RC are holding their rally at the Bridgend Recreation Centre, Angel Street, Bridgend. Doors open at 11am (10.30am for the disabled). Free parking, a bring and buy, Morse tests (pre-booked with RSGB), bar facilities and talk-in on S22. See ***Dave George GW10UP on 0656 723508*** for more details.

December 6:** The Verulam Christmas Rally will be held at St Albans City Hall. Doors open 11am. Contact ***S.C.B. Dunning on 0923 52959 for more details.

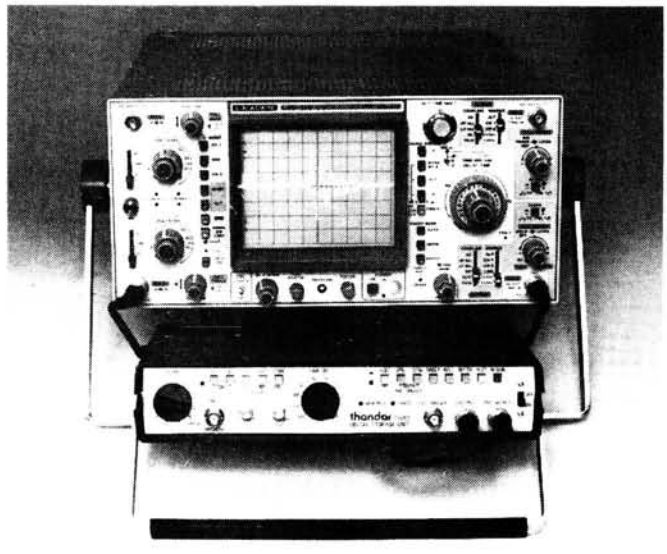
July 15–17: The National Convention, organised by the RSGB, will once again be held at the National Exhibition Centre, Birmingham. BUT, at a different time of year than normal. This rally should be a very special one as, in 1988, the RSGB are celebrating their 75th anniversary.

Digital Scope Store

Often when working on pieces of electronic equipment it is useful to be able to set the 'scope to monitor a test point to see what is happening. However, unless you are super-human with a built-in camera, single, fast transient events such as interference spikes, are easily missed and lost.

Thandar have designed and developed an add-on low-power, digital storage unit to enable you to convert your real-time 'scope to a storage model.

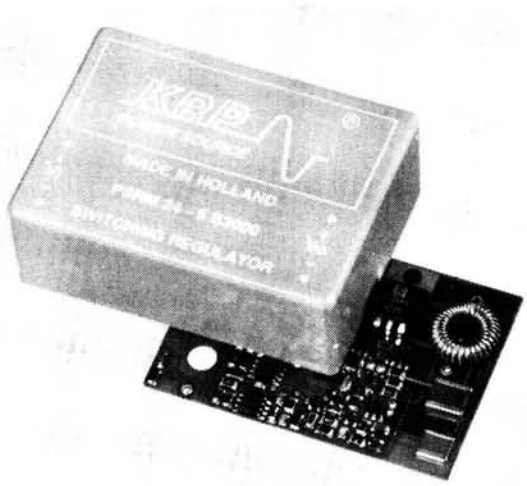
The TD201 is priced at £195.00 + VAT and offers sensitivity down to 5mV with a real-time bandwidth of greater than 200kHz. It can operate in real time, refresh and roll modes, and single shot with selectable pre-trigger of 0, 50 or 100 per cent. Internal and external triggering, pen plot and hold facilities are also provided.



The maximum sampling rate of 200kHz allows fast transients to be captured whilst at the slowest sampling rate events lasting over one hour can be acquired. Data is stored in a 1K memory and this is retained for up to four years as long as batteries are fitted. These can be disposable or rechargeable cells, and the optional a.c. adaptor also acts as a charger when rechargeable cells are fitted.

This is the sort of test gear that a club might consider buying rather than an individual and ***Thandar Electronics Ltd., London Road, St. Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646*** can supply further details.

High Efficiency Switching Regulators



A new family of high efficiency encapsulated switching regulators, designated the PSRM range, is now available from KRP Power Source BV.

Based on the recognised and established international size of 70 x 50 x 25mm with equivalent pin-out for direct interchangeability, the PSRM range has the extra advantage that no external input capacitors are required.

Using a unique Current Mode Control circuit the units include an inhibit facility, and the ability to be paralleled with power foldback, short circuit protection and thermal overload.

The use of surface mounting components enhances the reliability to a calculated m.t.b.f. (mean time between failures) of 210 000 hours.

Models are available with input voltages covering the range of 9–80V d.c. and output power from 15–48W.

London Morse Tests

Since the RSGB began administering Morse tests on behalf of the DTI, it has been difficult to find suitable accommodation in central London. Many amateurs have had to travel long distances to sit the Morse test.

The BBC Club's Ariel Radio Group has now been able to negotiate with the Senior Examiner and arrange for tests to be conducted in Shepherd's Bush on a trial basis, subject to official confirmation between the RSGB and the BBC.

The RSGB will be advertising the details in due course, although it is expected that the tests would run from 9.30am to 4pm one Saturday a month. Note that all tests would be by prior appointment.

AMRAC

The Amateur Radio and Computer Club has revised its membership subscriptions. As from May 1 the subscriptions are:

UK	£8.00
Europe	£10.00
Rest of the World	£12.00

AMRAC produce a bi-monthly 40-page newsletter *AMRAC USER* which covers all the latest news, idea and technical items on packet radio, as well as AMTOR and RTTY. In addition to the newsletter the club also produce a "Hot-news sheet" in alternate months to ensure members are kept right up to date.

AMRAC is keen to encourage the formation of local AMRAC groups which hold regular meetings and promote digital communications at a "grassroots" level. Such groups have already been formed in Hampshire, Thames Valley and Essex. It is hoped that more will be formed around the country.

Further details of AMRAC may be obtained by sending an s.a.e. to ***Phil Bridges G6DLJ, 9 Hollydene Villas, Hythe, Hants SO4 5HU.*** Or Prestel mailbox 703847754.

Microwave Dinner

We received a letter from Mr Smith the organiser of the Microwave Bands Assembly and Dinner, due to be held on July 18 in Wolverhampton.

"Regrettably due to lack of support I had to cancel the function. In March or April of this year I had 92 names who clearly indicated that they would be in attendance. 154 letters were forwarded to operators on the u.h.f. bands, 30 clubs were notified and over 100 telephone calls made relative to the Assembly.

"Some seventeen days before July 18, I had received 16 applications for tickets . . ."

So where were all the microwave enthusiasts? It's a pity when someone goes to all the trouble of organising an event such as this that it gets so little support.

I do hope this hasn't put Mr Smith off from organising anything else.

Information Sheets

I have recently received Radio Amateur Information Sheets No. 4 and 5. These are about Amateur Radio Callsigns and Amateur Radio Club and Societies. They answer some of the questions that are often asked by both new and not-so-new amateurs.

These Information Sheets are available free of charge from ***The Department of Trade & Industry, Room 613, Waterloo Bridge House, Waterloo Road, London SE1 8UA.***

The Sheffield Award

This award is available to both licensed transmitting amateurs and short wave listeners.

You need to supply verified log entries according to the necessary requirements.

UK stations: Must establish two-way contact with 30 Sheffield stations. Short wave listeners should log the same number of Sheffield stations and must include in their log extracts of the calls of the stations being worked by the Sheffield operator.

European stations: Must establish two-way contact with 15 Sheffield stations. Short wave listeners must follow the same procedure as before.

Stations outside Europe: Must establish two-way contact with 10 Sheffield stations. Short wave listeners must follow the same procedure as before.

A Sheffield station is one found within the city (i.e. Metropolitan District) boundary.

The award costs £1 for UK stations or the equivalent of £1.50 in IRCs for all other stations.

For more details on the various endorsements available and a full set of rules, contact:

SARC Awards, G3PHO, 146 Springvale Road, Sheffield S6 3NU.

Microwave Newsletter

I've just received the latest copy of the *Microwave Newsletter* from the RSGB. If you are interested in the microwave allocations on the amateur bands then this newsletter is for you. It is full not only of useful little tips on how to get the best out of your system, but contains designs for things like a Narrow Band Filter for 5.7GHz.

It is edited by G3PHO and G8AGN of the RSGB Microwave Committee, so they really know what's what in the world of microwave. If you would like more details then write to the RSGB marking your letter Microwave Newsletter.

RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE.

In his series on Valved Communications Receivers, Chas. Miller has made frequent reference to the desirability of aligning i.f. transformers visually by means of a frequency-modulated signal generator ("wobbulator") and an oscilloscope. Letters and conversations with readers have demonstrated that some confusion exists as to exactly how the method works. Particularly puzzling, it would seem, is the notion of using an f.m. generator on a receiver made to receive only amplitude modulated (a.m.) signals. In this article, Chas. seeks to dispel the doubts and misapprehensions.

Visual Alignment of IFTs

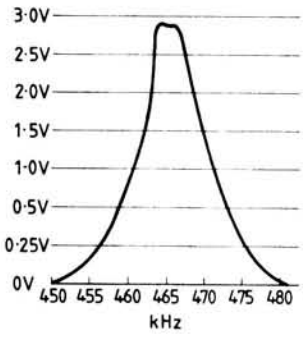
First of all, let's look at conventional alignment by means of an a.m. generator. The standard process is to inject the signal to the control grid of the mixer valve, and then to adjust the i.f. transformer trimmers in sequence for maximum output from the set. Often the ear is relied upon to find the peaks of the trimmers by simply listening to the sound produced in the loudspeaker. Whilst this is just about acceptable for simple sets, it is far better to use an output meter of some kind, such as an a.c. voltmeter connected across the loudspeaker terminals. It is sometimes quite astonishing to see how the true peaks, as shown on the meter, differ from those determined aurally! Another form of visual display could be a valve voltmeter connected to the demodulator diode load to measure the voltage developed across it as the i.f.t.s are brought into line. If we were to adopt this method a means of checking the overall response curve of the i.f.t.s would present itself.

When a conventional i.f. of 465kHz is employed in a receiver, the maximum bandwidth required for communications purposes is about 10kHz overall; many receivers have means of reducing this at will in steps down to perhaps only a few hundred Hz for c.w. reception. However, for alignment we always start with the maximum passband available. Thus at the centre frequency (465kHz) the demodulator voltage should be at maximum, and it should fall gently and symmetrically to either side as the generator input is varied from about 450kHz to 480kHz. The sort of thing we would be aiming for is shown in Fig. 1. If, however, we were to adopt the idea of measuring demodulator volts versus frequency and plot the results on a graph the eventual shape of the response curve might well surprise us by looking more like Fig. 2. The double hump to the higher side of 465kHz would make exact tuning to a station difficult, whilst the general asymmetry of the response would give poor selectivity.

Now, whilst this experiment might be instructive, it is not very practicable for everyday use, as the process would have to be repeated ad nauseam as the i.f. trimmers were adjusted. Suppose, then, that we replace the ordinary amplitude-modulated signal generator with one with an output that may be made to vary continuously and automatically over the i.f. passband—in other words, a frequency-modulated generator? The voltmeter would then register a constantly varying voltage as the injected signal swept through the point of maximum response and back again. This in itself would be of limited interest, but if we were then to replace the voltmeter by the probe of an oscilloscope, the voltage would be shown as a curve on the screen—a curve that represented exactly the response curve of the receiver. In practice the generator and oscilloscope are linked to make them run in synchronism, to render the curve steady on the screen. The only pitfall to be avoided is trying to use too high a sweep repetition rate for the generator and oscilloscope, as this can produce a distorted picture of the true response curve.

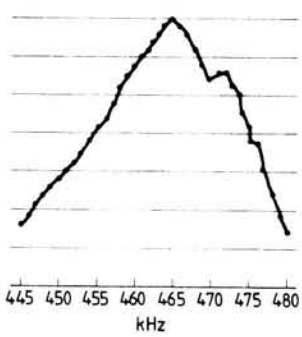
It now becomes possible to make adjustments to the i.f. trimmers and to see what is the effect, until something like Fig. 3 is achieved. Sometimes a little overall gain has to be sacrificed in the interests of achieving symmetry, but this is well worthwhile when compared with the great advantages to be achieved in selectivity and fidelity of reproduction.

Visual alignment has been around for a long time now, commercial equipment for the work having been available for half a century. Readers may be interested to learn that the writer uses a Cossor wobbulator dating from the late 1930s. As far as can be ascertained the valves are the originals and only minor repairs have had to be made to it over the years—none in the last dozen. Touch wood! ***PW***



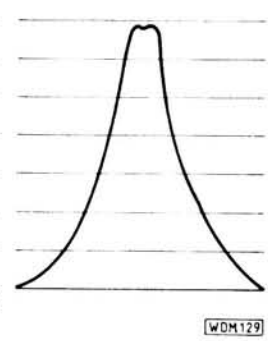
This would be a very acceptable response curve, but . . .

Fig. 1



. . . plotting detector volts against frequency might produce something like this . . .

Fig. 2



. . . which can be tuned to this with the aid of the wobbulator and oscilloscope

Fig. 3

Hands On

Full constructional details of the PW "Westbury", a simple wobbulator covering the frequency range around 450-470kHz, appeared in the January 1987 issue of *Practical Wireless*. Copies are available from PW Publishing Limited, Freepost, Post Sales Department, Enefco House, The Quay, Poole, Dorset BH15 1PP, price £1.25 including post and packing.

You'll also need an oscilloscope, of course, and if you don't already have such a beast on your workbench, our Special Offer this month could be of interest to you. For details see page 51.

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B £29.95

A 28-Range FET VOM. Perfect for electronics testing! 10 megohms per volt DC sensitivity. Measures: 1000 volts DC in seven ranges and 1000 volts AC in five ranges. DC current to 10 amps, resistance to 100 megohms. Decibles: −20 to +62 dB. Fuse protected. Requires one 9v and one "C" battery. Measures: 7 1/16 x 5 1/2 x 2 3/4".
22-220 ..... **£34.95**

B 43-Range Multitester. 50,000 ohms per volt DC sensitivity. Fuse and overload protected. Measures to 1000 volts DC in 12 ranges and 1000 volts AC in 8 ranges. DC current to 10 amps, resistance to 20 megohms. Decibles: −20 to +62 dB. Requires one 9v and one "AA" battery. Measures: 6 11/16 x 4 7/8 x 2 3/8".
22-214 ..... **£29.95**

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See Yellow Pages For Address Of Store Nearest You

Tandy UK, Tandy Centre, Leamore Lane, Bloxwich, Walsall, West Midlands. WS2 7PS

A Guide to 144MHz Operating

David A Dodds GM4WLL has produced this down-to-earth article from which both young and old radio amateurs alike can learn a great deal.

Today the v.h.f. bands are rapidly becoming more and more congested as new licensees come on the air at a frightening rate, often with very little knowledge of how to proceed after switching on their brand-new Japanese transceivers.

Until recently it was customary for anyone seeking an amateur licence to spend some time as a short wave listener, getting the feel of amateur radio. Today it is more common for people to obtain a licence and come on the air with either no experience at all or, worse, experience of the unnecessarily flamboyant style of operating employed by Citizens' Band radio enthusiasts. Fortunately, f.m. on the 144MHz band is informal enough to enable the newcomer to learn a few of the idiosyncracies of his new hobby, but when he ventures down to the bottom end of the band things can become very confusing.

Since s.s.b. is commonly used for long-distance operating involving weak signals, the newcomer can cause a great deal of irritation to others and is likely to miss out on most of the DX. It isn't difficult to operate courteously and successfully if a number of simple rules are followed. There are often standard patterns used for a contact and, although some people dismiss these as "rubber-stamp" contacts, they often allow information to be exchanged with very weak stations with whom a contact would otherwise be impossible.

Finding a Contact

The starting point for most contacts is a CQ call on the s.s.b. calling frequency (144.3MHz), except during exceptional conditions, when the sheer number of signals on the band renders the calling frequency unnecessary and it is usually abandoned. It has been argued that calling frequencies are unnecessary anyway and that the v.h.f. bands should employ the same anarchic system as the h.f. bands, but since there are often times when the band may be quiet and v.h.f. buffs tend to like to leave the receiver monitoring in case anything interesting appears, the present system is well worth holding on to.

A CQ call is a general call for any station and should never be used for a call to an individual station. The all-too-often heard "CQ CQ CQ G7ZZZ this is G9ZZZ" is a contradiction in terms and will only confuse any distant station who just hears "CQ" and a callsign through the noise.

When calling CQ it is a good idea to try to imagine yourself in the position of the person you are hoping to contact. He may be monitoring the calling frequency while doing something else, or he may hear you very faintly and need to peak your signal with the rotator. If this is the case, as it often is, then a single five-second call is unlikely to produce any results. What is needed is a longer call lasting perhaps half a minute, but don't go on for too long or you'll just irritate all the locals! Repeat the call several times and the chances are that if there's anyone out there they'll be able to reply. It's also a good idea to announce your approximate location at least once during the call to give any distant stations an idea of where their beams should be pointing for optimum signal strength.

With any luck your CQ call will soon result in a reply and you're faced with the question of what to do next. The answer is to QSY **immediately**. There is no need to exchange names, signal reports or anything else while you are still on the calling frequency. If you can hear one another sufficiently to make initial contact then it should be possible to exchange a frequency to which you can QSY. Sometimes one hears two stations politely passing back and forth, each insisting that the other should decide which frequency they will move to. There is a very simple convention that the station who made the initial CQ call should suggest the frequency and the other station then confirms that frequency. However, if for any reason the suggested frequency is not usable, then the station answering the CQ call should submit an alternative. If this convention is followed then both stations will be off the calling frequency quickly, with the minimum of fuss. The longer you remain on the calling frequency, the longer you are preventing others from using it and the greater your risk of having your contact destroyed by someone calling CQ over the top of you.

Obviously the frequency you QSY to must be within the RSGB Bandplan, i.e. for s.s.b. between 144.15 and 144.5MHz, avoiding frequencies such as 144.4MHz, which is used for meteor scatter. Adherence to the bandplans is not compulsory, but out of courtesy and commonsense they should be followed.

It is remarkably common to hear people referring to "channels", usually people who have come from CB and don't appreciate that the s.s.b. section of 144MHz band is **not** channelised and doesn't need to be channelised. There is no need to stick to multiples of 10kHz, indeed since so many people do it's a good idea to QSY to frequencies between the tens of kilohertz as these may be free of QRM.

It is equally common to hear people on the air who assume that because they were asked to QSY to

144.345MHz then they must not deviate from that frequency by so much as a fraction of a hertz! Since the digital frequency read-outs on commercial "black boxes" are just not that accurate it makes complete nonsense. When the first station calls, the other station should net onto his frequency.

The Contact Itself

Having changed frequency it is customary for the station who called CQ to call first, **having first asked whether the frequency is in use.** Another very important convention comes into play here. The amateur licence states that the station callsign must be sent at the start and finish of every transmission and commonsense dictates that the callsign of the station being worked should also be sent. **Always give the callsign of the other station first and then your own callsign.** This convention means that anyone listening can easily tell the callsign of the station he can hear. Often newly-licensed operators can be heard giving their own callsign first and the result is utter confusion and often potential tail-end contacts are lost.

If at first you do not hear the station you are looking for, **never** assume that one of you made a mistake over the frequency and head back to the calling frequency. The 144MHz band is very prone to slow cyclic fading. A signal which is S9 one moment may be inaudible 30 seconds later and S9 again 30 seconds after that. If you keep calling at brief intervals for several minutes it is likely that contact will eventually be made.

Remember that when conditions are difficult it is often possible to resort to c.w. now that Class B licence-holders are permitted to use that mode. By its very nature c.w. is considerably better to understand at very low signal levels and can often be copied without difficulty when an s.s.b. signal is unreadable. As a rule of thumb it is not a good idea to send c.w. to a Class B licence-holder as there is no way of knowing whether he will be able to copy it. But if you are a Class B licence-holder who can send and receive Morse there is nothing to stop you from calling a Class A station in Morse or requesting that he sends you information using c.w.

However, **never** assume that just because someone has a Class A licence they are workable on c.w. It seems an

incredible waste, but a number of people never use c.w. after passing the Morse test. Unfortunately, contrary to popular belief, learning c.w. is not like learning to ride a bicycle and is easily forgotten if it is not used.

The information exchanged during the contact obviously varies a great deal, depending upon the people involved. For it to be a valid contact for the purposes of RSGB awards, then signal reports and callsigns must be exchanged and confirmed. It is usually the practice to extend this to include names and locations.

There are, of course, two possible locators which could be given: the old tried and trusted QRA system and the new Maidenhead locator. Although the Maidenhead system is the official one as far as the RSGB and the other national radio societies are concerned, many people refuse to use it and still use the QRA, so it's a good idea to be conversant with both.

Once the contact is complete, it is customary for the frequency in use to be considered the property of the station who made the CQ call. This means that anyone who has been listening to the contact and wishes to work the other station by "tail-ending" will call and be asked by that station to QSY to another frequency, usually "down 10" or "up 20", thus leaving the frequency clear for the first station.

"Tail-ending" is an excellent method of picking up contacts with DX stations, especially if you only have low power available, in which case you might not be heard in the chaotic free-for-all on the calling frequency. As it involves calling a station just as he finishes a contact there is a skill involved since it is essential not to call too early in case the QSO is not yet finished. Similarly, a call made too late will mean a lost contact as the station you are looking for may already have gone back to the calling frequency. If you can hear both stations then it is not too difficult, but if you can only hear the station you want to work it requires a good deal of intuition to pick the right moment. The golden rule is never to call unless you are **certain** that both stations are finished. Otherwise not only will you stand less chance of being heard but you will also be contravening your licence and being a nuisance. The practice of shouting "break" and diving uninvited into someone else's QSO is increasing and is very bad operating.

Conclusion

Operating on 144MHz, as with every amateur band, there are two golden rules which, if they are borne in mind, will ensure that you are always operating well. Always try to place yourself in the position of other amateurs, not just the ones you are trying to work but **everyone** who is using the band. Secondly, if you want to work anything interesting then **be patient**. It is always the amateur who is willing to wait until the right moment before calling and who is willing to search for the DX who ends up being successful and **popular!** ***PW***

ERRORS & UPDATES

Dayton Hamvention Report, August 1987

The specification figures quoted for the receiver section of the new Ten-Tec "Paragon" unfortunately contained several errors. Sensitivity should read 0.15μV for 10dB S/N @ 2.4kHz bandwidth; Noise floor −132dBm (approx. 1.06μV) @ 2.4kHz bandwidth; Intercept point +18dBm; Dynamic range 100dB.

Apologies to KW Ten-Tec Ltd and our readers for any inconvenience caused.

Multiple Choice, Answers September 1987

Question 8–4 In an a.c. circuit containing only capacitance, the current LEADS the voltage by 90 degrees. The correct answer is c. not b. as given in the answers. Well done all those eagle-eyed readers who pointed out our mistake.

PW "Blenheim", September 1987

Inductor L2 is a Toko S18 type, 1½ turns with ferrite core (White) Cirkit stock No 35-10103.

Testing op-amps

This short article by Martin Michaelis DK1MM will help you test and grade a few more of those surplus devices from the junk box.

This simple test rig will cope with most types of operational amplifier, all that is required is the basic circuit and a suitable means of connecting it to the device under test.

The test circuit, shown in Fig. 1, connects the operational amplifier under test as an astable multivibrator. The frequency of oscillation is set by C1 and R3 to approximately 1Hz. The output of the operational amplifier drives two l.e.d.s D1 and D2 via R4 which limits the current. Diodes D1 and D2 are connected in a back-to-back format, anode to cathode and cathode to anode, so that when the output of the chip under test drives negative and then positive the two l.e.d.s will be activated alternately, giving a blinking effect.

The activity shown by the two l.e.d.s D1 and D2 gives an indication as to the condition of the device under test. The five states commonly observed when testing, are listed in Table 1.

As to the construction of the test rig, this will depend on individual requirements and the package types involved. The prototype was constructed on a small piece of Veroboard. The circuit uses all standard type components and no difficulties should arise in the unit's construction. No power switch is required as the circuit draws current only during test. ***PW***

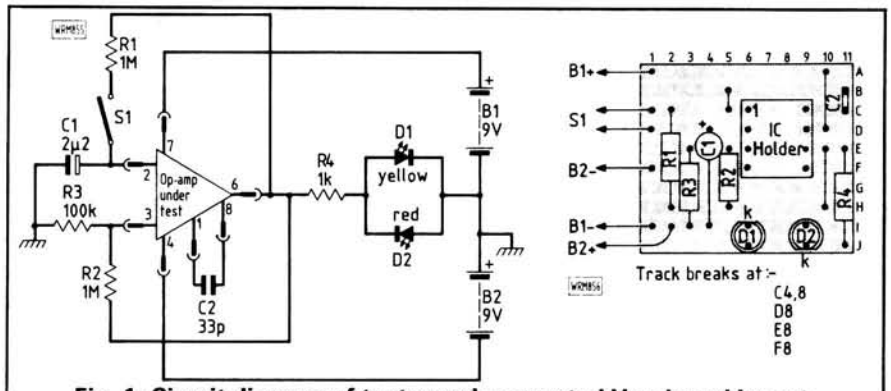

Fig. 1: Circuit diagram of tester and suggested Veroboard layout

Table 1:

Op-amp Condition	l.e.d. activity		Comment
	D1 Yellow	D2 Red	
Op-amp OK	Blinking	Blinking	Alternately with approximately one second period
Output fault	Off	Off	—
Non-invert input faulty	On	Off	—
Invert input faulty	Off	On	—
Leakage fault	Blinking	Blinking	Asymmetric blinking

SHOPPING LIST

Resistors
0·25W 5% Carbon film

1kΩ	1	R4
100kΩ	1	R3
1MΩ	2	R1,2

Capacitors
Ceramic Plate

33pF	1	C2

Tantalum Bead

2.2µF	1	C1

Semiconductors

Red l.e.d.	1	D2
Yellow l.e.d.	1	D1

Miscellaneous
S1 p.c.b.-mounted s.p.s.t. toggle; 8-pin d.i.l. socket; 6-F22 type battery connectors (2); Veroboard, Veropins, wire.

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Have FRG-9600 Withers Mark II still under guarantee. Would exchange for Sony ICF2001D similar condition plus cash adjustment. Peter. Tel: Kings Lynn 841119. *D125*

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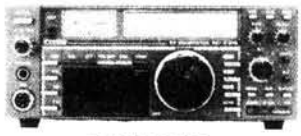

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PW REVIEW

Icom IC-751A HF Transceiver

Until recently, this transceiver was rightly considered to be the "flagship" of the Icom range, but with the advent of the IC-761 it seems to have been pushed from first place. Nevertheless, the IC-751A is still a worthy contender for a place in today's highly competitive market, says Ken Michaelson G3RDG, who compiled this user's review.

Performance tests were carried out in the PW *lab by Geoff Arnold G3GSR.*

The IC-751A is completely solid-state, including the driver and final power amplifier stages, and incorporates a total of 59 transistors, 23 f.e.t.s, 336 diodes and 64 i.c.s. It covers all nine h.f. amateur bands in transceive, producing an output power of 100W, or when operating in the general coverage receiver mode the range is from 100kHz to 30MHz. Frequency control is by means of a CPU-based, 10Hz step, phase-locked loop synthesiser, and the unit has two v.f.o.s, thus giving independent transmit and receive frequencies. The five emission modes available, s.s.b., c.w., f.m., RTTY and a.m. are selected from the front panel by means of a series of "push-on/push-off" switches. The frequency stability of the IC-751A is excellent, as the specification table shows. Both semi and full break-in are featured for those of you who are c.w. addicts, and make for smooth and fast c.w. contacts.

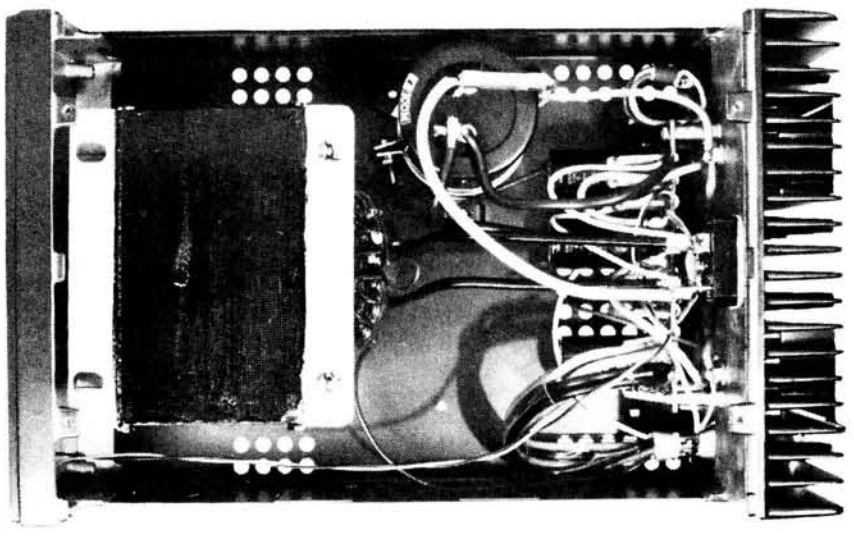
Thirty-two programmable memories are provided, storing both mode and frequency, and the CPU is backed-up by a lithium battery with a claimed life of 10 years. The Icom HM-36 low-impedance, electret fist microphone supplied with the IC-751A incorporates UP and DOWN scanning buttons, which can be used as an alternative to operating the keys on the rig itself.

The receiving system is a quadruple-conversion superheterodyne on s.s.b., c.w., RTTY and a.m., with continuous bandwidth control on the first three modes. In f.m. mode the receiver is triple-conversion only. This specification is similar to the Icom IC-R71 series of general-coverage receivers, even to using the same intermediate frequencies. However, it would appear that in certain frequency bands, the IC-751A is not as sensitive as the IC-R71. As I have reviewed the latter, I was able to compare the two units with the same antenna, and felt that I was not able to decide which was the better.

Functions

The controls are clearly labelled, and the functions of many of them are self-evident. The IC-751A does have some more unusual features, however, among which are the following.

The squelch control is operative in all modes, and was found to be particularly useful when endeavouring to work h.f. packet radio. The ability to switch the a.g.c. off, as well as vary its



Internal view of the matching IC-PS15 mains power supply

speed, was of great help when operating in the AMTOR mode.

The c.w. operating facilities are particularly good. As well as the semi and full break-in options already mentioned, an internal iambic keyer is fitted, with a keying speed variable between 5 and 45 w.p.m. The same 3-pole jack is used to connect either a manual key or an iambic paddle, with the necessary internal circuit selection being carried out by the VOX GAIN control, which also controls the speed of the iambic keyer. The "weight" of the keyer can be varied from the standard dot:space:dash ratio of 1:1:3 by means of an internal preset control. A 700Hz sidetone oscillator is provided to monitor c.w. keying, with the audio level adjustable by a control mounted on the top cover of the transceiver.

Tuning

There is no keypad to enter a frequency into the memory. Instead, one has first to tune a v.f.o. to the frequency and select the mode required, then push in the DFS (dial function select) button, which locks the displayed v.f.o. operating frequency and changes the function of the main tuning control knob to a memory channel selector. Pressing the WRITE button then enters the frequency and mode into the selected memory channel. Turning the tuning control clockwise increases the memory channel number, anti-clockwise decreases it.

Pressing VFO/M results in whatever frequency and mode were in the last memory channel in use, appearing in the display area. One then turns the control until the desired channel number, frequency and mode show in the display area. Turning the tuning control to move from channel to channel, instead of turning the traditional rotary switch, is very effective once you have got used to it.

Dual Functions

Several of the push-buttons have a dual function. The second functions, which are distinguished by the labels being printed in reverse (in black lettering on a white background), are brought into operation by first pressing the FUNCTION switch.

For example, operating in s.s.b. mode, the lower sideband will normally be automatically selected for amateur bands below 10MHz, and upper sideband for those above 10MHz, as decreed by international convention. Should you wish to transmit or receive on the opposite sideband for any reason, this is achieved by pressing FUNCTION followed by SSB. Operation reverts to the conventional sideband after a change of mode or band. When using the GENE (general-coverage) mode, the sideband changeover occurs at 9MHz.

Changing frequency band, either between amateur bands when operating in the HAM mode or in 1MHz steps when in the GENE mode, is yet another job for the main tuning control. Pressing the BAND push-button once selects this mode; pressing it again returns the tuning control to its normal function.

The RIT/△TX knob can be used to offset the transmit and/or receive frequencies by up to ±9.9kHz. The offsets can be switched off and then recalled, or they can be cancelled, or they can be added to the displayed v.f.o. frequency, as desired.

An optional speech synthesiser can be fitted to announce the displayed frequency in English.

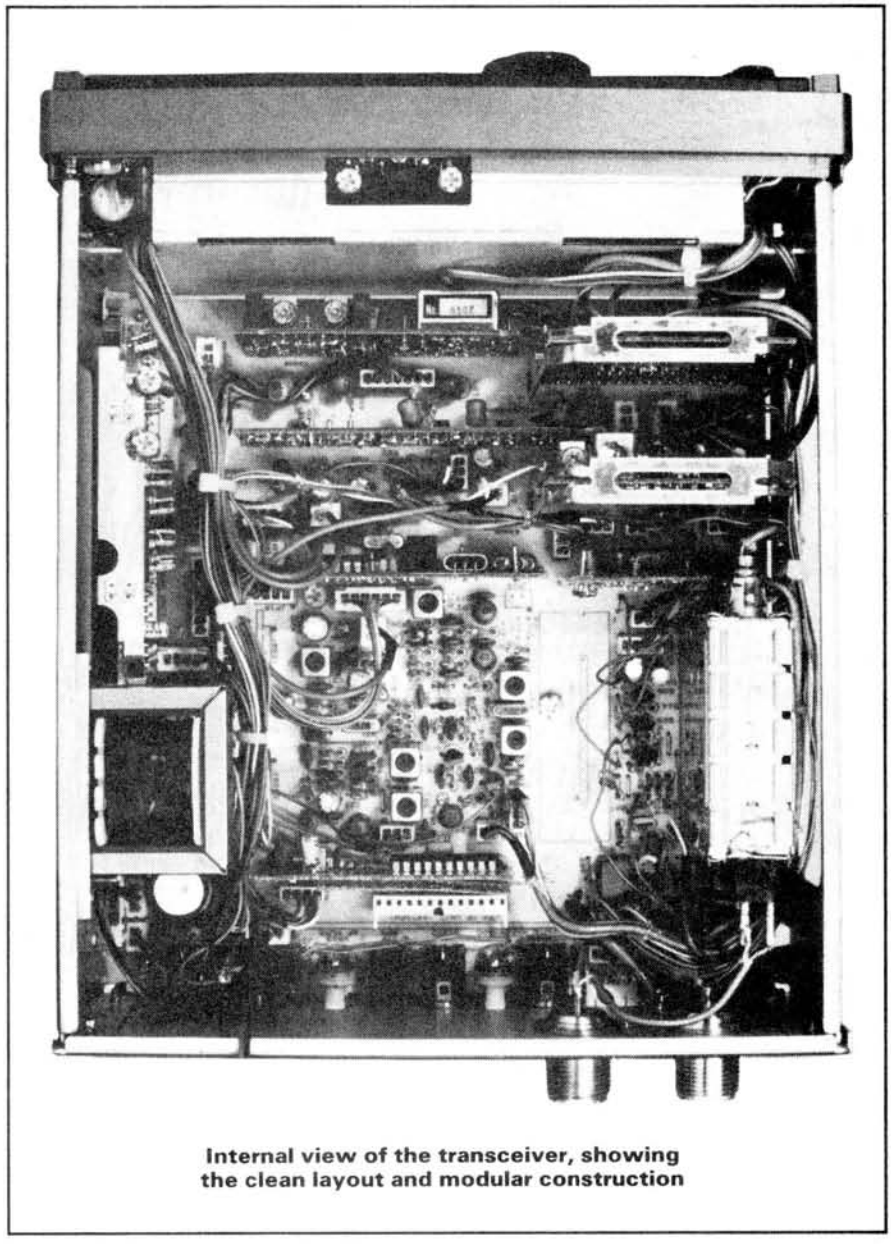
Scanning

Three different scanning formats are available in the IC-751A. The normal format scans each memory channel having a frequency stored, pausing for about 10 seconds on any with a signal strong enough to open the squelch. Changing over an internal switch allows the "pause" to be changed to a "stop", with scanning being restarted by pressing the SCAN switch again.

The second format is Mode Scan, selected by pressing the MODE-S button. In this, only memory channels having frequencies programmed with the same mode will be scanned. In the third format, a band of frequencies can be swept. The band limits are the frequencies stored in memory channels 01 and 02.

Five controls are mounted at the front of the top panel. These are the r.f. pre-amplifier/attenuator switch, the c.w. monitor/10kHz calibration marker switch, and adjustments for the c.w. monitor level, calibration marker frequency (check against WWV, etc.), and anti-VOX level.

I must remark on the excellent feel and smoothness on the tuning control. It really is a pleasure to operate, but has in addition the facility of an adjustable friction brake, to set the drag to suit individual preference. Turning the tuning control normally changes frequency in 10Hz steps, but this increases to 50Hz steps if the knob is spun faster. Frequency is normally displayed to the nearest 100Hz, but when the TS button is depressed, the tuning rate is increased to 1kHz and the 100Hz digit clears to "0". I found



Internal view of the transceiver, showing the clean layout and modular construction

★ MAKER'S SPECIFICATIONS

TRANSMITTER

Frequency coverage: 1.8–2.0MHz (160m)
3.45–4.1MHz (80m)
6.95–7.5MHz (40m)
9.95–10.5MHz (30m)
13.95–14.5MHz (20m)
17.95–18.5MHz (17m)
20.95–21.5MHz (15m)
24.45–25.1MHz (12m)
27.95–30.0MHz (10m)

RF power: a.m.: 50W output
c.w./f.m./f.s.k.:200W input
s.s.b.: 200W p.e.p. input

Carrier suppression: More than 40dB below peak output

Unwanted sideband: Better than –55dB with 1kHz a.f. input

Harmonic emissions: More than 40dB below peak output

Spurious emissions: More than 60dB below peak output

Microphone: Impedance 600Ω
Typical input level 12mV

△TX variable range: ±9.9kHz

RECEIVER

Frequency coverage: General coverage:
100kHz–30.0MHz
Ham bands: (as for Transmitter)

Intermediate frequencies: 70.4515MHz, 9.01MHz,
455kHz, 9.01MHz*
*not used on f.m.

Sensitivity: Input in μV for 10dB S/N with pre-amp ON less than:

Mode	100 to 500kHz	0.5 to 1.6MHz	1.6 to 30MHz
s.s.b./c.w./f.s.k.	0.5	1.0	0.15
a.m. (Narrow)	3.0	6.0	1.0
f.m. (12dB SINAD)	0.3 from 28–30MHz		

Squelch sensitivity: Less than 0.3μV from 1.6-30MHz

Image rejection: More than 80dB

I.F. rejection: More than 70dB

Selectivity: (–6/60dB)

s.s.b./c.w. (W)/f.s.k. (W)/a.m. (N)	2.3/3.8kHz
c.w./f.s.k.	500/1300Hz
a.m. (W) (–6/50dB)	8/18kHz
f.m. (–6/50dB)	15/30kHz

Notch filter: Better than –45dB

RIT variable range: ±9.9kHz

Audio output: More than 2.6W into 8Ω with 10% t.h.d.

GENERAL

Antenna impedance: 50Ω unbalanced

Power requirements: 13.8V d.c. ±15%, negative ground
Approx 20A max. transmit
1.8A max. receive

Frequency stability: Better than ±200Hz from 1 to 60 minutes from power on
Better than ±30Hz after 1 hour at 25°C
Better than ±350Hz in the range 0° to +50° C

Usable temperature range: –10° to +60° C

Dimensions: (W)322 × (H)120 × (D)385mm overall

Weight: 8.5kg

★ PW LAB TESTS

TRANSMITTER

Outputs in c.w. mode:

Freq. (MHz)	Max. Output (W)	Spurious outputs at 100W (dBc)			
		Harmonics			Other
		2nd	3rd	Higher	
1.81	100	–63	—	—	—
3.51	105	–65	—	—	–64 @ 10.6MHz
7.01	110	–67	—	—	—
10.11	115	–67	—	—	—
14.01	115	—	—	—	—
18.11	115	—	—	—	—
21.01	115	—	—	—	—
24.91	120	–68	—	—	—
28.01	110	–68	—	—	—
29.01	110	—	—	—	—

Notes: dBc = dB referenced to carrier.
— = better than –70dB.

2-tone Intermodulation products:
(100W p.e.p. at 14.1MHz using 700 and 1900Hz tones)
Wanted signals 0dBc
3rd order products –41/–46dBc
5th order products –43/–47dBc
7th order products –46/–50dBc
9th order products –49/–52dBc

Carrier suppression: 49dB (1kHz modulation)

Unwanted sideband suppression: >70dB (1kHz modulation)

RECEIVER

All receiver measurements with pre-amp in circuit and r.f. attenuator Off

Sensitivity: (input p.d. in μV for 10dB S+N/N with Filter switch in Out position)

Freq. (MHz)	c.w./ s.s.b.	a.m. (70% mod)	f.m. (3kHz dev)	Input for S9
1.81	0.15	0.99	—	20
3.51	0.12	0.78	—	18
7.01	0.12	0.78	—	18
10.11	0.06	0.74	—	18
14.01	0.07	0.80	—	20
18.11	0.08	0.92	—	21
21.01	0.10	0.78	—	20
24.91	0.07	0.78	—	17
28.01	0.06	0.72	—	16
29.01	0.06	0.72	0.02*	16

Note: * = for 12dB SINAD

Blocking dynamic range: (single signal, 20kHz off-channel) 118dB

Dynamic range: (two-signal)

Signal separation from carrier (kHz)	Dynamic range (dB)
20/40	84
50/100	94

Squelch threshold: 0.1–0.6μV (f.m.)

S-Meter calibration: (at 14.01MHz u.s.b.)

Reading	Input required	
	μV p.d.	dBμV
S1	1.1	0.7
S2	1.3	2.5
S3	1.6	4.4
S4	2.3	7.1
S5	3.1	10
S6	4.5	13
S7	7.4	17
S8	11.5	21
S9	20	26
S9+20dB	202	46
S9+40dB	1.4mV	63
S9+60dB	11.3mV	81

Image and i.f. rejection: Better than 80dB

AGC threshold: 1dB gain reduction threshold 2.5μV (s.s.b.)

RF attenuator: 22dB at 14.01MHz

Pre-amplifier: 8.9dB at 14.01MHz

Selectivity: (–6/60dB)

c.w.	0.54/1.13kHz
s.s.b.	1.32/3.0kHz
a.m.	7.9/15.6*kHz
f.m.	15.2/31.5*

I.F. Notch filter: 42dB

Audio output: 2.76W into 8Ω with 10% t.h.d. for 3μV input at 14.01MHz

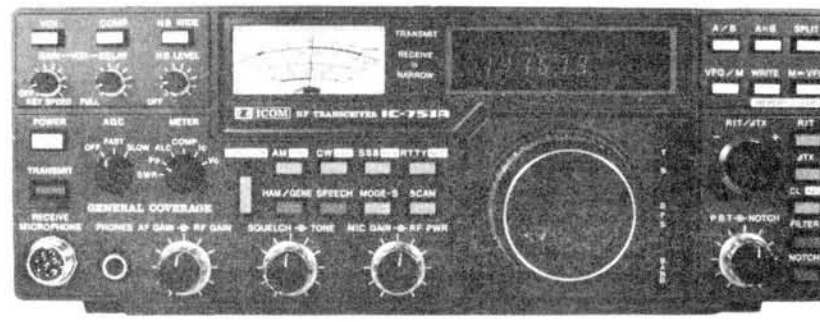
Test equipment used:
2017 and 2019 signal generators, TF2370 spectrum analyser, 2435 frequency meter, TF2304 modulation meter, TF2337A distortion and SINAD meter, TF2005R two-tone generator, TF893A power meter, TF2163S attenuator, all by Marconi Instruments; Bird Model 43 r.f. power meter plus power attenuator; Hatfield Instruments signal combiner.

that this enabled me to flip from one end of a band to the other without any effort, returning to the normal tuning rate by pressing the TS button once more when I neared the wanted frequency.

Facilities on the rear panel include external amplifier or transverter controls, transverter drive of about 30mV, and an accessory socket for operating RTTY using either a high-speed relay, an optically-coupled level converter, or an a.f.s.k. generator. It was also possible to run SSTV using this socket.

I operated the IC-751A using AMTOR, Packet and RTTY with complete success, though all the inputs and outputs of these modes were a.f.s.k. and entered the rig via the microphone socket. I also used the receiver section for FAX, where the excellent frequency stability really came into its own, there being no discernible drift. The operation of the PBT (pass-band tuning) control was, in my estimation, phenomenal. It was absolutely uncanny to have a station I wanted to receive being swamped by a more powerful signal, then turn the PBT control one way or the other and find that the offending station just wasn't there any more. The PBT control combined with the notch filter made operation of the rig a pleasure.

An r.f. speech processor is included in the many facilities. I must confess I did not find a use for it, possibly because most of the stations I worked



were of reasonable signal strength. I did check with some of them what the effect of the processor was, and the answers confirmed that in difficult conditions it would be of great assistance.

Gripes? Well, I have two, if they can be called that. First of all, I did not like the side-mounted loudspeaker, which I found made listening to a contact just that much more difficult than with the more conventional upward-facing top cover mounting. Of course, I know that an extension speaker facing the operator could be used, but that's not quite the point. The other matter was the positioning of the combined a.f./r.f. gain controls. I found that when headphones were plugged into the adjacent phones socket, my left hand got cramp trying to operate the controls sideways, as it were. Perhaps my hands are too large, but there is no doubt about the awkwardness of the controlling position.

Really, though, these are minor points in the design and operation of a very fine transceiver, which I had a very good time operating. Before I end, I must mention the excellent and beautifully printed Instruction Manual. It was a treat to read, and the clarity of the various photographs would make addition of any of the optional extras very simple.

The price of the IC-751A is £1465.00, and that of the associated a.c. mains power supply, type IC-PS15 is £158.00. There is also a switched-mode power supply, IC-PS35, available. This is intended to be mounted internally, under the unit, and comes with all the necessary hardware for this purpose. The price of the IC-PS35 is £193.00. All prices include VAT.

Thanks are due to **Icom (UK) Ltd., Sea Street, Herne Bay, Kent CT6 8LD, telephone 0227 363859**, for the loan of the transceiver and power supply for the purposes of this review. ***PW***

Practically Yours

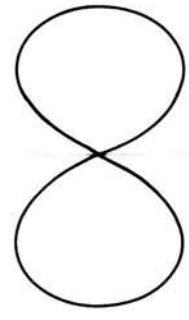
by Glen Ross G8MWR

For the newcomer to the hobby probably one of the most difficult decisions to make is which antenna to put up for any given band. The reported performance of a particular antenna can be very confusing and in some cases the reports can differ to such an extent that they appear to be referring to different systems. The answer is that unless all the information about the antenna is available, you really haven't got much hope of finding a satisfactory answer as to how the antenna will work in your location. You need to know how the antenna is mounted, with respect to its height above ground, local obstructions and even the ground conductivity.

Keep it Simple

One of the easiest antennas to put up for use on the h.f. bands is the simple half-wave dipole and yet many people are put-off using one of these because it has "no radiation off the ends". Yet, depending on your requirements, this may not be true and the dipole could be an excellent choice. The problem is

Fig. 1

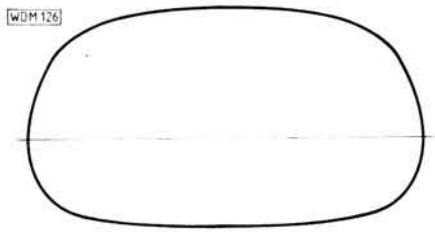


the accepted radiation diagram which is shown in Fig. 1 does seem to indicate a null in line with the wire ends. The answer is that this diagram is only true in the horizontal plane and also only when the antenna is in free space, which is rarely the case in an amateur installation. Another point to be kept in mind is that the figure of eight pattern is actually a doughnut shape which encloses the whole antenna and this brings a new dimension to the discussion.

Ground Effects

Due to the fact that most amateur antennas are mounted fairly close to ground, in the electrical sense, then the radiation patterns of nearly all of them suffer an upward tilt to a greater or lesser extent. To put it another way, horizontal radiation is a near impossibility in an amateur installation even using vertical antennas either above ground or in conjunction with a radial system. To achieve anything like horizontal radiation on 3.5MHz, for example, you would need to get the antenna up to a height of nearly 60 metres.

Fig. 2



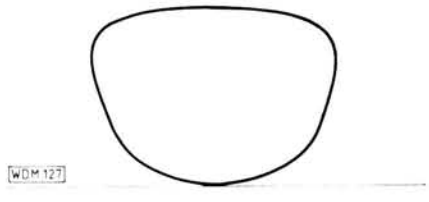
Radiation Angle

Once we accept the inevitable tilt the dipole looks a much more reasonable proposition. If we assume an upward radiation angle of around 20 degrees then the polar diagram of the dipole looks like that shown in Fig. 2 and the deep nulls that we thought we would see off the ends of the wire are no longer there. At this angle of radiation the antenna is virtually omni directional and we now have the answer to the problem of how you manage to work into South Africa straight off the supposed null at the wire ends.

Lower Frequencies

An interesting effect is seen when a l.f. band antenna is mounted electrically close to earth, say at under 12 metres. Under these conditions the radiation pattern becomes nearly vertical as is shown in Fig. 3. Due to this effect the idea of ground-wave coverage on Top Band is shown to be a fallacy because there is virtually no

Fig. 3

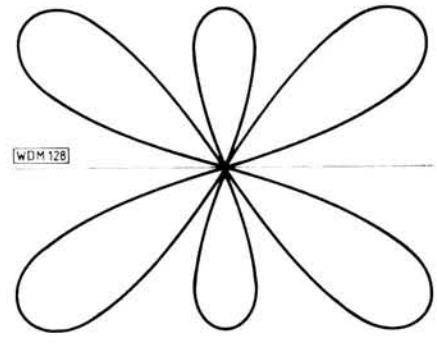


horizontal radiation to provide it. What is actually happening, even with stations located only a few kilometres apart, is that the radiation is going up nearly vertically and then being reflected down. This gives an actual path length of around 192 kilometres and accounts for the otherwise inexplicable fading and sideband distortion that can occur on these "ground-wave" paths.

Alternative Choice

The effects which we have been looking at are more noticeable at the lower frequencies but at 28MHz a dipole at 6 metres above the ground is no longer close to earth and so the "nothing off the end" effect will be much more noticeable. If your interest is mainly in 28MHz and 21MHz then it is well worth considering the use of a three half-wave dipole (three times the normal length of a dipole and still fed at the centre). This will give the advantage of having some gain over a single dipole but, more importantly, from the polar diagram as shown in Fig. 4, it can be seen that we now have four major lobes spaced at 90 degrees and two slightly smaller ones at the usual dipole position. These lobes are all doughnut shaped around the wire and we end up with an excellent antenna system.

Fig. 4



Useful Lobes

If an antenna of this type is arranged with the wire running North and South or East and West then a look at a Great Circle map will show that the main lobes will put signals into North America, South America, Africa and Australia and the smaller lobes will give a useful fill in between the major lobes. The 14MHz band is probably the lowest frequency on which you can use this antenna in an average location, as the wire length required is around 30 metres. The feed impedance depends on the height above ground as with all horizontal dipoles but is a nominal 50 to 70 ohms. If you have a 7MHz dipole it will exhibit these characteristics on 21MHz where it is working in the three half-wave mode and so makes a good two-band antenna. **PW**

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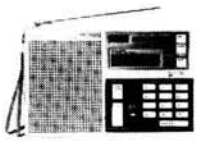

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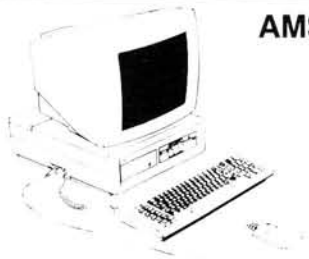

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The new Consumer Protection Act just managed to pass through its final stages and become law before Parliament was dissolved for the 1987 General Election. These new measures add considerable weight to what is now a mountain of consumer protection legislation introduced over the past two decades, says John McQueen.

More Power to the Consumer

Twenty years ago, manufacturers and retailers had everything their own way. There were very few laws to protect the consumer. As a result our High Streets were filled with many goods that were shoddy or unsafe, and consumers had very few rights when it came to complaining. Those were the days when many a painful argument developed at complaints counters as customers sought to obtain compensation or replacement for faulty goods, and manufacturers and retailers often wrote into sales contracts disclaimers for liability which were legally valid.

Since then a powerful consumer lobby has grown up which has persuaded Parliament stage by stage to provide long-needed protection for the long suffering consumer. Slowly the scene has changed as each new piece of legislation was introduced. The Sale of Goods Act was the most notable of these because it introduced the concept of "merchantable quality." This significantly strengthened the position of the consumer, who was entitled to goods fit for the purpose for which they were bought, and any attempts by manufacturers and retailers to write in disclaimers to these rights were invalid.

But all these important improvements pale into insignificance compared to the massive new rights given to the consumer under this latest Act. The consumer is now well and truly King in the eyes of the law, and many manufacturers and retailers are quaking in their boots at the implications of the new changes. The three main areas the new laws deal with are:

Product liability: Producers must now accept greater responsibility for any defective products. Customers who might be injured by such products will no longer have to prove negligence to be able to claim compensation.

Safety: Suppliers may be liable to face criminal charges if they sell goods that are not reasonably safe. This puts us on a par with many other European countries.

Price protection: Suppliers who mislead consumers as to the prices of goods and services will be more heavily penalised.

These changes add up to massive new protections for the consumer and are worth looking at in detail.

Product Liability

The new Act provides for producers, importers or own-branders to be liable for the damage caused either wholly or in part by any of their products.

Consumers used to have to prove negligence on the part of the manufacturer if they were to have any chance of succeeding in pressing a claim for damages for death or injury. But now, the consumer has only to show that a defect in a product caused damage regardless of whether the manufacturer was negligent or not. "Damage" is defined as covering death, personal injury or damage to private property in excess of £275.

"Products" are defined to mean any goods and services provided to a consumer and includes all their component parts. So if, for example, a radio contained a defective part produced by another manufacturer, then both the manufacturer of the part and the manufacturer of the finished product are liable for damages.

There are just one or two exceptions. Buildings are excluded from the provisions, as are food products that have not undergone an industrial process. Thus fresh fruit would not come under the new provisions but tinned fruit would. However, the mass of manufactured goods that consumers buy are covered.

"Importers" are defined as any firm or individual who imported the goods into the European Community, and not necessarily the UK importer, as the new Act is based on the concept of EC law. This means, for example, that if a UK importer bought some goods from a German firm that had previously imported those goods from somewhere like Taiwan then it would be the German firm that would be liable for the damage caused.

In the same way a UK company importing goods from a country outside the EC and supplying them to a country within it would be liable for any damage that might be caused.

"Own branders" are defined as firms who buy other manufacturers goods and sell them under their own brand names. This is common amongst many of the large superstore retailers. Retailers and wholesalers who do not sell own brands will not be liable unless they fail to identify the supplier, producer or importer of goods they are selling. Those selling own brands, however, will be directly liable.

This part of the Act will take effect from January 1988 and has many producers and manufacturers extremely worried about being laid open to a flood of claims from consumers. The only crumb of comfort for them is that the government has inserted a clause that lets off the liability hook any manufacturer who can prove that "the state of the art" of their particular product did not enable them to foresee that the products they are producing would cause harm. The reason for this clause is so as not to damage the prospects for new innovatory ideas for fear of being sued.

It remains to be seen how many claims will be made under this particular section and quite how the courts will deal with them, but these are impressive protections for the consumer.

Safety

The Act makes it an offence to supply consumer goods which are not reasonably safe having regard to all the circumstances. This is an additional requirement to the product liability provisions and widens the protection for consumers into areas where there are currently no accepted standards. In effect, the protection offered to consumers from unsafe goods is now virtually total.

Absolutely anyone who supplies goods, be they manufacturers, importers, wholesalers or retailers, are caught under these provisions. It might just be possible for a retailer to escape by showing that he did not know, and had no reasonable grounds to know, that the goods being sold did not comply with the general safety standards.

In making decisions on questions of safety the courts will look at such matters as general safety standards, the cost involved in making goods safe and whether or not goods were supplied as new.

The Act makes it an offence to give consumers misleading information regarding the price of goods, services or facilities. This part of the Act is covered by a Code of Practice intended as a working guide to offer practical

advice on what might be judged to be an undesirable practice.

Rules will also be laid down showing what steps must be taken to ensure that adequate pricing information is provided, as well as specifically prohibiting certain practices. This section covers services as well as goods. Therefore it also applies to areas such as banking or insurance, caravan parks or the supply of gas, or any other service.

As with other consumer laws it will be impossible to exclude liability for responsibilities under the new Act by trying to write disclaimers into trading terms and conditions. The powers given to the enforcement authorities to police the new laws are draconian and will enable them to search premises, to seize goods, and to serve suspension notices on any firms they have good reason to believe are breaking the law.

The legislation also says that a product will be deemed to be defective if its safety is not what people can generally be entitled to expect. In looking at issues in this area courts will examine such matters as the way in which a product was marketed, the instructions supplied, the reasonable use to which a product might be put, and the date on which the producer supplied the product.

This will allow a court to decide on such questions as to whether a product has become less safe because of its age or because it has been misused. A product that may have been manufactured some years ago will only be expected to match up to the safety standards of the period in which it was made—and not to standards of recently made versions featuring improved safety measures.

Close attention will also have to be paid to the labelling of goods and to making sure that clear and precise instructions are given for use. It will be absolutely essential for any necessary warning signs to be very clearly displayed.

Taking Action

Consumers are now therefore armed to the teeth with rights when it comes to dealing with unsatisfactory or unsafe goods. Retailers are often slow to inform their staff on changes concerning consumer law who in any case have a practice of sticking to old habits.

There is an absolute right to have defective or flawed goods replaced or to have the money paid for them returned. Retailers who fail to meet their obligations can be sued in the county court by using a very simple and inexpensive procedure. And they will have to pay the costs involved if they lose. Most Citizens' Advice Bureaux will explain how this can be done as will the clerks of the county courts.

In the case of injury being caused then a solicitor should be consulted immediately. He will ascertain who is liable for the injury and issue proceedings against the retailer or manufacturer or other supplier depending on the circumstances.

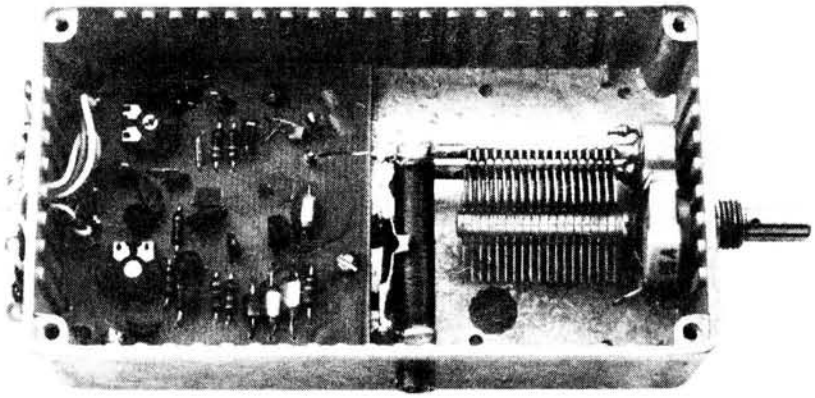
Where false or misleading information has been supplied consumers should contact the Trading Standards officer of their local council who will investigate and take the necessary action.

Consumers should now have a greater degree of confidence than ever before in going about obtaining compensation for defective or unsafe goods which they have bought and should not hesitate to act upon their rights.

With the passing of the latest Act, consumer protection laws are now here to stay. The responsibilities on manufacturers and suppliers of consumer goods are now enormous.

Parliament has not gone to the trouble of implementing these new laws without due cause. Some industries have in the past been irresponsible in their attitude towards consumers producing a mounting wave of consumer protests. But the strong consumer lobbies now firmly entrenched will see to it that in the future the consumer will always get a fair deal. ***PW***

A High Stability VFO



One of the problems with v.f.o. design and construction is whether the results obtained are reproducible. Another snag is the lack of thought often given to the inclusion of features such as i.r.t. and frequency modulation. This v.f.o. from the Kanga Gang is designed to overcome both these problems.

The basic circuit of the v.f.o. is given in Fig. 1. Transistor Tr1, a 2N3819 f.e.t., is used in a conventional Colpitts circuit. There is nothing unusual about this design except that the usual clamp diode is omitted for the sake of stability, as it was found that this diode was the major source of thermal drift. The supply to the oscillator is stabilised by a 78L05 regulator. This is a TO92 style package which lends itself very well to applications like this due to its relatively low noise output and low internal consumption, keeping heat generation to a minimum.

The two-stage, d.c.-coupled amplifier formed by Tr2 and Tr3 is a straightforward wideband circuit. The d.c. coupling and feedback in this amplifier has the ability to cope with large variations of transistor parameters. The absence of r.f. negative feedback enables this stage to work at maximum gain. Resistor R3 is included as a simple attenuator, and after construction this can be varied if necessary to adjust the output level. In practice it is best if R12 is set at about three-quarters of its travel and R2 chosen for the required output. Potentiometer R12 can be used at a later date if it is necessary to alter the drive for any reason. An output of about 5 volts p-p is obtainable from this unit, which is enough to drive a diode ring mixer.

IRT

There are three other parts of the circuit to consider, the i.r.t., the transmit offset and provision for frequency modulation. The i.r.t. (independent receiver tuning) has to be able to shift the receiver frequency a few kilohertz either side of the transmit frequency. To do this we have to shift the frequency of the v.f.o. by biasing a Varicap diode on transmit and then supplying another level of bias on receive. This can be achieved with a suitable potentiometer mounted on the front panel and supplied with a stable voltage. To enable this shift to take place we use a supply which is switched on transmit/receive, this is usually available as it is a requirement in most transceiver designs.

It is desirable that the +8 volt supply used on receive and transmit is well regulated as any variation in this supply will cause a variation in the frequency of the v.f.o. On transmit, the TX 8 volts is fed to R13 and this can be used to set the transmitter offset. On receive the supply is fed to the front panel potentiometer and the variable voltage available from its slider is fed to the RX i.r.t. pin on the v.f.o.

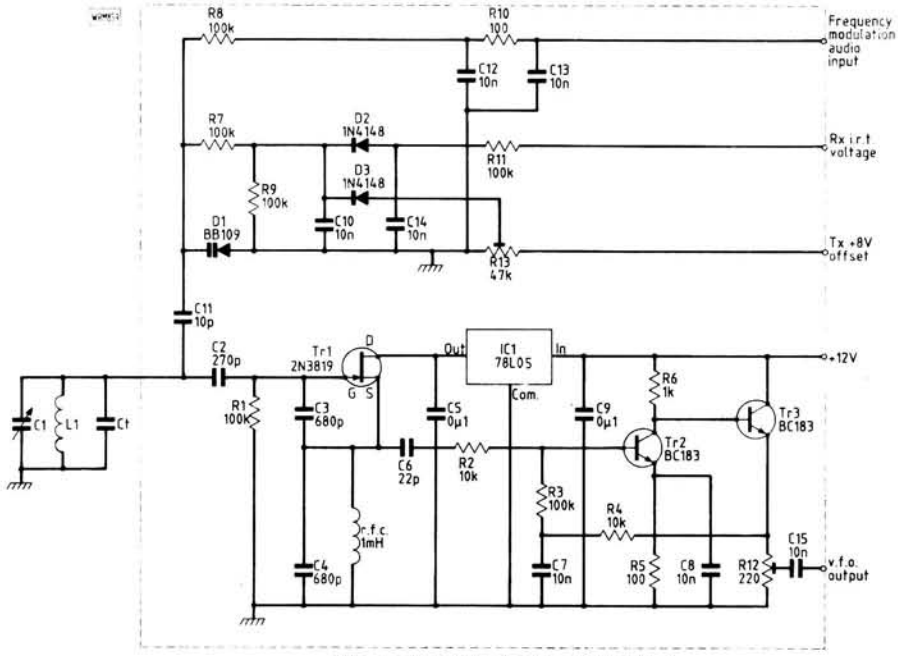


Fig. 1: Circuit diagram of v.f.o.

Frequency Modulation

The frequency modulation input is d.c. coupled to the Varicap diode to enable a d.c. bias to be applied if required to offset the v.f.o. in the f.m. mode. If no offset is required, the audio from the modulator should be coupled to the v.f.o. by a low leakage 0.1µF capacitor.

If the i.r.t. and f.m. are not required C11 should be removed from the p.c.b. If f.m. is required without i.r.t. then remove D2 and D3, alternatively if the f.m. mode is not needed then remove R8.

Thermal Compensation

The long and short-term drifts of the v.f.o. are shown in Fig. 3 and Fig. 4.

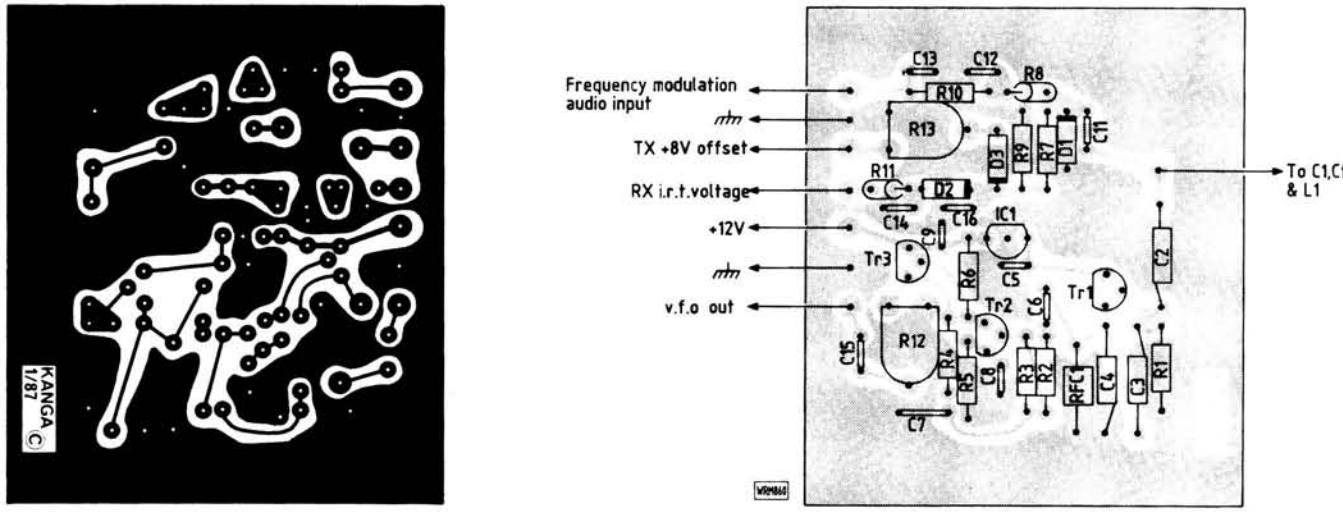


Fig. 2: Full size p.c.b. track pattern and component layout

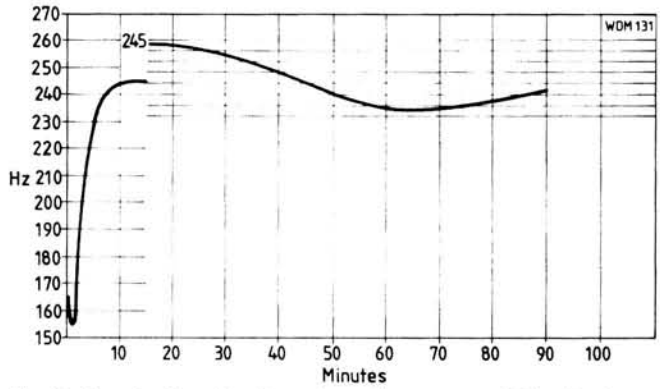


Fig. 3: Graph showing long term frequency drift of v.f.o. The switch-on frequency of the oscillator is 5.555165MHz. After 12 hours the oscillator frequency was 5.555242MHz with a maximum drift of 6Hz per hour. Note the expanded scale

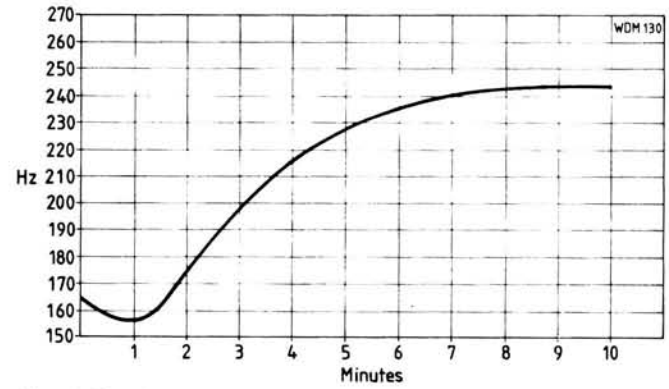


Fig. 4: Graph showing short term frequency drift of v.f.o. The switch-on frequency of the oscillator was 5.555165MHz

The inductor L1 consists of a close-wound coil on a ceramic former, the number of turns and gauge of wire are dependent on the frequency range required, see Table 1. Experience has shown that ceramic formers are best for v.f.o. inductor construction and the little Aladdin former has stood the test of time well.

The most common form of drift in a v.f.o. is thermal, which manifests itself as a creep of frequency in one way or the other as the temperature inside the box rises. This is due to the heat generated by the oscillator circuitry. If the frequency drifts low this means that the overall capacitance is increasing with a rise in temperature and so negative temperature coefficient capacitors are added in small amounts. It is of course necessary to reduce the value of the existing capacitance by the same amount as the NTC capacitor added, otherwise the frequency range will suffer.

Compensation is a fairly hit-and-miss affair unless very careful notes are made as to the frequency change for a given change in temperature. It is then possible to calculate total correction required. In the 5-5.5MHz v.f.o. polystyrene capacitors were used in conjunction with a 100pF NPO ceramic capacitor, and it can be seen from the graphs in Fig. 3 and 4 that good stability has been achieved.

Frequency Range

The v.f.o. can be used on any frequency between 1.8 and 10MHz with good stability. It would be possible, if extra care were taken in the mechanical construction, to use it on the 14MHz band, but the work involved is so great that a crystal mixer v.f.o. can be designed, tested and in use before the free-running v.f.o. is considered satisfactory.

To alter the frequency range it is necessary to change the inductor L1 and the value of the tuning capacitors (Ct) can be used with C1 to change its value without resorting to removing plates. It must be remembered however that these capacitors are also liable to temperature variation and must be included in any calculations for compensation. Table 1 shows the inductors that can be used for a given frequency coverage.

The feedback in the v.f.o. circuit is kept to a minimum to reduce the effects of Tr1 on the tuned circuit. Due to this the circuit may not oscillate at switch-on, or it may fail towards the l.f. end of its range. If total failure is encountered but everything seems in order the value of C2 may need to be increased to 1nF, then check for output. If there is now a signal present at the output of the v.f.o., try reducing the value of C2 until the minimum amount of capacitance is used to maintain oscillation across the desired band.

Mechanical Construction

The box used to house the v.f.o. is a diecast aluminium alloy type in order to achieve good mechanical stability. If

TABLE 1: TUNED CIRCUIT DATA

Freq (MHz)	Ct (pF)	C1 (pF)	L1 Coil Winding Data
1.8–2.0	440†	100	¼in dia former, no core, 88 turns close-wound 32 s.w.g. enamelled copper wire
3.5–3.8	18	75	½in dia former with core. 20 turns close-wound 26 s.w.g. enamelled copper wire
5.0–5.5	100	75	¼in dia former, no core, 47 turns close-wound 26 s.w.g. enamelled copper wire
7.0–7.3	220	75	½in dia former with core. 8 turns close-wound 26 s.w.g. enamelled copper wire

† Total capacitance

a folded alloy enclosure is used, ensure that all the corners are firmly bolted to each other and the lid is a good fit. This may seem a little excessive, but if good thermal stability is to be obtained then all external circulating air currents should be excluded from the v.f.o. circuitry.

The first thing to do with the diecast box, is tap along the sides slightly distorting its shape, making the lid a push fit. Next place the lid flat surface down, half over the edge of a table, then applying a slightly downwards pressure affect a very slight bend in the material, taking care not to make the overall bend more than 1mm. This will ensure that when the screws are tightened the centre of the lid will be in firm contact with the sides of the box.

Slow Motion Drive

The next, and often the biggest problem, is the slow motion dial. A good tuning rate for receivers is between 20 and 30kHz per turn unless a very big knob is used. Amateurs over the years have always been on the lookout for tuning drives and most have several in the junk box. For the younger amateur this is not so easy, but junk sales should be followed very closely as they are a good source of supply. Failing that, epicyclic drives, two in tandem, can be very effective. However, considerable care must be taken to supporting the mechanical parts, if frequency stability is to be maintained.

When two of these drives are used in tandem it is almost impossible to fit a practical dial assembly to them. There is also the problem of slip in drive mechanisms, rendering calibration useless. One possible solution to this problem is to purchase an inexpensive, slow motion, vernier dial, from one of the electronic component suppliers that appear in *PW*.

Conclusion

A kit of parts including the box and p.c.b. are available from Kanga Products, 3 Limes Road, Folkestone, Kent, price £9.45 including post and packing. Components **not** included in the kit are the variable capacitor and the ceramic coil former as these are very expensive new. They can usually be found in your own or a friend's junk box. ***PW***

SHOPPING LIST

Resistors

0.25W 5% Carbon film

100Ω	2	R5,10
1kΩ	1	R6
10kΩ	2	R2,4
100kΩ	6	R1,3,7,8,9,11

Horizontal skeleton preset

220Ω	1	R12
47kΩ	1	R13

Capacitors

Polystyrene

270pF	1	C2
680pF	2	C3,4

Monolithic ceramic 100V

10nF	7	C7,8,10,12-15
0.1µF	2	C5,9

Ceramic plate

10pF	1	C11
22pF	1	C6

Variable air spaced capacitors

C1 See Table 1

Semiconductors

Diodes

BB109	1	D1
1N4148	2	D2,3

Transistors

BC183	2	Tr2,3
2N3819	1	Tr1

Integrated circuits

78L05	1	IC1

Miscellaneous

1mH r.f.c. (1); Aladdin ceramic former (see Table 1); diecast alloy project box; p.c.b.(1); 26 s.w.g. enamelled copper wire; 32 s.w.g. enamelled copper wire; 6BA nuts bolts and washers; connecting wire.

(1) Kanga Products (see text)

SWAP SPOT

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G-zero? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE here. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Enefco House, The Quay, Poole, Dorset BH15 1PP, for inclusion in the first available issues of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing below, it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale— and one of the items MUST be radio related. Adverts for ILLEGAL CB equipment will not be accepted.

The appropriate licence must be held by anyone installing or operating a radio transmitter.

Have Yaesu FT-100 h.f. rig. Would exchange for R600 receiver or 144MHz multi-mode or w.h.y? Tel: 0952 57670. *D135*

Have PRO-2004 25-520 and 760-1300MHz scanner boxed as new also DX302 10kHz-30MHz receiver in good condition. Would exchange for FRG-9600 in good condition with p.s.u. Steve. Tel: Bloxwich 493331. *D141*

Have Sony HV200P video camera worth £150. Would exchange for general coverage receiver e.g. R600 or R1000 etc., or older with cash adjustment. Might also consider 430MHz multi-mode transceiver or disk drive for BBC. Phil Gabel. Tel: 0604 864249, 6-8pm. *D152*

Have microwave components, e.g. lengths of WG16 complete with flanges and rings, burglar alarm, unit guns, etc. and *PW* back numbers for construction of *PW* "EXE" Microwave Transceiver. Would exchange for signal generator and or frequency meter. Tel: Warrington 62410. *D154*

Have Olympus XA2 35mm compact with A11 flash, new condition in case. Would exchange for Philips 580A mains radio. Roy. Tel: 0272 776891. *D168*

Have 1000 new boxed valves from vintage (AC/Pen) to modern (6F33). Would exchange the whole lot or just the one you want for any good d.i.y. tools or materials. Tel: 021-472 3688 (answer phone when not in). *D181*

Have ex-RAF mains p.s.u. suitable for R1332 receiver plus large RSGB world prefix wall map, mint unused. Would exchange for 19 Set rotary p.s.u. Type less generators wanted. Callers only, item heavy. Mr T. Heslop. 75 Alder Park, Brandon, Durham DH7 8TJ. *D185*

Have 934MHz Reftec transceiver with 2×18-element Yagi v.g.c. Would exchange for 144MHz or 430MHz transceiver. Jon G1DYG. Tel: 0249 712009. *D182*

Have a collection of early cigarette cards, 106 sets, catalogue value £1100. Nothing rare but a nice general collection. Would exchange for general purpose receiver or transceiver could be ex-government equipment. Mr Howlett. 122 Victoria Avenue, Hull HU5 3DT. Tel: 0482 441255. *D186*

Have Uniden 175XL base scanner plus discone antenna with cable and plugs. Both in mint condition, only one month old with guarantee. Would exchange for Uniden 100XL hand-held scanner. Must be in good condition. Dave Jnr. Tel: Wigan 227782. *D206*

Have Ferrograph Series 5 reel-to-reel tape recorder also pair of Heathkit Berkeley loudspeaker units (each cabinet containing 12 inch and 3 inch speakers), would exchange for BRT400, Eddystone, AR88 or similar receiver. Tel: Whitby 601567. *D208*

Have s.s.b./c.w. 3.5/28MHz transceiver. Three crystals each band plus v.x.o. with matching speaker and p.s.u. Would exchange for general coverage receiver or 144MHz multi-mode or FT-101E accs. Brian. Tel: 06462 2825. *D225*

B.N.O.S. ELECTRONICS + CUE DEE

THE ULTIMATE PARTNERSHIP

With the recent surge in interest in the lower VHF bands the average amateur is looking around for new equipment on these bands. In what promises to be the ultimate partnership BNOS have teamed up with Cue Dee of Sweden to offer the highest quality equipment available anywhere.

BNOS, of course, have always offered a five year guarantee on all our linear amplifiers and the 4m/6m range is no exception. The compact LP models for 6 metres incorporate many of our popular features which offer peace of mind to the user. The LPM models for both bands contain all of our user friendly additions including the power meter and our famous overdrive protection circuits.

	LP50-3-50	LP50-10-50	LPM50-10-100	LPM70-10-100
Frequency Range	50-54MHz	50-54MHz	50-54MHz	70-72MHz
Class of Operation	AB1	AB1	AB1	AB1
Minimum input power	500mW	500mW	500mW	500mW
Maximum input power	5W	15W	15W	15W
Recommended input power	3W	10W	10W	10W
Output impedance	50 ohms	50 ohms	50 ohms	50 ohms
Output Power	50W	50W	100W	100W
Power Requirements	13·8V 6A	13·8V 6A	13·8V 12A	13·8V 12A
Pre-Amp gain (typical)	12dB	12dB	12dB	12dB
Noise Figure (Better than)	1·5dB	1·5dB	1·0dB	1·0dB

As is usual with BNOS products the specifications mean what they say. Power is quoted in RMS and harmonic outputs are kept incredibly low.

Many black boxes produce terrible second and third harmonics and at six metres these harmonics are even more troublesome. The second harmonic of 50 MHz is slap bang in the middle of the broadcast FM band. BNOS's range of low pass filters are designed to remove harmonic problems without cutting out the DX too. Fit a BNOS filter and the next time there's a stateside opening on 6, you can rest assured that the bloke next door can still listen to "The Archers".

Cue Dee are the Aerial world's BNOS. They also can offer a five year guarantee on their products because of the superior construction of their antennae. The aerials are made from the finest Aluminium and tested to Sweden's stringent national regulations.

The Cue Dee Duo is a combined yagi with 5 elements on 4 metres and 6 on 6 metres. The Duo incorporates a factory adjusted gamma match so you don't have to mess about tuning up like with other aerials. The boom is strong 28mm tube with a 1.5mm wall. Each element is a big strong 12mm diameter yet the overall effect of tubular section materials is to reduce wind loading by up to 66% over square section aerials.

With a 5 year guarantee, 6db gain over a dipole on each band and a preset gamma match the Cue Dee Duo – like all Cue Dee Aerials - is a fit and forget product.

BNOS and Cue Dee – The Ultimate Partnership.

Model	Band MHz	Insertion Loss dB	Harmonic 2nd	Rejection 3rd	Non Harmonic Rejection	Power Handling	Connectors
F50-L/U	50	Better than 0·5	50dB	75dB	75dB	250W	UHF
F70-L/U	70	Better than 0·5	50dB	75dB	75dB	250W	UHF
F144-L/U	144	Better than 0·5	50dB	75dB	75dB	250W	UHF
F144-L/N	144	Better than 0·5	50dB	75dB	75dB	250W	N
F432-L/N	432	Better than 0·5	50dB	75dB	75dB	250W	N

Note: Rejection Figures are typical and w.r.t. the wanted signal

6 metre Amps

LP50-3-50 Linear/Preamp	**175.00**
LP50-10-55 Linear/Preamp	**175.00**
LPM50-10-100 Linear/Preamp	**235.00**

4 metre Amps

LPM70-10-100 Linear/Preamp	**235.00**

Filters

F50-L/U	**29.95**
F70-L/U	**29.95**
F144-L/U	**29.95**
F144-L/N	**35.35**
F432-L/N	**35.35**

CUE DEE Duo Antenna 5 elle on 4m & 6 elle on 6m 6dBd on both bands **129.95**

Access VISA

B.N.O.S. ELECTRONICS

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Tel: 0371-86681 Tix: 817763 BNOS G

A Smarter Repeater

Part 2

In this concluding part, J.M. Bryant G4CLF details some advanced techniques that could be used to defeat repeater jamming.

Jamming

Deliberate jamming and the reception of legitimate signals intended for remote co-channel repeaters can be problems to a repeater. A smart controller should be able to minimise both by recognising the commoner forms of jamming and remote interference, and not relaying them. However it should not be programmed to enforce any but the most basic of operating standards upon legitimate users—and it is certainly not the duty of repeater groups to enforce licence regulations upon repeater users.

Jamming takes four main forms: unmodulated carrier, music, continual opening of the repeater without otherwise making use of it, and abusive, irrelevant or obscene speech. Quite simple programming enables a controller to recognise the first 2 and stop transmission if their duration exceeds 10 seconds; during the continued reception of such signals the repeater should send a regular, distinctive signal to inform listeners what is happening and to invite stronger, legitimate signals to override the jamming. The earlier section of this article, on beacons, describes a simple algorithm which allows the repeater to respond to a quick interrogation (consisting of just a short toneburst) without becoming liable to the third type of jamming.

It is hard to deal with the fourth type since the controller cannot easily be programmed to recognise it. However, an active programme of identification and prosecution of persistent misusers of the repeater may well minimise such abuse. A smart repeater can greatly aid such identification by keeping a log of all transmissions received, including times and signal strengths.

A remarkably effective way of improving the jammer detection possibilities of a smart repeater is to equip it with a direction finder (d.f.) such as is made by Datong; these devices use a standard receiver and a few accessories and give bearings accurate to a few degrees. Jammers will find it discouraging if their unmodulated carriers or music produce, as an immediate automatic response, a transmitted report of their signal strength and bearing from the repeater. Such information would also, of course, be logged.

In the case of persistent obscene jamming the repeater group might use the d.f. to lock out all transmissions from a particular direction (a more sophisticated response would lock out all signals from a particular direction within ±10dB of a particular level); this would be inconvenient to other users in that direction but would prevent the repeater having to be closed down altogether. Such a sophisticated response is only possible for a smart machine fitted with d.f.

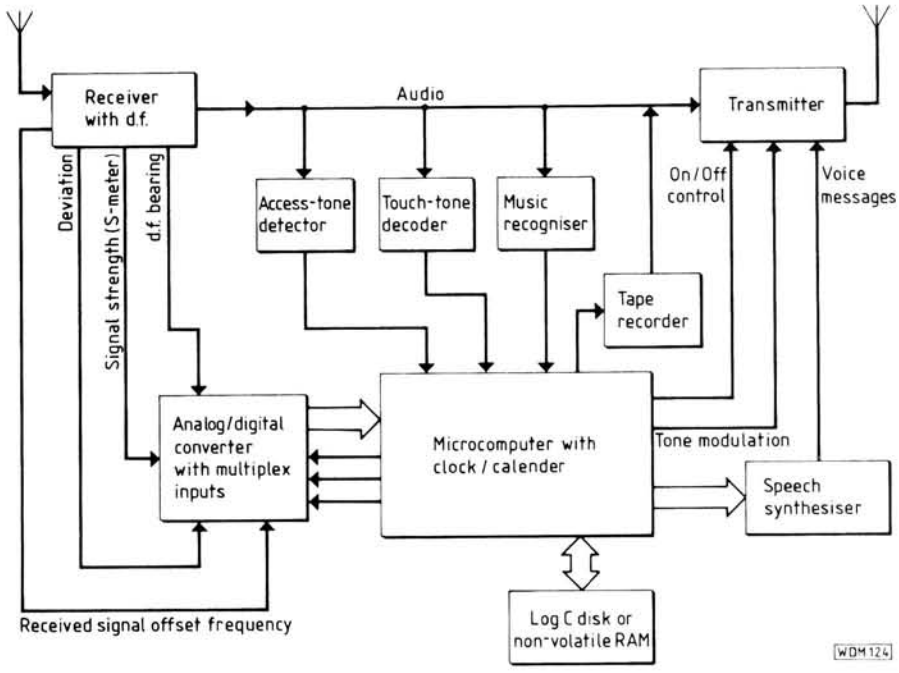


Fig. 2.1: Very smart repeater still does not require very much hardware and performs most of the functions described in the article

A paper given at the IERE Conference on Radio Receivers at UCNW, Bangor, in July 1986 described a computer-controlled phasing technique for antennas which allowed a receiver to copy a v.h.f. signal in the presence of a jamming signal up to 40dB stronger, on condition that the two signals did not come from the same direction. Provided that a computer can recognise that a signal is unwanted, a repeater might be built to exploit this technique.

Advanced Features

This section describes features which are not used in any present repeater but are quite practicable and might well be incorporated in a smart repeater. The d.f. mentioned earlier is such a feature; it exists but has not as yet been installed in a repeater.

A more sophisticated end-of-transmission detector is another. At present repeaters recognise only "carrier" and "no carrier" as possible input states. If a smart controller had access to the S-meter reading it could recognise, distinguish, and react appropriately to such phenomena as mobile flutter (mentioned previously) and the end of a transmission in the presence of a weaker background or jamming signal.

An automatic log has many benefits. By recording activity patterns and, even better, signal strengths and bearings, it enables the repeater operating group to plan services and locate jammers. Such a log might use cassette tapes or floppy disks—the latter could be read over the air if necessary (a week's worth of log is unlikely to require more than 50 kilobytes of storage and might even be stored in RAM if battery back-up was provided to save the log during power cuts).

In addition to logging details of transmissions, a tape recorder (on the lines of a cockpit voice recorder) might be installed which uses a reversible cassette deck to hold a recording of the last four hours' activity, overwriting the earliest with the latest. If recordings are needed for any purpose a signal may stop the continuous recording pending the collection of the tape.

Within the next few years speech recognition by microcomputer should become possible. This would enable a repeater to log the callsigns of all stations using it (which would give even more detailed traffic analysis and might improve the response to repeater-group fund raising—who could resist a request for a subscription which was accompanied by a breakdown of one's own past year's utilisation in terms of QSOs, overs, and total trans-

mission time?). It might even allow obscene jammers to be recognised and locked out.

Conclusion

Use of a microprocessor or microcomputer in a repeater allows a much wider repertoire of response than has hitherto been possible, while preserving fundamental simplicity of operation. This article has described a few improvements which a micro might make to a repeater and it is hoped that it will promote discussion and the proposal of many more.

Appendix

Summary of control of a simple micro-controlled repeater: 100ms 1750Hz initial tone access; responds with callsign. After 2 accesses within 5 minutes with no modulation ceases to respond to access without modulation.

If carrier drops with a step of 20dB of more, controller assumes an end of transmission unless there has been recent evidence of mobile flutter, when it looks for a total absence of carrier for 1.5sec before assuming it.

If, after evidence of mobile flutter, the repeater sees continuous appearance and disappearance of a modulated signal it stops relaying 20sec after the first such disappearance, and stops transmitting without sending a callsign or the two re-access tones; a toneburst in these circumstances resets the 20sec timer.

At end of transmission, controller sends 2 tones separated by 2sec—access before the second tone is timed out after 20sec (the first such timeout in any transmission from the repeater consists of a superimposed tone followed by a voice warning at the end of transmission—later tones by loss of audio and an "engaged" signal). If there is no re-access within 8 sec of the second tone the repeater sends its callsign and ceases transmission.

For correct access and modulation there is no timeout but overs of more than 5min have their duration announced when they finish.

Repeater sends signal reports in response to toneburst and unmodulated carrier between 1 and 2sec in duration. Sends other information in response to toneburst and unmodulated carrier of longer duration (length of carrier burst determines information sent). Signal information should include frequency, deviation (of signal preceding request for data), level of residual a.m., level of 100Hz hum, level and frequency of reference sidebands, and frequency of toneburst. Other information might include time, temperature and other current meteorological data, h.f./v.h.f./u.h.f. propagation conditions and, if allowed by the licence, announcements concerning local and national amateur radio news. Long transmissions should be unavailable at peak traffic times.

Access to the computer by the repeater group is by coded tone; this allows shutdown, reading of log, alteration of mode, and other features.

Repeater sends callsign every 10min starting exactly on the hour; if there is conflict between this callsign and the ones sent on access or shutdown, the timed one has priority.

Repeater shuts down on receipt of unmodulated carrier or music lasting over 10sec. During this shutdown it sends regular signals (possibly the bearing of the offending station) and may be accessed normally by a stronger signal.

If the repeater is equipped with d.f. it should have a mode where it sends the bearing of the transmitting station after every transmission. If it is found to suffer badly from jamming this might be made the normal mode of operation.

If the repeater is equipped with d.f. it should be possible for the repeater group to instruct it to lock out signals with a particular bearing and power level.

Repeater logs time, signal strength and duration of every transmission (and bearing if equipped with d.f.). It may also record all signals received, overwriting them after four hours.

When technology allows, repeater should log callsigns of stations using the repeater, using voice recognition.

Information may be sent by coded tones, synthesised speech, c.w. or RTTY; mode could be user-selectable. Experiments would be needed to determine preferred mode: RTTY and c.w. might require RTTY or c.w. instructions to select mode. ***PW***

SWAP SPOT

Have Canon SV518 Auto-zoom Super 8 cine camera and Eumig Mark-S 705 (dual standard sound) projector, both in immaculate condition. Would exchange for any recent 144MHz all-mode base station or w.h.y? Tel: 094 881 302. *D236*

Have Minolta XGM camera, Minolta zoom lens 70-210 plus accessories. Would exchange for any good general coverage receiver. D. Cable. Tel: Folkestone 58351 (daytime), 59862 (evenings). *D246*

Have complete modern amateur photographic equipment plus accessories, all equipment nearly new and in excellent condition. Would exchange for Yaesu FT-707 plus matching v.f.o. or a.t.u. Fair deal wanted, radio equipment must also be in good condition. Kevin. Tel: Stoke-on-Trent 314383 (evenings). *D265*

Have Hitachi VT63E front loading video recorder plus remote control petrol engine car, also have Grundig TK141 reel-to-reel tape recorder. Would exchange for complete weather satellite receiving system or w.h.y? Paul. Tel: St Annes (0253) 720416 (before 7pm). *D266*

Have 3 off QV08/100 valves, two new and boxed worth £150 each, third slightly used spare. Also copy of SWM plans for 400 watt linear amp using same. Would exchange for working Commodore 64 with p.s.u and datacorder. Richard. Tel (0202) 678558 (office hours). *D290*

Have 40-60MHz tunable converter, 7.5MHz output, working well, stable. Would exchange for 16K ZX81. G4FFO. Tel: Cambridge 860150. *D291*

Have AR88D plus spare valves and manual. Also Codar PR30 preselector and p.s.u. All in working order. Would exchange for quality portable recorder, Datong FL2 filter, s.w.l. user books, WRTV Handbook, light-weight rotator or w.h.y? Monty. Tel: 01-771 6867 (evenings), not Wednesdays. *D292*

Have Sankyo 8mm movie camera, interval timer, editor viewer, plus Sankyo stereo sound projector with screen and film splicer. Would exchange for all band transceiver with general coverage receiver. Mr Weedon, Suffolk House, Weavers Drive, Glemsford, Nr Sudbury, Suffolk *D304*

Have PET 4032 computer with toolkit ROM, less monitor. Computer has composite video or r.f. output. Also printer and PET Revealed book. Would exchange for 144MHz equipment or w.h.y? Mr J. E. Cronk GW3MEO, 2 Mostyn Avenue, Prestatyn, LL19 9NF. *D308*

Have Ricoh K.R.10 Super 35mm camera plus Fotima camera bag, tripod, flash and several Cokin filters. All in pristine condition. Approx £220 value. Would exchange for Yaesu FRG-7 or scanner of similar value and in good condition. Lancashire only. Mr L. Lee, 52 Franklin Road, Witton, Blackburn, Lancashire. *D309*

Have Sinclair ZX81 16K p.s.u. value £120. Would exchange for m.w. DX machine, such as a Trio 9-R59DS, CR100, AR88D, etc., or R517 Air band hand-held receiver. Tel: (061) 743 1570. *D334*

Have Realistic DX-200 5-band communications receiver in excellent condition, with headphones and manual. Would exchange for Canon Auto-Focus Compact Camera or similar. Mr J. H. Cross, 4 Lonsdale Court, Lovelace Road, Surbiton, Surrey KT6 6PB. Tel: 01-399 9658. *D339*

Have 1cc aero engine, diesel glow-plug type, suitable for small model aircraft, little used. Made in USA by Cox. Would exchange for s.w.l. preselector or a.t.u. home made or commercial. T. Davies, 8 Cig-Y-Graig, Llanfairpwll, Anglesey, Gwynedd LL61 5NZ. Tel: (0248) 715856. *D341*

Have SWL KX3 a.t.u., boxed. Would exchange for Datong Notch Filter or Morse Tutor. C. Greig, 12 Credon Drive, Airdrie, Lanarkshire, Scotland ML6 9RT. *D361*

The most coveted item at any junk sale or rally is the roller coaster inductor. Few people give any thought to how such a versatile device may be used in an a.t.u., particularly with regard to logging the number of turns used for each band. K. Buck has applied himself to the problem and found a solution in the shape of this simple d.i.y. counter.

A Roller Coaster Turns Counter

Modified reel-to-reel tape counter coupled to roller coaster inductor

There are three ways of displaying the number of turns used on a roller coaster. The first is to have an open top to your a.t.u., the second is to fit a plastics window in the lid of the a.t.u. and count the turns visually in each case, but both are inconvenient methods. The third choice is to fit an in line mechanical counter.

Fruitless searches of electronic junk shops, rallies and suitable retail outlets spurred me on to design my own indicator. A cord drive system was first tried but this proved to be inadequate with its very cramped readout. After talking to an amateur colleague who suggested using a bicycle mileometer, one was promptly purchased. Knowing virtually nothing about these, I carefully dismantled and inspected the mechanism. The gear wheels and actuator would be of no use, otherwise it showed possibilities for modification and this formed the basis of the project.

These counters are very simple in operation. During each turn, a cog engages in a notch and advances the adjacent, cascaded decade wheel. An end spring maintains constant pressure and latches the wheels after each change in count. When testing the first hastily built counter, it was found to be successful, but I noted with dismay that on the return countdown, a reading of "00" was given when there was still one full turn to be counted. A third decade wheel was fitted to be the lowest significant digit, and promptly cured an unacceptable situation. The addition of a third wheel makes this counter superior in some respects to some of the commercial types available, as it provides a logging facility and will register one tenth of a turn when set up correctly. This feature will be most useful to the operator who likes experimenting with antennas.

Easily made gear wheels provide the drive to the counter from the shaft of the roller coaster. The finished prototype was very compact measuring only 22 × 22 × 27mm including the bracket, it can of course be tailored to fit almost any variable inductor. To speed up the tuning of the multi-turn inductor, construction details of a cranked knob are given later in this article.

Mounting Bracket

The counter assembly consists of two separate parts as can be seen in Fig. 1, a "U" shaped cradle and an "L" shaped bracket. The "U" cradle section is attached to a sliding plate with two 2.5mm countersunk screws and nuts. In turn, this plate is clamped to the "L" bracket via two self-tapping screws and a small clamp plate. The clamp assembly together with two slots in the "L" bracket allow a degree of adjustment with regard to the drive gear train and the overall accuracy of the counter.

Assembly

As with all projects of this type it is impossible to quote any dimensions for parts in the assembly. Each constructor will have his own personal requirements, plus different types of

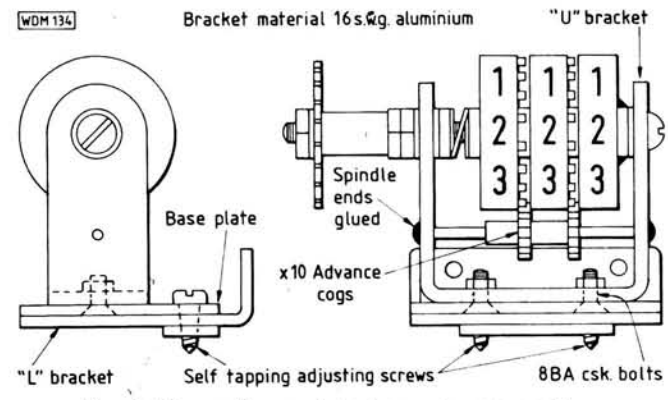
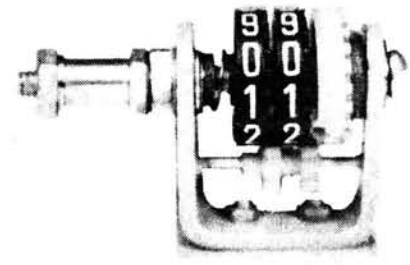


Fig. 1: View of completed counter assembly



Completed counter before installation

mileometer and inductor. My prototype used a 5BA × 35mm machine screw for the main shaft of the counter. The decade wheels must rotate freely without excessive play with the exception of the "tenths" wheel as this is the main drive to the rest of the counter. When all the metalwork has been completed to suit your choice of counter wheels. *(Just a note of guidance, it is probably a good idea to save the two end plates of the original mileometer, in order to use them as drilling templates, with regards to the distance between the main shaft and the advance cog spindle.)* Take the red "tenths" wheel and glue the tight fitting nylon washer from the original assembly to the side of this counter wheel, see Fig. 2. This wheel must not slip round on the main spindle when the counter is finally assembled. Finally load the main shaft with the components as shown in Fig. 2, commencing with the red "tenths" wheel and ending with a plain washer. The latching spring is centred on the main spindle with a 1.5mm thick fibre washer. This should be a close fit to the inside diameter of the spring. When working out the dimensions for the "U" bracket take into account the length of the tension spring, it is not necessary for this to be fully compressed. The two retaining nuts should be carefully tightened to give free spindle rotation without excessive end-float.

Setting up

The advance spindle retaining holes should be drilled slightly oversize.

Set the three decade wheels to read 000 for side centre viewing. Assemble the two advance cogs to mesh with the respective slots on the decade wheels, this operation is a little bit fiddly. Alternatively, end-viewed counters will have the setting notch adjacent to figure 4 or 5 and not 2 as shown in Fig. 2. Temporarily hold the advance spindle in place and rotate the main shaft checking for positive latching of the × 10 advance cogs, if all is well glue spindle end to sides of "U" bracket.

Gear Wheels

A right-angle drive is required from the roller coaster spindle to the shaft of the counter at a 1:1 ratio. This can be achieved with two home-made ten tooth gear wheels 20mm in diameter and 4 × 1.5mm teeth. These can be made of glass fibre p.c.b. material for ease of working, and have proved to be quite satisfactory over a long period of time.

The ten centre positions of the teeth are marked out with dividers on an 80mm diameter circle. A little extra time spent on marking and filing will reflect on counter efficiency and accuracy. The retaining nuts should not be over tightened, to allow for any adjustments during testing. The drive gear on the main roller coaster shaft is glued to one face of spindle coupler.

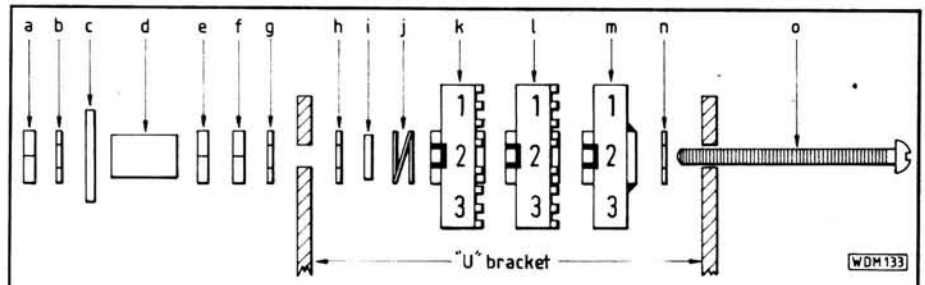


Fig. 2: Exploded view of counter sub-assembly

(a) Nut (b) Plain washer (c) Drive gear (d) Spacer (e) Nut (f) Nut (g) Plain washer (h) Plain washer (i) Fibre washer (j) Spring (k) Decade wheel (l) Decade wheel (m) Decade wheel with shaft gripping washer (n) Plain washer (o) Long machine screw (main shaft)

Testing

Set the counter to read 000 before fitting to the roller coaster end plate, the two spindles should be level. The wiper of the roller coaster must be at the front, earthy end of the coil. With the gear wheels engaged, rotate the inductor one full turn and repeat this procedure if necessary, carrying out any adjustments to achieve a reading of 010 then tighten all adjustment screws and nuts. Run the inductor up and down a few times checking the action of the × 10 advance cogs.

Notes

I have since built another counter with the same basic principles using a counter salvaged from a vintage reel-to-reel tape recorder. This counter has slightly larger decade wheels allowing it to be mounted closer to the front panel. The gear wheels may be reduced marginally in diameter although there is a limit. Gear trains of other than the 1:1 ratio should be avoided, as this could lead to an unwanted confusion and poor accuracy.

Should a counter be used that produces a reverse count, as was the case with a vertical type, three ten-tooth gear wheels will correct this, the centre gear acting as an idler.

Knob

Tuning the roller coaster inductor can be tedious, a cranked knob will speed things up especially for band changing. A flat fronted knob with a wide lip is suitable, and many surplus types conform to this description. A tapered pen case glued on to a 6BA brass spacer can form the handle. The plastics pen case is slightly longer to cover the head of the securing bolt which runs down the centre of the spacer. A hole is drilled near the edge of the lip on the knob, the hole being just big enough to take the 6BA securing bolt. On the rear of the lip the hole should be deeply countersunk. In the final assembly, a plain washer between knob and handle will ensure smooth rotation. The countersink on the reverse of the knob should be filled with epoxy once the handle securing bolt has been located in the hole. When gluing the crank assembly in place make sure that the epoxy does not seep into the handle as this may spoil its free running movement on the shaft. ***PW***

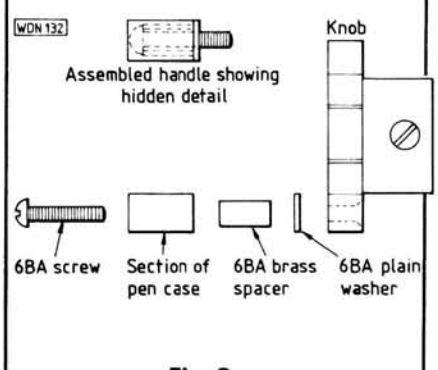


Fig. 3: Exploded view of cranked knob

SHOPPING LIST

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Parts List

Bicycle mileometer (1); copper-clad, glass fibre p.c.b. material; Suitable length and diameter machine screw (part ref. O); The following should match machine screw diameter (part ref. O), Brass spacer (1), Nuts (3), Plain washer (4), Fibre washer (1) (see text); 16 s.w.g. aluminium plate; Small self tapping screws (2); Small countersunk machine screws with matching nuts and washers; spindle coupler; 6BA brass spacer (1); 6BA machine screw (1); 6BA plain washer (1).

The Microwave MESFET Part 2

Brian Dance concludes his series on the mystery surrounding m.e.s.f.e.t.s.

Monolithic Devices

Devices known as m.i.c.s (microwave integrated circuits) have been available for some time, but as they are thin film hybrid devices one could argue that they are not really i.c.s at all. Recently true i.c.s known as m.m.i.c.s (monolithic microwave integrated circuits) have emerged onto the market. High performance m.m.i.c. devices incorporate gallium arsenide m.e.s.f.e.t. devices, but m.m.i.c. devices based on silicon are also available for more limited frequency ranges. An advantage of gallium arsenide m.m.i.c.s is that surface acoustic wave (s.a.w.) devices can be fabricated in insulating gallium arsenide substrates as part of a monolithic i.c. Such devices have been successfully tested and are attractive for the military missile market, etc.

A range of silicon m.m.i.c. devices is available from Avantek for frequencies of up to about 3GHz. They are small, highly reliable, cascadable building blocks for such applications as narrow and broad band i.f. and r.f. amplifiers in military and commercial mobile, airborne and land-based systems. The gain variation of amplifiers with frequency in these three series of devices is shown in Fig. 2.1. Each of these series contains eight different design types with maximum usable frequencies of 1.5, 2, 2.5, and 3GHz. The typical noise figure of the MSA01 series of devices is quoted as 5dB and that for the members of the other two series as 6dB. The products are available in micro-X and 70-m.i.l. transistor packages; they are known by trade mark "MODAMP".

Marconi Electronics Devices Ltd. (MEDL) claims Europe's first m.m.i.c. which was developed at the GEC Hirst research centre near London and which is produced at the MEDL fabrication facility at Lincoln. It offers ultra-broad band amplfication from zero frequency up to 12GHz with a gain of 6dB ±0.5dB per i.c. The typical noise figure is better than 6dB. Four of these devices have been cascaded to produce a high gain, broad band amplifier modules providing 24dB gain from 20MHz–12GHz.

Siemens offers a range of monolithic integrated gallium arsenide broadband amplifiers for operation up to 3GHz with 3–6V supplies. They are two-stage m.e.s.f.e.t. devices. The CGY21 provides a typical power gain of 20dB over the 40–860MHz range and the CGY31 typically 17dB over the 800–1800MHz range, both with typical noise figures of 4.5dB.

Plessey has reported on the design of a gallium arsenide low-noise amplifier i.c. for the 8–10GHz band which provides a gain of 16dB with a gain flatness of ±0.1dB over this frequency range.

Military requirements have undoubtedly led to the advances made in gallium arsenide m.m.i.c. technology, but it is taking a considerable time to move into the commercial and consumer markets. Most of the devices which have become available are for the lower frequency regions where the packing densities on the i.c.s need not be limited to quite such low values to minimise spurious coupling between active and passive components. Production of m.m.i.c. is currently plagued by low device yield. In the case of moderately complex devices, only about 1 per cent of the devices on which production commences mature from the production line as satisfactory final products. This greatly increases the prices. In the case of simpler devices, the success rate is much higher, but even then there are more unsuccessful devices than successful ones.

Microstrip

At higher frequencies, extensive use is often made of microstrip transmission (such as in the Plessey H/I band amplifier covering the 7–11GHz band with a gain of over 16dB). The microstrip has been derived from open transmission lines. A narrow strip forms one conductor and a ground plane forms the other. A dielectric substrate fills the space between them. The effective wavelength decreases with increasing dielectric constant, so as the dielectric constant is increased, the microstrip can be made smaller. Gold is the most widely used conductor material, partly because it is inert chemically, so passivation is not required. High dielectric constant, low loss substrates such as sapphire, aluminium oxide or ferrite must be employed to confine the electric field between the conductor and the ground plane.

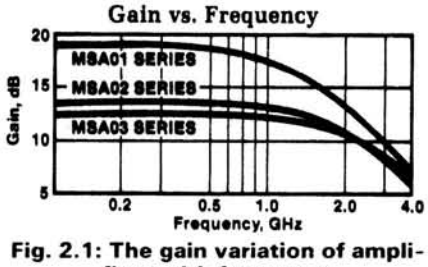


Fig. 2.1: The gain variation of amplifiers with frequency

An important factor in microstrip devices is the substrate thickness which should be about one-eighth of a wavelength. This avoids the generation of unwanted high order modes in the substrate. Ferrite has a high dielectric constant, so very thin layers may be required if it is selected as the substrate material. When the substrate material is suitably chosen, the microstrip principle offers a significant size reduction in comparison with coaxial and waveguide technology.

TVRO Application

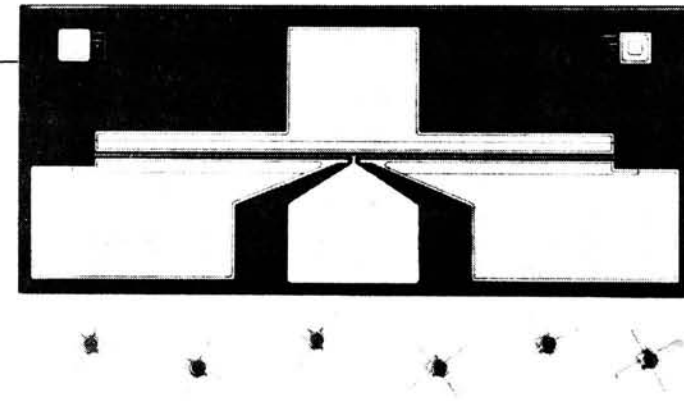
Sanyo Electric Co. Ltd. claimed to have marketed the first commercial television tuner using a gallium arsenide m.e.s.f.e.t. device. Although the relatively economical dual-gate m.e.s.f.e.t. costs about twice as much as the m.e.s.f.e.t. it replaced, Sanyo claims improved noise figures down to 4–6dB instead of 6–9dB. The use of the m.e.s.f.e.t. also eliminates the need for a booster switch in the tuner, since the device automatically controls the input sensitivity.

The 3SK97 m.e.s.f.e.t. used is manufactured by the Matsushita Electrical Co. for Sanyo. Other Japanese manufacturers, such as Nippon Electric Co., are manufacturing devices for television reception. This company reduced the gate length for its DBS device from 0.5 to 0.3 micron to provide ultra-low noise.

However, the real future for satellite television reception is believed to be in the use of a m.m.i.c. device in the antenna amplifier. This will reduce both size and weight of the head amplifier which could be mounted on a dish antenna of modest dimensions without strain and without obscuring any substantial part of the surface of the dish.

European satellite TV broadcasting

For details of the current range of Avantek microwave devices, contact Bonex Ltd, 102 Churchfield Road, Acton, London W3 6DH, telephone 01-992 7748.



HFET-1102 gallium arsenide m.e.s. f.e.t. magnified

is now a reality so there is great interest amongst European device manufacturers. It has yet to be decided whether m.i.c. hybrid devices will be used until m.m.i.c. products become available. It is intended that the satellite transmitters will provide an effective isotropic radiated power (e.i.r.p.) level of over 65dB per channel with a power flux density in Germany of −103dBW per m^2. Thus the use of a parabolic dish antenna 0.9–1.8m in diameter will result in an input power of −79dB to −73dBm at the receiver front end. The incoming signal will be in the 12GHz band.

It is recommended that an overall figure of merit of 6dB/K for individual domestic reception or 14dB/K for communal reception should be the goal for optimum picture quality. The gain of the parabolic dish reflectors is 38dB (0.9m) or 46dB (1.8m), so a low-cost 12GHz front-end with a maximum noise figure of about 5dB is required.

The front-end must provide low-noise amplification over the 11.75–12.5GHz band, incorporate a stable 10.75GHz oscillator and provide gain at the i.f. of 0.95–1.75GHz. Although satisfactory hybrid front-ends using m.e.s.f.e.t. devices have been tested, extensive efforts are being made to produce suitable m.m.i.c. devices for mass production. A gallium arsenide m.e.s.f.e.t. is very suitable for use as an oscillator because it can provide relatively high r.f. output power with high overall power efficiency, together with a low noise figure and high stability in a suitable circuit. Siemens has considered both the use of distributed elements using stripline and lumped elements. The former offer considerable size reduction.

Siemens has fabricated a m.m.i.c. converter with a noise figure of 2.3dB at the 1.5GHz i.f. with a v.s.w.r. of 2:1 throughout the band. Direct selective ion implant technology was employed in the device fabrication process. A noise figure of 1.8dB at 12GHz was obtained using a 0.5 micron single gate m.e.s.f.e.t. and 3.5dB for a dual-gate device where the noise is inherently greater. However, the use of a dual-gate device results in less feedback and hence higher power gain and greater stability.

The enormous potential market for television down-converters has created the greatest interest yet seen in the m.e.s.f.e.t. and m.m.i.c. field. As long ago as 1982 the LEP Company of France reported it had developed m.m.i.c. low-noise amplifiers with a 3.6dB noise figure and a gain of 7.3dB and also dual-gate m.m.i.c. mixers with a 6.5dB noise figure and 2dB conversion gain at 12GHz.

In Japan, Toshiba gave details of its monolithic devices for DBS down-conversion. These include a low-noise amplifier with a 3.4dB noise figure at 12GHz together with a 1GHz bandwidth i.f. amplifier and a dielectrically stabilised oscillator for 11GHz operation.

Thus the performance of m.m.i.c.s has been demonstrated to be satisfactory in the laboratory. However, it remains for manufacturers to show that they can produce suitable devices in the huge numbers required at satisfactory prices. The results of this extensive work should be appearing in the fairly near future.

Other Devices

There is also considerable interest in other devices for various fields of application. One of the most important is known as the h.e.m.t. (high electron mobility transistor) which is also known as the t.e.g.f.e.t. (two dimensional electron GaAs field effect transistor) and as the m.o.d.f.e.t. (modulation doped field effect transistor). In one form of this device alternate layers of gallium arsenide and gallium aluminium arsenide are employed. Electrons have a greater affinity for gallium arsenide, so free electrons in the gallium aluminium arsenide layers are transferred to the gallium arsenide where they form a quasi-two-dimensional electron gas which accumulates at the hetero-junction interface. A very high mobility is thus obtained, values about double those found in m.e.s.f.e.t.s being obtainable. At low temperatures the mobility can be increased to 260 000$cm^2V^{-1}s^{-1}$ at a temperature of 5K, this being about 55 times that in gallium arsenide at room temperature.

The French Thomson-CSF Company reported as long ago as 1981 that the use of a h.e.m.t. device in a m.m.i.c. with a 0.8 micron gate enabled a 2.3dB noise figure using a h.e.m.t. with a 0.5 micron gate length. The gain also rose from 10.3 to 12dB. Thus it seems that h.e.m.t. devices may offer considerably improved noise figures and gain when compared with gallium arsenide m.e.s.f.e.t.s.

There is also considerable interest at the research level in the use of indium phosphide in the manufacture of m.m.i.c. devices. Preliminary work using this material has involved frequencies from 20GHz to 110GHz; such millimetre wave frequencies are of great interest for military work. In addition, the use of this material would enable gallium indium arseno-phosphide lasers to be fabricated on the same i.c. for signalling applications.

Mitsubishi has developed a new technique for fabricating m.e.s.f.e.t. devices with extremely low noise figures and a good high frequency performance. This technique involves the use of a focused ion beam to pattern the gate electrode rather than the conventionally used electron beam. The scattering of electron beams makes it very difficult to fabricate m.e.s.f.e.t. devices with gate lengths of 0.25–0.5 micron, but ion beam scattering is extremely small. Mitsubishi's new technique has enabled gallium arsenide m.e.s.f.e.t. devices to be produced with a noise figure of only 1.08dB at 12GHz, whereas the very best devices produced by electron beam exposure have a noise figure of about 1.1dB at the same frequency.

Conclusion

Associated with the development of microwave gallium arsenide devices has been the very extensive work carried out in recent years on gallium arsenide logic circuitry. Products involving such circuitry may well provide us with the fastest computers of the future, although this remains to be seen. They are also likely to be involved in high speed data communications by radio, satellite and light beam. **PW**

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PW REVIEW

Hung Chang OS-620 Dual-trace Oscilloscope

The Hung Chang Products Co Ltd of Seoul, Korea, originally manufactured panel meters for incorporation into electronic and radio equipment, and later expanded operations into the digital multimeter field.

One of their handheld digital multimeters was reviewed in Practical Wireless *many years ago, and impressed us at the time as being excellent value for money. That same d.m.m. has been kicking around our office and workshop ever since, used for all sorts of jobs and often thoroughly ill-treated, but still it carries on working!*

So, when Black Star Ltd announced earlier this year that they were to distribute several of the Hung Chang range of oscilloscopes in the UK, Geoff Arnold G3GSR was keen to try one out.

For anyone involved in radio engineering or experimentation, the decision which oscilloscope to buy is a difficult one. For TV work, it's not so bad—provided the 'scope has a good video response and solid triggering from line and field syncs. For radio, though, you begin thinking about signals at 30MHz as a minimum, and if v.h.f. or u.h.f. are your field then, unless looking at modulation envelopes with an r.f. probe will serve your purpose, you're talking big money!

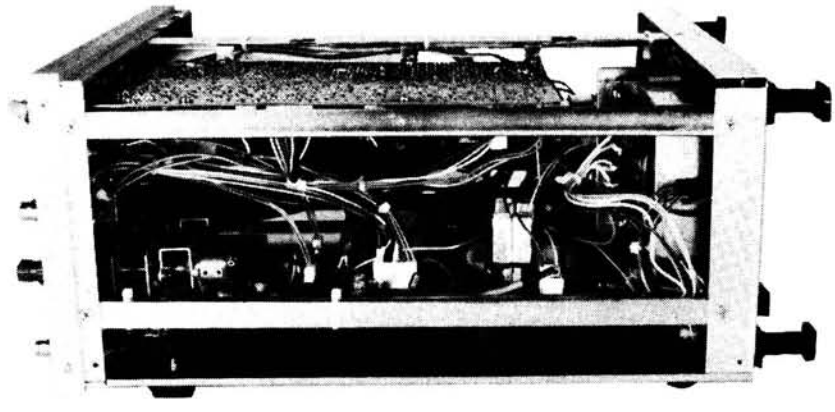
For some time now, circuit techniques in oscilloscopes have meant that, by and large, prices were generally in the region of £250–£300 up to around the 20MHz bandwidth mark, but above that they increased by roughly £100 for every extra 10MHz, so that a 60MHz beast would set you back about £700, for example. Above that, the price increases tend more towards the exponential!

So, weighing extra bandwidth against extra cost, we chose for our review, and our *PW* Special Offer this month, the OS-620 with its −3dB bandwidth of 20MHz. Our lab tests confirmed a very smooth roll-off in response above that point, with the −6dB point coming around 25MHz, and a usable (though uncalibrated) display to 50MHz and beyond.

The OS-620 has the added attraction of a simple component test facility built in, which allows you to show characteristic curves of capacitors, resistors, inductors and diodes, including Zeners. The circuit applies 9V r.m.s. a.c. via two resistors to the component under test, and the resulting currents are monitored and output as an X-Y display. The maximum current through the component under test is limited to about 2mA.

Features

The specification table and photograph reveal most of the OS-620's features. The 5in-diagonal c.r.t. has a blue-green trace, and has an internal graticule marked out in 1cm squares, with 0, 10, 90 and 100% points marked to help with rise-time measurements. A neutral filter is fitted over the tube face to improve display contrast. Although the e.h.t. of around 2kV is perhaps somewhat on the low side by modern standards, the brightness of



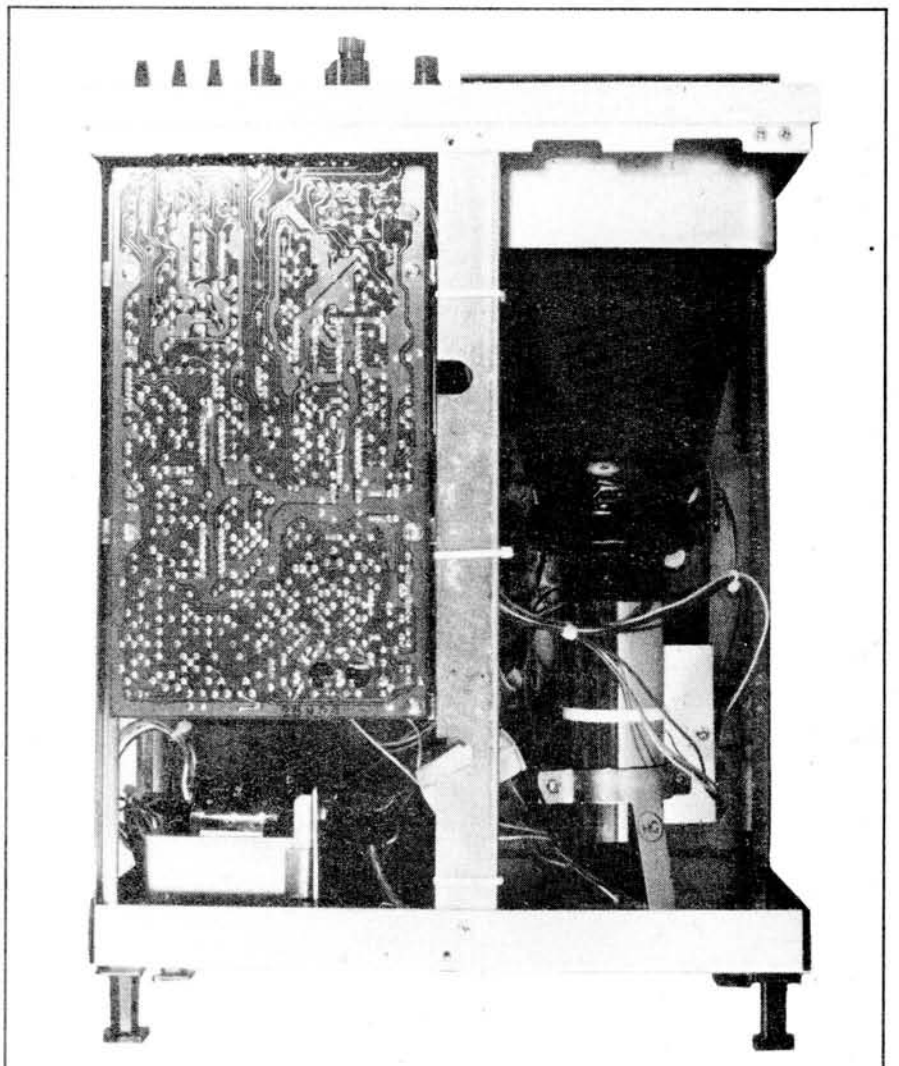
Timebase and amplifier p.c.b.s

the trace was found to be quite acceptable under normal ambient lighting conditions (i.e. with the usual benchlamp in operation nearby), and only when trying to view a single transient pulse did it prove necessary to shut out surrounding light.

The instrument case is constructed of steel sheet, and is fitted with a carrying handle and a tilt-foot which lifts the front by approximately 100mm. On the rear panel, which carries the mains input socket, voltage selector, fuse, and a BNC socket for the Z-mod input, four pillars give a neat stowage for the mains lead when not in use, and also double as feet should you need to operate the unit "screen-upwards".

Two signal amplifiers, Channel A and Channel B are provided, identical in their specification apart from a signal invert facility on Channel B, and fitted with BNC input sockets. The two channels can be used in the DUAL mode for simultaneous viewing of two time-related waveforms; in the ADD mode for displaying the sum or difference of two waveforms (differential input); or in X-Y mode for phase or frequency measurement (Channel B becomes the horizontal amplifier). When operating in the DUAL mode, the two signals are chopped at about 200kHz for timebase sweep rates of 1ms per division or slower, but they are displayed alternately for sweep rates of 0.5ms per division and above.

That same dividing line of sweep rate automatically determines whether the line or field output of the inbuilt sync separator is used for triggering when the SYNC selector is set to its TV position. That sync separator is very effective indeed, even to producing a



Top view of the OS-620 with cover removed

★ MAKER'S SPECIFICATIONS

VERTICAL DEFLECTION

Deflection factor:	5mV to 20V/div. in 12 ranges in 1–2–5 sequence with fine control
Bandwidth:	DC: d.c. to 20MHz (–3dB) AC: 10Hz to 20MHz (–3dB)
Risetime:	<17.5ns
Overshoot:	<3%
Input impedance:	1MΩ shunted by 20pF ±3pF (Max input 600V p-p or 300V d.c. + a.c. peak)
Operating Modes:	CH-A, CH-B, DUAL and ADD
Chop frequency:	200kHz approx.
Channel separation:	>60dB at 1kHz
CH-B polarity:	CH-B can be inverted

TIME BASE

Type:	Automatic and triggered. In auto mode, sweep is obtained without input signal
Sweep time:	0.2µs to 0.5s/div. in 20 ranges in 1–2–5 sequence with fine control and X–Y
Magnifier:	×5 at all ranges
Linearity:	Better than 3%

TRIGGERING

Sensitivity:	INT: 1 div. or more EXT: 1V p-p or more
Source:	INT, CH-B, LINE or EXT
Trigger level:	Positive or negative, continuously variable level control. Pull for AUTO
Range:	20Hz to 20MHz or more
Sync:	AC, HF Rej, TV (Each + or –)

HORIZONTAL DEFLECTION

Deflection factor:	5mV to 20V/div. in 12 ranges in 1–2–5 sequence with fine control
Frequency response:	d.c. to 1MHz (–3dB)
Input impedance:	1MΩ shunted by 20pF ±3pF
Max input:	600V p-p or 300V d.c. + a.c. peak
X–Y mode:	Selected by SWEEP TIME/DIV switch. CH–A: Y axis CH–B: X axis
Intensity modulation:	3V–50V p-p (+ bright)

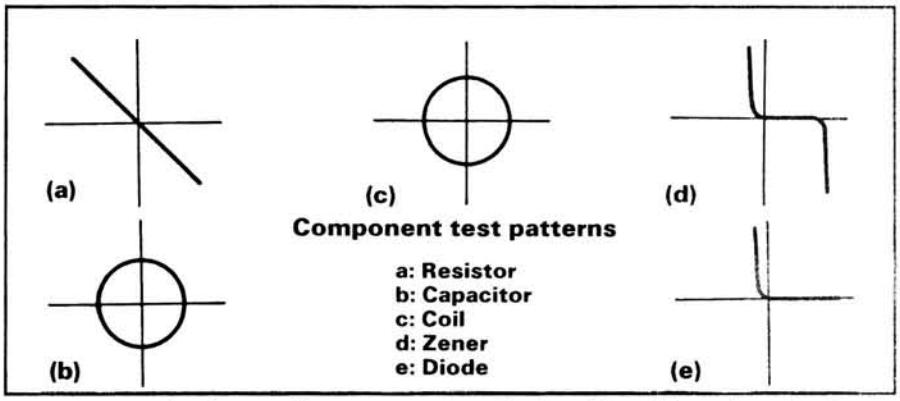
GENERAL

CRT e.h.t.:	2kV approx.
Calibration voltage:	0.5V p-p ±5% squarewave
Power requirements:	100/120/220/240V 50/60Hz 19VA
Dimensions:	(H)162 × (W)294 × (D)352mm
Weight:	7kg approx.

rock-steady display of either field or line rate waveforms when waved near a word processor screen! The HF REJ position of the SYNC selector inserts a low-pass filter into sync circuit input, to remove r.f. which might cause erratic triggering. Triggering can also be at a.c. mains frequency, or from an external source via a BNC socket. Our lab tests showed that a 1kHz squarewave will trigger the display solidly down to a 0.2-division-high display, and sinewave signals up to 50MHz can be satisfactorily synchronised.

Variable controls give continuous adjustments between the switched range steps for sweep rate and amplifier sensitivity. These controls must be set to their CAL positions for accurate measurements using the c.r.t. graticule.

The Instruction Manual gives full details of the technical specification, plus information on operation, circuit description, plus maintenance and adjustments, together with full parts lists, circuit diagrams and p.c.b. layouts. It is a very good manual, 29 pages long, with just the occasional hint of "Oriental English". The only word that really caused some head-scratching was a preset control labelled JEOME, connected to the c.r.t. first anode. This was eventually worked out to mean GEOM, standing for "geometry".



Component test patterns

a: Resistor
b: Capacitor
c: Coil
d: Zener
e: Diode

Probes

The two slim-line, switched ×1/×10 probes have a 10MHz bandwidth in the ×1 position, with a rise-time of 35ns. The input impedance is that of the oscilloscope plus the 40pF of the 1.2m connecting cable.

In the ×10 position, the probe bandwidth is d.c. to 250MHz, rise-time 1.4ns, and input impedance 10MΩ in parallel with 11.5pF. Accessories supplied with each probe are spring-loaded test-hook, i.c. test-tip, insulating tip, BNC adaptor, compensating tool and 300mm ground lead.

Our thanks to **Black Star Ltd** of **St. Ives, Huntingdon, Cambs,** telephone 0480 62440, for the loan of the review instrument. For details of price and availability, see our Special Offer below. ***PW***

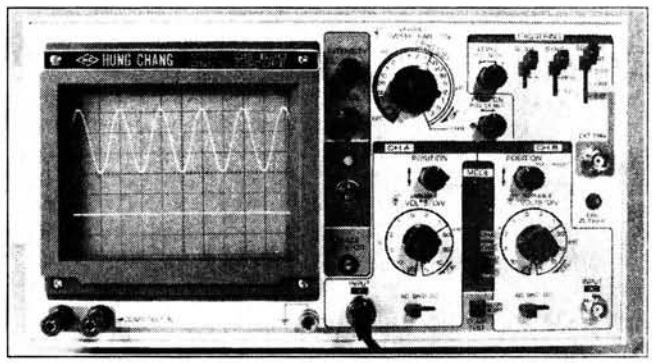
★ Special Offer ★

20MHz DUAL-TRACE OSCILLOSCOPE

Just £333.00 including two ×1/×10 switched probes, instruction/service manual and carriage and packing

A calibrated wide-band oscilloscope is probably the single most useful test and measuring instrument for radio or electronics work. This month, we are pleased to be able to offer our readers the Hung Chang Model OS-620 dual-trace oscilloscope, which has a 3dB bandwidth of 20MHz, a high-brightness, 5in diagonal, flat-faced c.r.t., an effective TV video sync filter, and offers X-Y mode, Z-modulation *and* a component test facility. For further technical details see the review starting on page 49 of this issue.

The OS-620 with two probes and the instruction/service manual is normally priced at £362.25 including carriage and VAT. We offer it to our readers this month at £333.00 inclusive.



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On The Air
On The HF Bands

Reports to Paul Essery G3KFE
Practical Wireless, Enefco House, The Quay, Poole, Dorset BH15 1PP

Immediately last month's piece was safely into the post, the columnar horseless carriage was aimed in a generally south-west direction for a holiday. I did take a v.h.f. rig, but that of course had to expire on the way, in accordance with the requirements of Murphy's Law. However, as it began as an intermittent, there are several puzzled users of the West Country repeaters to whom I owe an apology and the promise that yes I have mended it, and properly too! Other delights were an evening at Goonhilly (thanks, G4PEM), and a visit to the Cornish Rally. A very pleasant evening was spent with Colin G0AEA, who mentioned the Scillonian Air Day activity he is putting on over the weekend of September 19/20. This commemorates the first commercial aircraft landing on the Isles of Scilly fifty years ago—and a couple of years later the islands were host to Sunderlands, Catalinas, and Hurricanes! Now of course, St. Mary's airport receives regular BIH, Skybus and Brymon flights with no need at all to use the golf course. I can't help but wonder how their history would have changed had that first landing found a bunker!

Actually, G0AEA's QTH is at the highest point, at Telegraph, from whence he has worked EA8 on 144MHz. He uses a ground-mounted vertical to work h.f. with great success, despite being surrounded by masts—Decca Navigator station, TV and coastguard antennas within yards. Because of the winds, Colin cranks his tilt-over mast down to ground after each v.h.f. operating session—so even a near-perfect site has its snags.

I must add that this holiday was the longest I've had in years, and hence I don't have much idea of what happened on the bands apart from your letters. Letters are always in short supply at this holiday season, so bear with me.

Sunspots

Evidence that the new cycle is definitely under way continues to accumulate, and while the month under review saw some flat days, it also saw some days on which sunspot activity was high enough for 28MHz to open, and even 50MHz.

Bands

As always, "yer pays yer money and yer takes yer choice". On 28MHz, **G2HKU** (Sheppey) offers a heck of a lot of static(!) plus c.w. contacts with EA3JJ, UB5BAZ, YQ0A, TK/F6BUM and I0BAM. The latter, noting that G2HKU had heard much Spanish and Italian CB within the amateur band, passed on a request that anyone coming across Italian CB signals should try and copy as much detail as to name and address as possible, list them all up and pass them on to the Italian Society, ARI. It seems the Italian authorities are having a crackdown on these out-of-band and high-power CBers.

Another one to look at 28MHz was **Leighton Smart** (Trelewis) who noted W2LOT at 2110Z on July 19, then KA1HXY and KA1IMY, the latter at 2136.

G3BSN (London SW9) found activity on most days during the month, and worked 4X5000 (a special event station), LA2CBA, OK2PO, SM7PVH, plus, on the evening of July 17, K2ARO, KA1PCN, PP1BG and LU2DF. Activity was noted right up to 50MHz. In general the band seemed to open up in the early morning, then close for a period, followed by a second phase starting around 1400Z on most days and lasting well into the evening.

The 1.8MHz Band

This is the time of the year when only the stalwarts are active—but by the time you get to read this conditions will have improved and static levels fallen somewhat. Certainly on the two occasions when I switched to Top Band, I was all but deafened by the QRN. G2HKU has been too busy for much activity, but did find time for a s.s.b. QSO with ON7BW on the band.

G3BRD (Seaford) is hoping to complete his DXCC fairly quickly when the new DX season starts, in which case he will have done it in under the year. Doubtless then he will be sitting like a cat on hot bricks waiting for the QSLs to come in! So far, John has 85 countries and he reckons that his success is largely due to his original design of antenna; I have his promise of an article on it in the near future. It is by no means a "One-Band Wonder" either; used with an a.t.u. it has been yielding some quite acceptable results on 3.5MHz too. Mentioned this time are c.w. QSOs with 3C1CW, LU2YE, UA9CBO, YO3CD, UB5GLO, UG6GAW, UO5OOA, VE1ZZ, W3BGN, HG9R, OK1DOT and UT5UIR.

John adds a brace of Candidates for the Clot of the Month Award—DJ and OK stations who sat ragchewing on top of 3C2A for thirty minutes while the "Top Band World" waited for a chance to work him on the last night of the DXpedition!

Still with Top Band, I have noted that right up to 14MHz it is easier to work east than west from here, no matter what antenna is tried, the effect becoming more marked as I come down in frequency. A first look at the site would suggest that if there is going to be a problem it would in fact be harder to work to the east. The problem is not a function of antennas as such, nor does there seem to be a local absorption effect in house-wiring. Indeed on 14MHz, while beaming west it is hard to work eastern seaboard Ws while UA0s give 59 reports; reversing the beam makes the Ws totally disappear and the UA0s come up to 59+—odd!

Another one threatening to appear on Top Band is GW3FXI, heard for the first time on the local net—though to be fair, for the moment there are higher priorities than amateur radio.

Your deadlines for the next three issues are:
September 26
October 28
November 27

Finally, it won't be hot news anymore by the time I reach you, the YOs have been licensed for Top Band—their band is 1.810–1.860MHz. Thanks *ARRL DX Bulletin* and the weeklies for this news.

Contests

Autumn is the season for these, of course; but one could wish that administrations would do something to reduce the numbers of tuppenny-ha'penny ones that clash with the bigger contests and serve no real competitive purpose. *CQ Magazine* have the first CQ WW RTTY Contest scheduled for September 26/27. Rules are shown more fully in RTTY on page 62; mailing deadline for all entries is December 1, to CQ RTTY Contest, 76 N. Broadway, Hicksville NY 11801, USA. October 24/25 is the CQ WW DX Phone contest, and November 28/29 the CQ WW CW Contest, for which the rules are unchanged from the previous year. On October 3/4 there is the VK/ZL/Oceania SSB contest and on October 10/11 the VK/ZL Oceania CW contest. The RSGB's 21MHz CW is on October 18 and October 11 sees the RSGB 21/28MHz Phone contest.

Coming Along

Our news under this heading is as usual mainly thanks to the weekly outputs from *The DX Bulletin* and *DX News Sheet*.

Various people seem to be able to operate from China. BY1QH is reported as having been activated by NS7Z, and F2JD who was TR8JD and TR0AB is noted to be in China from July-end, although at the time of writing it isn't known whether he will be able to operate.

DXNS, noting details of some EP activities, wonders aloud just how many of the currently active EP stations are alright for DXCC purposes.

Looking forward a little, FT8Z, Amsterdam & St. Paul should be active from December-time, as I hear that F6CZB, who was J28EI, will be there and promises activity on nine bands, mainly in c.w. mode.

The Andaman Is. are rumoured to be the subject of tentative plans to activate this one again after September 1.

I am distinctly puzzled by the question of the YA stations; despite the appearance of several Russian callsigns /YA and claiming to be in Afghanistan, the noises emanating from Moscow are very firmly on the track of "no legal operation from YA as yet!"

That SO operation by the Lynx DX Group which I mentioned last time seems to have been delayed—how long for I don't know at the moment. Don't forget that if this one comes off, it might well become a new DXCC country.

On the subject of phoneys, I have two to mention; HV0FE is confirmed to be a dud, as is the HZ1MR recently noted; the only legal HVs are HV3SJ and HV1CN, while the active HZs are; HZ1AB, HZ1HZ, HZ1FM, HZ1TA, and HZ1HA. Yet another phoney was the J20/Q who appeared for several hours on July 26 on 14.013MHz. Seems like dud ZAs are going out of fashion!

It'll be history by the time you get to read this, but the Market Reef operation has been going well; the QSLs go to OH0NA for this one.

Although there are no legitimate Tunisian stations at the time of writing, I understand that 3V8FRA will be active legally between October 19–27; and of course this implies the recent 3V8AQ activity wasn't legitimate.

In the line of Busted Flushes, that Andorran activity of KV4AM came to an abrupt stop when he found the promised TVI-less spot on the mountain turned out to be in the bottom of a valley close by a low-power TV repeater!

New Bands

It really is quite amazing how few people are reporting activity on these new bands; indeed I often get little comments in the mail which imply that on 18 and 24MHz at least, the writers have never heard an amateur signal! However, the patient ones usually find something or other.

In fact, our only reporter was G3BSN, who says his total of Gotaways even was lower than last month, including DL, EA, I, LZ, SM, UA and the UK, while those worked were UQ1XX, YU3IB and DL3NCW. Much higher up the band, on a measured 10.122MHz, was the lonely signal from DL7HC. Why can't users of this band spread out a bit more—it would help things along no end I believe.

The 3.5MHz Band

Firstly a word from a new reporter, namely **Glyn G4CFS** (Finningley), who has been away from the hobby for eight years due to work commitments. Glyn runs a completely home-brew station at 3 watts, and in his first five days managed lots of QSOs of which he singles out G0AEG (Oxford), G5RV (Burgess Hill), G4WDM (Essex), GW4CC (Swansea) and G3PBA in Slough as the best. The antenna is a G5RV with centre at 8m and ends sloping down to about 2m.

Talking of QRP, our local 3.5MHz net this morning (August 2) was pleased to receive a check-in from Tony G4ZFY, down in Southampton, who has 10W of s.s.b. to a mediocre (for the moment) antenna; despite our local collection of equally mediocre, or worse, antennas, G4ZFY was solid copy to all of us among the mountains of mid-Wales. So—give it a whirl, this QRP can be FUN, and it sharpens up your operating technique too!

G0HGA (Stevenage) is another QRP operator. On 3.5MHz her Gotaways included WB1CAG, K4EG, 4N3BSA, EA3EGV, but she did get the coconut for PB0AES, SK4AO/4, DL6FBE, Y47YI/P, PA0VYL, GW0FJY through QSB, QRN, and QRM, OK3CSA, G0CEK in Durham, IE5GB, G3ZQS, DH9SBF/P, G0FCW (Yorkshire), ON5IG, GM3TMK and ON4APD.

Leighton Smart (Trelewis) found PU9WAW, ZS1MH, PU5BHX, PY3JZ, LU1IV, CE3ESS, VK6AD, CK1CBF, PU1AAJ and ZD7CW.

Help!

I have a letter from **John Clarke TK5FF/G8KA** who worked Julian ZD7CW, back on 29 January 1985, and wants his QSL address. If anyone can help, could they pass the word on to: John Clarke TK5FF/G8KA, Villa de l'Alzelli, Ocana Par, 20117 Cauro, Corse, France.

The 7MHz Band

Here's a band for you! I note that G2HKU managed to find OY1R and N4JIP. Nobody else even mentions the band.

The 14MHz Band

I have, as already stated, not been active due to holidays, but there were a couple of c.w. sessions, and as already indicated everything was to the east, out to UA0 and JA on c.w. and s.s.b. at exciter level during the middle of the day.

G0HGA (Stevenage) is QRP of course. Angie notes that those who realise she is QRP will often go to great trouble to pull her through a QSO, but many others don't want to know or will only give a quick report. Certainly if there is DX about, not many people will go to the length of a rubber-stamp QSO—but I am sure if Angie sent, instead of "QRP", "YL QRP" she'd have a higher return rate! Seriously, G0HGA's c.w. rang the bell with UA1TAW, IK0ADY, YO5AIR, IK0HTA, HA1DLS, DK8TC, LZ2KML, OH8BGM, OF5OZ, HB9O, YZ1DL, UZ3AYR, UA3DCW, YU4GJK, TK/DK9UE, YT0UNI, YU3GJ, HA6QU, EA, EA7, I0PL, SP6BFG, PA2SAM, I4DHI and YU1RZ. Gotaways included VK6HQ, OX7AN, Y31ZB/Y38NG and C31LBB.

Leighton Smart noted LU2FFN, 4U1UN, VX3MDE, a special call working PA3BFC, VE8RCS, HS0B, UZ4WWG and LU1EPQ.

The 21MHz Band

On the better days 21MHz has been quite lively, obviously. It should be realised that while there can be a sunspot count of over 100 today and nothing tomorrow, as at the bottom of the cycle, it has to be accepted that 21MHz is not the reliable DX producer which it will be in a couple of years. Thus the motto must be "keep a weather eye open and snaffle any DX that pops up!"

This is the motto practised by G0HGA, but so far Angie hasn't quite clicked with the real DX. However, she is now able to enjoy such delights as a 50 minute rag-chew with HB9CWZ, using 500 watts to her 3 watts, another 25-minute session with SP6WM, and a very near miss with UZ9AD, and of course shoals of rubber-stamp QSOs all over Europe. In fact, if G0HGA tots up her countries worked score she may have a pleasant surprise!

Finale

We can always use more support for this section; it is on the odd occasion when the stalwarts are away that the shortage becomes noticeable. Remember, that DX is something individual, and if you are chuffed to work your first W, there are folk who want to read about it and are happy for you, simply because they themselves have never managed a W yet! So—send your reports, to reach us by the dates noted in the box. Meantime, work DX, and have fun. 73 de GW3KFE.

VHF Up

Reports to Norman Fitch G3FPK
40 Eskdale Gardens, Purley, Surrey CR2 1EZ.

The middle third of July provided some useful 144MHz Es openings with some long DX worked by some lucky people. The 50MHz band has seen some spectacular openings to distant parts while some operators have made E-layer contacts into Europe with very low power.

The Awards Program

Irwin Brown GI1JUS (XO21g) is a well known v.h.f. operator from Newtownabbey in County Antrim. He has become the 81st member of the 144MHz QTH Squares Century Club and his certificate was issued on July 14 for exactly 100 squares confirmed.

23 countries were represented which is a good achievement from such a westerly part of Europe. 78 QSOs were on tropo, 13 via Es, 7 via Ar and two on m.s. mode. Best DX were YU1LA (KE) at 2175km and HG8CL (KG) at 2080km, both via Es. Irwin's station comprises a Yaesu FT-221R with MuTek board and BNOS LPM144-10-100 amplifier with a Tonna 9-ele Yagi at 10.5m, the site being 61m a.s.l.

Alex Della Casa I4YNO (FE25e) from Modena was issued his 225 confirmed sticker for certificate no. 60 on August 1. 11 QSOs were by c.w. m.s., 7 via Es, 6 on tropo and one by f.a.i. or field aligned irregularity mode. The latter was with YO3JW (NE) in Bucarest on June 7 this year.

Paul Brockett G1LSB from Spalding (LCN) was elected to membership of the 430MHz v.h.f. Century Club on June 2 which should have been included in last month's VHF Up. He is the 43rd member. Paul was first licensed in December 1984 and moved to his present QTH on 20 Feb 1986. His station consists of an Icom IC-471H, 80W output to a 21-ele Tonna Yagi at 16m a.g.l. He uses a 3SK97 GaAs.f.e.t. masthead pre-amp at his sea level site. Four 21-ele Yagis are planned.

For details of *PW* v.h.f. awards send an s.a.e. to the Awards Dept., Enefco House, The Quay, Poole, Dorset, BH15 1PP.

Contest Notes

The results of the BARTG Spring v.h.f./u.h.f. contest have been received. From the logs it appeared that the conditions on April 11/12 ". . . were worse than normal for a BARTG contest . . ." according to the adjudicator's remarks. Winner of the Single-op 144MHz section was GU4YMV with 311 points, runner up being G1IQN/P with 234. There were 15 entries.

Only five entries were listed in the 144MHz Multi-op part, winner being G4SKA/P with 488 pts. G3WOR/P with 266 was second. G4LAU won the 432MHz Single-op event with 13 pts. joint runners up being G4STO and GU4YMV with 10. Only seven entries here. Lastly, only two entries in the 432MHz Multi-op part with G1SSR/P the winner with 23 pts.

Entries were down this year with no s.w.l. or 1.3GHz entries received. I wonder if this is because many one time RTTY enthusiasts are now "going packet"?

The last leg of the 10GHz Cumulatives is on Sept 13, 0900-2100GMT. Immediately afterwards, send your entries to G4FRE at 15 Ferry Lane, Cavendish Park, Felix-

stowe, Suffolk IP11 8UR, postmarked no later than Sept 28.

On Sept 20, 0900-1600UTC there is the 70MHz Trophy and s.w.l. event. Three sections; Fixed, All-other and s.w.l. Entries to G4NBS, 10 Quince Road, The Limes, Hardwick, Cambridge CB3 7XJ.

The weekend Oct 3/4 sees two major contests from 1440-1400UTC, both for 430MHz up. The IARU version has Single and All-other station categories with scoring at one point per kilometre. The RSGB event is for Single-op, Multi-op and s.w.l. categories with the same scoring system. Entries to GM8MJV, 2 Dudley Avenue South, Edinburgh EH6 4PJ.

The first of the five legs of the 430MHz Cumulatives is on Oct 8, 1930-2200UTC. These are for Fixed and All-other categories with a "normalised" scoring system which is alleged to make the contest fairer.

The first leg of the 1.3/2.3GHz Cumulative sessions is on Oct 16, 1930-2200 with similar rules to the previous event including the normalised scoring idea.

South African News

Hal Lund ZS6WB has sent a most interesting news sheet called *VHF News*, Issue 87-15 dated July 26. Obviously there is little scope for the extensive activity we enjoy in Europe so there is considerable interest in moonbounce (e.m.e.) activity on 144MHz and above. Also the ZS amateurs have had a 50MHz band for years and they are looking forward to some trans-equatorial propagation (t.e.p.) tests from Sept 26 to Nov 1.

An interesting item is that ZS6BNT has kits for various v.h.f. projects available including the *PW* Meon 50/28MHz transverter from the October 1985 issue.

They use the Universal or Maidenhead locator system and the news letter mentions activity from "rare grid squares." A22KZ will be active on 50MHz from KG19 until early December when he returns to the UK from Botswana. ZS6ALE is QRV from 0800UTC on 144.250MHz with a 128-ele array so has e.m.e. capability it would seem from KG46. ZS4NS (KF29) is reported to be QRV on 50MHz around the end of September.

Hal mentions that the August *QST* magazine reports a confirmed Es QSO between W5HUQ/4 in Florida and K5UGM in Texas —on 220MHz. This is claimed to be a "first" Es contact on the band but no further information was given. (I recall reports of Band 3 TV reception via Es around 180MHz).

Beacon Information

GB3HV is a new beacon/f.m. TV relay in the 1.3GHz band. It is on channel RMT3 which is 1.248GHz input and 1.308GHz output. The location is High Wycombe (BKS) at locator IO91OO. When not in repeater use it goes into beacon mode and from 0800 to 2230UTC it transmits test sequences and pages of information for 30 minutes on the hour. Reports go to G6GIF who is QTHR.

ZS6WB reports progress on the Pretoria 50MHz beacon which will be on 50.0225MHz and run 50W to a 4-ele Yagi at 15m a.g.l. It was hoped to have this operational by Sept 1 in time for the t.e.p. season and beaming towards Europe. A similar beacon in Windhoek in Namibia (ZS3) on 50.0275MHz is mentioned, also beaming north, but no callsigns were given.

The 50MHz Band

Ladies first and **Diana Segal G1DMS** (LDN) has sent a copy of QSL from Leta Ladd WA2QCE in New Jersey confirming what could be the first YL-to-YL 50MHz QSO between the two countries and probably Europe. It was on July 17 at 2126GMT, Diana receiving an RS55 report. Any challengers?

Julie Yates G8MKD (WMD) could not work any Ws on July 21 but did copy a dozen assorted W/VE stations; not bad on an indoor rotatable dipole. She has been working cross-band to 28MHz stations in DL, EA, F, OH and OZ and has made in-band QSOs with CT4KQ (WA) on the 15th, LA6QBA (GV) on the 17th and 20th, and LA1BEA/P (CT), CT1WW (WB), LA9UX (FT) and LA6QBA again on the 19th.

Dave Ackrill G0DJA (WMD) now has 3W available and is experimenting with a 2-ele quad antenna which, if it proves satisfactory, will go on the chimney. Up to July 12 he had missed the good lifts but had heard CT0WW beacon and GB3RMK on a dipole in the loft. Dave has also heard the Greenland beacon OX3VHF on 50.045MHz.

Bob Nixon G1KDF (LNH) has contacted 17 countries on the band if you count EA, F and PA as "legit." He lists LA6QBA on July 10, CT1LN on the 13th, CT4KQ on the 15th, GM3WOJ and GM4ZBE via backscatter on the 18th, CT3DK in Madeira (IM12) and CT4PI (VZ) on the 19th and GJ8EZA on the 20th. Best DX were from 2255 on the 21st when Bob worked VE1BNN (FN84) with other W1, W2, W4 and VE1s heard.

G1KDF says how useful beacon CT0WW is for indication of E-layer propagation. **Greg Lovelock G3III** (WKS) reports reception of it on July 21, 22, 23, 26 and 27 usually between 0700 and 1100UTC at between S2 and S9-plus lots. He says, "It pops up like a cork out of a bottle."

Ken Osborne G4IGO (SOM) worked W6JKV/YV0 (FK85) on June 24, the only DX heard between 1723 and 1908. On July 10 he copied OX3VHF at S9 for 16 minutes from 2100. On the 15th GB3SIX was copied up to S3 between 1939 and 2100 but at an azimuth of 250-260° instead of the great circle bearing of about 340°; nothing else was heard.

On the 17th, 2032-2148, Ken worked WB8KRY and WA3USH (EN91), K2OS (FN13), W3WFM (FM19), VE3NPB (FN25), W9IP/2 (FN24), K8WKZ in Ohio and G8UGK/W2 in Syracuse. CT3DK and assorted LAs were worked on the 19th but there was another big W/VE opening on the 21st between 1820 and 2333 at least. Stations worked were WA1OUB and K1RSA (FN43), VE1BNN (FN24), WA1AYS, and K9ES/1 (FN42), W2CAP/1 (FN41) and VE1YX (FN74), with as many again in similar squares heard.

Flemming Jul-Christensen G4MJC (SXE) has 0.5W from a *PW* Meon transverter which has brought him QSOs with CT1WW on July 13 and LA6QBA and LA9DL (FT) on the 20th and 21st respectively. Several Ws and a VE1 were heard on the 21st.

Jerry Russell G4SEU (WKS) has a Yaesu FT-902DM, FTV-901R combination for 50MHz the antenna being a 50/70MHz interlaced Yagi with 5-elements on the band. He has worked GD3TNF/P, CT1WW, LA6QBA, LA9UX, LA1BEA/P and LA2AB (FT). Strong VEs were heard on July 21 presumably, via a dipole in the loft.

Mike Johnson G6AJE (LEC) mentions I2FHW (EE) and c.w. at about 1200 on June 28, plus the regular LAs and CTs in July. On the 21st he heard VE1YX and K1IKM (FN41) but realises he needs a

QTH Locator Squares Table

Station	Band (MHz) 1296	430	144	Total
G3IMV	11	116	400	527
G4KUX	—	80	345	425
G4IJE	—	—	338	338
G8GXP	30	140	307	477
G4DHF	—	—	297	297
DL8FBD	—	69	274	343
GJ4ICD	59	117	250	426
G4NQC	63	99	250	412
G4DEZ	44	38	246	328
GW4LXO	45	100	240	385
G4XEN	—	98	240	338
G4SWX	—	—	239	239
G4RGK	35	93	238	366
G8XVJ	18	88	236	342
I4YNO	—	—	225	225
G3FPK	—	—	221	221
G3UVR	63	113	217	393
G4IGO	—	—	216	216
G4SFY	—	—	216	216
G4MEJ	—	—	211	211
G1EZF	32	86	200	318
G8LFB	—	—	200	200
G6ECM	—	—	200	200
G6XVV	20	64	194	278
G6HKS	—	65	186	251
G4MJC	—	33	184	217
G3XDY	81	132	182	395
G4TIF	—	106	179	285
GM4CXP	—	30	179	209
G4XEK	—	—	178	178
G6DER	70	104	177	351
G4YUZ	—	—	177	177
G3COJ	44	102	175	321
G4SSO	—	56	173	229
G3JXN	80	126	172	378
G4DOL	—	—	163	163
G6HKM	16	98	161	275
G4YCD	—	36	155	191
G1EGC	—	44	154	198
G0DAZ	—	91	147	238
G4MUT	24	87	144	255
G1KDF	24	86	143	253
G4HGT	—	52	142	194
G6DZH	—	82	138	220
EI5FK	—	25	136	161
G6MGL	50	89	135	274
G8ATK	42	89	135	266
G8ZDS	—	43	129	172
G8PNN	58	94	128	280
G6YLO	32	104	128	264
GW8UCQ	—	81	128	209
GJ6TMM	—	31	128	159
G8MKD	—	49	127	176
G1GEY	—	30	124	154
GM0BPY	—	54	123	177
G6XRK	—	1	117	118
ON1CAK	—	—	117	117
G4TGK	—	—	106	106
GW8VHI	—	48	102	150
G8XTJ	—	—	99	99
G4CQM	—	52	94	146
G6AJE	1	52	91	144
G1LSB	—	111	88	199
G4NBS	56	95	86	237
G4FRE	63	136	84	283
GW6VZW	—	6	83	89
G4FVK	17	43	71	131
G6MXL	9	34	58	101
G8LHT	—	22	56	78
G1CRH	—	—	56	56
G0HDZ	—	—	55	55
G0FBG/PA	—	17	54	71
GU4HUY	—	—	54	54
GW4FRX	—	—	50	50
G0FOT	—	54	49	103
G1DOX	20	27	49	96
GM8BDX	13	31	41	85
G1NVB	—	—	41	41
GM0GDL	—	7	38	45
G6CSY	16	39	34	89
G8PYP	—	—	33	33
G2DHV	1	4	27	32
G1VTR	—	23	6	29
G4JZF/P	—	80	—	80

Starting date January 1 1975.
No satellite or repeater QSOs.
"Band of the month" 144MHz.

better antenna and that his site is not very good to the northwest.

Colin Redwood G6MXL (DOR) is now on the band using a Yaesu FT-290 and MuTek transverter with dipole antenna. July 17 brought LA6QBA and WB8KRY. Some European cross-band activity to 28MHz was rewarding on the 21st to DL, HB, OE and OZ stations.

Ron Oakley G8GRT (CBE) has been listening and calling a lot since the band was released to Class B licensees. On July 10 he copied OX3VHF up to S6. CT4KQ was worked on the 11th and his tally up to the 16th was 16 counties and three countries using 2.5W to dipoles at 12m.

Geoff Brown GJ4ICD submitted a very detailed report on stations heard and worked up to July 21 and he now has 57 squares worked. From his 24-page report, it is obvious that E-layer propagation in the Band I TV and amateur 50MHz allocation occurred almost daily but he concludes that Jersey stations seem to do better than most other British Isles folk, often hearing stations not copiable on the mainland.

He mentions the consistency of GM3JIJ (WS) who, ". . with his 2.5W is always S9-plus in Jersey." By contrast nothing was heard of the North America opening around 2200 on July 17. An interesting observation seems to cast doubt on the idea of double-hop E-layer contacts. On July 4 at 1915 GJ4ICD worked CT3BX, QRB 2205km. LA6QBA/P called in at S9-plus, QRB 1621km. Now from either end, CT and LA, the beam headings are almost the same to Jersey yet although Geoff was copying them both very strongly, the LA and the CT3 could not hear each other.

A similar event occurred on the 19th at 1901 when GJ4ICD had a 30 minutes QSO with CT3DK but this time the LA was heard in Madeira, so what are we to conclude about this phenomenon? Thanks for a very interesting report, Geoff. It will keep F8SH going for months!

Kevin Johnston GW4BCB (GNS) has written about the June 19 opening to N. America, the first station worked being WA1OUB at 1756. From 1900, many signals were "end stop" on the pessimistic FT-101 S-meter but always from a small geographical area at any one time. No signals were heard after 2015, exactly as G3BDQ reported last month. (My "ASTRO" computer program calculates Kevin's sunset time as 2026UTC—centre of disc, uncorrected for atmospheric effects.)

Dave Lewis GW4HBK (GWT) worked W6JKV/YV0 on June 24 and heard the OX beacon at 2058 on July 10. W2IDZ, KA1MFA and VE1BPY were heard on the 17th and VE1YX and KA1PE on the 21st. Dave is unhappy about the general release of the band since, during openings, there are local QSOs going on on 50.100 s.s.b., people between 50.100 and 50.110MHz calling for cross-band contacts, ". . . and general Bedlam whenever any DX appears." It is just the same on 144MHz in an Es opening, of course, some operators assuming that he who shouts loudest and longest will work the DX.

Finally I have to report that a few British operators have been worked while on holiday in countries that do not permit their own amateurs to use 50MHz. The lame excuse seems to be that their reciprocal licence wording says they can use the frequencies specified in their home licence. They conveniently forget that, notwithstanding this, they must also operate in accordance with local regulations. If the nationals of such countries want to flout their own regulations that is up to them but such selfish behaviour by a few British amateurs could lead to none of us getting reciprocal licences.

Annual v.h.f./u.h.f. table
January to December 1987

Station	70MHz Counties	70MHz Countries	144MHz Counties	144MHz Countries	430MHz Counties	430MHz Countries	1296MHz Counties	1296MHz Countries	Total Points
G1KDF	—	—	93	13	65	8	26	4	209
G6HKM	—	—	65	22	50	9	24	5	175
G4NBS	41	5	54	10	44	11	*15*	*6*	165
G1SWH	—	—	92	9	56	7	—	—	164
G1LSB	—	—	68	22	56	16	—	—	162
G6XVV	—	—	70	13	50	8	12	2	155
G1EHJ	—	—	58	12	53	9	—	—	132
G1GEY	—	—	65	15	41	8	—	—	129
G4DEZ	—	—	34	10	42	11	13	5	115
G4MUT	26	1	43	13	18	3	*5*	*2*	104
G8LHT	—	—	58	16	21	7	—	—	102
GW6VZW	—	—	65	21	9	2	—	—	97
G4VOZ	53	4	—	—	31	7	—	—	95
G4SEU	53	4	23	8	3	1	—	—	92
G4WJR	—	—	78	10	—	—	—	—	88
G6AJE	—	—	39	10	30	6	1	1	87
G3FPK	—	—	68	17	—	—	—	—	85
G6MXL	10	2	35	10	15	5	*7*	*2*	77
G4TGK	—	—	60	17	—	—	—	—	77
GW4FRX	—	—	65	12	—	—	—	—	77
G8XTJ	—	—	59	13	—	—	—	—	72
G4AGQ	13	1	29	9	13	4	*1*	*1*	69
G4YIR	—	—	57	12	—	—	—	—	69
G1CRH	—	—	56	12	—	—	—	—	68
G4ZTR	12	2	22	5	21	4	*2*	*1*	66
G0HDZ	—	—	53	11	—	—	—	—	64
G6MGL	—	—	25	6	25	2	1	3	62
ON1CAK	—	—	40	14	—	—	—	—	54
GW4HBK	45	6	—	—	—	—	—	—	51
G1VTR	—	—	16	2	22	5	—	—	45
G0HGA	—	—	37	7	—	—	—	—	44
G2DHV	11	2	21	5	3	1	—	—	43
G3EKP	13	3	12	3	7	3	—	—	41
GM4CXP	—	—	27	8	3	3	—	—	41
G4WND	25	4	—	—	—	—	—	—	29
G6XRK	—	—	8	6	—	—	—	—	14

Three bands only count for points. Non-scoring figures in italics.

The 70MHz Band

Bill Somerville-Large EI9FK (Co. Wicklow) sent a copy of his 70MHz Newsletter which he sends to regular operators on the band and very informative it is, too. He reports 1987 as a good year for cross-band 70/28MHz QSOs, the most recent session being on July 11 but he wonders how more overseas operators can be enticed to listen on 70MHz?

Jim Whittle G3EKP (LNH) used to write to *SWM* years ago and has now renewed his interest in the tables. He is disappointed that there are not more Class B operators on the band; the only one worked so far is G8SIC (CHS).

G4SEU reports a general increase in activity on f.m. due to the widespread acquisition of ex-p.m.r. transceivers now re-crystalled for 70.26 and 70.45MHz. The former QRG has become rather cluttered up so perhaps 70.425 and 70.475MHz might be sensible alternatives. On June 11 Gerry had a cross-band QSO with I5CTE (JN53XG) who was on 28.885MHz. G4SEU's antenna was a halo in the loft.

In-band QSOs including GM4ZUK/P (GRN) on July 5, G4WND/P (TWR) on the 25th plus a trio in DGL, GM0GTI, GM0HRP and GM6YZC, all -/P. EI4VBM/P (VM62j) and G4WND/P (NLD) on the 26th and G3UKU/P (CNL) on the 27th to bring his tally of counties to 53 so far this year.

Your deadlines for the next three issues are:
September 30
October 28
November 27

Like G3EKP, **Dave Meadows G4TGB** expresses disappointment that most of the Class B licensees appear to have opted for 50MHz. New stations worked from Mansfield (NOT) on f.m. were G3OVZ, G8UWJ and G4DME all in Derbyshire. using a halo antenna -/M from SK456606 (DYS) on July 7 he worked G3APY (NOT) and G4FMC (WKS), the latter again from home the next day. On a trip from Mansfield to the east coast on the 12th Dave worked G4BWW (LNH) at 136km, then G3VIP in Grimsby.

John Jennings G4VOZ (LEC) again notes the "once-a-year" stations that come on just prior to v.h.f. NFD. Operating from home in NFD weekend he worked 61 stations in 52 counties and four countries on c.w. and on s.s.b. 71 stations in 50 counties and four countries. He writes that several groups admitted they did not do well in the c.w. section due to lack of operators.

John reckons it is two years since "any serious operation has been heard on 70MHz from GI and GD and the situation is not much better from GJ/GU." New stations worked were G4OSJ and G6AFT both in NHM and G3IKR is back after moving. New f.m. stations worked were G8SYE and G4ZPL.

G6MXL operated in the phone section of NFD making 28 QSOs into G and GW from Dorset. Best DX included G3WUX/P (ESX), G4MEL/P (KNT), G3ZTZ/P (YSN), G4HNS/P (LCN), GW3UVR/P and GW3WAS/P. G8GRT has been busy building a transverter so may be on from CBE by now.

GW4HBK has been doing some cross-band work with SM6PU and DL9RM. Dave managed G4WND/P in both TWR and NLD plus EI4VBM/P on July 26 who was suffering from QRM due to Es signals from afar. Otherwise he found the band quiet.

Gordon Emmerson G8PNN (NLD) is now on the band, ". . . with a modest station . ." comprising a transverter and

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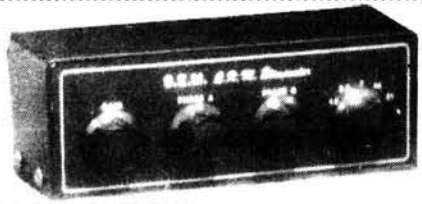

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modified p.m.r. amplifier giving 60W output to a home made 3-ele beam at 7.5m. Beacon GB3BUX and GB3ANG are always copiable from Morpeth and he worked 23 stations on s.s.b. in NFD in 17 counties but also wonders where everyone goes to after NFD.

The 144MHz Band

First the news from outside the UK. On June 7, a day when there was some good Es propagation, I4YNO worked YO3RG and YO5AVN/3 (NE) via f.a.i. mode and later in June, Alex worked his best f.a.i. DX to YO4AUL (OE) at 1406km. On June 26 he completed a QSO with GM6TKS (WS) on s.s.b. via random meteors at 1906km. Country no. 46 was UC2OEU (PM) worked via Es on June 7. On tropo, July 9 brought a QSO with IT9GSF/IG9 (GV) on Lampedusa Island which counts as Africa being Zone 33.

EI9FK caught a ". . . full blown, textbook Es opening . . ." the evening of July 21 in which Bill worked 10 Is and YUs in JN52, 53, 62, 65 and 75 plus a possible other two. **John McGowan EI2FN** (Co. Wicklow) sent a four page list of stations worked since May 29. He wishes more people would use c.w. mode on the band. He mentions the Autumn EI Counties Contest on Sept 13 wherein it should be possible to work some of the rarer EI counties.

Next the Es reports and I will not be able to cover these individually due to space limitations. Events were reported on June 30, July 10, 11, 13, 18-21 and 26, some rather fleeting, others more intense.

Readers reporting on these events include **Tony Wayland G1HJW** (ESX), G1KDF, Paul Brockett G1LSB (LCN), **Peter Atkins G4DOL** (DOR), G4IGO, G4MJC, **Ray Baker G4SFY** (NOR), **Ela Martyr G6HKM** (ESX), **Dave Gregory G8JDX** (DVN), **Ian Harwood G8LHT** (YSS), G8MKD, **Philip Murphy GI4OMK** (ATM), GJ4ICD, **Derrick Dance GM4CXP** (BDS) and **Paul Baker GW6VZW** (GWT).

On June 30, 1600-1700, G1HJW, G1KDF and G4IGO report QSOs with IW0BTS (GB), I7HCB (HB) and IK8IOO (IY) with EA and CT stations also heard around 1615 briefly. On July 10 it happened to the east and G1LSB, G4MJB, G6HKM and G8LHT between them worked SP8NCJ (LM), RB5AL (QL), RA3LE (QO), RB5EF (RI), UY5OE (SK) with UZ3YWB (RN) heard, times around 1650-1700.

On July 11, 0958-1014, G4IGO and GJ4ICD report hearing and/or working IW9AQS and IT9AUP (GX) and IT9DTX. An IS0 was also heard. On the 13th, 1602-1706, it was all happening to the south to Spain and North Africa as reported by G4IGO, G6HKM, G8JDX and GJ4ICD. Stations worked included CN8EO (WU), EA7DZI and EA7UH (WW), EA7CLH, EA7ERS and EA7WM (WX), EA7ECL (XW) and EA7CGH (YY). On the 19th, east coast stations, such as G4SWX, were heard working into Russia —UP, etc.

On July 20 there was a major opening, 1652-1730 which was reported by G1LSB, G4IGO, G4MJC, G4SFY, G8JDX, G8MKD, GI4OMK, GJ4ICD and GW6VZW; very widespread, some of the QSOs being quite short DX for the mode. Stations worked by various readers were IK3IUE and IW3EYG (FF), DL5MAE (FI), I6DQE (GD), I4SZJ (GE), IV3HWT, IV3TSA, YT3ET and YU3s AMC, ES and UKE in GF, OE5OLL (GI).

In HB, I7HCB, YT2AQ (HF), YT3NO, YU3LM and YU3RM (HG), OK1MDK and OK1VIF (HJ), YU3IT and YZ9HDE (IG), OK2KDS (IJ), OE3OBC, OE3RRA, SP6FUN and YT2GF (II), YU7CV (JF), OE3JPC (JG), HG2NP and HG7JAS (JH), OK2VIL and SP9CSQ (JJ), YU1AD and YU1DG (KE), YU1FC (KF) and UB5DAA (LI). On the morning of the 20th there was a short opening to EA3 and EA7, 1115-1130 when I heard Welsh stations working stations inaudible in London.

Another very widespread event occurred on the 21st, 1720-1758 as reported by G1KDF, G3FPK, G4DOL, G4IGO, G4SFY, G8JDX, G8MKD, GI4OMK, GJ4ICD and GM4CXP. At least 23 squares were worked as follows—IS0BHL (EZ), IW5BML, IW5BPE and IK0IXO/0 (FC), I5WHC (FD), DL5MAM (FI), I0JU, I0WWJ and IW0AKA (GB), I6CXD (GD), YU3ET (GF), YU3AN (GG), OE5OLL, YU2IQ (HE), OE6WIG, OE8HWQ, YT3KW, YU3EF and YU3UQX (HG).

In ID IW5BCC, YU2CCB, YZ9IW and YZ9KK (IF), HG3GR, YU2EZA and YZ9CAL (IG), HG1WD and HG5KF/1 (IH), OE1JNB, OE1XNC and OE3JPC (II), YU7NOU (JE), YU2OB, YU2OM, YU4EDO and YU7CV (JF), HG3ER, HG4KXG and HG8VF (JG), HG0SH, HG6ZB, HG5NF and HG8UG (JH), OE3CBU (JI), YU1EV, YU1OYR and YU7MJA (KE), HG8KAX, YU7s AS, EW, MS, PS, TU and VA (KF).

On the 26th there were three small events in different directions as reported by G4DOL, G8JDX and G3FPK. At 1609 G4DOL worked EA8BEX (SN) and at 1620 EA8XS (SO) and Peter heard nothing on Band I and II at this time. Between 1715 and 1735, IC8EGJ (HA) and 9H1FL (HV) and others in that area were copied at G3FPK. Then at 1835, G8JDX worked HG7JAS (JH).

I have plotted the paths of who worked what from your reports and on June 30, the reflecting point was over the Swiss Alps, on the 10th over western Poland, on the 13th over the north Spanish coast, on the 20th over Belgium—too near London! —and on the 21st on the Franco-German border approximately 8°E, 49°N.

Now the rest of the 144MHz news starting with **Angela Sitton G0HGA** (HFD) who used NFD to bump up her c.w. ladder totals nicely since it is quite in order to count contest QSOs in all our tables. She asked about working Es on c.w. and the usual method is to give short quick calls viz: CQ CQ CQ Es de G0HGA BK, until someone answers. But unless you have a fair amount of e.r.p. it is probably best to "tail end" someone who has just worked a DX station, just giving your own call.

Other readers who took advantage of NFD to add to their table scores were **Philip Everitt G1CRH** (CBE), **Roger Betts G1EHJ** (SFD), G1HJW, G1LSB, G4SFY, **John Wimble G4TGK** (KNT), **June Charles G4YIR** (ESX), G6AJE, Colin Redwood G6MXL (DOR), **Steve Damon G8PYP** (DOR), **John Fitzgerald G8XTJ** (BKS) and GW6VZW.

Laurence Howell GM4DMA returned to the Maureen Alpha platform on July 22 (AS69e) and G1KDF and GI4OMK worked him that evening. The next evening G4SFY and G3FPK were among many who contacted him.

SM6AFH/MM also came on from some choice North Sea squares. G8MKD worked him on July 5 when he was in AO and G4SFY contacted him the next day in BM. Conditions were good towards The Alps just before the start of NFD. **Ron Reynolds G6WEM** (ESX) worked HB9CCB/P (DH) and later in NFD to F, D, GJ, GM and 0Z2EDR (FQ). On July 4, a few hours before NFD, **John Quarmby G3XDY** (SFK) worked F1UO/P on Mont Blanc (DF), then I1KTC (JN45HK) and c.w.

Annual c.w. ladder

Station	Band (MHz) 70	144	430	µWave	Points
G4ZEC	—	516	—	—	516
G4XEN	—	182	11	—	193
G4ZNU	—	151	3	—	154
G4WHZ	—	139	—	—	139
G4OUT	—	129	—	—	129
G4VOZ	85	—	23	—	108
G4ZVS	—	102	—	—	102
G0HGA	—	79	—	—	79
G4YIR	—	73	—	—	73
G0DJA	—	64	—	—	64
G4YTR	—	56	—	—	56
G2DHV	15	28	1	—	44
G4AGQ	11	17	14	1	43
EI5FK	—	22	21	—	43
GM4CXP	—	27	—	—	27
GW4HBK	16	—	—	—	16
G0HDZ	—	9	—	—	9

Number of different stations worked since January 1.

The 430MHz Band

"Are people still using this band?" asks G1KDF who is still trying to complete a QSO with GM6TKS (WIL). Bob did just manage a contact with G3ZME/P (CNL) on July 28 though. By contrast, G1LSB lists some nice DX worked in NFD into EI, GM, D, several OZs in EP, EQ and FQ, LA1YCA (DS) and F1KLI/P (AE) in 905km. July 6 brought LA1ZE (CS) and LA2FV (FT), with TV6YGS (YG) on the 18th, also worked by G3XDY. John contacted a number of OZs in NFD, too, and on July 14, although beacon LA6UHF (CT) was a good signal, no LAs were heard.

G6AJE shouts himself hoarse on Monday evenings, supposedly Activity Night, on s.s.b. and f.m. but with very few replies. Mike suggests some of those in the tables might care to come on once in a while to boost activity. G6HKM worked GI4GVS (ATM), DD3KF and ON4YZ on July 13 and DB8KN and PE1EWR the next day in the Dutch u.h.f. Activity Contest.

After about five years, G8LHT is back on again from a new QTH using a Yaesu FT-101E and transverter to an MBM48 Multibeam at 12m. Best DX so far OZ2EDR/P in NFD.

G8XTJ says that many operators seem to have traded in their 430MHz gear for 50MHz equipment. This could have a "knock-on" effect since those who had thought of getting on the band might now decide it is not worth it as so few bother with it. Use or lose?

Phillip Stanley G3BSN (LDN) was out with the Clifton ARS at Wrotham (KNT) in NFD. He describes both weather and radio conditions as superb. They worked 297 stations in 13 countries including F, D, HB, LX, OZ and SM. Best DX was SM6HYG (JO58RG) at 1052km. From home, one of the c.w. stations mentioned was GW3NYY (GNS) who used to report to VHFB in *SWM* years ago. Glad to hear that Walt is still QRV.

The Microwave Bands

G0DJA worked three stations on June 21 in the 10GHz contest. Best DX, 76km, was GW3UYM/P in Radnor Forest, then G3ZME/P on Brown Clee Hill at 38km and G4GMV/P at 36km on North Hill, Malvern, all from Walton Hill, Clent.

G1KDF on 1.3GHz worked GI6ECV (ATM) on July 15 for the latter's first QSO

outside of GI. On the 23rd Bob worked GI4OPH (DWN) but no luck with GM4ZUK/P.

G3BSN used his own call on NFD with the Clifton ARS and worked 170 stations in 11 countries on 1.3GHz. The equipment comprised his Icom IC-127IE, 80W from two 2C39BA valves in the p.a. The antenna was a four 23-ele array of Tonna Yagis. **Barry Mayson G1LHL** was the other station operator. Best DX, as on 430MHz, was SM6HYG and Phil concluded that the best DX was worked from the south-east corner of England this year.

G3XDY added three new squares on 1.3GHz around the NFD period, F6HEO (BG), OZ1AXX (FQ) and OZ1IPU (FR). John also worked SM6ESG (GR) in NFD. In the Scandinavian Activity Contest on July 6, OZ5BZ (EP), OZ1KLU (EQ), SM6CKU (GR), OZ1UM (GP) and later LA8AK (DS) were contacted. On 2.3GHz in NFD John worked OZ1AXX with better reports than in the earlier QSO on 1.3GHz. SM6ESG was best DX on the band.

John Tye G4BYV (NOR) also worked SM6ESG on 2.3GHz on July 6 in good conditions. In the Dutch contest on July 4/5 he worked on 3.4GHz PA0MAR/P, PA0EZ, PA0RDY, PA0WWM and PA0ASH/P in CM and PA0GUS/P in CN.

Next to **P.M. Flint G4EFT** (SRY) who wrote about his 10GHz activity. He uses a *PW* dish and penny feed with an AEI Doppler Module modified as per the *PW* article in 1981. On receive, the mixer output is taken via a pre-amplifier/impedance matching stage to a Larsholt 7255 v.h.f. f.m. tuner with modified, switchable i.f. bandwidths.

He has been out for all this year's Cumulatives operating from Burton Down (SXW), Guernsey and the Downs above Ventnor (IOW). Best DX were from Cobo Bay (GUR) to G4EML/P at Kithurst Hill, Sussex—219km—G8UDT/P on Burton Down at 212km and G2DSP/P and G4ETU/P at Trundle Hill, Sussex at 204km.

G6MXL was on in NFD on 1.3GHz and found two more all-time new squares; FF6KBF/P (AJ) and G3CKR/P (ZM). G8GRT is on 2.3GHz using an SSB Electronics transverter, 600mW output driven by a Yaesu FT-290. The antenna is a 44-ele quad loop Yagi fed with Andrews cable in the loft.

Some of you have sent in your latest 2.3GHz All-time table scores but I still have not heard from G3JXN, G8TFI, G6DER and G1DOX for ages. If you would forward your current figures of squares, counties and countries worked I will publish the table in the December issue.

Late Extra

Charles Coughlan EI5FK proposes to activate WL/UL or VP squares on 144/430MHz some time in October depending on his mid-term break. Re the North Sea DFDS ferry operation by G4MJC and G4XNL, this may be put back to October 16-18. See page 55 of the June issue for the rest of the details. Flemming promised to telephone me but had not up to my posting date.

Mike Ray G4XBF and Peter Croucher G4YPC plan operation from The Lizard Peninsula (XJ) from Sept 23 to Oct 3 on 144.265, 432.165 and 1296.255MHz using their own calls.

Finally, don't forget to beam to southern Africa from Sept 26 if you operate on 50MHz. Until Nov 1 the ZS folk will be carrying out t.e.p. tests.

RTTY

Reports to Mike Richards G4WNC
200 Christchurch Road, Ringwood, Hants BH24 3AS

Terry Stanley G6GTO reports continued growth on the h.f. packet radio scene. The centre of activity is still the 14MHz band, but with the congestion on 14MHz, it's worth looking around the other bands. Packet activity will generally be found sandwiched between the RTTY and phone sections of the band.

Terry's packet report included a few rare countries, i.e. HK4BRP (Columbia) and XE3JA (Mexico), the latter being a new country for Terry. He is hoping to reach 100 countries on packet soon, but of course the final few are always the hardest, but I wish Terry good luck in his efforts.

One important point that came out of Terry's report is that many h.f. packet QSOs seem to time-out before they have really got going. I'm sure any of you who regularly operate or monitor packet activity will have also noticed this problem. The time-out is caused by the TNC reaching or exceeding its re-try count limit, which forces a disconnection. This problem can be minimised by optimising the TNC parameters to match the band conditions. The two key parameters when operating with either poor conditions or congested bands are packet length and the number of outstanding frames.

The length of the packet is important because the more information you send, the more chance there is of an error occurring and the frame having to be retransmitted. So the first important point is to reduce the packet length as conditions get worse. A good starting point for h.f. work is a limit of 40. With most TNCs this is achieved by setting PACLEN to 40. You can experiment without changing PACLEN simply by pressing <RETURN>, which with most TNCs forces the packet to be sent even though it may not have reached the limit set.

It is not worth reducing PACLEN below about 10 as the packet protocol itself requires about 160 bits of data to mark the start and finish of a packet and direct the packet to the correct destination. Each separate character typed at the keyboard for inclusion in a packet will add 8 bits to this basic length of 160 bits.

The other parameter to alter is MAXFRAME, this sets the number of outstanding frames allowed. If MAXFRAME is set to 1 then most TNCs will send packets in the order that they were entered at the keyboard and, more importantly, will not start sending the next frame until the last frame has been successfully acknowledged.

One final command that can be used when conditions are bad is to set CONPERM ON. This command overrides the retry counter and makes the connection permanent; the only problem is that the connection has to be established before this can be used!

John Barber G4SKA has sent in his usual comprehensive RTTY report, but pressure of work and lack of contests has reduced the content. John reports band conditions as generally very good, at least on 14MHz.

Despite the shortage of time for RTTY, John has had a fair degree of success. After four years of chasing a German station for a QSL card from Aaland Is. (OH0), he worked 2 OH0 stations in one week! One other first for John was Tasmania (VK7AE) on RTTY.

A final note from John concerns a DXpedition to Fernando de Noronha. Where's that? you may well ask! Well, it's a small group of islands about 400km NE of the most easterly tip of Brazil. The DXpedition will be on the air from September 9 to 13 and RTTY will be the prime mode of operation, which makes a nice change. The calls used will have ZY0F prefixes and there will be a total of 6 calls operating. If you've received your *PW* on time you should be able to catch at least some of this event.

By the way, John, congratulations on your fourth place in the BARTG h.f. contest.

FAX

Are there any UK amateurs using this mode? I have been keeping an eye on this mode for some time and there seems to be very little amateur activity. My equipment for receiving FAX comprises a FAX-1 from ICS Electronics, which links to the audio output of my Icom IC-720A and produces pictures on a Epson RX-80F/T.

For those of you with the facility to monitor or even transmit FAX the only regular activity I have found is on 14MHz on a Sunday morning. The stations I have positively copied are DJ3JN and DJ4SR, though I have seen copy from one or two other German stations. The main problem with this mode at present is that the band

An example of amateur FAX received on a Sunday morning

plan allocation of 14.100MHz has been rather taken over by packet radio. It is still possible to receive FAX despite the packet stations, but of course there will be interference on the received picture. The German stations can usually be found on about 14.105MHz between 0900 and 1200 on Sunday mornings, using an i.o.c. of 288 and 120 r.p.m.

I would be very pleased to hear from anyone with an interest in FAX and examples of received pictures would be very welcome.

Contests

Ted Double G8CDW, who is the BARTG contest manager, has written a very interesting letter concerning his recent contest success.

Ted operates as a single operator s.w.l. on the h.f. contests and uses fairly basic equipment. He has a Yaesu FRG-7700 receiver and a.t.u., a 20 metre wire dipole in the loft, an ST-5 Terminal Unit (10 years old) and a Commodore 64 computer with RTTY program in EPROM.

Ted's latest success is a very creditable second place in BARTG Spring HF contest.

I think that Ted's success emphasises the point I raise in the August *RTTY*, that you really don't have to run a latest state-of-the-art station to achieve success. If you are nervous about operating in a contest, then entering as a s.w.l. may well be the answer as you can get familiar with the operating practice at your leisure.

One final point from Ted is that even if you are not competing there are lots of interesting and rare DX stations to be found during a contest.

Contest Results

I have been sent the results of the BARTG Spring HF Contest. Shown here are the top five positions in the three sections of this contest:

Single Operator

Position	Call	Points
1	KT1N	678 280
2	I2OLW	624 690
3	WB5HBR	452 816
4	G4SKA	375 348
5	PT2BW	359 996

Multi-operator

1	WA7EGA	689 920
2	HD8G	610 452
3	VP2EDX	438 070
4	LZ2KIM	362 404
5	OH1AF	329 380

Short Wave Listener

1	ONL383	353 096
2	G8CDW	181 746
3	G6LAU	112 042
4	Y78-14-L	110 484
5	BRS86650	105 938

RTTY Contests

The next major h.f. RTTY contest in the calendar is the CQ Worldwide RTTY Contest. Hopefully I can give you enough details to have a go.

(1) **Contest Period**
48 hours
0000UTC September 26 to
2400UTC September 27

(2) **Bands**
1.8, 3.5, 7.0, 14.0, 21.0 and 28.0MHz

(3) **Classes**
a: Single operator
b: Multi-operator

(4) **Modes**
Baudot (ITA2)
AMTOR
ASCII
AX-25 (Packet at last, but strictly no digipeating)

Message
RST and CQ zone number for all stations outside USA and Canada

(5) **Logs**
All logs and entries to be received by December 1, 1987, at this address:
CQ RTTY Contest,
76 N. Broadway,
Hicksville,
N.Y. 11801, USA.

Next month's column should include a mini review of the RTTY program for the Amstrad PCW series computers.

Finally, if there's something you would like to see reported in this column—write and tell me, all reports are welcome.

Fig. 2 ▶

Prefix (Country)	Frequency (MHz) 3·5	7	14	21
A,K,W (USA)			APR	
C31 (Andorra)			R	
CE (Chile)			R	
CO (Cuba)			R	
DA,F,J,K,L, (W. Germany)		R	PR	
EA,C (Spain)			PR	
EA6 (Balearic Is.)				R
EA8 (Canary Is.)			R	
F (France)		R	PR	
FP (St. Pierre et Miquelon)			R	
FM (Martinique)			R	
G (England)	R	R	PR	
GI (N. Ireland)			R	
GM (Scotland)			AP	
GW (Wales)	R		P	
HA (Hungary)			P	
HB (Switzerland)			APR	
HH (Haiti)			R	
HI (Dominican Republic)			R	
HK (Columbia)			PR	
HP (Panama)			R	
HR (Honduras)			R	
I (Italy)			PR	
LA (Norway)			PR	
LU (Argentina)			R	R
LX (Luxembourg)			R	
OE (Austria)			PR	
OH (Finland)			P	
OHO (Aaland Is.)			R	
ON (Belgium)			PR	
OZ (Denmark)			R	
PA (Netherlands)			P	
PP (Brazil)			R	
PZ (Suriname)			R	
RA,T (USSR)			R	
SG,K,L,M (Sweden)			PR	
SP (Poland)			R	
SV (Greece)			R	
TR (Gabon)			R	
UV (USSR)			R	
V44 (Virgin Is.)			R	
VE (Canada)			R	
VK (Australia)			R	
VP (Anguilla)			R	
VU (India)			R	
XE (Mexico)			P	
XX (Portugal)			P	
YO (Romania)			R	
YU (Yugoslavia)			R	
YV (Venezuela)			R	
ZP (Paraguay)			R	
4X (Israel)			R	
9H (Malta)			R	

Amateur Satellites

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

Keplerian Elements

In response to requests by those who follow most everything in orbit that puts out a detectable signal, this month we have published a full and comprehensive listing of just about every in-range satellite of interest, other than those which are "classified". They are presented as Fig. 1. These have been sent to us by both **Harry Janssen LA4XC** and **Berger Lindholm**, both satellite experts in Scandinavia. Not every satellite given is known to be active at this time, and some frequencies are not fixed, but Meteor 1/30 has recently re-opened on 137.020MHz.

On the proviso that a computer program utilising the decay rate (drag factor) is used for scheduling and tracking, they should keep enthusiasts within a minute or so of passes over the next year, unless a sudden (and most unexpected) escalation of solar activity enhances the drag results. Normally, in order to conserve space, we shall publish the main satellites on a two-monthly basis only.

Equator crossings for the two Sundays this month are given by Fig. 2. The new addition, "R10" is for our latest satellite RS-10/11. "MIR" may prove to be several minutes out, as manoeuvres and boosts have been applied recently to match incoming progress cargoes.

OSCAR-10

Despite the grave problem of the total loss of the computer command control, OSCAR-10 has been functioning superbly well. Although eclipses around perigee prevent use at these times, at the employable mean anomaly periods close to the shadow zone signals have been found to be quite strong from the monopole antenna system. Over the past month many good DX stations have been active and worked from the UK. VU2NBC (Vidi, OM), VU2CVP (Chasel, XYL) and VU2DVP have all been very active from India. Abdul 9K2BZ has been on frequently from Kuwait. Also active have been VK0LM, VS6UZ, V85GA, 9M2OK, KX6A0, 8Q7CH, BV2B, UA0ALA and VK8OB. Lots of North American and European stations have been on, and the levels of power and abidance to the necessary use schedule have been far better than at any time in the past.

A few fine tunings have been made over the active period with the mean anomaly times of use permitted, which have been rather difficult to foretell well ahead, as the precise attitude and sun angle of the satellite is not exactly known, and cannot be read now from downlinked telemetry.

Peter Guzlow DB2OS, European command station for AO-10, pointed out in early August that the sun-angle was then approximating −33, giving 83 per cent illumination, plus a 37 minute eclipse period. By September 7, the estimated sun angle will be −67, the illumination only 39 per cent, and the eclipse period 51 minutes long. It is a foregone conclusion that the transponder-use plan will require closure for communications in late September for two months, due to the lengthening eclipse and more so the very bad sun-

Satellite Name	METEOR 1/30	METEOR 2/14	METEOR 2/15	METEOR 3-1	COSMOS 1602	COSMOS 1766	SALYUT 7	FO-12	AO-11
Internat Design	80-51A	86-39A	87-01A	85-100A	84-105A	86-55A			
Object Number	11848	16735	17290	16191	15331	16881			
Epoch Year	1987	1987	1987	1987	1987	1987	87	87	87
Epoch Day	162.70117910	174.22240113	187.50171222	187.54343792	188.20658282	138.03479667	173.80784454	152.82201216	165.68713132
Inclination	97.7252	82.5375	82.4662	82.5488	82.5397	82.5265	51.6127	50.0099	98.1025
RAAN	250.7157	102.6369	4.5049	18.9486	273.1556	19.9496	227.6981	72.5579	231.5872
Eccentricity	0.0042324	0.0012889	0.0014736	0.0018687	0.0023682	0.0025719	0.0000474	0.00113209	0.0014465
Arg of Perigee	180.5313	245.7268	93.1020	277.7802	233.3881	53.9001	237.3603	246.5515	103.6002
Mean Anomaly	179.5825	114.2554	267.1827	82.1171	126.5154	306.4589	122.5981	113.4115	256.6816
Mean Motion	14.98055160	13.83754659	13.83562863	13.16930842	14.73626912	14.73490293	15.31142819	10.44393206	14.62133694
Decay Rate	$1.173e^{-5}$	$6.0e^{-8}$	$6.0e^{-8}$	$4.3e^{-7}$	$1.03e^{-6}$	$8.9e^{-7}$	$9.43e^{-6}$	$-2.5e^{-7}$	0.00000105
Orbit No.	38129	5419	2520	8185	14947	4317	29684	3647	17533
SMA							6850.497	8840.766	7064.387
Anomalistic Period							94.0474	137.8791	98.48621
Apogee							479.4971	2479.774	703.606
Perigee							479.4971	2459.757	683.1685
Beacon Frequency	APT-137.02	APT-137.85	APT-137.85	APT-137.85	137.4MHz	137.4MHz	19.955	435.910	145.825

Satellite Name	MET 2-14	MET 2-11	MET 2-12	MET 2-13	MET 2-8	MET 2-9	MET 2-10	NOAA 6	NOAA 9	NOAA 10
Internat Design								79-57A	84-123A	86-73A
Object Number								11416	15427	16969
Epoch Year	87	87	87	87	87	87	87	1987	1987	1987
Epoch Day	90.20062791	174.09877810	174.26047352	104.04612191	174.25092202	174.28386402	174.16815709	174.06632258	185.39611103	187.26198635
Inclination	82.5410	82.5311	82.5338	82.5345	82.5382	81.2459	81.1641	98.4892	99.0506	98.7148
RAAN	169.4037	222.9133	161.2285	132.0099	274.8018	270.4336	299.7251	182.7408	151.1828	217.5642
Eccentricity	0.0015691	0.0014962	0.0016785	0.0016971	0.00141591	0.0054514	0.0096010	0.0013299	0.0016011	0.0014289
Arg of Perigee	116.4744	109.3171	355.4804	17.3472	299.5613	260.2962	25.1560	70.6929	154.8714	148.5596
Mean Anomaly	243.8006	250.9610	4.6204	342.8270	60.4141	99.2060	335.4214	289.5690	205.3238	211.6435
Mean Motion	13.83750141	13.83499932	13.83935189	13.84013164	13.83829009	14.12923320	14.21741367	14.25055337	14.11504877	14.22505641
Decay Rate	$6.0e^{-8}$	$6e^{-8}$	0.00000117	$6.0e^{-8}$	$6e^{-8}$	$6.0e^{-8}$	$6e^{-8}$	$4.1e^{-7}$	$1.62e^{-6}$	$2.04e^{-6}$
Orbit No.	4257	14985	12078	6556	26497	3318	18951	41461	13174	4145
SMA	7328.709	7329.592		7327.780	7328.43	7227.479	7197.564			
Anomalistic Period	104.065	104.0838	104.0511	104.0453	104.0591	101.9164	101.2842			
Apogee	969.2085	969.5581	969.2676	969.2158	967.8066	895.8789	895.668			
Perigee	946.2095	947.6255	944.8740	944.3438	947.0537	817.0791	757.460			
Beacon Frequency	137.000	137.000	138.400	137.000	137.000	137.000	137.000	APT-137.5 DSB-136.77	APT-137.62 DSB-137.77	APT-137.5 DSB-136.77

Satellite Name	RS 5	RS 7	RS 9 (RS 10+RS 11)	OSCAR 9	OSCAR 10
Internat Design					
Object Number					
Epoch Year	87	87	87	87	87
Epoch Day	166.2823319	165.22408125	174.59593305	161.48080726	172.59322815
Inclination	82.9547	82.9550	82.9265	97.6443	27.3243
RAAN	296.3197	262.1139	53.3166	178.5937	15.1209
Eccentricity	0.0009122	0.0021438	0.0010301	0.0000778	0.6025575
Arg of Perigee	30.6858	297.5927	259.8854	218.9062	218.3371
Mean Anomaly	329.4665	62.2943	100.1119	141.2124	78.0963
Mean Motion	12.05060565	12.08701074	13.71883140	15.29680979	2.05881381
Decay Rate	$1.2e^{-07}$	$1.2e^{-07}$	$6e^{-6}$	0.00001823	−0.00000168
Orbit No.	24160	24220	4	31571	3025
SMA	8036.371	8020.226	6851.952	6854.861	26100.84
Anomalistic Period	119.4961	119.1362	104.9652	94.13728	699.4319
Apogee	1672.702	1666.42	488.0103	484.394	35457.09
Perigee	1658.041	1632.032	473.894	483.3276	4002.584
Beacon Frequency	29.452	29.501	29.3575	145.825	145.810

Fig. 1

angles resulting in insufficient battery charge. The chances are that the lack of voltage available will automatically close the transponder down completely, and no communications will be possible until it re-emerges into a good charging state again.

Ian Ashley ZL1ADX, another of the dedicated OSCAR-10 command team, proposes a stimulating thought, inasmuch as the antenna system switched from the beam array to the omni-directional during the last "blackout" when the voltage fell, that the next loss of power may reverse the process and bring the beams back on again.

RS-10/11

The activity on the new pair of transponders increases daily, and lots of new stations are now added to the original occupants of RS-5 and 7. In the first few weeks of operation, the following stations were worked by your scribe:
DF4TA, DJ1KE, DK5JI, DL1TV, DL6KG, DL9GH, EI4CL, EI9FK, F6DO, F9EA, G2UK, G3BGM, G3CDK, G3CFG, G3LDI, G3PXT/M, G3RWL, G4CUO, G4HUV, G4LWM, G4RRX/M, G8QR, HA5AM, HA5HO, HB9CVT, I5YT, IK0HIT, K1DK, KB2E, KP4Z, KZ2S, OE1LM, OK3AU, OH7UK, RB5LHT, RW3AN, RW4LYL, SM5CLW, SM7BYU, SM7DLK, SM0KV/0, SM0RDW, SP3KRF, UA1NA, UA3SBW, UA4NM, UA6JD, UA9SF, UB5MBC, UB5PAC, UC2CBA, UD6MN, UR2RR, UL7GWV, UT5RP, UZ3XWA, VE1QO, W8VXH/MM, Y23CO.

Bill Kelly of Belfast has been listening to the new bird, the stations on the transponder, and the contacts being made over the Robot, and finds the signals to be excellent. His log includes G3s CAG, DDG, IOR, RHI, ZDF, 8QR, 0DLJ, plus SM7BYU, UV1AP, F9EA, OE1LM, IV3LCZ, F3ZD, HB9AQZ, SP9DH, I3YT, DL6LW, UA3PR, UL5XWA, UA1ZM, HA5AM and EI9FK.

Steven Metcalfe G4AZB has worked G4CUO, G4JUJ, SM0KV/0, UZ3XWA, UV9FF, and EI4CL on Mode "K" or "KT" combination, using a TS-820 transmitter into a half-wave vertical cut for 29MHz, used as a $\frac{5}{8}$ wavelength vertical on 21MHz, and a half wave vertical on 145MHz feeding a pre-amp then his FT-290R via H100 feeder. On Mode "A" using 30 watts to the same 145MHz antenna from a MM144 30 watt linear amplifier powered from his FT-290R, and the other vertical now as a half-wave going to the TS-820 as a 29MHz receiver, he has used s.s.b. to work G8ATE, OZ6QX, DF4XW, G3IOR and I5TDJ. "I am very pleased with the new satellite," says Stephen. "It is easy to find, low on Doppler shift, and tracking is not a problem using my vertical 'omnis'—quite a change from JAS-1!"

Ray Soifer W2RS says that thanks to the extreme sensitivity of RS-10, he now has what he believes to be the world's smallest satellite earth station. "I worked W1NU with it this morning," says Ray, "it being my 1.2 watt output IC-μ2 hand-held with its 95mm long 'rubber duck' antenna, keying the mic button. Signals were RST599 at both ends, albeit chirpy."

Ken Farrance G0AKF has been looking at the RS-11 telemetry over July, and sends several runs to us. A typical frame taken on July 18 between 1814 and 1823 reads: "RS11 NS79 NR15 ND23 NG45 IU45 IW00 IK00 IO00 AS35 AR32 AD43 AG32 MU00 AW45 AK00 AO88 RS11". Those who wish to translate from the TLM information supplied last month will discover that all parameters are "looking good".

We have received from **Leonid Labutin UA3CR** some further refined information on understanding the telemetry content, as well as some details of the mating of the RS-10/11/Cosmos 1861 combination satellite. Line 2, prefixed "IR" or "NR", indicates the attenuation applied as zero or −20dB to EITHER of the two receiver inputs, 145MHz, 21MHz, or both together. In combination with the following line indicating attenuation of 0dB or −10dB, again of either or both uplinked receivers, we thus can get signal reduction of 0, 10, 20 or even 30dB, which should help the alligator situation considerably.

The additional "dit" (that changes the "I" to "S", "N" to "R", etc.) is inserted to the start of the frame letter indicator when the 21MHz command station is activating the command receiver. If the 145MHz command is used, then a "dah" will be applied, changing the "I" to "D", "N" to "G" etc. This explains the prefix letters

discovered by observers not in our last month's listings.

The computer sounds that are heard in place of the Morse code telemetry is high speed telemetry coming down to the command station in the form of amplitude modulated encoded ASCII.

The power system comes from the solar cells and battery of the main Cosmos 1861 satellite, to which housing are fixed separately the antennas for the "RS" transponders. All antennas are linear, and consist of a common uplink reception 21MHz $\frac{1}{4}$ wavelength "vertical" ground plane (using the satellite itself as a ground base) for both the RS-10 and the RS-11 receiver inputs. The 29MHz downlink only antenna is a similar quarter wavelength ground plane, but it can be switched by ground command to the transmitter output of either RS-10 or RS-11 separately. On 145MHz, half wave dipoles are used. One is exclusively for RS-10 only, and can be switched to this transponder's receiver input or to its transmitter output. RS-11 has its own half wave dipole, and this too can be switched between the 145MHz receiver and the transmitter of the second transponder system according to mode requirements.

The linear antennas, used with a satellite not yet stabilised, account for the sudden drop out of signal when one is trying to get a full call into the Robot using the 21.120 or 21.130MHz uplink with linear antennas. The cut off level approaches when Faraday rotation attenuation is maximised, and only a "QRZ" or "QRM" results from the incomplete input format. Circular polarisation is suggested, i.e. a turnstile or inverted "V" on the 21MHz uplink, to overcome this problem. It is not known as yet if stability is to result in time.

Due to an air-dielectric capacitance change in the vacuum of space, the nominal frequencies supplied for both the beacons and the passband of RS-10 and 11 have moved slightly higher in frequency, and (allowing for Doppler shift) need to have some 7kHz added to the frequencies given in our last treatise. The term "higher" and "lower" frequency beacons referred to in the telemetry explanation given last month showing the separate 100mW or 1 watt power levels of the spaced beacons might have been thought to indicate the 145MHz beacon relative to the 29MHz beacon. Specifically, the term applied means the in-band beacons spaced by 3kHz from either end of the passband, e.g. 29.407MHz (lower) relative to 29.453MHz (higher), etc., with the same applying to the beacons at either end of the 145MHz downlink.

Considerable breakthrough and attenuation of uplinked signals on 145MHz is evidenced when the Cosmos 1861 scientific navigational satellite has its 150MHz transmitter activated, and it is for this reason alone that the RS-10/11 amateur satellite programme has had mainly up to now to use a mode which uses the 21MHz uplink, which is clear of the problem. A programme of use is now being instituted with the planners, to result in fair sharing of the resources according to availability and need. This will be announced on the various AMSAT and Sputnik nets for at least a week ahead.

"The main reason," says UA3CR, "for putting up a satellite with a 21MHz uplink, is to bring satellite communications to the many h.f. operators, but also for the additional purpose of propagational experiments. Most certainly the first objective is being realised, as many new callsigns are now active in satellite communications, especially those in the majority who have h.f. gear but nothing on v.h.f. Not since the days of the short lived ISKRA-3 satellite built by UK3ABT have we had a satellite using the space allocated part of the 21MHz band.

Paul Thompson G6MEN, unable to use RS-10/11 as it had only the 21MHz uplink receiver on, spent some time listening to the downlink, which he found full of QSO's, but only "CQ 15" and no "CQ satellite" calls. His hope is that the 21MHz operators will soon learn of and then recognise the space sub-band, as the presence of operators claiming to be running 400W to large arrays in line with the satellite were causing havoc to any attempted through-satellite QSOs.

Whilst the main reaction of the h.f. operators has been one of interest and delight, a few have objected to the sudden appearance of c.w. and s.s.b uplink signals in that 40kHz of the band which they have been using for many years without hindrance, it being a fairly clear spot. When being told by your author that they were being heard on 29MHz and 145MHz by satellite, after initial incredulity, followed by them then checking for themselves, amazement and fascination resulted, and another devotee has brought to the art of through satellite communications.

RS-10/11 operators are asked NOT to follow the code of conduct as set out for JO-12, which suggests that users move their uplink frequency to compensate for the shifting Doppler so as to maintain a given downlink frequency. This practice can result in collision with terrestrial users, and more so the practice of swishing one's v.f.o. of the 21MHz uplink transmitter whilst listening to the 29 or 145MHz downlink can cause unnecessary annoyance to other band occupants. It is better to first assure a clear frequency on the 21MHz uplink passband, then to calculate the appropriate downlink frequency allowing for Doppler shift, and then to stay put on that frequency, changing the tuning of the downlink receiver only. Naturally, one may well wish to call other users by matching their frequency on the downlink, and whilst the uplink may be clear of other users to them, it may not be to you, and mutual QRM may result.

Whilst it is good that terrestrial users be encouraged to use the remaining 410kHz available on the 29MHz band other than the 40kHz section in use (although it is possible to have both RS-10 and 11 on together, taking 80kHz of the space allocated band up, it will not normally be so) the retribution that could be enacted by some of the QRO stations could result in severe attenuation of the whole passband. Whilst the active presence of alternative users over wide areas is interesting in propagational terms of sub-horizon reception, a minimum of QRM and attenuation is desirable. An effective explanation of what is happening is the best way to gain a supporter from an operator who might otherwise assert his presence in arrogant terms, as the very user density of our overcrowded amateur bands means that we all have to live together.

The propagational possibilities are quite enormous, and already in strong "E" layer conditions, strong although fluttery signals have been heard from the satellite when it is up to eight minutes below horizon. If one can hear the 29MHz low power signal, then it is more than probable that 21MHz signals will be heard by the satellite. (A surer indicator will be to observe the now returned 21.001MHz OSCAR-9 telemetry signal on a similar path). An excellent QSO between Laura G4HUV, and your author occurred commencing when the spacecraft was over the Canadian Arctic, some six minutes sub-horizon, and G3IOR could hear his own 29MHz return occasionally twelve minutes before nominal AOS before this, and the auroral zone looks very promising due to its continual solar illumination in our northern hemisphere summer. On a north-east bound pass, the signals from G4LWMs 21MHz uplink could be heard still at LOS plus four minutes at G3IOR, some seven minutes after Stan should have lost his uplink input.

In late November and early December, equinoxial improvement of the F2 layer and elevating solar flux should be with us, and high possibilities of very distant and even antipodeal QSOs with ZL may evolve. Already, 21MHz signals from JA, ZS, LU, CE, OA etc. have been evidenced on the 145MHz downlink when the satellite is over Europe, well out of range of these distant places. All that is needed now are enough sunspots to effect 29MHz in similar terms!

A set of Keplerian elements for RS-9 (RS10+11) is provided in the list this month (Fig. 1), plus equator crossings for Sundays 13 and 27 of September as Fig. 2. The acquisition of signal times and the bearings for the United Kingdom for the same two Sundays is shown in Fig. 3.

ALLSATS EQX ON 13/9/87

SAT	UTC EQX	Brg W	Next Orbit +min	+inc	Next Day +min	+deg
F12	0123	296	115.7	29.2	64.3	20
RS5	0048	143	119.4	30	113.4	30
RS7	0037	148	119.1	29.9	108.7	29
Mir	0108	299	91.6	23.2	25.8	13
Sal	0125	180	94	23.8	64.9	22
RS1	0131	243	120.3	30.2	3.9	3
UO1	0040	86	94.1	23.5	66.4	17
UO2	0031	39	98.4	24.6	37.3	9
NO9	0141	154	102	25.5	90.3	23
N10	0117	85	101.2	25.3	78.4	20
M13	0012	343	104	26.1	16.6	6
M14	0004	315	104	26.1	16.9	6
M/1	0141	46	109.3	27.4	90.8	25
R10	0130	21	104.9	26.3	29.5	9

ALLSATS EQX ON 27/9/87

SAT	UTC EQX	Brg W	Next Orbit +min	+inc	Next Day +min	+deg
F12	0047	345	115.7	29.2	64.3	20
RS5	0132	175	119.4	30	113.4	30
RS7	0021	166	119.1	29.9	108.7	29
Mir	0050	20	91.6	23.2	25.8	13
Sal	0039	250	94	23.8	64.9	22
RS1	0035	251	120.3	30.2	3.9	3
UO1	0042	86	94.1	23.5	66.4	17
UO2	0113	49	98.4	24.6	37.3	9
NO9	0051	142	102	25.5	90.3	23
N10	0113	84	101.2	25.3	78.4	20
M13	0049	18	104	26.1	16.6	6
M14	0044	350	104	26.1	16.9	6
M/1	0111	62	109.3	27.4	90.8	25
R10	0135	46	104.9	26.3	29.5	9

Fig. 2 ▲ **Fig. 3 ▼**

RS10/11 * ON 13/9/87

AOS	0138	AZ	219
AOS	0328	AZ	274
AOS	0711	AZ	356
AOS	0858	AZ	355
AOS	1043	AZ	350
AOS	1229	AZ	343
AOS	1417	AZ	327
AOS	2238	AZ	136

RS10/11 * ON 27/9/87

AOS	0148	AZ	272
AOS	0531	AZ	357
AOS	0717	AZ	355
AOS	0903	AZ	350
AOS	1049	AZ	343
AOS	1236	AZ	329
AOS	2058	AZ	133
AOS	2242	AZ	185

RS-5 & 7

UA3CR further reports that the return of the RS-5 and 7 continuous activity, which should have recommenced at the end of July when the pair came out of eclipse, has been delayed. The cause is not due to further deterioration of the spacecraft batteries, but because of the conversion of the command console for RS-10/11. It is hoped that availablity and time will soon permit the construction of dedicated equipment that will permit the successful operation of all three satellites.

FO-12

A schedule of operation has been laid down for the satellite, currently Tuesday, Thursday and Saturday in Mode "JD" one week, and Mode "JA" the following week. There is no guarantee of the continuity of this plan of operations, so potential users should monitor the AMSAT nets for future operation mode times, which will normally be given a week ahead.

The long awaited 'BBS" (Bulletin Board System) has now been succesfully loaded, and users report that all on this new version 1.0 appears to be operating to perfection, with over a hundred messages posted and copied in the first few days of operation. It will hold 50 messages (192 kilobytes) up to a PACLEN of 199 long before the oldest become overwritten. No personal mail will be supported in this version, so you may read messages addressed to anyone, and similarly they can read yours. The user instruction is now modified to the following commands:

F: List the latest 10 messages headers with message numbers.
F*: List all the message headers in memory.
R (n): Read the message numbered "n".
W: Send a message, following which you will be asked a receiver and subject. Send (CR) . (CR) or (CR) ^ Z (CR) to end the message.
K (n): Kill a message numbered "n". A message being read by others cannot be killed, and only the originator can kill the message, FO-12 BBS being a multi-user system.
H: Help.

The TNC should be set as Protocol Version 2 WA8DED PROMS are needed for TNC-1. Commands TNC-1: v2. TNC-2: Ax2512 < 2 ON. T1 timer: 6 seconds or longer. Command TNC-1:F6. TNC-2: FRack 6. Max Frames: 2 or 3 is recommended. Command TNC-1:02 or 03. TNC-2: Max 2 or Max. 3.

Link to the satellite with its callsign 8JIJAS. If many users are on, the response may be slow, needing a longer T1 time. If you are the sole user, then T1=3 may be acceptable.

The regular users noted so far include DB2OS, DL1CF, G3RUH, HB9MHM, HB9XJ, I0JX, JA2PKI, JA3XJK, JM1MCF, KA9LNV, ON5PV, ON6UG, VE3JF, WA8EBM, WB5IPM, VE3JF and ZS6IT.

Dave Rowan G4CUO is currently planning further tran-satellite tests using FO-12 via RS-11. As FO-12 is so sensitive, with little use to cause attenuation, and RS-11 has such a powerful downlink, he has calculated that by listening to FO-12 on 435.870 ± 6kHz of Doppler shift, signals from RS-11 on 145.930MHz transponded from 21.230MHz uplinks will be re-transmitted. Tests will be carried out when FO-12 and RS-11 are in line-of-sight to each other, a maximum ground range of 8000km, but when RS-11 is at least 10 degrees sub-horizon to the experimenter, and FO-12 above horizon. Those interested in participating should contact G4CUO QTHR.

MIR

Three cosmonauts were launched to MIR via Soyuz-TM3 on 22 July, and three returned in TM-2 on 30 July after six days in MIR, two from the USSR, and one from Syria. Alexander Laveykin, who was originally due to stay with Yuri Romanenko for ten months, came back home, whilst Yuri remains until November.

The reason for the early return was probably spotted by **John Branegan GM4IHJ**, in his regular monitoring on of the MIR 143.625MHz groundlink communications frequency. A signal sounding like SSTV, somewhat irregular, with gurgling tones between the main pulses, may well have been a telemetered medical heart rate sequence. It has since been learned that Alex was brought back for medical attention following the development of an irregular heart beat during the long mission.

Your deadlines for the next three issues are:
September 30
October 28
November 27

Propagation

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

At his QTH in Wisbech, **Len Fennelow G4ODH** noted auroral tones on the signals from the 50MHz beacon at Potters Bar (GB3NHQ), on June 19, 21, 22, July 1, 2, 6, 7, 8, 12, 16 and 18. He heard the 144MHz beacon at Angus (GB3ANG) on June 29 and at Wrotham (GB3VHF) on June 19, 22, July 8 and 12.

"Zero sunspot numbers were returned on June 3 to 11 and again on the 16th, which lowered the monthly sunspot number for June to 17.5," said **Neil Clarke G0CAS** (Ferrybridge). He continued, "The solar flux responded to the lower sunspot number, falling from 88 s.f.u. for May to average 78 s.f.u. in June".

Patrick Moore (Selsey) found the sun's disc blank on July 4, 7, 11 and 12. From Bristol, **Ted Waring's** log was the same for June 2, July 11 and 17. Unfortunately, many cloudy days in July hampered Patrick and Ted's routine solar observations, however my thanks to them for their efforts.

"Activity remains low, although occasional sunspots have been noted," said **Ron Livesey** (Edinburgh) in his June report. Ron is the auroral co-ordinator for the British Astronomical Association. He learnt from Karl Lewis (Saltash) that his magnetometer was unsettled on days 1, 2, 5, 7, 12, 16, 17, 20, 22, 24, 25, 26 and 30 and very unsettled on the 6th, 11th and 19th. The NOAA observatory (Boulder) reports that the north American field was unsettled-to-active on June 11, 12, 13, 14 and 20, with minor storms on the 6th and 7th and a major storm on the 19th. They also logged a solar filament disruption on the 16th.

From 50 to 80MHz

"There was some good s.s.b. DX to be had on 50MHz on July 11", wrote **Alan Taylor** (Coventry). He also received "cracking good" signals from the Portuguese beacon (CT0WW) on the 11th and 15th. Len Fennelow also copied this beacon, at S9+, on June 30 and July 9. In Knutsford, **Dave Coggins** logged 2 GMs, via back scatter, on July 18 and s.s.b. and c.w. signals from VE1, KA1 and WA1 on the 21st.

"It is good to have the bands coming back to life," wrote **Bill Kelly** (Belfast) after identifying strong telelvision sound channels, via Sporadic-E in Band I, (48–68MHz) from Czechoslovakia, Italy, Norway, Spain and Yugoslavia.

I logged very strong f.m. signals from East European broadcast stations between 66 and 73MHz on June 26, July 3, 5, 8, 10, 11, 19, 20 and 22. Although the average was around 15 stations heard during each event, I counted 48 at 0910 on July 3.

The 28MHz Band

During several short skip openings between July 4 and 14, **John Levesley G0HJL** (Bransgore), using a Kenwood TS-430S transceiver with a vertical antenna, heard or worked several stations in Austria, France, Germany, Holland, Hungary, Italy, Poland, Portugal, Scandinavia, Scotland, Spain, Switzerland, Yugoslavia and the USSR. At 2100 on the 14th, he heard faint, but clear, s.s.b. signals from a VE1 who made several contacts in Europe.

"Band conditions have been quite varied, including ultra-short skip of around 320km and DX to both Americas and West Africa," wrote **Don Hodgkinson G0EZL** (Hanworth) on July 22. This was after adding 3 new countries (Canada, Grenada and Venezuela) to his score during the previous week.

"Things have been a bit livelier this month and whilst I haven't worked any DX, at least there has been a number of Europeans, mainly from EA, around," wrote **Greg Lovelock** (Shipston-on-Stour). Greg's antenna is well positioned for that direction but screened by houses in all others.

"5 GM stations at RS59, but with dramatic QSB to zero, at 1857 on July 17," wrote **Fred Pallant G3RNM** (Storrington). Typical of Sporadic-E, Fred.

Propagation Beacons

First my thanks to **Chris van den Berg** (The Hague), Dave Coggins, Len Fennelow, **Norman Hyde G2AIH** (Epsom Downs), Don Hodgkinson, Bill Kelly, Greg Lovelock, **Ted Owen** (Maldon), Fred Pallant, **Tony Usher G4HZW** and Ted Waring, for their regular beacon observations, which have enabled me to show the spread of 28MHz beacons heard during the month prior to July 25, Fig. 1.

"Not too bad a showing considering 28MHz conditions have not been all that good," remarked Norman Hyde. Don Hodgkinson learnt from OH1ZAA that a new beacon, OH2TEN, is due to appear on 28.252MHz. Tony Usher sampled the signal from DL0IGI for a couple of periods,

starting at 1210 and 1741 on June 24 and his results, seen in Figs. 2 and 3, were obtained via an interface connected to his 48K Spectrum computer.

"The 14MHz beacons have not shown the consistency which they had last time and many evenings only two or three were heard and at very low strength," said Len Fennelow. His log for the period June 19 to July 18 is the subject of Fig. 4.

Norman Hyde received "pings" of signals, via meteor trial reflection, almost daily from the 50MHz beacons in Portugal (CT0WW) and daily from Wales (GB3SIX) and Scotland (GB3RMK) between June 26 and July 23. "On a few days CT0WW, peaking 599, was copied by late morning/early afternoon Sporadic-E," said Norman. On July 20 he copied this beacon via three propagation modes, meteor scatter, Sporadic-E and tropo. "Around 1200 on the 20th it was almost f.s.d. on the S-meter of my FT-690!" said Norman.

Dave Coggins logged GB3RMK on July 18 and 19 and CT0WW on each of the following 3 days.

The 934MHz Band

"At 2130 on June 22, Bill Ellis WE-641 (Houghton-Regis), John Raleigh DW-04 (Bedford) and Ralph Rowlett GR-587 (Upper-Caldecote), worked into King's Lynn," wrote John Raleigh. He is the secretary of The Four Country 32cm Club. "We watched the barometer rise over 3 days from 29.9in to 30.1in and there was a very noticeable fall in temperature that evening," said John.

Following a slight fall in pressure and a fast drop in temperature, Fred Mills TL-01 (Kempston) had QSOs with stations in Felixstowe and Wantage around 2100 on July 4. John Raleigh worked into Kent, London and Yorkshire at 0130 on the 6th. Around 0800 on the 6th, Dora Mills TL-02 (Kempston) made contacts in Birmingham, Lowestoft, Market Harborough and Wiltshire and Ralph Rowlett worked into Wiltshire at 0530 on the 11th.

While the pressure was falling during the evening of the 14th, John Raleigh established QSOs with two stations in low-lying parts of Cambridgeshire who they cannot contact under normal conditions. Later that evening, Bill Ellis exchanged words with another 934MHz enthusiast on the Berkshire/Oxfordshire border.

While holidaying on the Isle of Wight, between June 21 and July 15, John Levesley UK-627 frequently operated either portable or mobile from Brading or St. Boniface Down. He had numerous contacts along the south coast from Brighton to Portland and the improved conditions during one evening opened his path inland to Chippenham, Salisbury, Stockbridge and Tetbury.

Almost daily, between June 30 and July 14, he worked or heard, GB-02, GY-186, JYs-77, 604 and 808 in the Channel Islands during periods of high pressure in excess of 30.1in. "Signals over the 160km plus, cross-water, path varied but were usually of sufficient strength for me to use the vertical antenna rather than the beam," said John. At various times between July 10 and 16 he heard stations in Bristol, Cherbourg, Hampshire, Sussex and Swansea and made contacts as far east as Seaford.

For reference, the variations in atmospheric pressure, recorded at my QTH, for the period June 26 to July 25 can be seen in Fig. 5.

Fig. 1

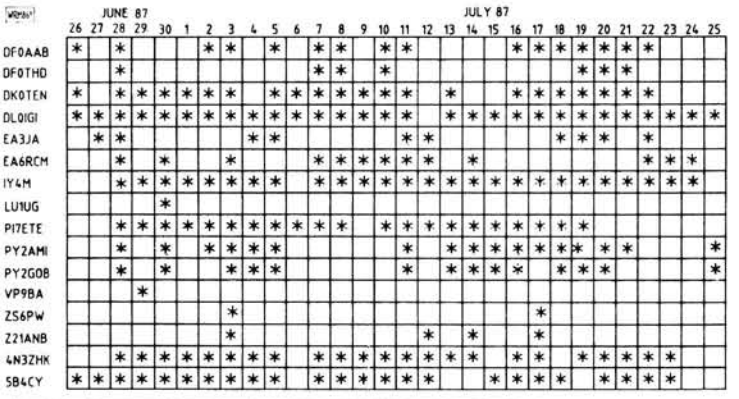


Fig. 2

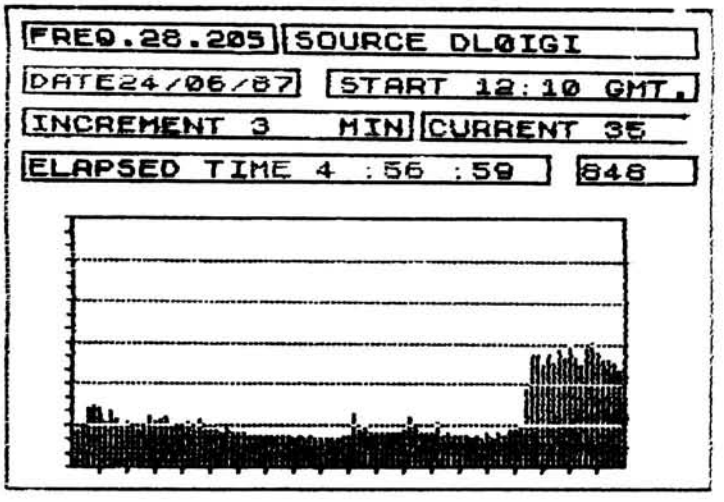


Fig. 3

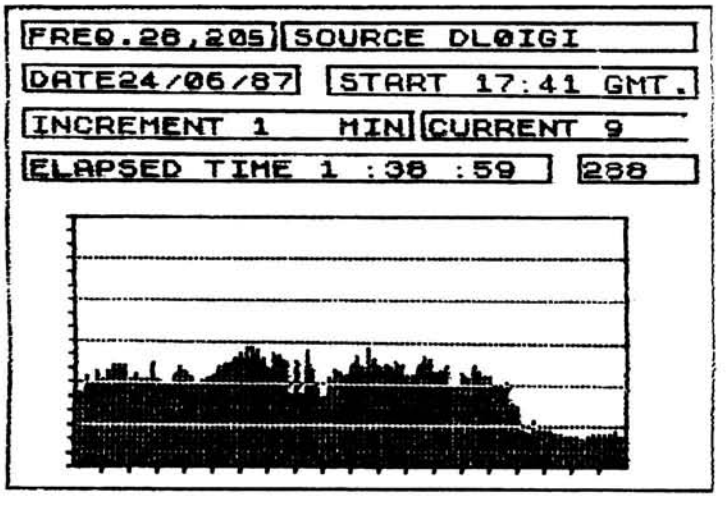


Fig. 4

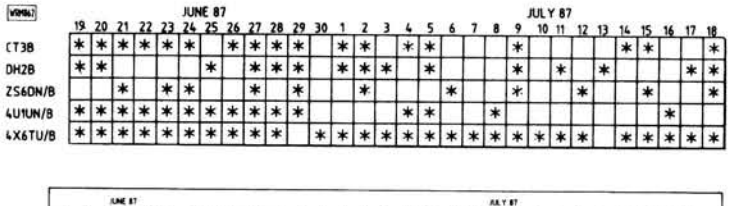
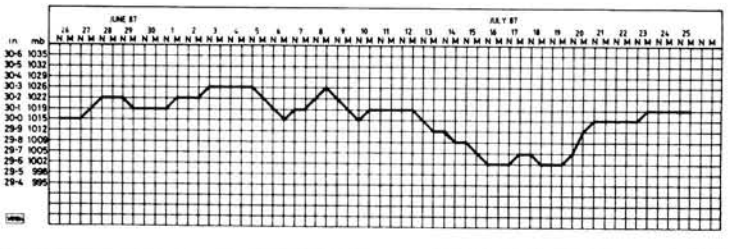


Fig. 5



Your deadlines for the next three issues are:
September 30 – October 28 – November 27

Broadcast Round-up

Peter Shore

With summer trying its hardest to make itself felt in recent weeks, it seems that conditions on the h.f. bands have deteriorated and listening has not been as pleasant and easy as during the spring. Perhaps as the nights start to draw in, as we approach autumn, DX listening will improve.

Jamming has been in the forefront of the broadcast media news lately: upon the arrival of a Soviet consular delegation in Israel, jamming of the Voice of Israel's Hebrew broadcasts to the USSR stopped on July 13. It was thought that the interference, which had been going on since 1972 might have been an alteration of Soviet policy, although the Russian, Bukharan and Georgian transmissions were still being jammed. However, the following day, jamming of the Hebrew service was noted to be back in operation.

Meanwhile, Deutsche Welle reported that its Bulgarian service has not been jammed since July 6, following more than twenty-four years of interference.

Tuning around some of the frequencies used by Radio Free Europe, the American-run, Munich-based propaganda station, it seems that some broadcasts are not being jammed from time-to-time, although this may be due to conditions allowing the RFE signal to propagate to the United Kingdom, but not the jamming signal.

A further theory may be that with the new Soviet policy of "glasnost", jamming transmitters may not be receiving full maintenance, and failing more often than has been the case in the past.

International Broadcasting News

NOTE: all times are UTC (GMT)

Europe

Following the dropping of most of the frequencies in the 7MHz (40m) amateur band, Radio Tirana is now heard in English:

0630–1700 on 9.500 and 7.205MHz
1530–1600 on 11.835 and 9.480MHz
1830–1900 on 9.480, 7.120 and 1.395MHz
2230–2300 on 9.480, 7.065 and 1.395MHz

If you are off to Denmark for a holiday, you may care to hear what Danish sounds like: tune in to Radio Denmark:

1000–1052 on 15.165MHz
2000–2052 on 11.875MHz
2130–2145 on 11.875MHz

Radio Finland continues to experience major problems with its new h.f. transmitting site. An announcement from the station said that for the period 1400 July 20 until 0430 the following day, only 6.120MHz would be operational—and then for only some of the time. The transmitter site is supposed to function automatically, but transmissions have been hampered by recurring malfunctions. No technicians are on duty after office hours, and accordingly, breaks caused by various technical problems may last for hours. The new Pori h.f. station cost some 120 million Finnish marks, with the transmitters from the Swiss firm Brown Boveri, the antennas from TCI in California and the automatic operation system built in Finland.

Staying in Scandinavia for a moment, Radio Norway broadcasts in English on Sundays, with European beamings at:

1000–1030 on 15.230, 15.175 and 11.870MHz
1300–1330 on 17.760, 15.310, 9.590 and 6.040MHz
1700–1730 on 15.310, 11.925 and 9.655MHz
1900–1930 on 15.310 and 11.925MHz
2000–2030 on 15.310, 11.865 and 9.590MHz

The Thursday *Media Network* programme from Radio Netherland's has some features planned for your listening pleasure during September . . .

10 September: Medium Wave Special—As nights draw in, *MN* prepares for the medium-wave DX season in the Northern Hemisphere. Will it be better, or worse, than last year?

17 September: News Update—including news from the *WRTH* Office.

30 September: The Long Path Through Asia—the first part of *Media Network*'s Round the World tour. This week, Thailand, looking at the complicated media in this exotic Asian country. A tune around the dial is promised, letting us hear what here in Europe we'd probably never hear!

If you've taken a summer holiday in Spain this year, then you might care to stay in touch with the news from that country. Radio Exterior de Espana is heard in English:

1830–1930 on 15.375, 9.765, 9.745 and 7.275MHz
2030–2130 on 9.765 and 7.275MHz

Radio Moscow, despite having a twenty-four hour-a-day English language World Service, still finds it appropriate to have a separate one-hour service to Great Britain and Ireland. It is heard daily at 1900 on 11.950, 11.850, 9.775, 9.630, 9.520, 7.370 and 7.330MHz. Readers may recall that during July, there was a special "radio-bridge" between Radio One in the UK and Moscow, when there was a hook-up between Bristol and the Soviet capital. Moscow's service to Great Britain and Ireland had trailed this endlessly, promising that a special feature with highlights from the radio-bridge would be broadcast. On the night in question, Radio Moscow opened up, and promptly had to apologise that they were only able to transmit the first few seconds of the programme, as a "technical hitch" had resulted in most of the tape of the programme becoming wiped at the Moscow studios. I wonder how many red-faced technicians are now turning blue in the colder outposts of the Soviet Union . . .

Radio Station Peace and Progress is reported to have stopped broadcasting in Chinese languages—in all, four languages have been discontinued by the station. In their place, Radio Moscow now broadcasts in Standard Chinese at the times of the old Peace and Progress transmissions.

Middle East

As this is written, there is tremendous tension in the Middle East, so perhaps it is appropriate to publish details of the transmissions of most of the Gulf states—all in English except where stated . . .

IRAN: Voice of the Islamic Republic of Iran
1115–1215 on 11.790MHz
1930–2030 on 11.930, 9.765 and 9.022MHz

Persian may be heard most of the day on 15.084 and on 9.022MHz.

IRAQ: Radio Baghdad
0000–0150 on 11.705MHz
2000–2150 on 9.875MHz

Voice of the Masses in Arabic can be heard on numerous frequencies during the day: try 9.770MHz (1600–0000), 15.150MHz (0600–1000)

EGYPT: Radio Cairo
1630–1830 on 15.255MHz
2015–2145 on 9.670MHz
2030–2200 on 15.375MHz

KUWAIT: Radio Kuwait
0500–0800 on 15.345MHz
1800–2100 on 11.675MHz

SAUDI ARABIA: BSKSA
1600–2100 on 9.720 and 9.705MHz

SYRIA: Radio Damascus
2005–2105 on 12.085 and 9.950MHz
2105–2205 on 12.085 and 9.950MHz (to the Americas)

Voice of Iraq may be heard 1800–1900 on any of 12.085, 11.625, 9.470 or 7.355MHz.

UNITED ARAB EMIRATES: Dubai
1030–1100 on 21.605, 17.865, 17.775 and 15.435MHz
1330–1400 on 21.605, 17.865, 17.775 and 15.435MHz
1600–1645 on 15.320, 11.955, 11.730 and 9.640MHz

Gabon-based Africa Number One is on the air 0500–0800 on 11.940 and 4.430MHz; 0800–1700 on 15.200 and 7.200MHz; 1700–2300 on 15.475 and 4.830MHz.

Asia

All India Radio in Delhi has announced that it is to install six 250kW transmitters in Bangalore, Panaji and Delhi, for transmissions to Indians abroad. All India Radio broadcasts in English to Europe:

1845–1945 on 15.360, 11.935, 11.620 and 7.412MHz
1945–2000 on 15.360, 11.935, 11.860, 11.620, 9.755 and 7.412MHz
2000–2045 on 11.860, 11.620, 9.910, 9.755 and 7.412MHz
2045–2230 on 11.715, 11.620, 9.910, 9.550 and 7.412MHz

Sri Lanka has featured in the news prominently during the past months. SLBC from Colombo is sometimes audible with its Middle Eastern and African service in English at 1745 to 1815 on 11.800MHz.

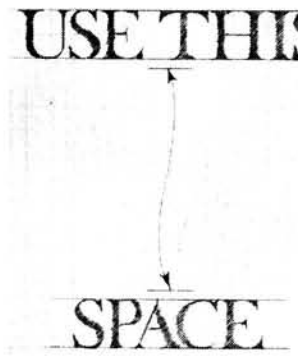
FEBC from the Philippines has an English transmission at 0000–0200 on 15.455MHz.

North America

WCSN, the Christian Science Monitor's radio station, is now heard at 1800 on 15.395MHz, and at 2000 on 15.390MHz. French may be heard at 0325 on 9.815MHz, with German at 0340 on the same channel. French is also at 0525, 0725 and 0925, with German at 0540, 0740 and 0940 on 9.465MHz.

WCSN owns KYOI on Saipan in the Mariana Islands and will beam its Boston programming from there by the winter. KYOI is a 100kW station (audible in the UK), beaming 340 degrees, towards Japan and Korea. Another 100kW transmitter will be built for Australasia on the Mariana Islands.

With that, we come to the end of this month's column looking at the international broadcasting scene. Good listening!



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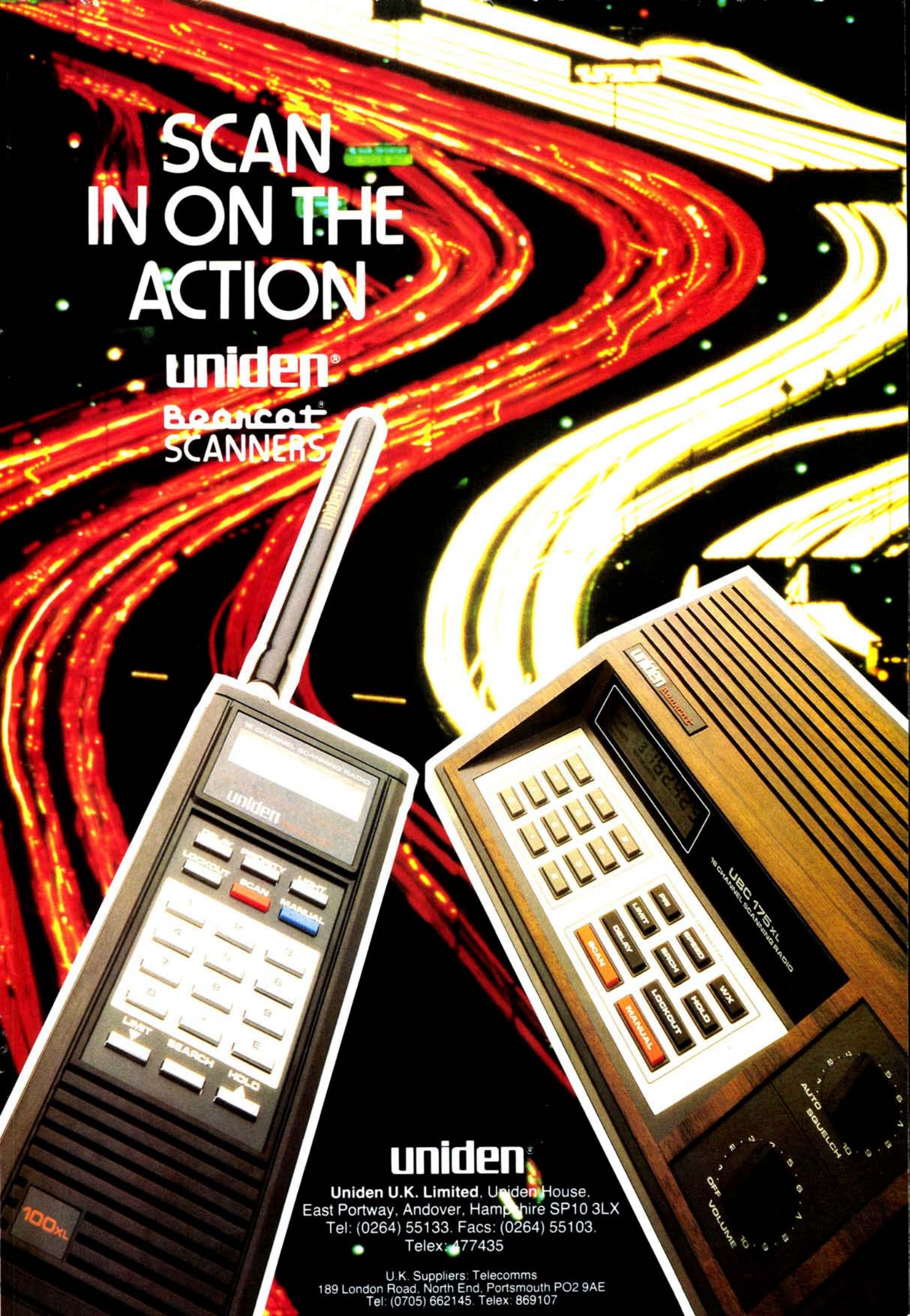
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