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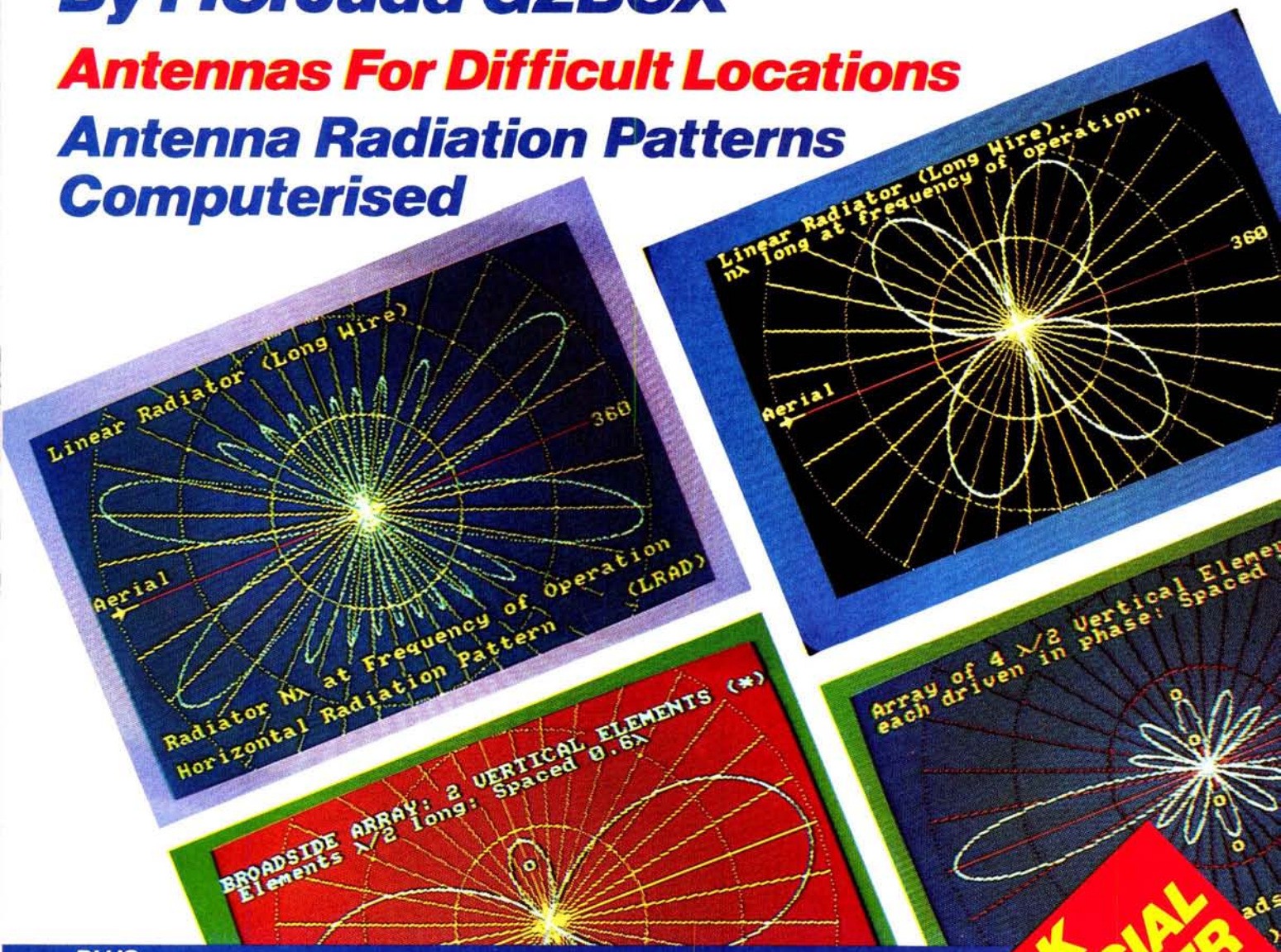

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SP980	Speaker	110.00	(2.50)
FT757GX	HF Transceiver	969.00	(—)
FC757	Auto A.T.U.	349.00	(2.50)
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NC11	Charger	10.50	(1.50)
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LPM 144-25-160	2m, 25W in, 160W out, preamp	255.00	(3.00)
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LPM 144-10-180	2m, 10W in, 180W out, preamp	295.00	(3.00)
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LPM 432-1-50	70cm, 1W in, 50W out, preamp	235.00	(3.00)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	235.00	(3.00)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	195.00	(3.00)
LPM 432-10-100	70cm, 10W in, 100W out, preamp	335.00	(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	41.50	(2.50)
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SP420	140-525MHz PWR/SWR/PEP	74.95	(2.50)
SP425	140-525MHz PWR/SWR/PEP	119.95	(2.50)
SP825	1.8-200-430-800-1240MHz	179.00	(2.50)
TOYO			
T430	144/432 120 W	52.50	(2.50)
T435	144/432 200 W	58.00	(2.50)

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

Icom Products

IC751	HF Transceiver	P.O.A.	(—)
IC745	HF Transceiver	P.O.A.	(—)
IC735	New HF Transceiver	P.O.A.	(—)
PS15	P.S. Unit	158.00	(4.50)
PS30	Systems p.s.u. 25A	343.85	(—)
SM6	Base microphone for 751/745	46.00	(2.00)
IC505	50MHz multi-mode portable	459.00	(—)
IC290D	2m 25w M/Mode	542.00	(—)
IC271E	2m 25w M/Mode Base Stn.	835.00	(—)
IC271H	100W version of above	1029.00	(—)
IC27E	25W FM mobile	399.00	(—)
IC28E	25W FM	325.00	(—)
IC47E	25w 70cm FM mobile	495.00	(—)
ICBU1	B/U Supply for 25/45/290	32.00	(2.00)
ICR71	General Coverage Receiver	825.00	(—)
IC02E	2m H/Held	299.00	(—)
IC2E	2m H/Held	225.00	(—)
ML1	2m 10w Linear	79.35	(2.50)
IC4E	70cm H/Held	285.00	(—)
IC04E	70cm handheld	299.00	(—)
BC35	Base Charger	70.15	(2.00)
HM9	Speaker mic	21.85	(2.00)
LC3	Carry Case	6.90	(2.00)
ICBP3	Std Battery Pack	29.00	(2.00)
BP5	High Power Battery Pack	60.95	(2.00)
CP1	Car Charging Lead	6.90	(2.00)
DC1	12v Adaptor	17.25	(2.00)
R7000	VHF/UHF Scanning Receiver	957.00	(—)
IC3200	2M/70cm Mobile Transceiver	556.00	(—)
IC12	23cm H/H	428.00	(—)
GC4	World Clock	39.00	(2.00)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(3.00)
SX200	VHF/UHF Scanner	325.00	(3.00)
SX400	VHF/UHF Continuous Coverage	625.00	(3.00)
AOR2002	VHF/UHF Continuous Coverage	487.30	(3.00)

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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)
BENCHER			
BY1	Squeeze Key, Black base	67.42	(2.50)
BY2	Squeeze Key, Chrome base	76.97	(2.50)
HI-MOUND MORSE KEYS			
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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	39.95	(2.00)
MK703	Twin paddle keyer metal base	34.50	(2.00)
MK705	Twin paddle keyer marble base	32.78	(2.00)
MK706		30.48	(2.00)
KENPRO			
KP100	Squeeze CMOS 230/13.8v	109.25	(3.00)
KP200	Memory 4096 Multi Channel	234.55	(3.00)

Trio

TS940S	9 Band TX General Cov RX	1895.00	
TS930S	9 Band TX General Cov RX	1595.00	(—)
TS440	**NEW** 9 Band TX General Cov RX	998.00	(—)
TS830S	160-10m Transceiver 9 Bands	981.59	(—)
AT230	All Band ATU/Power Meter	185.90	(2.50)
SP230	External Speaker Unit	56.03	(—)
TS530SP	160m-10m Transceiver	849.82	(—)
TS430S	160m-10m Transceiver	876.68	(—)
PS430	Matching Power Supply	151.48	(3.50)
SP430	Matching Speaker	39.50	(2.50)
MB430	Mobile Mounting Bracket	14.78	(2.50)
FM430	FM Board for TS430	45.00	(2.50)
SP120	Base Station External Speaker	36.33	(2.50)
MC50	Dual Impedance Desk Microphone	43.10	(2.50)
MC35S	Fist Microphone 50K ohm IMP	20.33	(2.00)
LF30A	HF Low Pass Filter 1kW	30.18	(2.00)
TR9130	2M Multimode	593.64	(—)
TM201A	2M 25W mobile	322.68	(—)
TM401A	7cms FM 12W	392.82	(—)
TH21E	2M Mini-Handhelds	199.00	(—)
TH41E	70cm Mini-Handhelds	240.99	(—)
TM211E	2M FM Mobiles	444.60	(—)
TM411E	70cm FM Mobiles	498.00	(—)
TS711E	2M Base Stations	839.96	(—)
TS811E	70cm Base Stations	999.00	(—)
TR3600	70cm Handheld	353.48	(—)
TR2600	New 2M FM Synthesised Handheld	328.00	(—)
ST2	Base Stand	72.09	(—)
SC4	Soft Case	18.48	(2.00)
SMC25	Speaker Mike	21.55	(2.00)
PB25	Spare Battery Pack	35.11	(2.00)
MS1	Mobile Stand	41.88	(2.00)
R2000	Synthesiser 200KHz-30MHz Receiver	565.32	(—)
HS5	Deluxe Headphones	32.02	(2.00)
SP40	Mobile External Speaker	19.70	(—)
TL922	160/10M 2kW Linear	1359.00	(7.50)
TS780	2M/70cm M/M Transceiver	998.00	(5.50)
TS670	6, 10, 15, 40M 10W M/M Transceiver	843.66	(5.50)
TR9300	6M M/M Transceiver	575.16	(5.50)
TR751	**NEW** 2M 25W Multimode	580.70	(—)

Power Supplies

DRAE				**BNOS**			
4 amp	43.40	(2.50)		6 amp	69.00	(3.00)	
6 amp	63.00	(3.00)		12 amp	115.00	(3.50)	
12 amp	86.50	(3.50)		25 amp	169.00	(4.50)	
24 amp	125.00	(4.50)		40 amp	345.00	(4.50)	

SMC			
RU120406	4 amp Power Supply	14.95	(3.00)

Aerial Rotators

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FU200	Light Duty	69.00	(2.50)
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)
HAM1V	8 core Heavier Duty	P.O.A.	(4.50)
T2X	8 core Very Heavy Duty	499.00	(—)
KR5400	Elevation/Azimuth	279.00	(3.00)
KR5600	Elevation/Azimuth	369.00	(3.50)

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	49.00	(2.00)
Drae	3 way SO239	15.40	(2.00)
Drae	3 way 'n' Skts	19.90	(2.00)
Kenpro KP21N	2 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)	79.00	(2.50)
DRAE	2m Pre-set A.T.U.	14.50	(2.00)
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HC200	10-80 HF Tuner	115.00	(2.50)
HC400	10-160 HF Tuner	199.00	(3.50)
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SPC3000D	3kW PEP	325.00	(6.00)

Oscar Antennas

20E	2m ¼ SO239	3.15	(1.50)
2NE	2m ⅝ SO239	8.94	(2.00)
78F	2m ⅞ SO239	21.15	(2.00)
258	70cm 2 × ⅝ SO239	29.37	(2.00)
358	70cm 3 × ⅝ SO239	33.73	(2.00)
70N2M	70cm/2m Dual band SO239	24.95	(2.00)

HS770	70cm/2m Duplexer	24.95	(2.00)
GCCA	Gutter clamp	14.25	(2.00)
SOMM	Mag mount	12.75	(2.00)

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The Radio Magazine

FEBRUARY 1987 VOL. 63 NO. 2 ISSUE 959

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The Lowe Electronics HF-125 Communications Receiver Reviewed

plus

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OR

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Lowe Electronic Shops are open from 9.00 am to 5.30 pm, Tuesday to Friday and from 9.00 am to 5.00 pm on Saturday. Shop lunch hours vary and are timed to suit local needs. For exact details please telephone the shop manager.

AR2002 receiver

Frequency range of the AR2002 is from 25 to 550 and from 800 to 1300 MHz. Modes of operation are wide band FM, narrow band FM and AM. The receiver has 20 memories, memory scan and a search mode which checks frequencies between user designated limits.

The receiver has a push button keypad for easy frequency entry and operation.

A front panel knob allows the listener to quickly step up or down in either 5, 12.5 or 25 kHz steps from the frequency initially chosen.

The AR2002 has a front panel LED bar "S" meter.

There is a front panel 3.5 mm jack socket for headphone use.

A socket for the optional RS232 interface (RC PACK) is provided on the rear panel. The RC PACK consists of an 8 bit CPU with its own ROM and RAM and with your own computer acting as a dumb terminal many additional operating facilities become available. Of course, if you want to write your own programs using the RC PACK as an interface then "the sky's the limit".

AR2002 Receiver . . . £487.30 inc VAT, carriage £7.00

from TRIO, a **new** short wave receiver, the **R5000**.

The R5000 is a new general coverage receiver. It offers the dedicated short wave listener and radio amateur a receiver that will match the performance of the best transceivers available today.

The R5000's frequency range is continuous from 100 kHz to 30 MHz and its modes of operation are USB, LSB, CW, AM, FM and FSK. An optional VHF converter (VC20) extends the frequency range to include 108 to 174 MHz.

The R5000 uses 2SK 125 junction-type FETs in the high sensitivity direct balanced first mixer resulting in outstanding two signal characteristics and a substantially improved noise floor level.

Operating from either 12 V DC or 240 V AC the receiver can be used both in the home or whilst out in car, caravan or boat.

The receiver has two rates of tuning for each mode selected by a front panel switch. The frequency increments for SSB/CW/FSK are 10 Hz and 100 Hz, for AM 100 Hz and 1kHz and for FM 2.5 kHz and 5 kHz.

Both low (50 ohms) and high (500 ohms) aerial connections are provided on the rear panel of the R5000. The required aerial can be selected by means of a front panel switch. Information on which aerial to be used with a stored frequency can also be held in memory.

The R5000 has 100 memory channels which store frequency, mode and which of the two aerial connections has been selected. Information is easily transferred from one VFO to the other, from memory to VFO and in order to quickly access your favourite station, from VFO to any of the memories. Both memory scan and frequency scan (between frequencies in memories 8 and 9) are included in the receiver. Halt on an occupied channel whilst scanning can either be timed or until the signal drops. The entire one hundred memories can also be quickly scrolled to check the data held and to find the location of an empty channel.

To enhance reception, IF shift and a tunable notch filter are part of the R5000 receiver. Filter selection according to mode is automatic when the front panel selectivity switch is set to AUTO. This automatic selection can, of course, be overridden. Additionally the introduction of optional SSB and CW filters (YK88SN for SSB and either YK88C or YK88CN for CW) will improve the already excellent signal to noise ratio and selectivity. The optional YK88A-1 AM filter will improve the shape factor and enhance reception even further.

The R5000 general coverage receiver also has keyboard frequency entry, dual mode noise blanker, two 24 hour clocks with timer, option VS1 voice synthesizer and CW tone mode indication for the blind operator, a large 100 mm diameter top mounted speaker, switchable AGC (fast or slow), RF attenuation (10, 20 or 30 dB steps) and a F.LOCK switch which protects against frequency shift if the VFO knob is accidentally moved.

R5000 Receiver . . . £8.95 inc VAT, carriage £7.00

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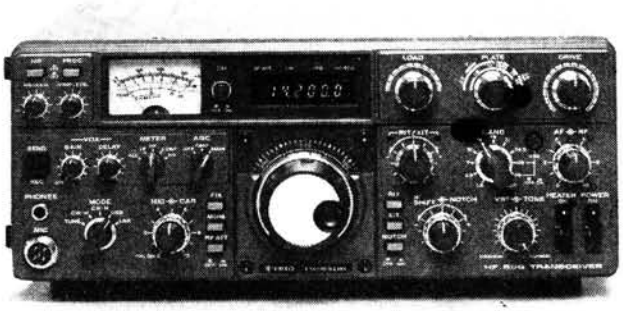
Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995.

send £1 for complete mail order catalogue.

the TRIO TS830S hf transceiver



The TRIO TS830S is for the operator who wants a dedicated amateur bands only transceiver, who is used to and wants a pair of 6146B valves in the PA stage and who wants a compact rig which has its own built in power supply. The TS830S is for the radio amateur who requires a rig capable of rising above today's crowded band conditions, a rig that has, as standard, the necessary features that will produce consistently good contacts where other lesser equipment would fail. The TRIO TS830S, a proven rig with an impeccable pedigree.

The TRIO TS830S covers on USB, LSB and CW the full amateur bands from 160 through to 10 metres.

Convenient to use, the transceiver has its own in-built power supply.

VBT (variable bandwidth tuning) enables the operator at will to vary the IF filter passband and establish optimum IF bandwidth relative to the interference being experienced.

The IF shift control allows the IF passband to be moved up or down in frequency without having to retune the receiver. Hence, an unwanted signal, present in the IF passband, may be attenuated significantly by moving the passband in the appropriate direction.

As the IF shift and VBT are independently adjustable they can, to advantage, be used together.

The tunable notch filter in the TS830S is a high-Q active circuit in the 455 kHz second IF. Sharp, deep notch characteristics will eliminate a strong interfering carrier within the passband of the receiver section.

The RF speech processor in the TS830S provides added audio punch and increases the average SSB output whilst suppressing sideband splatter. Compression levels can be monitored and controlled from the front panel.

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

For perfect listening, a tone control adjusts receiver audio response to suit operating conditions.

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".

It is possible to monitor the transmitted audio in order to assess the effects of the speech processor: a most useful feature ensuring perfect signal reports.

TS830S HF transceiver . . . £898.00 inc VAT, carriage £7.00.

data equipment

CD600 . . . RTTY, CW, ASCII, TOR, AMTOR decoder, output for UHF television, monitor and printer, can also be used as morse tutor.

CD600 . . . £215.14 inc VAT, carriage £7.00.

CD670 . . . A higher specification RTTY, CW, ASCII, TOR and AMTOR decoder complete with liquid crystal dot matrix display, variable RTTY shift, normal/reverse mode switch, outputs for TV, monitor and printer and can also be used as morse tutor.

CD670 . . . £327.77 inc VAT, carriage £7.00.

CD660 . . . Similar in specification to the CD670 but without the built-in dot matrix display.

CD660 . . . £264.97 inc VAT, carriage £7.00.

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NS448 with remote head . . . Frequency range 900 to 1300 MHz, forward power switchable 5/20 Watts, reflected 1.6/6.6 Watts, N type connectors.

NS660P . . . switchable meter reading (average, normal PEP and hold PEP) and provision for optional remote head (U66V), frequency range 1.8 to 150 MHz, forward power switchable 15/150/1500 Watts, SO239 connectors.

U66V . . . remote head, frequency range 140/525 MHz, max 300 Watts, N type connectors.

SC20 . . . extension cable for U66V, approx 20 metres long.

CN410M . . . £61.72 inc VAT, carriage £1.50.

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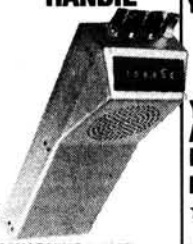

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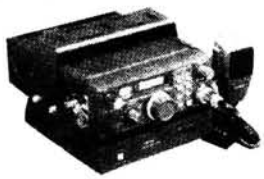

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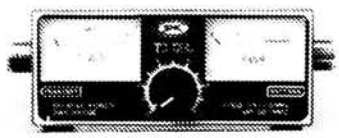

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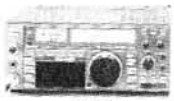

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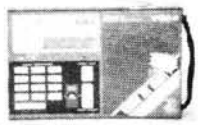

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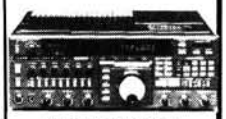

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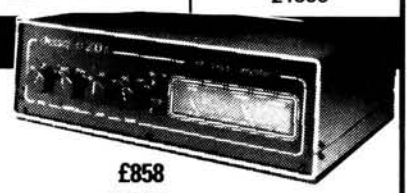

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IP3 order	+18dBM			
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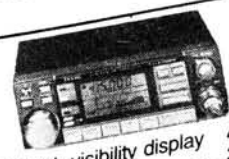

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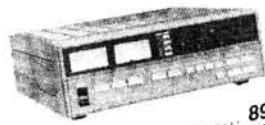

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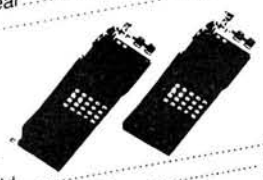

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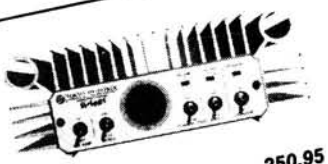

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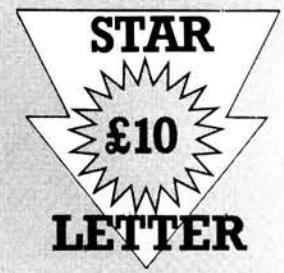


More General Radio

Sir: I, for one, heartily applaud your decision to drop Amateur Club News from *PW* (Comment December 1986) and I sincerely hope this is the beginning of an exercise to make *PW* a magazine for everybody interested in wireless and not just another magazine for the licensed amateur.

Surely there is no necessity to have so much amateur radio content—although I suppose it is inevitable as so many contributors are licensed amateurs. Surely they have plenty of their own specialist magazines—the RSGB publications, their local clubs. I should think these more than cater for their needs, without taking over a magazine for the common or garden radio enthusiast.

I am not saying cut out all amateur radio items, but let's have a better balance and leave out all specialised topics, e.g. Space and Satellites; let's have more constructional items—not too difficult—that would enhance and improve radio reception, e.g. I would like to try to build a v.h.f. converter, preferably air band frequency coverage, to work with my R-1000 but all I seem to be able to get are test meters, a.t.u.s and an abundance of equipment for amateur radio use.

So please, let's have a little more practical wireless for all frequencies and not just amateur band frequencies—and I promise I'll continue to buy *PW*!

H. Thomson
Merseyside

Dial a Drive

Sir: I was the proud owner of an HRO model 5T using octal valves and a solid-state p.s.u., all in mint condition.

On moving house, as the HRO was too large, I decided to sell the lot. I bought a Trio QR666, which I thought had a nice dial system, and the advantage of battery operation.

After a week the dial cord snapped. Having nothing like the original, I purchased something I thought might do from the pet shop! I made a drawing of the original before starting, the first attempt was a complete failure, the second was not much better with the cord binding and slipping.

I decided the fault was with the Trio's fantastic arrangement of pulleys. So apart from the primary cord driving the capacitor, I fitted a second cord driving the dial drum by the capacitor. It worked like a charm using ordinary string, so I have left well alone.

Although I have since obtained something like the original drive cord from a local dealer who specialises in bits and pieces for radio hams, I am now well satisfied with the receiver.

So the old moral, if you do not suceed, try, try again – and you just might win.

By the way, if any readers can supply any info on this receiver I would like to hear from them.

A. Clark
Grimsby

GB QSLs

Sir: A little over a year ago, I took over as the QSL Sub Manager for GB callsigns on behalf of the RSGB. Although this information was published in *RadCom* and subsequently printed in the 1986 Callbook envelopes are still being sent to the address of my predecessor (the late Mr Newman), and occasionally to his predecessor, too. Mrs Newman has now moved. Whilst temporary arrangements have been made to forward any mail to me this arrangement cannot continue indefinitely.

So, would organisers of special event stations please note.

1: All envelopes for collection of cards for GB stations should be sent to me **G4RVV**. I am **QTHR** in the 1985 and subsequent callbooks.

2: Send envelopes as

PW COMMENT

Where Next?

A RECENT ANNOUNCEMENT from the Department of Trade and Industry, the government ministry responsible for the administration and control of radio matters in the UK, reveals that the next callsign series to be used for new Class B Amateur Radio Licences will be G7. When the Class B Licence was first introduced, the prefix G8 was used, and this lasted for many years. With the boom in interest in amateur radio resulting largely from the influx of ex-CBers, the next series—G6—was quickly used up, and we have now reached the stage where the G1 series is almost gone too.

The question must now be asked: where do we go next? The G0 series is currently being allocated to Class A licensees, and G2, G3 and G4 have also been used in past years for these. G9 has always been reserved for experimental licences, rather than amateurs, leaving only G5-plus-3-letters. The latter series was used until fairly recently for visitors from overseas taking out reciprocal licenses in the UK, but these calls were taken away from them a couple of years ago (much to their disgust!). So, unless G10 and above could be activated, G5-plus-3 is now the only series available for re-use, and indeed it is reliably reported that it is next in line.

Past statements from the DTI have indicated that after the computerisation of amateur licence records, it would be policy to re-use lapsed callsigns in the earlier series (G2, G3, G4, G8, etc.). Many of the holders of G2 and earlier G3 calls are now "silent keys", and assuming that their sons or daughters did not wish to take up the hobby and the callsign, the calls could be reallocated. Similarly, many G8 calls belonging to amateurs who have passed their Morse tests, are now unused (other than by the odd pirate!) and could be reallocated.

But, assuming that amateur radio does not suffer a dramatic downturn in its popularity in years to come, even if all these options are used the solution will probably be short-lived. Then what? Well, two other international callsign prefixes are allocated to the United Kingdom, though they have never been used for radio amateurs. The first of these, M, has been in use since shortly after World War II for ship radio stations, and also for stations in the mobile and point-to-point services. The other, the prefix 2, has not been used for any service so far as I am aware.

Are UK radio amateurs (and the rest of the world, come to that) ready to accept such a radical change? I think that M would not be at all bad to use, on either c.w. or 'phone, but a 2 prefix would present more of a challenge for the devotees of Morse, at least. If these series do come, perhaps the first ones will be eagerly sought after for their novelty value—they should certainly drag in the DX! Each series would last a long time, for the UK has the whole allocation MAA–MZZ and 2AA–2ZZ.

You could get some interesting callsigns out of such series—how about M4SIS (emphasis), or 24TEA (two for tea) for example. Can you think of any other good ones? There's a £5 PW voucher (see above) for the sender of the best suggestion received in our Poole office by 31 January 1987. Just one condition—they must be printable! And remember, the Editor's decision is final.

Geoff Arnold

soon as possible after the event when you have some idea how many cards there will be to collect. A 5 x 7·5in envelope at 13p will hold about 20 cards.

3: Send in cards for GB stations as soon as possible. **Do not wait** until your card arrives from the GB station. Cards arriving with me a year after the event may well not be collected if it was a "one off" event.

4: Cards are to be sent to the main bureau, G3DRN, cards for GB stations **only** may be sent direct to me.

5: GB station managers please note that I can only hold uncollected cards for the statutory three months. They are then destroyed.

Good QSLing.

M. W. Stoneham
Sevenoaks

RSGB Plus

Sir: I am amazed that you wasted so much space with the letter of Vic Copley-May G3AAG in the December issue. It could have been condensed into half the space!

As an ordinary member of the RSGB, I can find areas to criticise, but bearing in mind the fact that there are many, many dedicated amateurs working extremely hard on our behalf completely voluntarily, I consider this gentleman insults all of these people.

There are democratic ways of altering the Society. Obtain support and put up for election if he feels so strongly, instead of whining to the press.

Or is it perhaps he has some other vested interest?

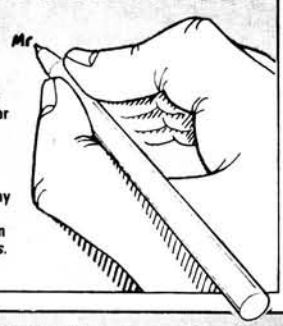
May I say to the Society, "keep up the good work" and continue to improve wherever and whenever possible. I personally consider the Society does listen to members and acts wherever possible.

Norman A. Bedford G4NJP
Bridlington

The letter from G3AAG had already been condensed from a very detailed paper some three times the length. It was not felt possible to reduce it further without totally losing the thrust of his arguments.—Ed.

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.

Letters must be original, and not duplicated to other magazines. We reserve the right to edit or shorten any letter. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of *Practical Wireless*.



Winter Schedule

Sir: On 30 September '86, the Winter Schedule of BBC External Service went into effect. However, it includes something very unpleasant for quite a number of European amateurs. The BBC World Service now makes use of 18·080MHz between 1100 and 1330UTC, right in the middle of the 18MHz amateur band.

As the UK Department of Trade and Industry is responsible for the allocation of h.f. spectrum in the UK, is it not rather peculiar that this body has authorised BBC to operate in the band which is allocated to British amateurs, among others, and to which, under international agreements (ITU allocation of h.f. spectrum for international broadcasting, etc.), the BBC has no right whatsoever, because broadcasting is allocated the segment between 17·700 and 17·900MHz.

We all know too well what is happening in the amateur 7MHz band, so a swift action by the DTI would be welcomed among the amateur radio fraternity.

Igor Pifat YU1PQI
Yugoslavia

The DTI tell us that the 18·080MHz outlet of the BBC is in fact a point-to-point link to an overseas relay station, and is operating quite legally on a Fixed Service allocation. Until replacement frequencies are implemented for the Fixed Service, the Amateur Service uses this band on a Secondary basis only.—Ed.

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.

COMPONENTS, KITS AND PCB'S

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the article. **Kits** for most of our more recent projects are available from **CPL Electronics,** 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE, telephone Middlesbrough (0642) 591157. 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.

BACK NUMBERS AND BINDERS

Limited stocks of most issues of *PW* for the past 18 years (plus a few from earlier years) are available at £1.25 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 area of the country 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 **Post Sales Department, "Practical Wireless", Enefco House, The Quay, Poole, Dorset BH15 1PP,** with details of your credit card or a cheque or postal order payable to Practical Wireless. 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 £13 per annum to UK addresses and £15 overseas, from **"Practical Wireless" Subscription Department, Competition House, Farndon Road, Market Harborough, Leicestershire LE16 9NR. Tel: (0858) 34567.** Airmail rates for overseas subscriptions can be quoted on request.

BUNAC

If you don't know what that stands for, don't be surprised, it's the British Universities North America Club. They send young people to the United States to work in American children's summer camps in a variety of activity areas. Last year, over 3000 young people took advantage of the system and spent three months working and travelling in this way.

The attraction is that the programme is self-financing, allowing those on a budget to see an aspect of the States that is never seen by a tourist. BUNAC provides the job, the visa, the flight and a salary to the participant.

For more details contact: ***BUNACAMP, 232 Vauxhall Bridge Road, London SW1V 1AU.*** Also watch future news pages.

WX Forecasting

TV weatherman Jim Bacon G3YLA visited Chesham & District ARS to unravel some of the mysteries of lift conditions and weather forecasting to the club.

During the evening he also cut the ribbon and officially opened the Club's new extension.

As you can see from the photograph, he's not one for worrying about bad luck!

Spare Parts

The White Paper on Intellectual Property and Innovation (Cmnd.9712) should be presented to Parliament this session. The Industrial Copyright Reform Association has sent in details as they feel more people should know about it.

They say that, if this goes through, it could have far reaching consequences.

It is a proposal for a new unregistered design right of protection for ANY functional design including designs for original parts which will later require replacement by spare parts. The protection will give the original manufacturer an absolute monopoly for marketing his spares for the first five years, to the exclusion of everyone else. Following this period other manufacturers can then market the spare, subject to you then being granted a licence (and there are no guarantees of this), and the payment of a royalty, possibly 10 per cent, may be 20 per cent, to the original manufacturer, provided he has not set protection running again for 10 years by making a small modification to the original design. Only after the design is ten years old or more will a free competitive market exist again.

This is only a small part of a very complicated and detailed paper. But ICRA believe that this single source of supply will inevitably force higher prices, will restrict freedom of choice and will upset rights which have existed for over two centuries.

More details about this and ICRA can be obtained from: ***John Wardle, Industrial Copyright Reform Association, Barker Gate House, Belward Street, Nottingham NG1 1JZ.***

Amateurs Beware!

When re-applying for a lapsed licence or when making a new application radio amateurs should ensure that they are using an up-to-date application form (available in the latest *How to become a Radio Amateur*—Aug 86). Otherwise they might find that their details will be withheld and their stations will not be included in the *Amateur Radio Call Book*.

With the passing of the Data Protection Act 1984, the application form used was updated so that amateurs could say in a positive way that they wanted their details published. Many amateurs are still using old application forms which do not meet this need for positive affirmation of intention. This is in spite of the fact that copies of the new application form were circulated to colleges which run RAE courses.

Because applications made on the old forms will automatically be marked "details to be withheld", unfortunately many amateurs will be excluded from future call books when they wished to be included. If this has happened in your case, write to RALU with a positive statement that you would like to see your personal details in any future call books.

A number of amateurs' Standing Orders have been kept up-to-date. Many are made out to the wrong amount (in which case the license will not be issued) or they are made out to old Home Office and DTI accounts (which delays the issue of licences). If you are in any doubt about your Standing Order details, please contact RALU to confirm the correct details and then inform your bank of any alterations necessary.

If you would like to pay by Standing Order, then write to RALU requesting a mandate form. You cannot pay your first payment by mandate, but all subsequent ones.

Some old application forms also show the accounts address as Tolworth Tower. In fact, all payments should be made out to *The Post Office* and sent to ***The Radio Amateur Licensing Unit, The Post Office, Postal Headquarters, Chetwynd House, Chesterfield, Derbyshire S49 1PF.***

Note that RALU's telephone number is now ***0246 217555***.

RSARS & RAFARS

Following the successful running of stands at the Blackwood Rally, these services will be at the Barry College of FE RS Rally, March 1.

Anyone willing to assist at this or other events in 1987 will be welcome, as will visitors, Service and Ex-Service personnel. The groups would like to thank the organisers of the rallies for the "free" space provided.

Electrovalue Catalogue

A new catalogue service is available. A new, updated, catalogue is issued three times a year. All you have to do to obtain your copy of the latest issue (October) is to send your request to ***Electrovalue Ltd, FREEPOST, 28 St Judes Road, Egham, Surrey TW20 8BR.*** You don't have to stick a stamp on!

Give a Child a Chance

A special event station, GB3HHT, will be on air between 16 and 18 January in aid of Harefield Hospital.

It's being arranged in conjunction with the Mayor of the London Borough of Hillingdon's Charity Appeal. Hopefully the station will be transmitting from the grounds of the hospital itself.

If you want more details then contact ***A. D. Whiteman G1ADW on 01-822 6635.***

NEWS . . . compiled by G4LFM

GB3HP Operational

The packet radio Digipeater GB3HP, located at Olivers Battery near Winchester, is now operational. It was built by members of AMRAC and operates on 144·650MHz using AX.25 packet protocol.

It is expected to provide good coverage of Hampshire, so AMRAC would welcome any reception reports from amateurs and s.w.l.s. Reports should be sent to the GB3HP project leader, Lloyd Arrow G1JAR, QTHR.

Don't forget that AMRAC publish a bi-monthly newsletter which deals with all forms of computer communications. Membership is currently £5 per annum and further details may be obtained from the secretary: ***Phil Bridges G6DLJ, 9 Hollydene Villas, Hythe, Hants SO4 5HU.***

You can also contact him on 0703 847754 or Prestel Mailbox 703847754.

New Radio Club in Clacton

The initial meeting of the Clacton ARS will be held at 7.30pm on Wednesday January 14. They will meet in The Eldorado Club, The Broadway, Jaywick, Essex.

If you want any further information contact: ***Reg Taylor, 14 Meadow Way, Jaywick CO15 2SQ.*** Or Tel: Clacton-on-Sea 430466.

The Radio Gram

Issue number six of this publication has landed on my desk this month. It is a publication for all valve radio enthusiasts, published bi-monthly by subscription only.

The publication contains articles on all kinds of subjects, historical, technical, funny and readers' letters.

UK subscriptions for 12 months (six issues) is £6 and Europe is £8.10. All correspondence should be sent to: ***The RadioGram, "Larkhill", Newport Road, Woodseaves, Stafford ST20 0NP.***

Stolen

Some items of equipment have been stolen from G6WLE in Berkshire. If you are offered the following equipment for sale or repair, please contact your local police station and/or G6WLE on 048839 441.

Yaesu FT-208R, 144MHz handheld Serial No. 2C081428. It has speaker/mic and NiCad battery pack. The case that holds the battery has recently been renewed, and the internal resistor to the ear socket has been shorted, giving an improved audio level to an external speaker.

Alinco ELH-230E 144MHz linear Serial No. 311060843. This is housed in a silvery case that is very scratched on one surface.

Oscar dual-band mobile antenna.

Ham International MS50 extension Speaker. A small, black speaker of about 2in diameter with a dent on the front metal grill, complete with a lead terminating in a miniature jack plug.

International Conference

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

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

Evans Air Publications

This company have sent in details of some publications that might interest the listener.

The five publications mentioned are all up-to-date and currently used by the US Air Force. Subjects range from flight information to charts used by air traffic controllers.

For full details and prices contact ***Evans Air Publications, 11 Hill View, Bryn-y-Baal, Mold, Clwyd CH7 6SL.***

SMC Open Day

Following the success of their Open Day in 1986, South Midlands Communications have decided to make it an annual event.

So, September 13 is the date for your diary. It's a day out for all the family, they have discounts for local attractions—Marwell Zoo, Broadlands—RAIBC car boot sale and much more.

The venue is ***South Midlands Communications, School Close, Chandler's Ford Industrial Estate, Chandler's Ford*** *(just off the A33 at Eastleigh).*

Can You Help?

Does anyone know the whereabouts of a "B" band r.f. coil for the Heathkit Mohican general coverage receiver (L2 on the blueprint). **Ken** on **Winkfield Row 883918** would like to hear from you.

Mr R. A. Waterman requires two 50kΩ + 50kΩ linear dual concentric potentiometers. If you know of a source then you can contact ***Mr Waterman*** at ***42 Kingsmead Drive, Hunts Cross, Liverpool L25 0NQ, or telephone 051-486 1386.***

BVWS

The new-style bulletin from the British Vintage Wireless Society is very impressive. As usual it contains an amazing amount of interesting and unusual material about both radio and television. There are also a few useful advertisements in its pages, too. They carry technical as well as historical articles, but are always looking to hear from new authors.

Membership is £8 for the UK, £10 for Europe and £12 worldwide. Anyone interested should write to: ***British Vintage Wireless Society, Gerald Wells, Vintage Wireless Museum, 23 Rossendale Road, West Dulwich SE21.***

BARTG

The British Amateur Radio Teleprinter Group has announced that the membership subscription for 1987 is being held at £7.

To join the ever-growing ranks, send £7 with your name, address and callsign (if you have one) to: ***John & Pat Beedie, Ffynnonlas, Salem, Llandeilo, Dyfed SA19 7NP.***

Microwave Dinner

The overall planning for the 1987 Microwave Assembly and Dinner is now well under way. Lecturers and trade stands are organised, fairly advanced technical equipment will be in operation and plenty of help will be on hand for amateurs interested in the microwave bands.

The event takes place at the ***Dunstall Suite, Wolverhampton Racecourse Banqueting Centre, Wolverhampton*** on July 18. More details from ***Fredrick Smith, 5 Pinfold Crescent, Penn, Wolverhampton.***

Young Electronic Designer Awards

Two British companies are to fund technology awards for students to the tune of £100 000. Texas Instruments and Cirkit Holdings plc have, together, set up the YEDA Trust.

Briefly, to enter, applicants in full-time education have to complete an electronic design project, which has a useful and viable application in everyday life, for assessment by a panel of experts. The judges assess not only innovative and technical merit but the commercial potential of the projects. Preliminary judging will take place in May and the finals in June/July.

For more information contact: ***The YEDA Trust, 3rd Floor, Standard House, 16–22 Epworth Street, London EC2A 4SX.***

NEWS... compiled by G4LFM

EDXC Roadshows

There are going to be two shows, one on Saturday February 21 and the other on Saturday March 7.

The whole idea of these shows is that they will be aimed at both existing s.w.l. and DXers and newcomers to the hobby. The days will include "hands-on" demonstrations of receiving equipment, international broadcast station schedules and information will be available as well as a number of different presentations.

The venues for the events will be:
21 February
New Imperial Hotel, Temple Street, Birmingham B2 5DR.
7 March
Royal Station Hotel, Neville Street, Newcastle-upon-Tyne NE1 5DH.

More details will be available next month, but if you can't wait that long write to: ***EDCX, On the Road Shows, PO Box 36, Wallingford, Oxon OX10 0TG,*** enclosing a large (9 × 3in) s.a.e.

Amateurs Down Under

We hear from quite a few readers around the world, see their QSL cards and hear of their triumphs as they upgrade their various licences.

It's always good to hear from you and if you have something interesting let's hear about it—others may be interested too!

Garrett Naumann (now VK2K??) is one old friend who let us know he's upgraded his licence. Now he's just waiting to know the new callsign. We'll keep our ears open for you on the bands!

PO Box Mix-up

If you wrote to Amateur Radio Maintenance Service and have received no reply, the answer is a mix-up over Box numbers at their Post Office. So contact them again and all should be well. The address is ***ARMS, Freepost, Ormskirk, Lancs L39 3AB.***

PRODUCTS ... compiled by G8VFH

Packet Radio Software

Grosvenor Software have launched a software package for AX25 Packet Radio using a Dragon 32/64 or 32K Tandy Color computer.

Up to now it has been quite expensive to get onto packet radio—the t.n.c. (terminal node controller) costing around £200. Grosvenor's approach cuts this cost dramatically by enabling a Dragon computer to be used with a conventional modem.

The software is available on ROM cartridge or disk and supports either 300 or 1200baud operation. It is a complete implementation of Version 2 of Level 2 AX25 and can also communicate in Version 1 for contacts with stations using the earlier protocol. Up to eight intermediate repeater stations can be specified as relays and six contacts can be conducted simultaneously together with digipeater operation and an optional beacon. The software "listens" before transmitting to avoid collisions with other packets.

Although this software approach is cheaper than the t.n.c. plus driver system it is a far more sophisticated solution. No modifications are needed to the computer or transceiver and p.t.t. timing is not critical.

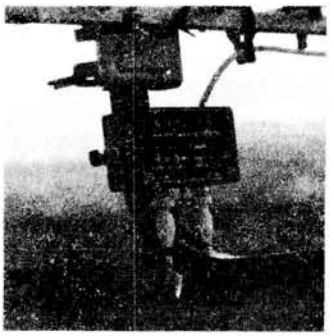
The AX25 system is available as a complete package with software on ROM cartridge or disk and a 1200baud v.h.f. modem for £99.00. The software alone costs £49.00. If you do not have a Dragon, Grosvenor have some re-conditioned Dragon 32 computers available at £40.00, to purchasers of this software only.

Further information is available direct from
Grosvenor Software,
2 Beacon Close,
Seaford,
East Sussex BN25 2JZ.
Tel: (0323) 893378.

KT Electronics

This new company, based in Eire, manufactures masthead pre-amplifiers and power supplies for the TV market. However, the proprietor is a licensed radio amateur and has added a range of antennas, amplifiers and power supplies aimed at the v.h.f. and u.h.f. orientated amateur to the product list.

All the pre-amplifiers are r.f. shielded and the masthead versions are water protected in aluminium die-cast boxes.



For details and prices contact
K. T. Electronics,
Newbawn, Rathdrum, Co. Wicklow,
Eire. Tel: 0404-6521

Coaxial Cable

I have just been told that Geefor Enterprises have added RA519 coaxial cable to their product range. This cable is a 50 ohm semi-airspaced cable with a solid centre conductor and both a foil and copper braid outer conductor.

The cable is claimed to be easy to work with and can be bent to a minimum radius of 55mm. Attenuation is quoted as 3·2dB/m at 100MHz and 13dB/m at 1GHz.

RA519 is available from ***Geefor Enterprises, 112 Leeds Road, Mirfield, West Yorkshire, WF14 0JE*** and is priced at 80p/m with discounts available for large quantities.

Spectrum Slow-Scan TV

This software package provides slow-scan TV facilities from a Spectrum computer. Both transmit and receive are provided for on h.f. and v.h.f. bands.

Two cassettes are provided, one containing the main transceive software while the second is a design program which allows you to design your own personal screens for transmission. A grey scale and 62 graphics shapes are provided which, with the facility for adding varying sizes of text to the screen, allows pictures to be built up. If you have a camera and digitiser these can be used with the program to enable transmission of your own pictures.

Pictures can be loaded and saved to and from either cassette or micro-drive and up to eight pictures can be stored in the program memory bank on a 48K Spectrum—many more on the 128K machine. These stored pictures can be for transmission, "captured" or a mixture of the two. A tuning aid is incorporated in the software to assist in netting onto frequency.

The software costs £25.00 inc. VAT and postage and a ready built interface and tone generator with automatic p.t.t. is available in either kit form or ready built and tested.

Further information is available from

J. E. P. Electronics,
New Road Complex,
Kidderminster,
Worcs. DY10 1AL
Tel: (0562) 753893

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Here are some of our most popular Mods & Kits:-

OVER 100 Kits sold at Leicester!

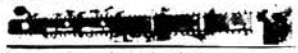
NEW

10 Mtr MOD BOARD - Remember who did it first!

This is a complete modification board designed to fit all CB radios that incorporate modification board designed to fit all CB radios that have the SANYO LC7137 series of sytheslzer chip, the unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the currnet upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10mtr amateur band.

PRICE £22.50 × £1.00 Post and packing (built & tested)

Works excellent in Cybernet, Binatone Lowe TX40G etc. *Check if your radio has the Sanyo chip fitted. We will fit unit for you **£40.00** inclusive. P & P.



* Only suitable for experienced constructors.

KIT OF PARTS AVAILABLE **£17.50 × £1 p&p**

*Only available from RWC see R&EW March 1985 for full circuit description etc.

New Storno CQM713/P3 2mtr Modification Kit

This new kit of parts enables conversion of the Storno 55ch Radiophone to the amateur 2mtr band. The end result is a 80ch 25Khz steps 25W transceiver with repeater shift and option of local or remote control BCD or B. ary channels. The unit renders the ideal basis for a cost-effective mobile or Packet Radio transceiver or even Raynet emergency repeater! The kit comprises of two pcbs 2× adder chips, components (excluding external switches and pots) and 2× 7th overtone crystals and instructions and should present the average amateur with some constructional experience the minimum of difficulty. Why not have a go! Many parts available. Storno Mod Kit. **£29.50** Inc post.

FRG9600 SCANNING RECEIVER

RWC Best seller £xx — with mod & carriage

The FRG9600 Scanning receiver was first modified by RWC and now has coverage up to 950Mhz and improved receiver performance and S meter. We fit an additional BNC socket for frequencies above 460Mhz and are able to supply optional antennas to cover this range. This has been our most successful mod to date with many delighted customers, to our competition who copy the mod we say "Immitation is the best form of flattery!"

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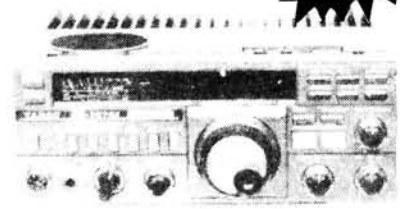

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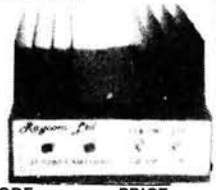

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HF Beam Directivity Check Out

You've seen the ads, read the books, and maybe bought a commercial h.f. beam antenna, but does it really work as well as you think and hope? P. E. Lonsdale G3PVX decided to try and establish the horizontal radiation pattern (h.r.p.) on 14MHz of his triband 3-element h.f. beam and also a friend's.

The ideal antenna "farm" might be a set of fixed V beams, instantly switchable from the operating position, covering the geographical areas of interest in the world. Fine, if you have the "real estate", not to mention tolerant neighbours, but not realistic for most amateurs, so many of us compromise and put up a rotatable Yagi beam of some sort.

Having a beam antenna has advantages and disadvantages; its forward gain helps to boost your transmitted signal relative to the standard dipole, but perhaps the best plus point is the ability to reduce unwanted signals on receive by placing them at the back or side of the beam. However, you may miss that rare DX if your beam is pointing in the wrong direction.

The antenna handbooks and manufacturers' literature generally give the directivity characteristics of beam antennas, but these are usually given for ideal conditions, clear of any other objects, and above a perfectly conducting ground-plane. What happens when the beam is close to a house, trees and the other objects found in real gardens?

The Tests

With h.f. band conditions in decline as the sunspot minimum was approached, the 21 and 28MHz bands were quiet and 14MHz was relatively free of strong signals on the cool August day in 1985 when these tests were carried out. The set-up is shown in Fig. 1.

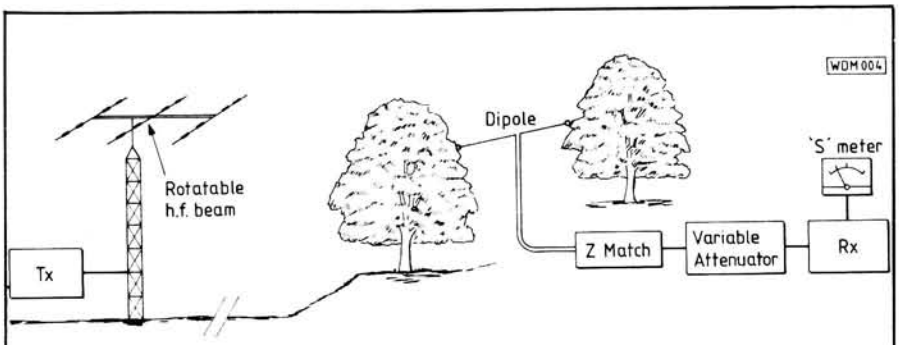


Fig. 1: The test set-up for checking the h.f. antennas

A horizontal half-wave 14MHz dipole with 12m of 75Ω balanced-twin feeder was slung between two large oak trees at a height of 10m above ground. This dipole, erected in the classic "T" configuration at a local viewpoint area, was the receiving antenna. It was the nearest approach to the textbook version, being a half wave length above the ground and having an unobstructed broadside line of sight to the transmitting antennas some 4 to 10km away.

A KW E-Zee Match, which performed the function of a balun and tuner, coupled the balanced feeder to 50Ω unbalanced coaxial cable and then via a calibrated 50Ω variable attenuator to the measuring receiver. A constant level of plain carrier was radiated from each beam in turn whilst rotating it through 360 degrees. At intervals of 12 or 15 degrees, the value of attenuation in the receiver coaxial lead needed to maintain a selected fixed S-meter reading in the receiver was noted. By this method the receiver a.g.c. characteristics and S-meter accuracy could be ignored, since the receiver was always working at the same input level.

Plotting the attenuator values against beam heading and normalising to show maximum at the top, gave the patterns shown in Figs. 2 and 3. A v.h.f. 145MHz link was used for passing the attenuation figures between the receive and transmit sites; a casual listener may have been forgiven for thinking that Bingo was being played!

The receiving site was about 4km from the nearest transmitting beam, and according to the Ordnance Survey map, there was a difference of about 80m in height. This gave an elevation angle of about 1 degree upwards from the transmitting to receiving sites.

The frequency chosen for plotting the h.r.p.s was 14·2MHz, roughly midband for the beams being tested. My beam used traps, and the other both traps and capacity/linear loading techniques to achieve resonance. The results of these tests are therefore only representative of the midband h.r.p.s because of the relatively small bandwidth of these beams, the h.r.p.s could be quite different at the band edges.

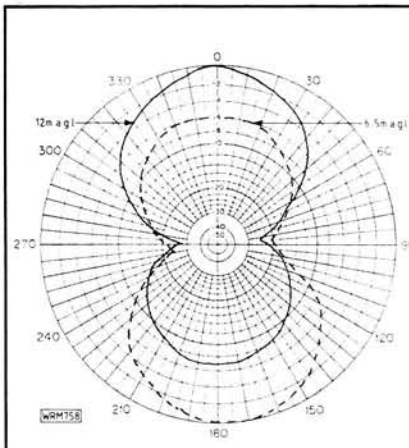


Fig. 2: The patterns for the TET HB33M

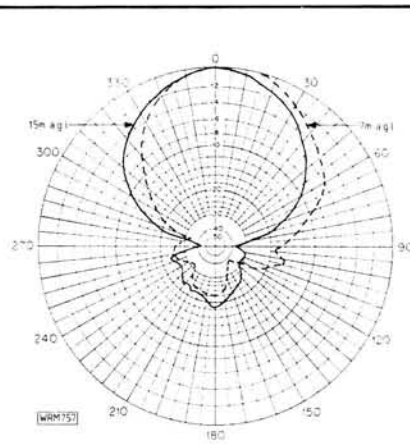


Fig. 3: The patterns for the TH3 Mk III

The Transmitting Locations

The sites were within the established suburban areas of Harrow and Ruislip with housing built in the 1930s. The soil was predominantly London basin clay which retains water and gives good ground conductivity. A brief description of the sites was:

(1) A Hy-Gain TH3 MKIII beam, mounted on a self-supporting crank-up tower, was fed by RG8/U coaxial cable via a BN86 balun attached directly beneath the driven element feedpoint. The tower is 4m from the rear of a semi-detached house. When at maximum height, 15m above ground, the beam is clear of all nearby obstructions in any direction by at least 9m, but only 2m from the house roof when the tower is at minimum height. See Fig. 4.

(2) A TET HB33M beam, mounted on a home-brew crank-up mast, was fed by RG213 coaxial cable and a balun. When fully raised, the beam is 7m from the nearest roof tile of the semi-detached house, but only 2·5m when at minimum height. Apart from other similar houses, there are no significant obstructions nearby. See Fig. 5.

The Results

As can be seen from the h.r.p. plots (Figs. 2 and 3), the beams have useful nulls at the sides of their response curves, but the shape and hence front-to-back ratios are modified by antenna height above ground and proximity to the house. Both beams are affected by close objects, whether resonant or not, and the directivity patterns change accordingly. The v.s.w.r. is also affected, indicating a coincident change in the feedpoint impedance. Curiously, the TET h.r.p. reverses when the beam is close to the house, which perhaps explains why VKs are stronger on short path when other stations reckon long path is better. Please note that the h.r.p.s shown here are not definitive for the Hy-Gain TH3 and TET HB33M types, but are the patterns of these beams at specific locations. At other sites, and with other examples, results may be quite different.

Beam radiation patterns are, of course, three dimensional, having many lobes changing in shape with azimuth and elevation from the source plane. The h.r.p.s shown in this article are the values at an elevation angle of about 1 degree. No attempts were made to measure the forward gain of the beams, since it will vary with the elevation angle.

To get a complete picture of the radiation lobes, some professional antenna manufacturers use helicopters, large balloons and chart recorders to measure the h.r.p.s at various elevations and azimuths, but this is beyond the scope of most amateurs! Scaling down (or is it up?) to say 430MHz is a feasible technique, and F. C. Judd G2BCX has documented this approach and his results in Reference 4.

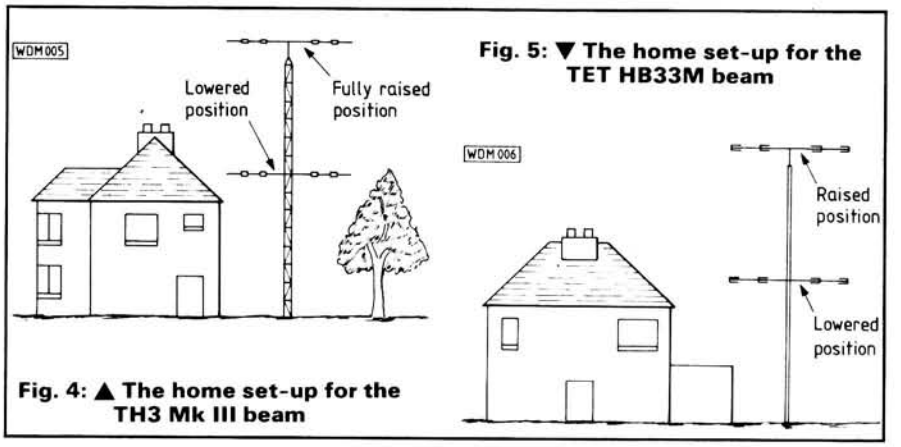


Fig. 4: ▲ The home set-up for the TH3 Mk III beam

Fig. 5: ▼ The home set-up for the TET HB33M beam

The optimum elevation angle for the most reliable h.f. band communication depends on the distance between stations, the E, F1 and F2 layer heights, time of day, etc., but it is generally considered that the lower the angle, the better it is for DX. References 1, 2 and 3 cover this subject in detail.

In practice, the results described here agree well with the beam performances when used on the 14MHz band. In comparisons between my TH3 beam and a doublet antenna, DX signals are often inaudible on the doublet, whilst perfectly readable on the beam. Conversely, high angle signals from the near Continent can be stronger on the doublet than the beam. This is what you would expect, and proves that most DX signals arrive at relatively low angles of less than 30 degrees above the horizontal.

Summary

So, getting the beam as high as possible, and in the clear, does pay dividends by giving a better radiation pattern, and should enable your beam to work properly. Clearly, money spent on a better antenna system is more productive than investing in a linear amplifier. Don't forget, if you can't hear them, you can't work them! Although not previously mentioned, I recommend the use of a balun, not only to provide the correct unbalanced to balanced match between coaxial cable and beam, but also to avoid skewing of the pattern by radiation from the feeder system.

You can copy these experiments to assess your own antenna system. It only needs the co-operation and time of a few amateurs, and a calibrated coaxial cable attenuator. Circuits and construction details of suitable attenuators are given in many handbooks, see Reference 5. If you can, plot the h.r.p. of your beam near the band edges as well as midband. You might be surprised at the results, since directivity patterns can change radically at frequencies not far from beam resonance.

There is one important point to remember if the results are to be within reasonable experimental error; the level of carrier radiated by the transmitter must be kept constant whilst rotating the beam. A power output or similar r.f. indicator should be carefully watched to ensure a steady level. If you use a transmitter with "sweep tube" valves in the final, make sure you do not exceed their dissipation ratings by running too high a constant carrier level. Although amateur transmitters are not generally designed for continuous duty, most solid state rigs will tolerate "key down" conditions of around 20 watts r.f. output for some time. In practice I found that a power output of around 10 watts was adequate. By the way, don't forget to identify your carrier at intervals to comply with the Licence Regulations!

Acknowledgements

I would like to thank my intrepid helpers; G4IRP for his expertise with a fishing line and weight (to erect the receiving dipole), G4PTI for the tests on his TET beam, and especially G4IPX who did the field work at the receiving site. Their assistance, ideas and co-operation made these tests possible and very enjoyable. **PW**

References

1: *The ARRL Antenna Handbook*, 14th Edition, ARRL 1982. Pages 2.10 and 2.23

2: *HF Antennas for all Locations* by L. A. Moxon G6XN, RSGB. Chapter 10 pages 132 to 146.

3: *Beam Antenna Handbook* by William I. Orr W6SAI, 5th Edition, Radio Publications Inc, USA.

4: *Aerial Performance Test Set* by F. C. Judd, *Practical Wireless* Jan 1978. Pages 678 to 682.

5: *The ARRL Antenna Handbook*, 14th Edition, ARRL 1982. Pages 15 and 17.

Surface Mount Prototyping

Nick Allen-Rowlandson BSc G4JET takes a look at one of the fastest-growing areas of p.c.b. production

The surface mount industry has grown rapidly in a very short time as a result of the demand for more and more miniaturisation at reasonable cost, and also because it is a technology which has been aimed at large volume production. Inevitably, many people, both in industry and the home market, want to be able to build their first s.m. (surface mount) design without committing themselves to a c.a.d. (computer aided design) layout. Computer aided design costs the same whether it is for one off or many thousands. Also, it is becoming increasingly common for new devices to be brought out in s.m. packs before their conventional part. Many devices, like l.c.d. drivers for example, will never be available in d.i.l. (dual-in-line) packs because of the number of pins!

Hand assembly techniques are quite feasible for small volumes, and is still used for prototypes even in industry where it is not worthwhile programming "pick and place" machines.

The single largest problem to overcome to achieve a cheap prototype, is the manufacture of the p.c.b. Even if you have c.a.d. to hand, there is still the cost of converting your c.a.d. file to an artwork, and using traditional methods of crepe taping means photoreduction. One solution, is the use of dry film transfers as an etch resist, a technique used for conventional components for some time. The component outlines available on the transfers from EDS [1], have been designed with hand assembly in mind, all of the designs have extended pads to allow for the use of a soldering iron. All of the usual outlines are on an A4 sheet; 0805, 1206, 1210, 1812, SOT23, SOT143, SOT89, MELF (metal-ended leadless faced), MINI MELF, SO and SOL i.c.s, tantalum and polycarbonate capacitors and, of course, a range of PLCCs (plastics leaded chip carriers). In all, around 700 device outlines are on the sheet as well as a selection of conventional pads and three sizes of track.

Of the tools that are required, the commodities most needed are patience and a steady hand, but very good results at low cost can be achieved.

Tools

For any work on surface mount p.c.b.s you will need the following tools:

Fine tipped, temperature controlled, earthed soldering iron
Fine tweezers
24s.w.g. resin cored solder
Magnifying glass
Liquid flux
Small paint brush

Additionally, if you are going to produce your own boards using dry film transfers, the following items will be useful:

Etch resist pen
Solvent or Scotchbrite to remove etch resist from board

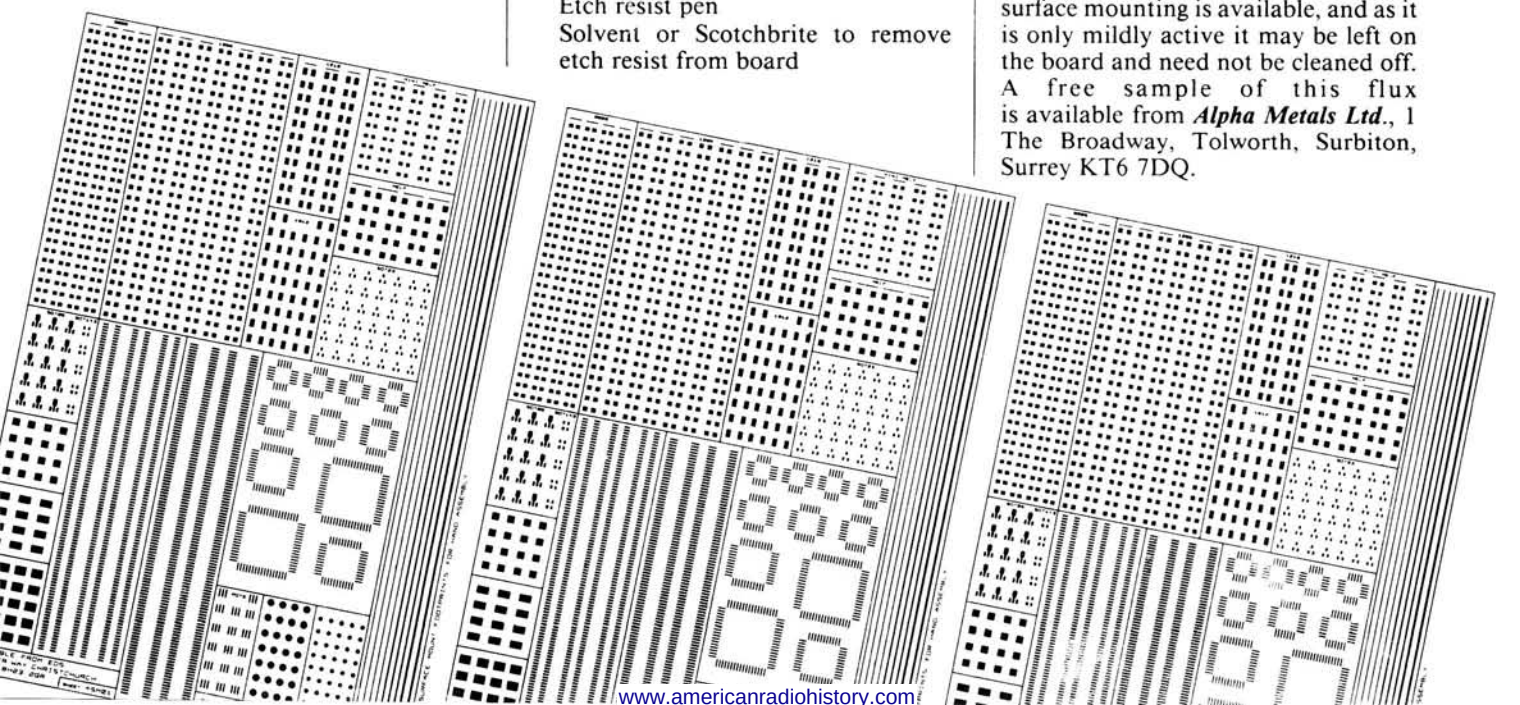
Method

It will soon be discovered that the small components just don't want to stay where you put them, especially when you bring the soldering iron near them. Use the tweezers to hold the component while you tack one end of the component with the soldering iron, let it cool before soldering the next leg, then go back to the first joint and rework it to a good finish. This will be a simple matter if there is enough flux on the joint. This is where the small brush and a small pot of liquid flux is important. Apply the flux over the joint and just touch the joint with the iron and the flux will do the rest, and a nice shiny joint will be formed. If additional flux is not used, the joint will not flow properly as there is not enough flux in the cored solder relative to the amount of solder used for the joint. Remember, the liquid flux that you use is more active than the rosin flux so it will have to be cleaned off the board when you are finished.

References

(1) EDS, 70 River Way, Christchurch, Dorset BH23 2QR. Dry-film etch-resist transfers cost £4.85 including P&P, please include cash with order. **PW**

Note, a flux paste which is suitable for surface mounting is available, and as it is only mildly active it may be left on the board and need not be cleaned off. A free sample of this flux is available from ***Alpha Metals Ltd.***, 1 The Broadway, Tolworth, Surbiton, Surrey KT6 7DQ.



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VK2ABQ Tribander

When D. V. Pritchard G4GVO made his first sorties on the h.f. bands he found that commercially made beams were priced out of his reach. The 2-element triband beam designed by Fred Caton VK2ABQ/G3ONC caught his eye and he soon had his version soaring above his roof-top. Here he looks at the practical aspects of building and trimming this remarkable beam.

While it may be invidious to suggest that the status symbol syndrome of the magnificent commercial beam seems to make most of the running these days—and I am not questioning the efficacy and construction of commercial arrays—it seems a pity that the potential of the VK2ABQ seems to have been overlooked. To say nothing of the fun to be had in building it!

Furthermore it is noteworthy that Les Moxon G6XN, in his book *HF Antennas* (RSGB), points out that the VK2ABQ is a "serious contender" in the search for high-performance beams.

It must be emphasised, however, that the author takes no credit for the designs offered here. That honour goes exclusively to Fred Caton.

The Basic VK2ABQ

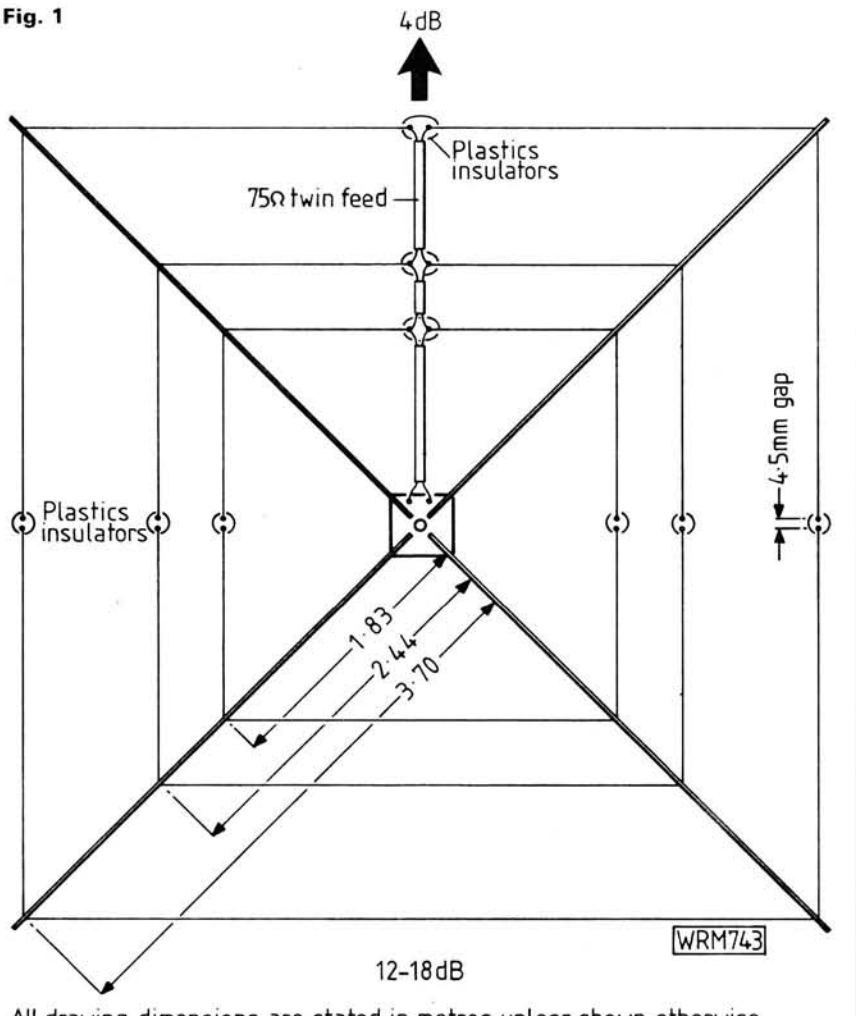
The old dictum, *there is no substitute for a full-size resonant antenna*, is exemplified by the VK2ABQ. The beam in its original form is shown in Fig. 1, and it will be seen that if the elements were spread out in straight lengths from the feed-point, a nest of resonant dipoles would result. By doing the same with the reflector elements and mounting the assembly on a boom, one would end up with something like a conventional full-size beam.

By building it in a quad fashion as shown—looking up or down at the array—it will be seen that the elements are still full-sized, but folded inwards and supported by insulators. This reduces the size and results in a rotatable beam with a turning circle of only 3·7 metres.

Another way of looking at it is to consider it as a nest of quad loops each cut at their centre-points and separated by insulators. The analogy ends here because, as is obvious, the VK2ABQ is mounted in the horizontal plane.

The purpose of the insulators, and especially their size, is important to note. The gap between the element ends should be 4·5mm and certainly no wider than 6mm. As the antenna is effectively a number of high-*Q* circuits tightly coupled by end capacitance, the need for small gaps is sometimes overlooked. Their purpose is to turn the rear elements into voltage-driven reflectors with a 90 degree phase shift, thus providing a forward cardioid pattern with useful characteristics.

Fig. 1



All drawing dimensions are stated in metres unless shown otherwise.

Construction

Although any method of basic quad construction may be employed, a few points should be kept in mind. If metal is used for the centre-plate and parts of the spiders, it must be bonded electrically to a metal mast if one is used. However, experiments with six of these beams have proved that wood, bamboo or glass re-inforced plastics construction is not only easier, but that trimming problems are minimised.

A piece of 13mm-thick exterior grade plywood 400mm square is used for the centre-plate, and this should be primed and given at least two coats of paint for weatherproofing. Bamboo is used for the four 3·7m long spiders, and although problems may be encountered in obtaining these lengths, they are sometimes available from nurserymen. Failing this, one 2m and one 3m length securely taped together will serve just as well.

An important thing to remember is that bamboo, unless firmly taped from end to end, often splits. A better method is to wrap it with glass fibre tape coated with resin, unless of course you can afford complete glass fibre rods! If U-bolts are used for clamping the spiders to the centre-plate, eight metal shims of U-channel section should be inserted to equalise the pressure, otherwise there is a danger of splitting the bamboo when tightening up. The use of saddles, easily made from aluminium sheet, is probably a better method (Fig. 2).

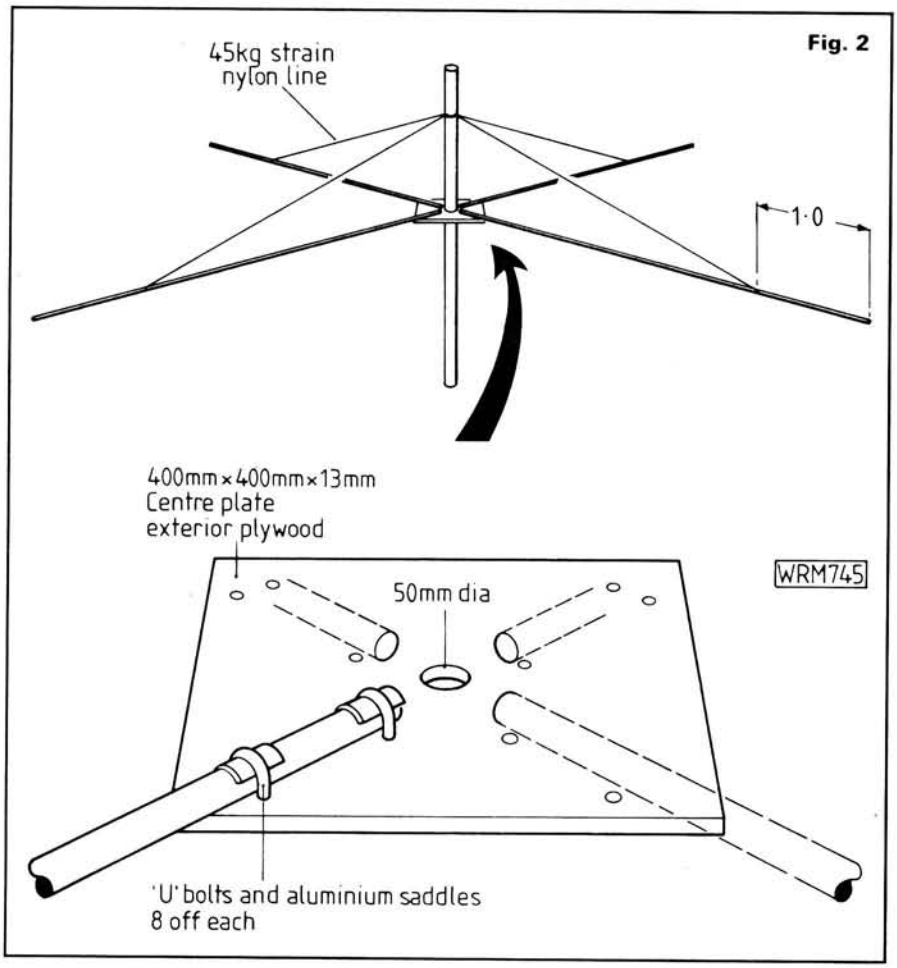


Fig. 2

On assembling the framework, ensure that the spiders are straight and spaced at the distance shown in Fig. 1 before drilling any holes.The U-bolts or saddles should be tightened just enough to hold the spiders in position while trimming, yet slack enough to allow movement under gentle pressure for final adjustments.

Assembling the Loops

Lightweight insulated flex is recommended for the loops as this is quite satisfactory and makes for ease of assembly and trimming. The loop lengths are found from the formula:

Length (m) = 300/Frequency (MHz)

giving 14MHz = 21·4m
21MHz = 14·3m
28MHz = 10·6m

It will be seen that these lengths correspond approximately to the l.f. ends of each band, and the reasoning behind this is based on the following:

(1) Overcoming interaction between elements.
(2) Providing sufficient wire for trimming purposes.
(3) At an operating height of 10m the elements are resonant at mid-band position.

Whichever of the two designs shown is chosen the basic method of assembly is the same. The loops are cut to size and laid out on the spiders as shown in Fig. 1. At this stage the loops should be lightly tied in position with string to allow movement for trimming.

Trimming the Loops

Since many amateurs have told the author that trimming the loops presents the greatest problem, it is worthwhile examining possible reasons.

The original articles on the VK2ABQ correctly gave the input impedance at the feedpoint as 50 ohms but stated that 75 ohms twin feeder could be used. Les Moxon G6XN has also pointed out that losses can be reduced, and money saved, by ***not*** using coaxial cable—a point of view with which I agree. Nevertheless, many amateurs have to use coaxial cable for a variety of reasons and this often leads to problems when trimming the loops.

The VK2ABQ is a fairly high-gain beam which, with careful construction and erected at a reasonable height, can deliver up to 4dBd of forward gain with an equally useful front-to-back ratio of up to 18dB. As with any balanced array fed with an unbalanced line, severe distortion of the radiation pattern, as well as other undesirable effects, is bound to arise. The use of a 1:1 balun is therefore mandatory when feeding the beam with 50 ohm coaxial cable, and the simple unit shown in Fig. 3 is adequate up to the full legal maximum power.

A g.d.o., or its f.e.t. equivalent, is needed for measurements and again attention is drawn to some important points. Early publications advocated the use of a two or three-turn pick-up coil at the feedpoint with each loop being gripped at its voltage point —where the insulator will be placed later on—to check that the correct loop is being trimmed. To trim the 14MHz loop you will need to possess arms two metres long, or hold hands with a friend! Neither is recommended as the presence of bodies, normal or otherwise, within the loops will affect the readings.

The beam should be supported on wooden boxes about 1·5m above the

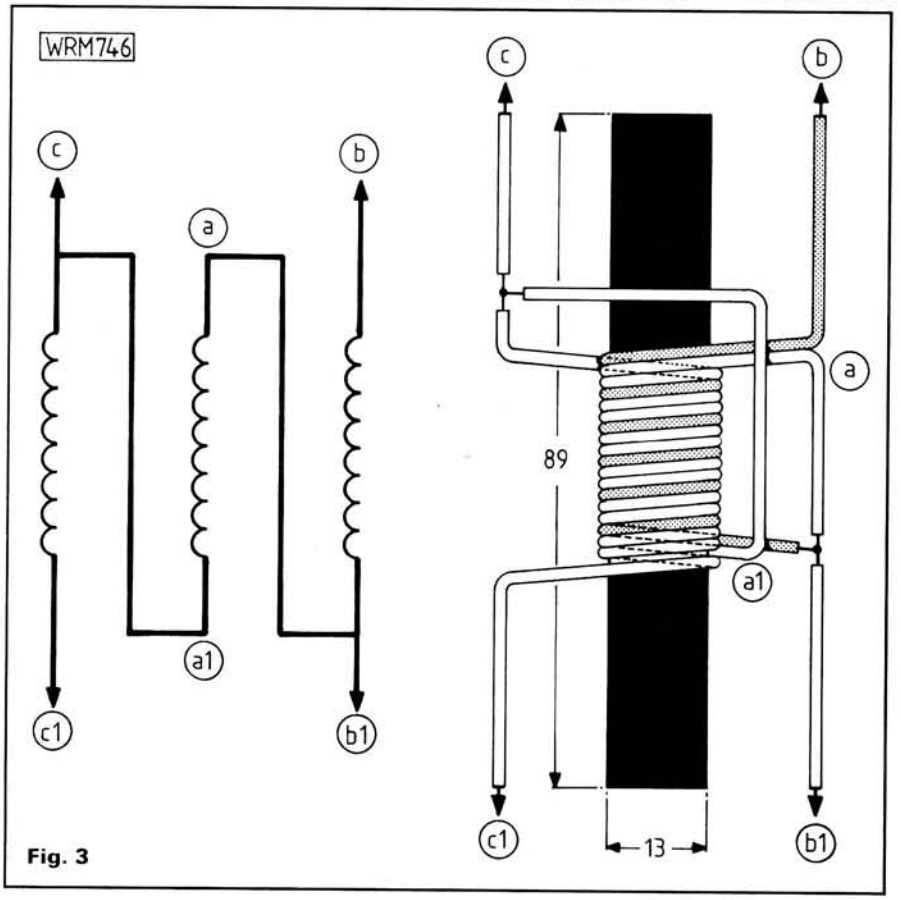


Fig. 3

ground and the balun connected. The coaxial cable is dressed downwards and led away from the beam to the g.d.o. about 3m away from the loops. Any surplus cable should be either coiled up or spread around ***away*** from the beam. A two or three-turn pick-up coil as connected across the end of the cable and the g.d.o. measurements carried out on a wooden table clear of any metallic objects.

It is at this point that frustration usually sets in and blasphemy is often heard accompanied by a strong desire to discard amateur radio in favour of hang-gliding. Often the reason is that the 14MHz loop has been trimmed first, followed by the 21 and 28MHz loops in that order, and the 14 or 21MHz loop is then found to be off tune. The author has found that the following procedure works best.

1. If the beam is to be supported on an aluminium tube for insertion into a rotator, the tube must be mounted ***first*** under the centre plate but not allowed to touch the ground.
2. With the assembly 1·5m above the ground each loop is tuned for the l.f. end of each band. (Anything up to 10kHz above the bottom of the band is satisfactory).
3. ***Begin adjustments with the 14MHz loop,*** followed by the ***21MHz loop*** and then the ***28MHz loop.***

Although this may entail some unwanted physical activity while trimming, the results are well worth it. When each loop is resonant at the correct frequency it is permanently fixed in place on the spiders, and as bamboo is a poor insulator when wet, Nylon cord or fishing line is recommended for this purpose.

To turn the array into a beam the loops are cut exactly at their midpoints on both sides and plastics insulators inserted. In the original designs shirt-buttons were used, but these are not recommended as variations in the materials used makes them unreliable. It is better to make the insulators from Perspex, countersinking the holes to prevent undue chafing of the wires. On completion the spiders are extended with gentle pressure to take up any slack and the clamping bolts tightened.

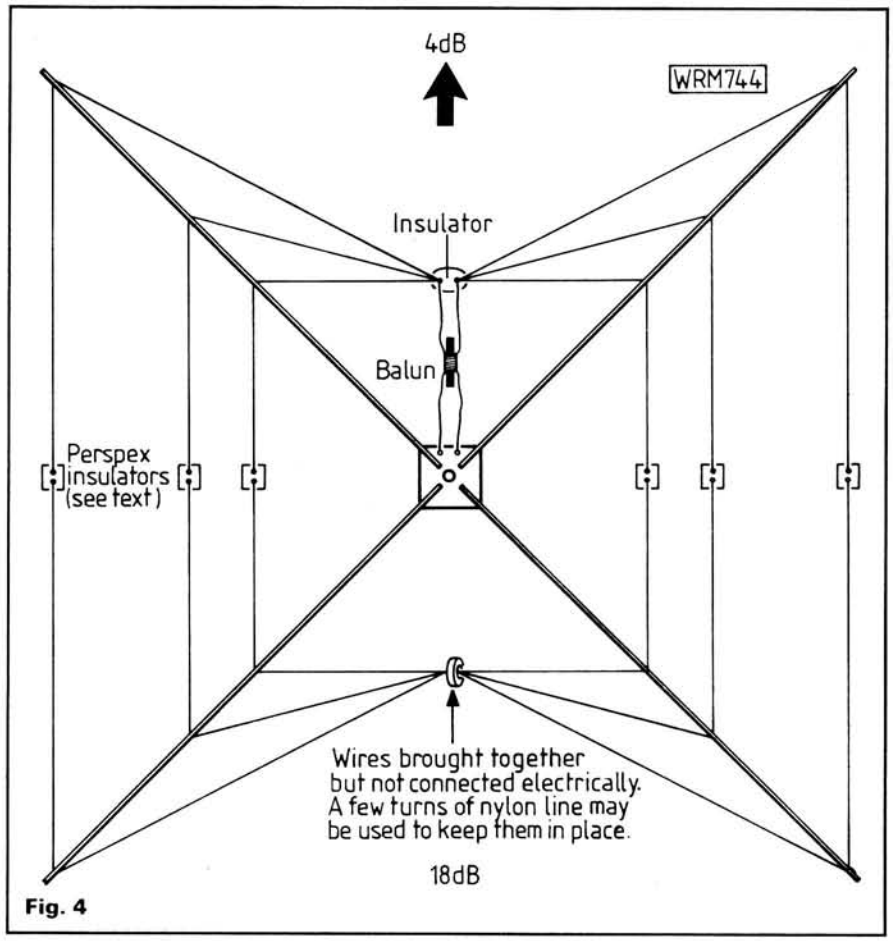


Fig. 4

Unless you have a tilt-over mast you may require help to get the beam up onto the rotator, although the author has managed it on his own quite successfully, during experiments, on six occasions. The entire assembly is very light and windage is no problem, even for a light-duty rotator. Bowing of the spiders can be overcome by the addition of a stub mast and by using 45kg fishing line to take the weight of the spiders (Fig. 2).

Once in position about 10m up in the air the beam appears considerably smaller than when on the ground, and its turning circle of under 4m makes it ideal for limited spaces. A further advantage is that its lightweight construction poses few problems of damage to persons or property should it come to grief in a storm. Moreover the construction of a replacement is effected very quickly as the original dimensions need only be copied with no need for adjustments or tuning.

Experiments at G4GVO with six such arrays over the years have resulted in the adoption of the modified design shown in Fig. 4, and this version has brought in WAS, VE, VK, ZL, VP, JA and many more stations, all worked on 100W of sideband. The "double-humped" cardioid pattern has proved particularly useful when beaming towards the west, as a wide-area response has often been affected.

It is hoped that the suggestions offered will prompt more amateurs to experiment with the VK2ABQ beam and discover its potential for themselves. ***PW***

ERRORS & UPDATES

Automatic NiCad Charger, October 1986

Feedback from readers who have built this project indicates that, because of circuit tolerances, the performance obtained from the prototypes built by the author and by *PW* staff cannot reliably be reproduced. It appears that a more realistic limit to the number of cells that can be charged at one time is eight AA size cells and fewer of the larger cell types, as shown in the table. If required, higher numbers of cells can be charged using the existing control circuitry, in conjunction with a higher voltage and current rated transformer and smoothing capacitor. The overall current regulation of the circuit can be improved by altering the value of R5 from 820Ω to 470Ω if desired.

Cell type	Normal capacity (Ah)	Charging current (mA)	Number of cells
AA	0·45	45	8
C	2	200	4
D	4	400	2
9V (PP3)	0·11	11	1

High-Impedance MOSFET Voltmeter December 1986

If you are experiencing difficulties in obtaining D1, a BAT85, try Cricklewood Electronics Ltd., 40 Cricklewood Broadway, London NW2 3ET. Tel: 01-450 0995.

HF Band Antennas for Difficult Locations Part 1

Local planning, very limited space, or both, are perhaps the two main reasons why one is liable to run into difficulties regarding the erection of a suitable antenna, or antennas, on the numerous h.f. bands allocated to Class A licence holders. F.C. Judd G2BCX hopes that this article may help those, especially newcomers, who face the situation where it is just not possible to put up what may be loosely described as "a full size antenna".

If you decide you want a half-wave antenna (centre-fed) for the 3·5MHz band, for example, it would have to be approximately 40m (132ft) long at a height above ground of the same order—a requirement few amateurs could meet. Most antennas used on the lower frequency bands e.g., 1·8, 3·5 and even 7MHz, are something of a compromise anyway, at least as far as height is concerned.

A modern h.f. band rig costs a good deal of money these days and it is natural that one will want to make the most of it even though there may be restrictions of one kind or another when it comes to the antenna system(s). This could entail severe limitation of both height and length of outdoor antennas, or resorting to the use of an antenna completely out of sight, i.e. indoors, in a loft space. A compromise of any description does however mean some loss of efficiency, but on the other hand, it is surprising just what can be accomplished with an antenna that some might regard as "an invisible piece of wet string". It may not be capable of boring holes in the ionosphere, indeed it shouldn't, but good DX can and has been worked with compromise antennas when conditions are reasonably favourable. Remember, you have the next sunspot cycle peak on the way!

The physical height of an antenna affects its performance in a number of ways and one is a change in radiation resistance as the height is varied. The radiation resistance v height of either a horizontal or vertical half-wave dipole can be found from Fig. 1.1. For example, the radiation resistance of a dipole is very low when it is close to the ground but rises rapidly, to over 90Ω, at a height of about 0·3 of a wavelength. It drops to 60Ω at 0·6 of a wavelength and then settles at about the "free-space" value of 73Ω for greater heights. Longer antennas (several wavelengths at the frequency of operation) behave in a similar way although the nominal free-space radiation resistance of 73Ω, at any current maximum, increases with the number of half-waves contained within the antenna. This change in radiation resistance with height, is probably the reason why difficulties are often experienced in obtaining accurate matching, particularly with vertical antennas at low height which increases the radiation resistance.

Ground Reflection Characteristics

This subject was dealt with in the article Antennas Part 7 in *Wires and Waves* (a *PW* Publication). However, it is important to understand a little about the effect of ground, particularly on low height antennas used for the lower frequency bands e.g. 1·8 and 3·5MHz. Hence the reason for a recap on this subject.

Average ground is not normally a very good conductor but its behaviour depends considerably on the transmitted frequency. At low frequencies for example most types of ground have relatively high conductivity, even up to 3·5MHz. At these frequencies radio waves can penetrate the ground for quite a distance and find a large low resistance cross-section sub-surface in which current can flow.

In the higher frequency region, 7MHz and above, the penetration decreases and the ground may behave like a lossy dielectric, the main effect of which is to absorb radiation. Therefore, the nature of the ground, the frequency of operation, and the height of the antenna all contribute to determining the amplitude of radiation at various angles from ground.

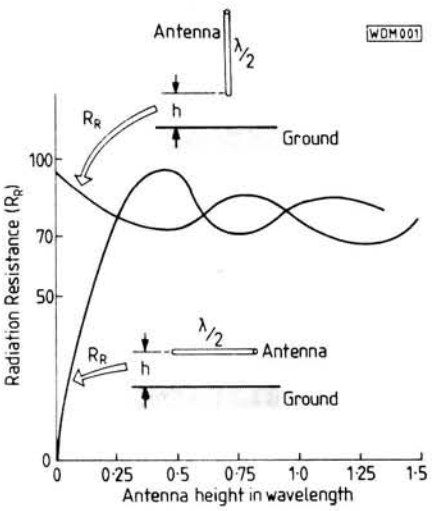


Fig. 1.1: Radiation resistance of both horizontal and vertical half-wave antennas relative to height above ground in wavelength (see text for further explanation)

Ground Reflection and Radiation Resistance

If the ground conductivity is high, waves radiated directly downward from an antenna will be reflected vertically from the ground at considerable amplitude and since they pass the antenna on the way up, will induce current into it. The phase of this current will depend on the height of the antenna above the reflecting surface. The total current flowing in the antenna thus consists of two components. The amplitude of one is that due to the power from the transmitter and the otherwise "free-space" radiation resistance of the antenna, the other being that induced in the antenna by the wave reflected from the ground. The second (reflected) current component could be small or large, depending on the ground reflection factor.

However, at certain antenna heights the two currents may be more or less "in-phase", in which case the total current in the antenna will be larger than would be expected relative to the "free-space" radiation resistance of the antenna. At other heights, the two currents may be "out-of-phase" or partly so, in which case the total current is the "difference" between the two and will therefore be smaller. The radiation resistance is determined by the "total" power flowing in the antenna. The effect on radiation at vertical angles, due to the height of an antenna above ground and which takes into account the phase relationships of direct and induced currents, is shown in Fig. 1.2.

Effective Directivity

The usual horizontal diagrams of directivity do not necessarily provide an accurate indication of the directive properties of a horizontal antenna at

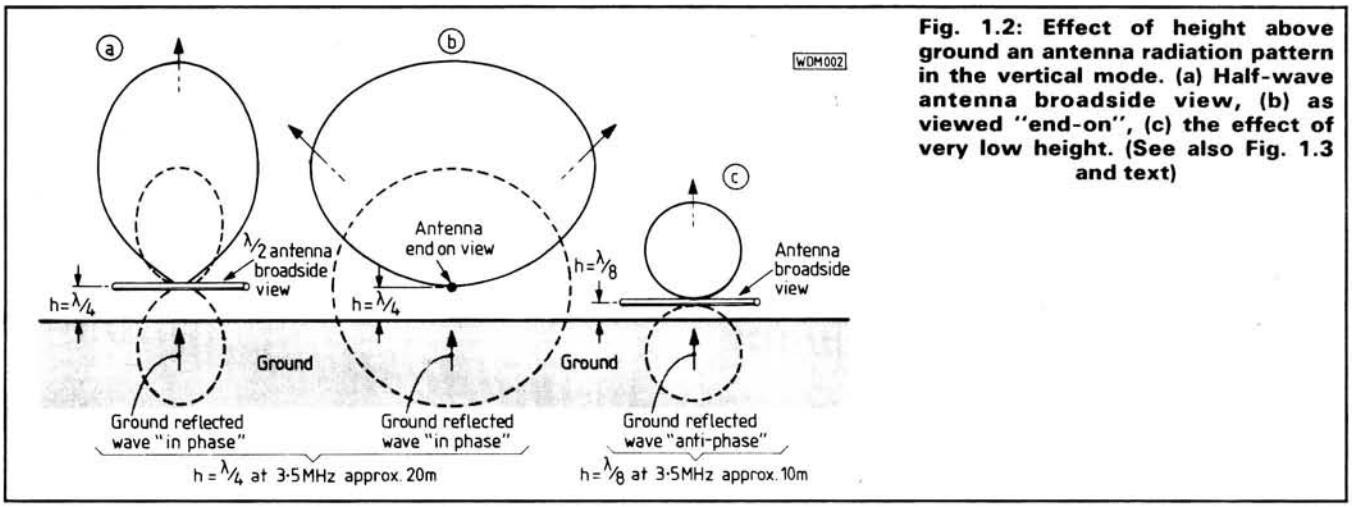


Fig. 1.2: Effect of height above ground an antenna radiation pattern in the vertical mode. (a) Half-wave antenna broadside view, (b) as viewed "end-on", (c) the effect of very low height. (See also Fig. 1.3 and text)

wave angles above zero. Consider for example the figure-of-eight polar pattern of a half-wave dipole in horizontal mode. It shows that there is no radiation directly in line with the antenna itself and which is true at zero angle. However, if the antenna is at low height, i.e. a relatively small fraction of its operational wavelength above ground, then the previous statement is not true.

The reason may become clear from Fig. 1.3. This shows a cross-section of the radiation pattern looking at the antenna from a point at right angles to it, i.e. a broadside view. The angle lines OA, OB and OC all point in the same geographical direction (applies to either end of the antenna and in all directions around it) but the angles are different when related to the vertical mode of radiation. The purely horizontal radiation (angle OA) has zero amplitude, but at a slightly higher angle (OB), the radiation amplitude is greater and at an even higher angle (OC), is greater still.

It will be realised that this pattern is similar to that shown in Fig. 1.2(c) which, as already mentioned, is due to the low height of the antenna above ground in terms of wavelength at the frequency of operation. Either of these patterns also shows that "maximum" radiation is at an angle of 90 degrees to ground. The distance over which communication can be carried out depends on (i) what might be called the "useful" angles of radiation in the vertical plane i.e. less than 90 degrees, (ii) the height of the ionospheric layer, whether E or F (F2) and (iii) which layer is used. The distance covered in a single hop depends not only on the foregoing but also on the frequency of operation. Note: Ionospheric Radio Wave Propagation was dealt with in a recent issue of *PW*.

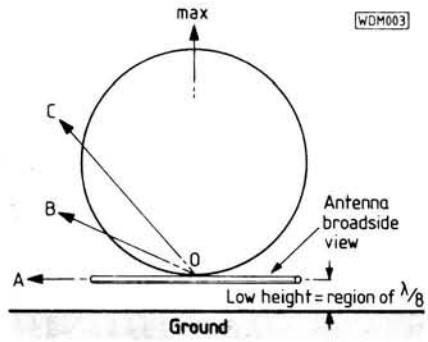


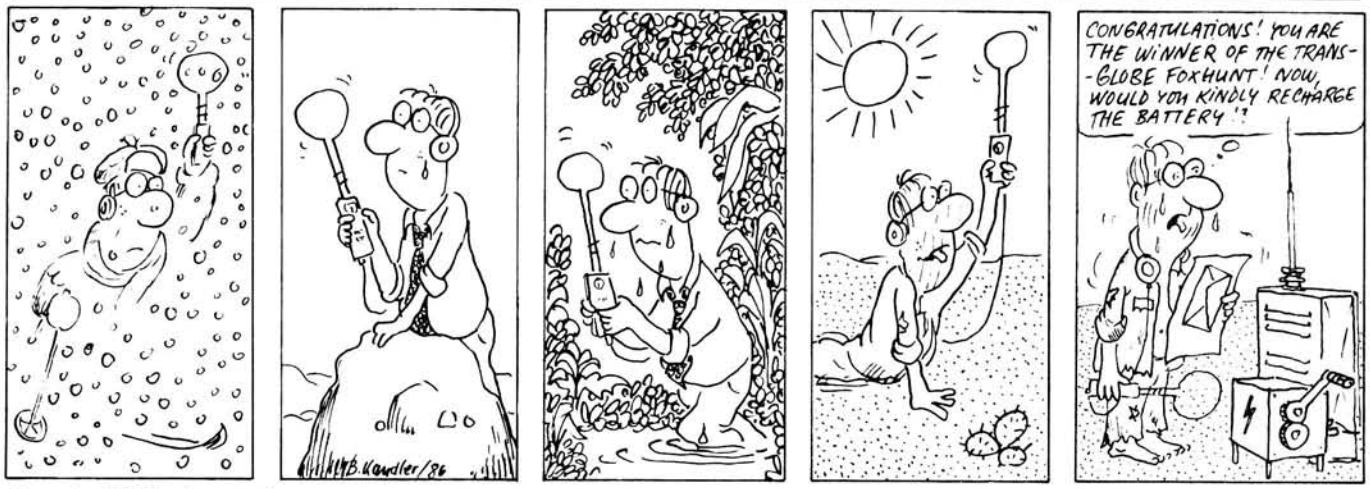
Fig. 1.3: Useful angles of radiation in the vertical mode relative to low height of antenna (text provides further explanation)

The reason for including the foregoing paragraphs concerned with ground reflection and antenna height, etc., is because, with few exceptions, radio amateurs are unable to install antenna for the lower h.f. bands at a height that would ensure adequate radiation at reasonably low vertical angles. This could also apply to antennas for the higher frequency bands if the antenna height is a small fraction of the operational wavelength and which could be the case with some compromise arrangement. However, before dealing with some suggested ideas in this respect it would be remiss of me not to include some information concerned with both naturally resonant and non-resonant wire antennas and methods of tuning and/or loading, such information may prove to be very useful when it comes to setting-up a "compromise" antenna.

Part 2 continues with more practical aspects of the problem.

Part 2 continues with more practical aspects of the problem of antennas in small spaces

BENNY



Antenna Radiation Patterns Computerised–1

by Dr. L. W. Brown G0FFD and F. C. Judd G2BCX

Apart from reduction in size of the original print-outs the radiation patterns reproduced in this series of articles are exactly as displayed on the computer screen. Incidentally, the exercise has revealed that not all the "standard" patterns to be found in various textbooks may be correct, which is not surprising since many were calculated and/or measured long before the advent of computers. Whilst the articles have not been compiled specially for computer enthusiasts, it is hoped that they and readers of PW *in general, will find them of interest as they deal almost exclusively with the radiating properties of transmitting antennas of various kinds and show how performance may be affected by height above ground.*

The computer print-outs as they appear in these articles have been graphically enhanced with an Amstrad CPC464 (colour) computer and reproduced on a DMP2000 printer. The original programs were simplifed as much as possible and some examples of these, also produced with a CPC464, will be included in Part 3, together with suggestions as to how they may be used with other computers. Explanatory notes will be given as to how the programs were derived.

The general fundamentals concerned with transmitting antennas may be found in various textbooks, such as the *ARRL Antenna Handbook*. Accordingly such technical comments as are necessary will be only those directly related to the various radiation patterns.

Radiation patterns can be obtained by measuring the field strength around the antenna (a suitable environment is necessary) and then plotting the signal level over 360° (horizontal mode) or 180° (vertical angle radiation), a tedious operation since readings need to be taken every few degrees. On the other hand, radiation patterns in polar diagram form do provide a better visualisation of the radiating properties of an antenna regardless of how they are derived and this is where the computer scores. It does not directly measure the radiation from an antenna, but providing the requisite mathematics are used for the programming, accurate radiation patterns can be produced not only in polar coordinate but in Cartesian form as well.

The Half-wave Dipole

We begin with the well known "figure-of-eight" radiation pattern of a half-wave dipole in horizontal mode, a relatively simple exercise for a computer, and which is illustrated in Fig. 1.1. The theoretically "solid" and free-space pattern is shown in Fig. 1.2 and from this it is not difficult to realise that if the dipole were vertical then the vertical angle radiation pattern will be similar to that for the horizontal mode, i.e. the familiar figure-of-eight pattern. Otherwise radiation in the horizontal plane becomes omni-directional, the pattern simply being a circle with the antenna at the centre.

This is illustrated by the vertical angle radiation pattern of the *Slim Jim*, as in Fig. 1.3, and which is otherwise an omni-directional antenna for v.h.f. operation and is normally operated sufficiently high above ground to be regarded as a free-space antenna.

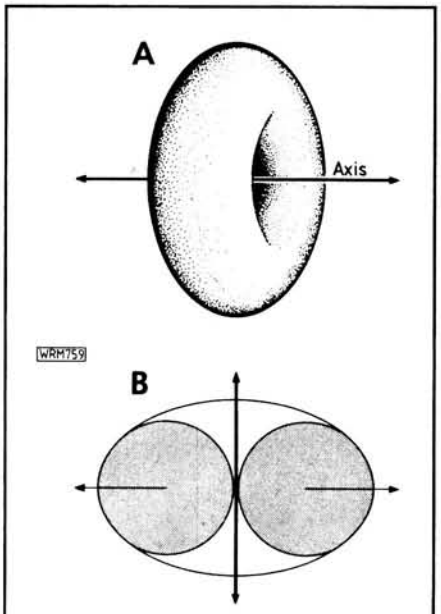


Fig. 1.2: (A) Solid, or three dimensional pattern of radiation from a dipole in free space. Arrowed line (axis) represents dipole. (B) Cut through centre illustration with dipole (axis) vertical. Compare with Fig. 1.3

At lower frequencies (h.f. bands) the vertical angle radiation of the dipole, as well as other antennas, is greatly affected by height above ground, this being in terms of wavelength related directly to the frequency of operation.

For example, at 3·5MHz a half-wave antenna at a height of say 10 metres or about 33 feet, will be only one-eighth of a wavelength above ground. At 7MHz this would be 0·25 wavelength, at 14MHz 0·5 wavelength and so on. On the other hand if the height for 3·5MHz were increased to about 20 metres then the height of the antenna in wavelengths would be 0·25. By using a computer "Input" program, various heights in wavelength can be entered to obtain the resultant vertical angle radiation patterns. We can only show print-outs for a few selected heights. For the first example, a horizontal dipole (some may prefer to call it a half-wave antenna) at a low height, say 10 metres, or 0·125 wavelength if operating at 3·5MHz. As Fig. 1.4 shows, the vertical angle radiation is mainly upward as well as being attenuated by out-of-phase radiation reflected from the ground beneath.

Now if we could raise the height to 0·25 wavelength (operating at same frequency) then the radiation is increased (radiation reflected from ground in phase) and although mainly at high angles, would provide a larger area of ionospheric region illumination resulting in stronger signals at longer distances. The radiation pattern obtained for this height is shown in Fig. 1.5.

At much higher frequencies the height of the antenna (in wavelengths)

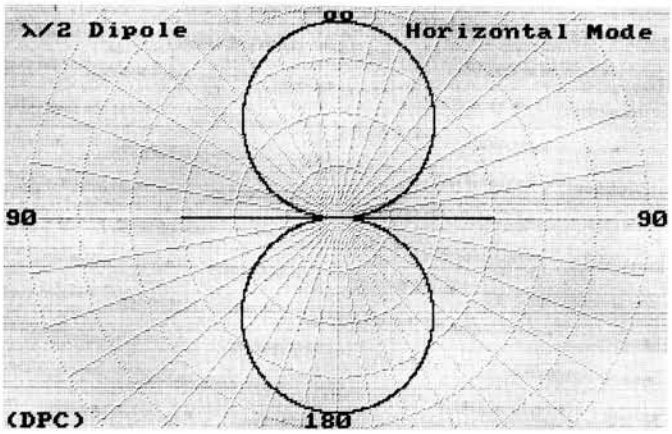


Fig. 1.1: Radiation pattern. Horizontal Dipole. Compare with line diagram of "solid free-space" radiation field as in Fig. 1.2

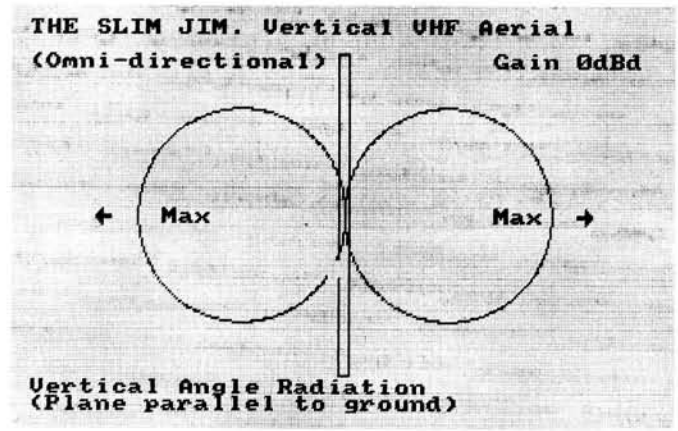


Fig. 1.3: Vertical angle radiation of the *Slim Jim*, a popular vertical omni-directional antenna for 144MHz

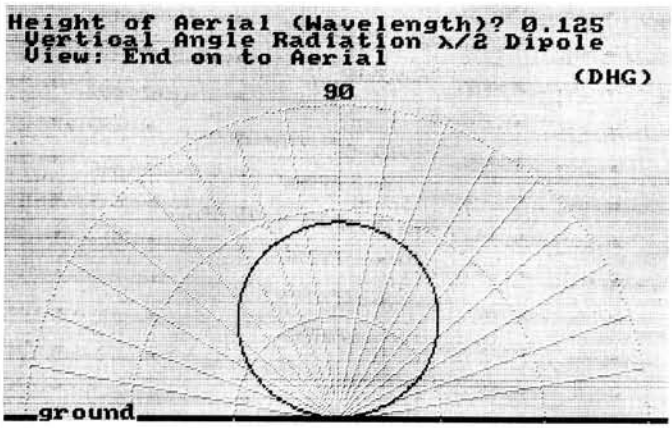


Fig. 1.4: Vertical angle radiation from a half-wave dipole at low height above ground (0·125 wavelength) Note: height in wavelength relative to frequency of operation. Applies to Figs. 1.5, 1.6 and 1.7

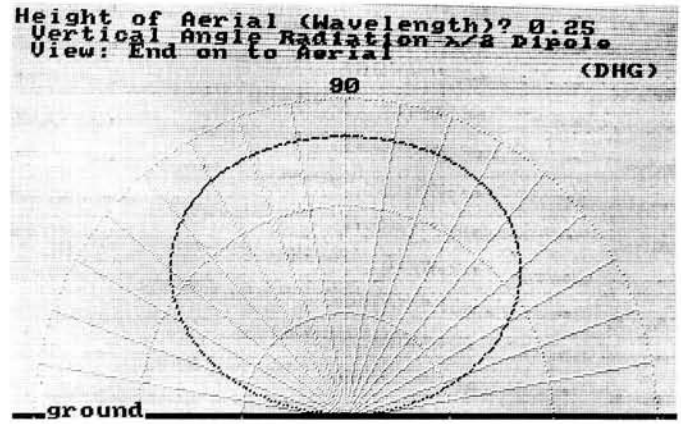


Fig. 1.5: Vertical angle radiation from a half-wave dipole at a height above ground of 0·25 wavelength (see text)

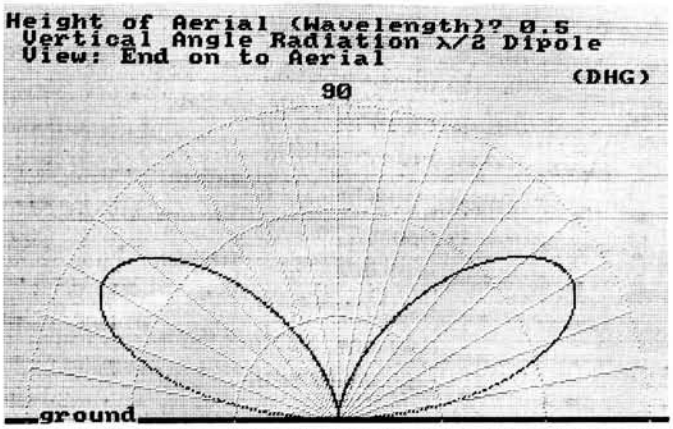


Fig. 1.6: Vertical angle radiation of a half-wave dipole at a height above ground of 0·5 wavelength. A reasonable height for say 14 and 21MHz with main lobe angles in region of 30°

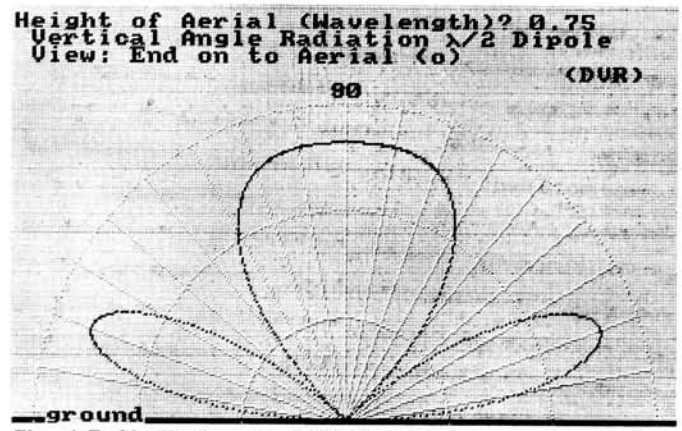


Fig. 1.7: Vertical angle radiation. Half-wave dipole at a height above ground of 0·75 wavelength. A height to be avoided at the higher frequencies

will be greater even though the actual physical height may not be much more than 8 to 12 metres, about average for most radio amateurs. So at 14MHz for example, the height in wavelengths may be in the region of 0·5, with the vertical angle radiation as in Fig. 1.6 and with each main lobe at an angle of a little over 30°. A height that should really be avoided when operation is in the higher frequency region is 0·75 wavelength since, as Fig. 1.7 shows, maximum radiation is at high angles, with that at the very low angles being of little value particularly as this may suffer some attenuation due to ground absorption.

In Part 2 we shall be dealing with the vertical angle radiation patterns of grounded vertical antennas of various heights (height/length of antennas in wavelengths), of vertical dipoles at different heights above ground, the ground-plane antenna and simple arrays, e.g. a dipole with reflector in both vertical and horizontal mode.

References

Antennas. Prof: J. D. Kraus. McGraw-Hill Book Co. Inc. *The ARRL Antenna Handbook.* The American Radio Relay League. *Reference Data for Radio Engineers.* Standard Telephones and Cables. *Radio Wave Propagation.* F. C. Judd. *Practical Wireless.* Jan/May '85. *Radio Amateurs Guide Radio Wave Propagation (HF Bands).* F. C. Judd. Newnes Books. (W. Heinemann Ltd).

Kit Construction– It's Easy

After looking at a u.h.f./v.h.f. converter, what else could be built to improve the 430MHz band reception? The Wood and Douglas 430MHz GaAs-f.e.t pre-amplifier seemed an ideal candidate to Elaine Richards G4LFM.

The kit arrived safely through the post and was supplied with adequate documentation for a reasonably experienced constructor to build with no problems.

The first job was to check the components supplied against the components list, all were present and correct. Don't take the GaAs-f.e.t. from its packing before you are ready to use it (more about that later). All the components were good quality as was the glass fibre printed circuit board which had all the holes drilled and correctly spaced. The coils were supplied ready-wound with the enamel stripped from the ends ready for soldering (a nice touch).

Construction

The instructions were simple, but precise and included diagrams showing how to mount the various components. As with any u.h.f. project, attention to detail is essential if performance is not to be compromised. Particular attention should be paid to lead lengths and ground connections.

When handling the GaAs-f.e.t., as with any m.o.s. device, precautions should be taken to minimise the risk of static damage. You may say, "I never blow m.o.s. devices," but how much do you impair their performance by taking no static precautions?

A simple way to do this is to make sure you are discharged by working with a high resistance lead between your wrist and ground. A recommended lead comprises a length of thin wire with a 2M2 resistor at each end connected to a pair of croc clips, shown in Fig. 1.

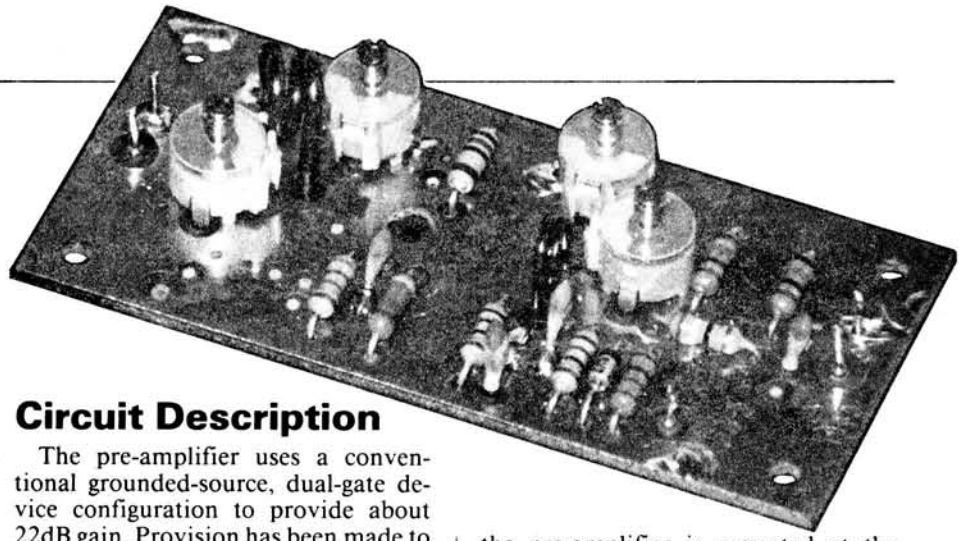
One end of the lead is connected to ground and the other to a metal watch strap, or other piece of metal around your wrist. One point of warning, you should always be working on a "safe" bench preferably with r.c.c.b. protection. More details on that can be found in the article Electrical Safety—The Shocking Truth, which started in *PW* August 1986.

The construction posed no particu-

lar problems and was completed in about 2 hours. One small, but possibly expensive, point is to double check the mounting of the GaAs-f.e.t. as it is mounted upside down to normal practice with "helicopter" style packages.

Testing and Alignment

The review kit had a quiescent current consumption of 22mA at 13·2V. The recommended initial settings for the trimmer capacitors proved to be very accurate. Alignment is very easy providing a signal source is available, either off-air or preferably using a SINAD tester (e.g. *PW* Durley started March 1983). The review kit was built without the transmit protection diode as it was to be used in a monitoring role. The protection diode is likely to have a marginal effect on the noise performance, but is probably only detectable by measurement.



Circuit Description

The pre-amplifier uses a conventional grounded-source, dual-gate device configuration to provide about 22dB gain. Provision has been made to fit a *pin* diode transmit protection circuit to the input of the pre-amplifier. This is operated by applying +12V bias when transmitting. This protection circuit attenuates any stray r.f. due to crosstalk in the transmit/receive relay. The output of the GaAs-f.e.t. is applied to a 6dB attenuator to reduce the gain to a more practical 16dB. If the pre-amplifier is mounted at the masthead provision has been made on the p.c.b. to feed power via the output lead.

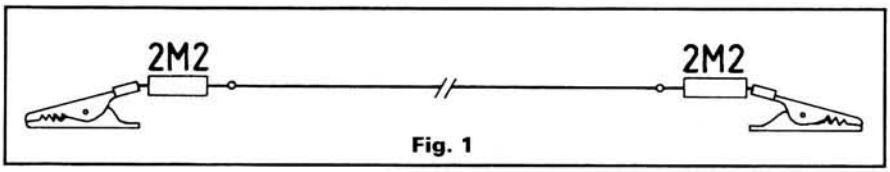


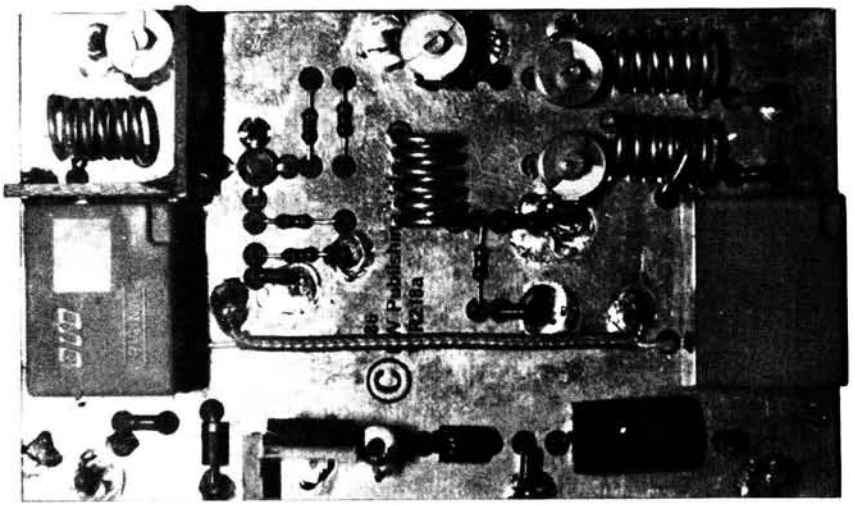
Fig. 1

Conclusion

The on-air performance was very encouraging and well up to expectations, which is pretty good in a v.h.f./u.h.f. site like ours. Overall a well designed kit giving the u.h.f. amateur access to the performance advantages of GaAs-f.e.t.s at a reasonable price.

The kit is available from **Wood and Douglas, Unit 12–13, Youngs Industrial Estate, Aldermaston, Reading, Berkshire RG7 4PQ,** priced £14.75.

Masthead Pre-amplifier for 144MHz



Pep-up your station with this high performance 144MHz band pre-amp from Peter Rouse GU1DKD. The design possesses high gain, low noise, good dynamic range and an onboard regulator that will compensate for volts drop in the supply on long feeder runs.

Before considering the installation of any pre-amplifier several factors must be taken into account.

No matter what kind of pre-amp is used, the most effective place for its installation is at the masthead well before any feeder losses occur. The only use for a pre-amp is to boost the weaker signals and these will be the ones most vulnerable to loss on the feeder even when good quality coaxial cable is used. That is not to say that pre-amps cannot be used in other ways. In some instances a pre-amp used for mobile work will help reduce "flutter".

Having established a case for pre-amps some caution must be exercised in their use, indeed they should only be switched in as a last resort. This is because most v.h.f. transceivers are already working at their optimum. The major limiting factor is the mixer's ability to handle strong signals without going into distortion or blocking. Further limitations may also be the set's own r.f. amplifier stages where even strong out of band signals may cause undesirable effects such as distortion, compression and instability.

Choice of Devices

Until quite recently designers and manufacturers have placed great stress on using low noise m.o.s.f.e.t.s designed for use at u.h.f. Some very misleading figures have been quoted for gain versus noise and there has been little mention of the all important third-order intercept figure whilst operating at v.h.f. It is this figure that determines the ability of the transistor to cope with strong signals. It is now known that some of the u.h.f. transistors that became the "in" device have bath-tub noise curves, i.e. moving down or up from their intended frequency of operation sees an increase in the noise figure. Most also have poor third-order intercept figures at v.h.f.

The GaAs-f.e.t.s also come in for some criticism for despite their excellent performance at u.h.f. and microwave frequencies, it is now accepted that when used in conventional circuitry their dynamic range at v.h.f. is poor. There may be hope yet for GaAs-f.e.t.s at v.h.f. as at least one firm has achieved good results by using circuitry incorporating low-noise negative feedback.

However, for this project we are sticking to a device that was designed to have optimum performance at v.h.f. It is the BF981 which has gained a good reputation and is favoured by several respected manufacturers of v.h.f. equipment. The BF981 m.o.s.f.e.t. has good dynamic range with a gain of 26dB for a noise figure of less than 1dB.

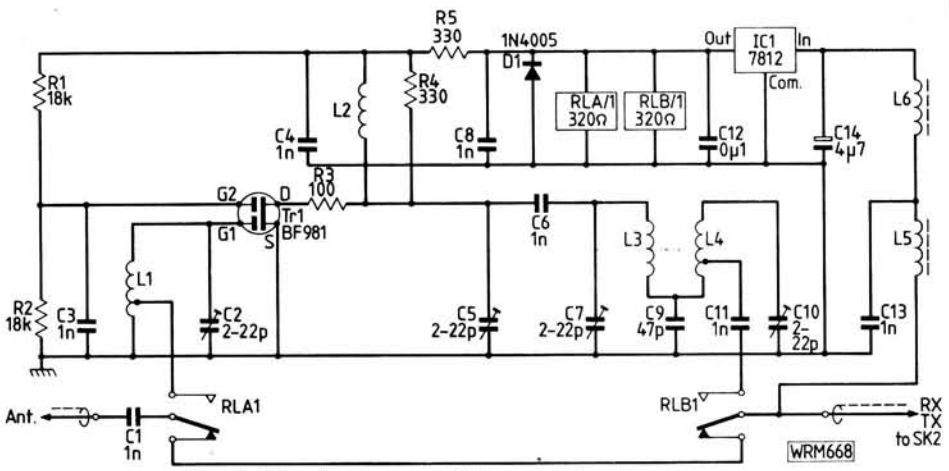


Fig. 1: Circuit diagram of the masthead pre-amp

Design Criteria

No claims are made that the design presented here is state-of-the-art or will perform any kind of r.f. miracles. The aim was to produce a stable and reliable performer that could be installed with the minimum of fuss. The only equipment required to set up the pre-amp is a suitably calibrated pair of ears and a 144MHz receiver.

The following criteria were aimed at.

1. Reasonable gain without undue noise. The BF981 has helped us to overcome this with 18dB of gain for 1dB of noise.
2. Stability. Three prototypes have been built and not one has shown a tendency to go unstable.
3. Good dynamic range. By using a device optimised for v.h.f. operation and a 12V supply rail good dynamic range has been achieved. Low supply rail voltages place a severe restriction on the "headroom" the device can obtain.

4. Failsafe operation. The pass relays are energised during receive so power supply failure or forgetting to switch the unit on will not result in damage to either the pre-amp or transmitter.
5. No-fuse installation. The power supply for the change-over relays and masthead pre-amplifier are fed up the coaxial cable, so there are no additional cables to run.
6. Low v.s.w.r. The worst case on the three prototypes built was 1·3:1.
7. Out-of-band rejection of strong signals. This has been achieved by the use of four tuned circuits.

Circuit Operation

As the circuit diagram shows in Fig. 1, inductor L1 provides the initial matching to the input of Tr1 with the antenna connected to a tap on the low impedance end of the coil. Resistors R1 and R2 set the biasing for Tr1. The point at which the f.e.t. is biased provides optimum gain and dynamic range. The f.e.t. is operated in the grounded source mode and the stability of the device is enhanced by the use of the stopper resistor, R3. Drain output is tuned by L2, C5 with R4 being used to slightly damp the *Q* of L2. The amplified signal is then fed via C6 to the loose coupled bandpass filter arrangement comprised of L3/C7 and L4/C10. Capacitors C3, 4, 8, 12, 13 are all used for r.f. decoupling. Inductors L5 and L6 act as r.f. isolating chokes which ensure the d.c. circuitry does not affect the v.s.w.r. Integrated circuit IC1 is a standard 1A 12V regulator suppling both the pre-amp and relays. The reason for putting the regulator at the masthead is to allow for the inevitable voltage drop that occurs on long cable runs.

With this arrangement you can feed a relatively high (28V max.) unregulated supply up to the masthead. This will enable the amplifier to operate on some very long cable run without loss of supply headroom.

Capacitor C1 ensures that the d.c. feed is not shorted out at the antenna and diode D1 helps to soak up any back e.m.f. generated when the field in the relay coils collapses at switch off.

Power Supply

The power supply is a fairly unsophisticated affair, as shown in Fig. 2. Its output relay RLC can be energised during transmit either by a positive voltage connected to SK3 or by grounding SK4 through the transceiver's p.t.t. switch. Remember that the supply voltage must be present on the feeder for the masthead pre-amp to be activated during receive. The switching arrangements should suit most station requirements. With Link **A** connected it can be used with the ubiquitous Yaesu FT-290R which has a d.c. voltage present on its transmitter output. With Link **A** removed any positive going voltage up to 15V d.c. can be applied to SK3, or SK4 may be grounded to SK5 during transmit.

Capacitor C16 is used to block any d.c. content superimposed on the output signal from transceiver and to stop the output of the masthead p.s.u. from being shorted out or interfered with by the front-end circuitry of the transceiver. Inductors L7, 8 are incorporated to ensure that the d.c. circuitry does not upset the v.s.w.r.

Construction

Construction is very straightforward and should not present any problems. However, component leads must be kept as short as possible to ensure stability and **all** ground plane contacts on the pre-amplifier p.c.b. must be soldered both top and bottom.

Start by fitting Tr1 (do not be surprised if the lettered side faces downwards). Bend the leads to fit the holes and then carefully solder it in place. Continue by fitting all the resistors and trimming capacitors followed by the fixed capacitors. Next the coils and relays should be added. Care must be taken when soldering the trimming capacitors to the ground plane as it is easy to melt their plastics bases.

Coil winding details are shown in Table 1. Coils L1–4 should be wound on a mandrel, i.e. a 5mm twist drill shank. Inductors L5 and L7 were made by winding 18 turns of 26 s.w.g. enamelled copper wire along a 6mm diameter ferrite tuning core, and then covered with a layer of insulating tape. Inductors L6 and L8 are 5 turns of 26 s.w.g. enamelled copper wire wound through an anti-parasitic ferrite bead. All coupling capacitors must be suitable for use at v.h.f. and constructors are strongly advised not to use devices of unknown performance.

In order to gain good v.s.w.r. sockets SK1 and SK2 in the p.s.u. must be mounted close together with C16 soldered directly from one to the other. One end of L7 must be soldered directly to socket SK2, and the other end directly to the p.c.b. All component leads in the r.f. path should be kept as short as possible.

Finally, use a couple of scrap pieces of p.c.b. material to make the small screen that fits round the input stage. Although all the prototypes showed no sign of instability without the screen, it was included as an extra precaution. After all it costs little and only takes a few seconds to solder in place.

Assembly of the components on both circuit boards can be seen in Figs. 4 and 5. The installation of Veropins for Link **A** on the p.s.u. board is advised for easy access. Veropins are also used wherever external wiring is connected to either p.c.b.

Housing the Project

The choice now faced by the constructor is how to connect and house the pre-amp. Ideally a die-cast waterproof box with weatherproof N-type connectors is the first choice—it's also a very expensive one. The method adopted for the prototype seems to work and is much cheaper. The pre-amplifier p.c.b. was left to stand loose in its enclosure with the coaxial cables soldered directly onto the circuit board. The inside of the enclosure (an r.f.i. shielded plastics box) must be insulated as the material used in the r.f.i. shielding is conductive. The reason why no attempt was made to affix the p.c.b. is because it adds to the problem of trying to weatherproof the box. Plastics boxes always seem to fare better than die-cast, when exposed to the elements. Finally, while on the subject of plastics boxes it will no doubt horrify many a pre-amp perfectionist, to find that one version has been tried using an ordinary plastics case with the same sealing method as

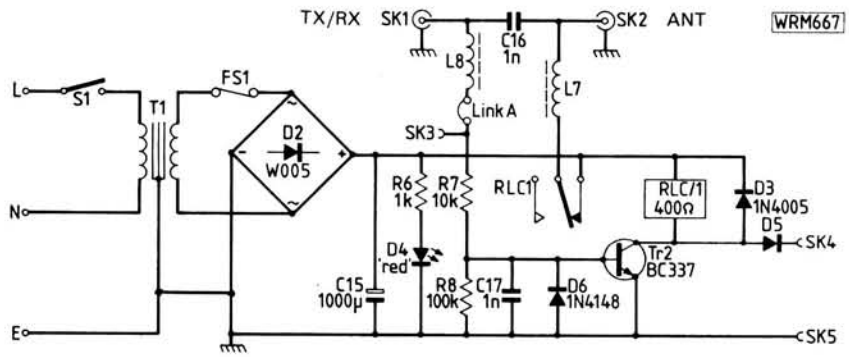


Fig. 2: Circuit diagram of p.s.u. for the masthead pre-amp

TABLE 1

Coil No.	Turns	Wire (s.w.g.)	Diameter (mm)	Remarks
L1	6½	18	5	Tapped 1½ turns from cold end
L2	6½	18	5	
L3	6½	18	5	
L4	6½	18	5	Tapped 1¼ turns from end near C9

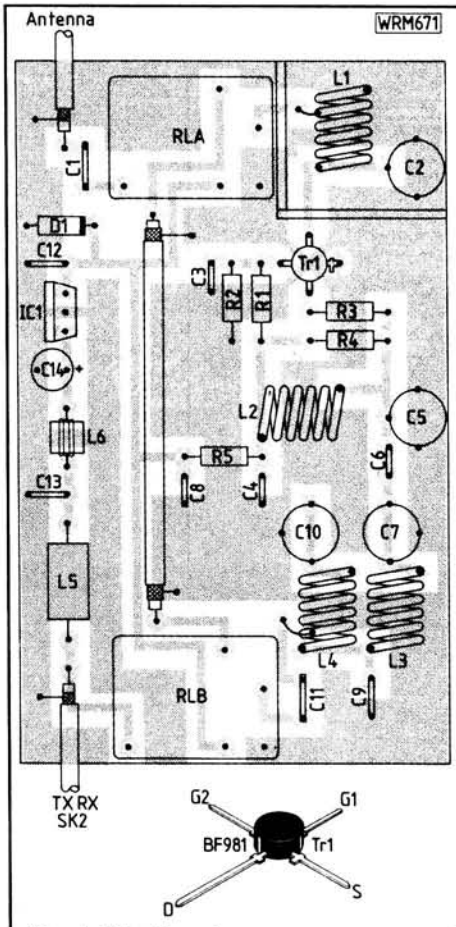
Coils L1 to L4 should be wound with silver-plated wire for best results.
L5, 6, 7, 8, see text.

described previously. Even though another amateur operates with 100 watts of s.s.b. less than a hundred yards from the site, no problems of any kind have been experienced.

The weatherproofing can be done in one of two ways. First, the cable can enter through rubber grommets which are then sealed with silicone rubber and the same sealant applied to the joint between the lid and the box. One point to watch concerning the silicone rubber—some of the types sold for sealing the edges of baths are not suitable as they contain an acid. If the sealant has a pungent smell like vinegar then do not use it.

The second method involves the same procedure except instead of using a sealant, the pre-amp with its case and downward facing cables are fitted into a small polythene bag with the open end facing downwards. The end is then merely taped up. It may not look very pretty but the whole assembly can then be taped to the mast. One of the prototypes installed in this way has operated perfectly for some time.

As to fitting the p.s.u. board in its aluminium case, care must be exercised to ensure the p.c.b. is properly secured on insulated pillars as this p.c.b. is carrying mains voltage. Every effort must be made to insulate all live joints on the mains switch and primary of the transformer by means of sleeving. It is also recommended that the mains plug be fitted with a 2A fuse.



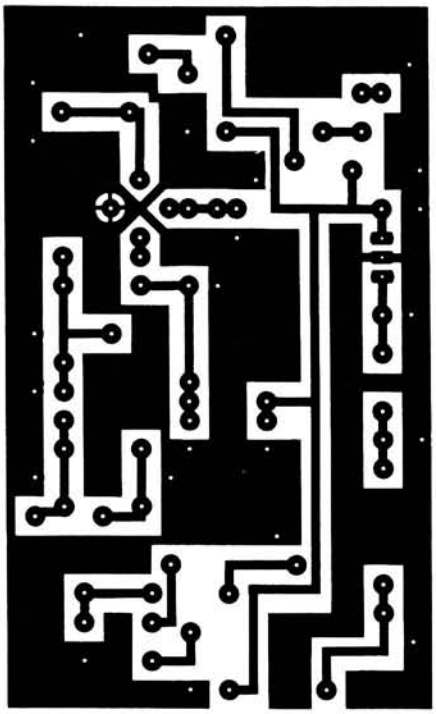


Fig. 3: Track pattern for pre-amp

Fig. 4: Masthead pre-amp component layout. Note the ferrite bead used for L6 is an FX1115 type or similar with a 2mm centre hole

Alignment

Before sealing the unit and installing it, setting up can be done at the bench. Run an antenna input to the pre-amp then with a length of coaxial cable connect the pre-amplifier output to SK2 on the power supply. Next connect your transceiver to SK1 via a v.s.w.r. bridge. Before switching on the antenna p.s.u. test that the v.s.w.r. is not excessively high. If problems appear at this stage then check all connections. The most likely cause of high v.s.w.r. is incorrectly wound chokes or excessive lead length in the r.f. path through the p.s.u.

Once the v.s.w.r. is at a satisfactory level, switch on the antenna p.s.u. An increase in background noise should be apparent. Roughly set all the trimmers for maximum noise. If you are within receiving distance of a beacon then the trimmers can be peaked on a signal using the S-meter. However, it should be noted that maximum signal is not necessarily the best setting. Now find a fairly weak f.m. transmission and make slight adjustments for minimum background noise. Check the s.s.b. portion of the band and again look for a weak signal. Try switching the power supply on and off and notice the difference.

If any problems are encountered in getting C7 and C10 to peak then it may be necessary to slightly adjust the value of the padding capacitor, C9.

There may be some slight interaction between C5 and C7, so repeat the trimming procedure a few times for optimum results. Do not be surprised if C10 does not peak as sharply as the other three trimming capacitors.

Before disconnecting your bench test set-up, check that the means you have chosen to operate the relay system functions correctly. Once tested, the pre-amp can be sealed, installed at the masthead and left well alone.

Using the Pre-amp

The simple rule is to leave the pre-amplifier switched off unless you really need it. Any device of this type has its own limitations, let alone those within the receiver being used. However, there are many occasions when a pre-amp of this kind will be extremely useful, in particular where installations involve long feeder lengths. It is surprising just how much signal loss can occur on just 6m of good quality coaxial cable.

More Through Power

The pre-amp was not designed to be used with a linear amplifier. However, the prototype was built with small gas-filled reed relays. These have now been replaced with small open-frame relays with a much higher current rating. This type of relay should be quite capable of handling in excess of 100 watts. If higher power handling is needed then some form of sequential switching should be employed. Specific details will have to be worked out by the constructor, but you must ensure that the transmitter power is not applied to the relays until they are fully switched over and likewise the relays must not switch back until all transmitted r.f. has been cut. ***PW***

SHOPPING LIST

Resistors

¼W 5% carbon film

100Ω	1	R3
330Ω	2	R4,5
1kΩ	1	R6
10kΩ	1	R7
18kΩ	2	R1,2
100kΩ	1	R8

Capacitors

Monolithic ceramics 100V

1nF	9	C1,3,4,6,8, 11,13,16, 17
0·1μF	1	C12

Ceramic plate

47pF	1	C9

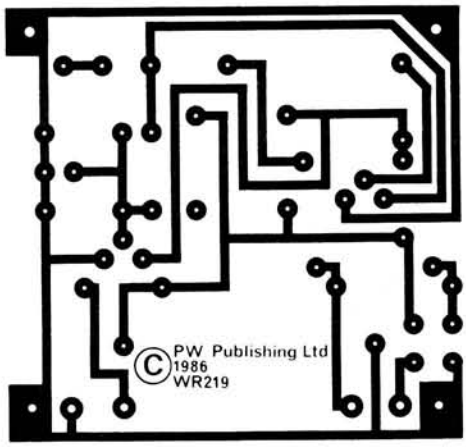


Fig. 6: Track pattern for p.s.u.

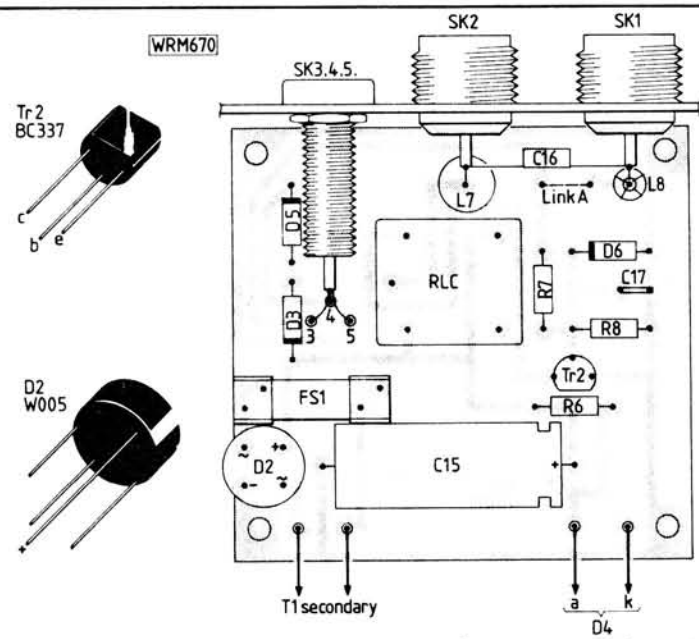
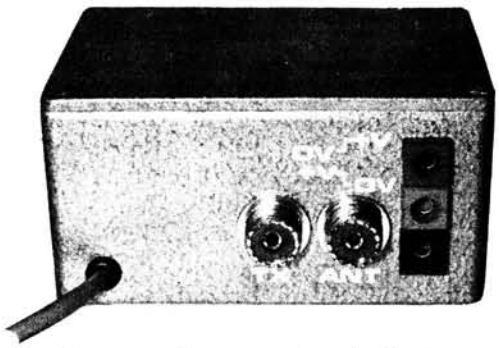
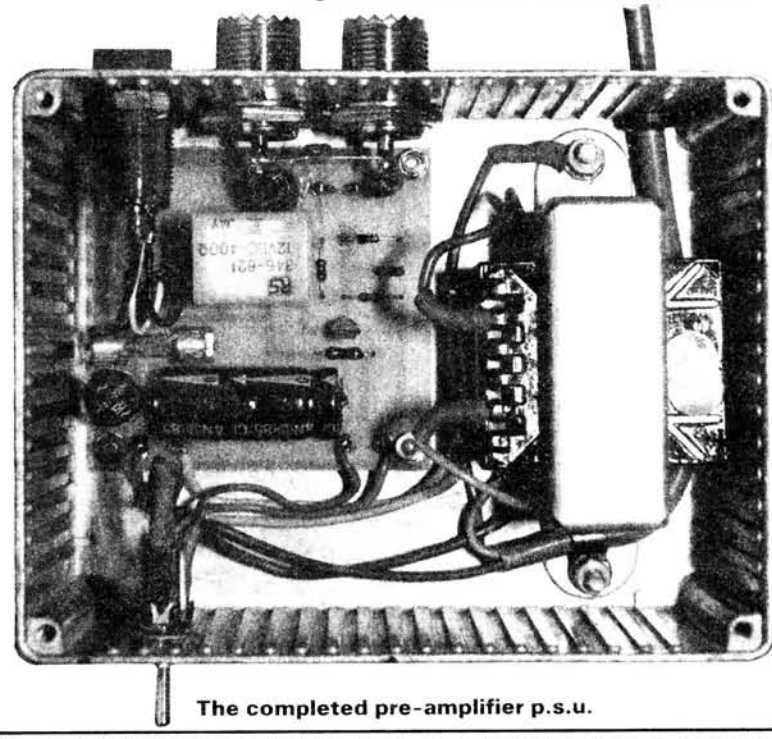


Fig. 5: Power supply component layout



Pre-amplifier p.s.u. terminations



The completed pre-amplifier p.s.u.

This project has been designed in accordance with UK practice and safety standards at the time of publication. Overseas readers contemplating construction must ensure that they make any modifications necessary to comply with their local and/or national regulations and conditions.

Miniature foil trimmers

2–22pF	4	C2,5,7,10

Electrolytics

Radial 25V		
4·7µF	1	C14
Axial 50V		
1000µF	1	C15

Semiconductors

Diodes

Red l.e.d. 0·2in.	1	D4
W005 Bridge	1	D2
1N4005	3	D1,3,5
1N4148	1	D6

Transistors

BC337	1	Tr2
BF981	1	Tr1

Integrated circuits

7812	1	IC1

Miscellaneous

S1 s.p.s.t. mains type toggle (1); relays p.c.b. type OUD 46-70050(2)[1]; relay p.c.b. type KS1-P 46-80020 (1)[1]; ferrite core F14 grade, 6mm dia × 12·7mm (2)[3]; ferrite bead (2); 1A quick acting 20mm fuse (1); p.c.b. mount fuse clips (2); r.f. shielded plastics case 120 × 65 × 40mm[2]; alloy project box 116 × 91 × 56mm; transformer type 12VA YK28F; Veropins; p.c.b.; 150mm miniature coaxial cable; S0239 sockets (2); terminal post red (1) black (1) green (1); spacers (4); strain relief grommet (1); l.e.d. mounting kit (1); 18 s.w.g. tinned or silvered copper wire; 26 s.w.g. enamelled copper wire.

[1] Cirkit Holdings plc, Park Lane, Broxbourne, Herts EN10 7NQ.
[2] Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY.
[3] Maxi-Q. G & P Powles, Unit, 8 Brunel Road, Gorse Lane Industrial Estate, Clacton-on-Sea, Essex CO15 4LU.

How Much? & How Difficult? £30 Intermediate

A Syrup Can Dummy Load

The dummy load has had its place in amateur radio since the early days when it was then known as an "Artificial Aerial". Its purpose was to absorb the r.f. power from the transmitter so that experimental work could be carried out, tuning up and so on, without causing interference to other stations. J. Thornton-Lawrence GW3JGA describes a dummy load that we could all build.

An electric lamp was often used as an artificial antenna as this served the dual purpose of a cheap resistive load and gave a direct visual indication of output. The lamp was chosen to have approximately the correct filament resistance to match the transmitter, but the resistance would of course vary with brightness so accurate measurements were very difficult if not impossible.

When measuring r.f. power it is essential that the load resistance is known and remains constant. The measurement itself is usually made by measuring either the r.f. current flowing through the load or the voltage across it and applying Ohms Law to derive the power in watts: $W = I^2R$ or $W = V^2/R$

(the squared part of the expression is why a power meter scale is usually square-law, not linear).

Today, virtually all amateur band transmitters have a coaxial output connection designed to work into a 50Ω resistive load. Similarly, all power meters, s.w.r. meters, filters, etc. are intended for use in a system, which ends or is "terminated" in a 50Ω load.

Bearing these points in mind, it becomes clear that, to tune-up a transmitter, measure r.f. power, check the performance of a filter, or for experimental work, a 50Ω dummy load is an essential piece of equipment to have in the shack.

Design

The essential requirements for a "good" dummy load are that it should be resistive (50Ω) over the range of frequencies for which it is required and be capable of dissipating the r.f. power applied to it.

First of all, the frequency limitation. Any resistor or combination of resistors used in a dummy load will also have inductance, e.g. the inductance of the resistive element and the leads. It will also have capacitance, e.g. stray capacitance between the ends of the resistor(s) and between connections. At low frequencies, these effects can be ignored, but as the frequency is increased these effects become more significant and eventually, at very high frequencies, they will become dominant. The load will then have a complex impedance far removed from 50Ω and be unusable.

Now the power limitation. Obviously, all the power fed in to the dummy load (providing none of it is radiated) will be converted into heat in the resistor(s). This heat must be removed as quickly as possible or the resistor temperature will rise steadily to a level where permanent damage may occur. Normal component type resistors are cooled by air convection and lead-wire conduction. Convection cooling can be improved by spacing out the resistors (which would increase the lead length) and/or by blowing. Conduction cooling can be improved by clamping the resistor to a heatsink (which would increase the capacitance), immersing in oil, etc.

Obviously, the problems increase as the power rating and/or frequency is increased and the design of a dummy load is, as with many things, a compromise of conflicting requirements. Commercially made dummy loads use special coaxial resistors and connections to tailor the inductance and capacitance effects, making the load substantially resistive over a wide frequency range.

Performance

The dummy load to be described uses low-cost easy-to-obtain components and provides excellent performance up to 30MHz (s.w.r. 1·03:1) and useful performance up to 150MHz (s.w.r. 1·8:1). The load is built into a syrup can, and when filled with oil will dissipate 100 watts for up to 10 minutes (followed by a 30 minute or less cooling period) or 25 watts continuously. With the can unfilled, the dissipation is reduced to 25 watts for about 10 minutes, but the s.w.r. at 150MHz is improved (1·4:1). A graph showing s.w.r. against frequency is shown in Fig. 1.

Construction

The load consists of twelve 2W, preferred value, carbon film resistors (seven at 560Ω and five at 680Ω) connected in parallel giving an effective resistance of 50Ω. The resistors are soldered between two plates of double-sided copper-clad printed circuit board and the assembly is connected to the input coaxial socket, on the

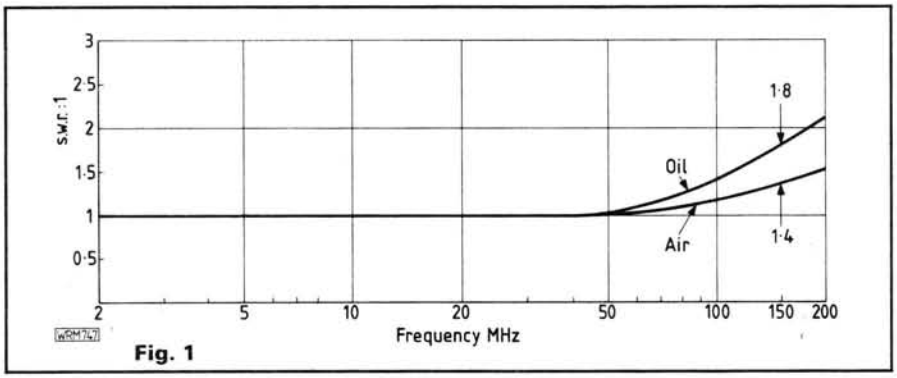


Fig. 1

can lid, using copper-clad board and copper rod or tube to keep stray inductance to a minimum. The general arrangement is shown in Fig. 2.

You should note that soldering copper-clad board (c.c.b.) is very easy, unsoldering is very difficult—a lot of heat is required and the c.c.b. is easily damaged. Assembly of the dummy load should be a "right-first-time" job.

1: Mark and drill the lid of the can to suit the coaxial connector.

2: Mark the positions of the support pieces of c.c.b. under the lid. If you are using a square type u.h.f. (SO239) socket, it may be necessary to place the c.c.b.s diagonally to avoid fouling the fixing screws.

3: Fit the coaxial connector.

4: Solder the support pieces of c.c.b. to the lid keeping a spacing of 20mm. "Tack" them at a couple of places first and then run the solder along the joint.

5: Drill the two resistor mounting plates as shown in Fig. 2. One plate has a 10mm centre hole (the upper one in the diagram) and the other a 5mm centre hole to suit the 5mm diameter centre rod or tube.

6: Clean all the resistor lead-out wires by gently scraping with a knife and solder one end of each resistor to one plate—leave 4mm space between the end of the resistor and the "inside" face of the plate. Solder the "outside" face joints first. Alternate the resistor values as far as they will allow: 560, 680, 560, etc.

7: Feed the free ends of the resistors through the other resistor mounting plate and solder the "outside" joints leaving a space between the plates of 32mm. To assist in keeping the plates parallel solder resistors on opposite sides first, with the correct spacing, and then the rest.

8: Solder the resistor lead wires on the "inside" of the plates. Keep the iron on the lead wire to get this to tin first then allow the solder to flow on the c.c.b. If your iron is in contact with the c.c.b. first most of the heat will be absorbed and you will have difficulty in getting the lead wire to tin. Crop off all the resistor leads.

9: Mark the positions of the support c.c.b. on the top mounting plate—the one with the 10mm hole in it.

10: Place the lid and support c.c.b.s on top of this plate and "tack" in position and then solder fully along the joints.

11: If you are using a 5mm rod then one end will require drilling to fit over the coaxial connector centre solder spill.

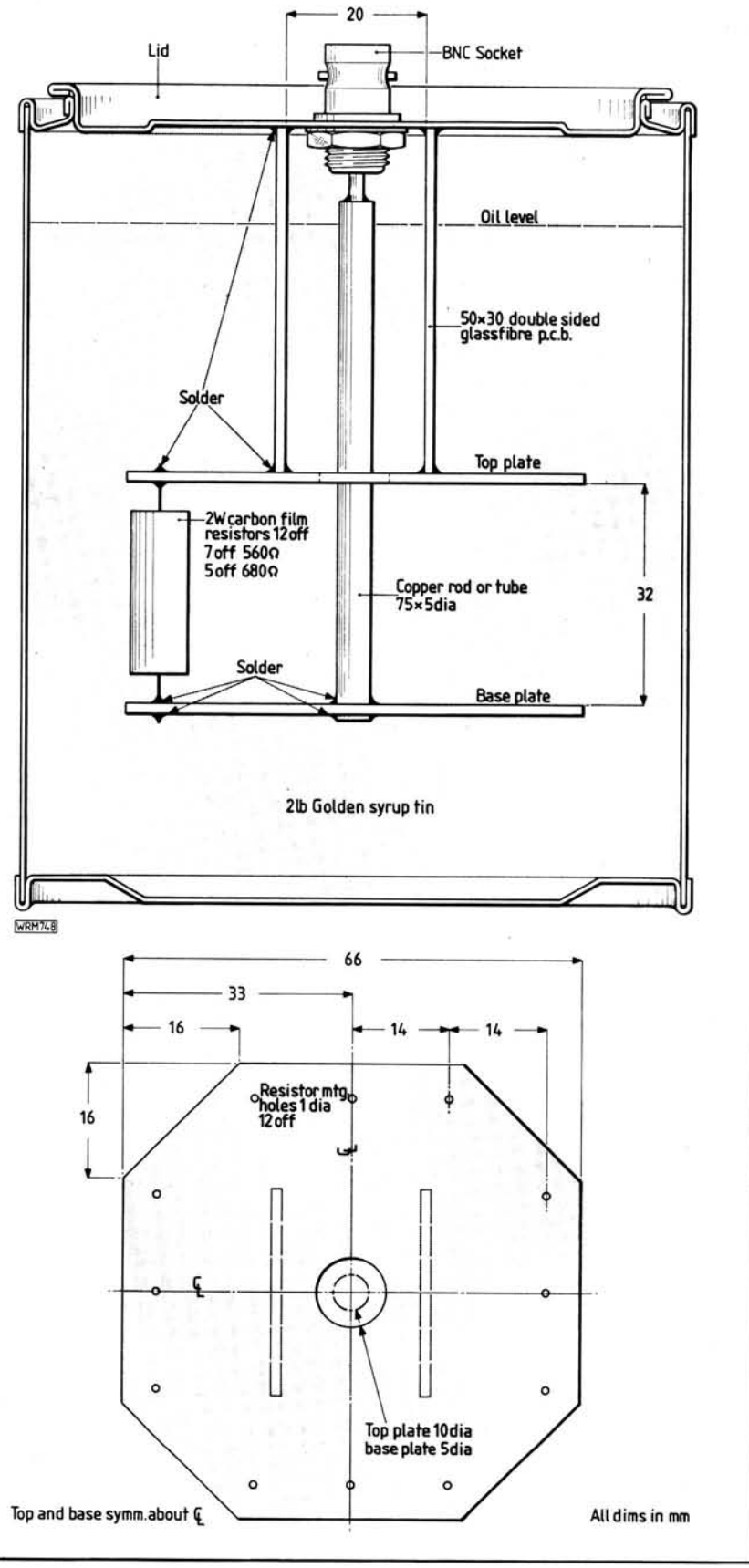
12: Slide the 5mm rod or tube through the centre of the bottom plate so that the end fits over the coaxial connector centre spill. If the rod is too long, mark, remove and cut it to length. Solder the end of the rod/tube to the coaxial connector.

13: Solder the bottom end of the rod to the bottom plate. If you solder to the "outside" first then keep the iron on the end of the rod, sufficient heat will travel up the rod to enable the joint "inside" the bottom plate to be soldered by simply poking the solder between the resistors and touching it on the rod and then the c.c.b.

14: Before filling with oil, test the dummy load using a known good s.w.r. meter. At frequencies up to 30MHz the s.w.r. should be better than 1.03:1.

15: Fill the can with normal engine oil (I used Multigrade) to within about 25mm of the top, lower in the assembly and firmly close the lid. This will provide about 15mm of air space above the oil to allow for any slight variation in pressure.

Fig. 2



Notes

Special electrical oils are made for cooling purposes but these are not available in small quantities. Engine oil has a somewhat lower flash point,

about 150°C. The temperature rise in this oil-filled dummy load with a continuous input of 100W is approximately 6·5°C per minute, i.e. for an ambient temperature of 20°C the temperature after 10 minutes would be approximately 85°C.

If the load is to be operated "dry" then, to improve convection cooling, drill a row of 6mm diameter ventilation holes around the sides of the can at the top and the bottom. Painting the can matt black inside and out will also improve heat dissipation.

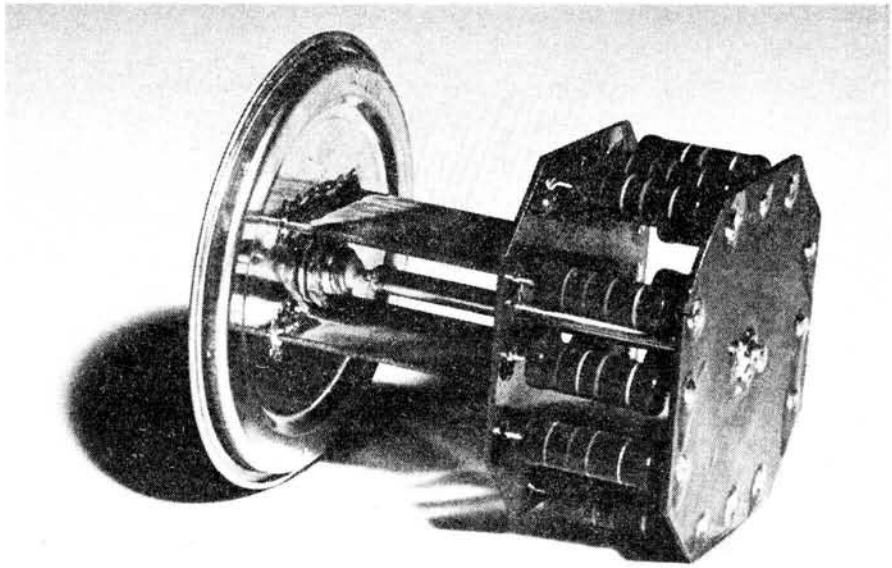
It may be possible to improve the high frequency performance a little by replacing the 5mm diameter rod with one of 10mm diameter and increasing the c.c.b. centre holes sizes to 18mm and 10mm, but this has not been tried.

Grateful thanks to members of the Practical Amateur Radio class at the Prestatyn Adult Centre who all built dummy loads and to Dr. J. D. Last GW3MZY for reflection co-efficient measurements on various prototypes.

PW Test Results

We decided to try the dummy load in practice. The h.f. test set-up is shown in Fig. 3. Unfortunately the Bird Thruline was not available, but using the equipment shown the load provided a better match than the Welz up to 30MHz. There was no measurable difference between running the load in air or oil.

The v.h.f. test set-up is shown in Fig. 4 and as expected, the dummy load was somewhat worse than the Welz CT300 at these frequencies. In free air an s.w.r. of approximately 1·2:1 was measured, whilst in oil the result was 1·5:1.



SHOPPING LIST

Resistors

2W 5% High stability carbon film

560Ω	7	R1–7*
680Ω	5	R8–12**

Miscellaneous

Coaxial socket (BNC/SO239); double-sided copper-clad board (glass fibre preferred); 82 × 5mm dia. copper rod or tube; 2lb (907g) syrup tin or similar.

*Available from Electromail, PO Box 33, Corby, Northants NN17 9EL. Tel: 0536 204555. Stock No. *134-721 and **134-737*

Readers may like to know that a set of 12 selected 2W high stability carbon film resistors and 4 pieces of double-sided copper-clad glass fibre board, cut to size, is available from: Geoffrey Martin, 40 Aberconway Road, Prestatyn, Clwyd LL19 9HL. Price £3.90 inc. p&p.

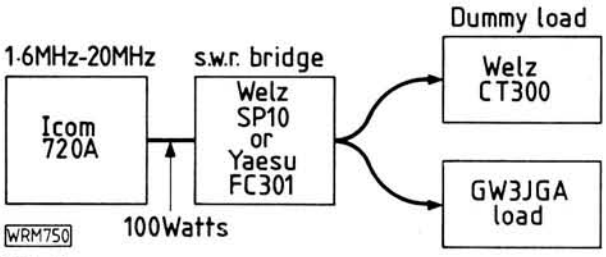


Fig. 3

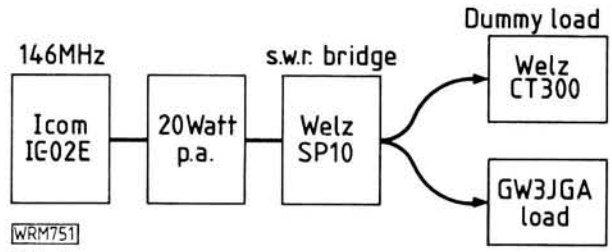


Fig. 4

Further Reading

The ARRL Handbook, ARRL. Pages 25.28 and 34.16

Radio Communication Handbook 5th Edition, RSGB. Pages 6.42, 7.24, 18.21

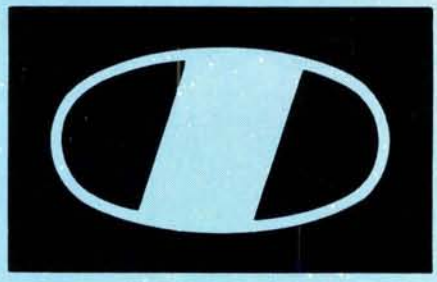
VHF-UHF Manual 3rd Edition, RSGB. Page 10.14

The UHF Compendium, Parts 1 & 2, by DJ9HO. RSGB. Page B2.

Technical Topics, Radio Communication, RSGB May 1984, Page 404.

CLUB NEWS

If you want news of radio club activities, please send an s.a.e. to our Poole office, stating the area of the country you're interested in. Club Secretaries, please keep the info coming to Elaine Richards G4LFM.



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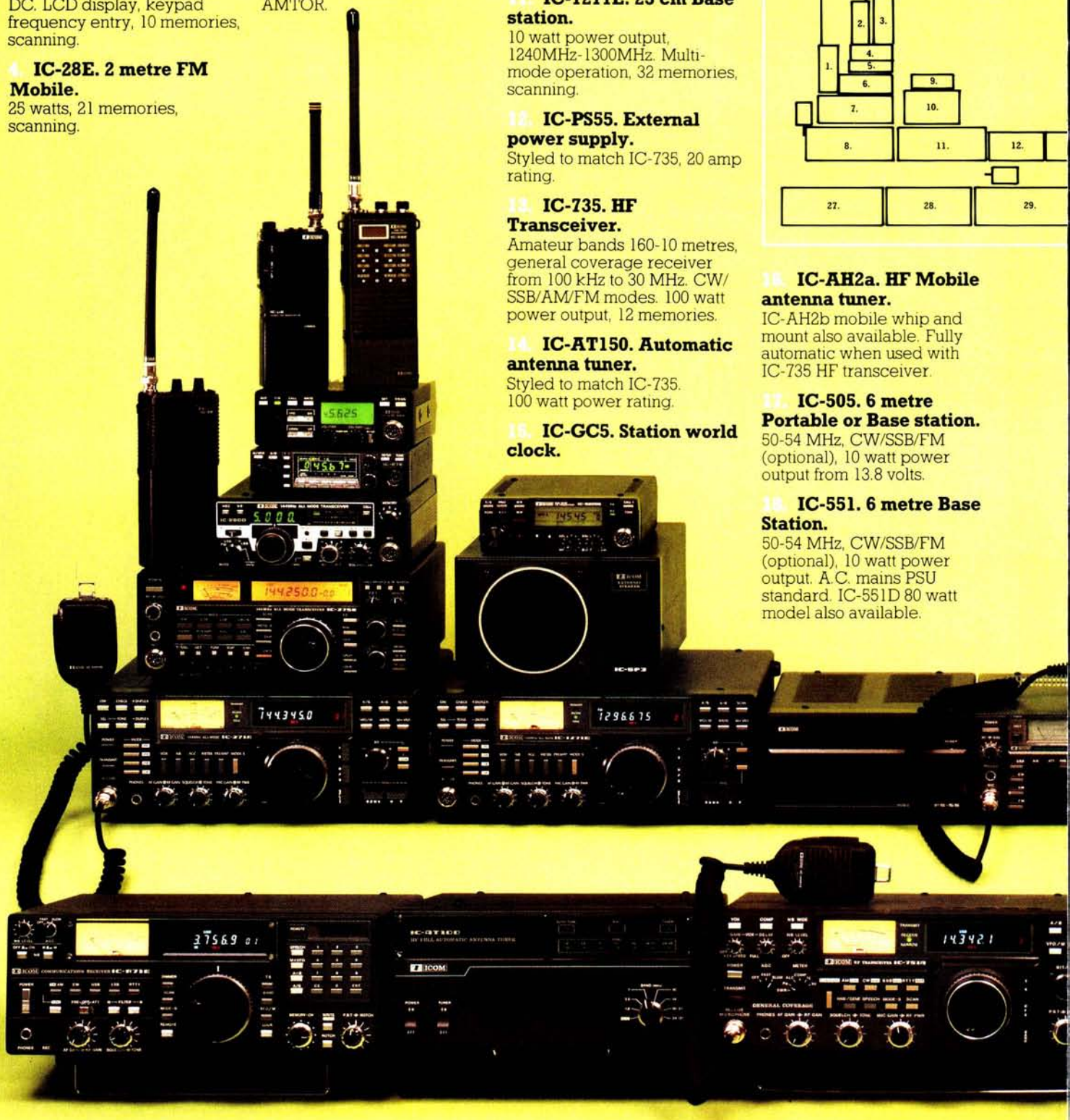

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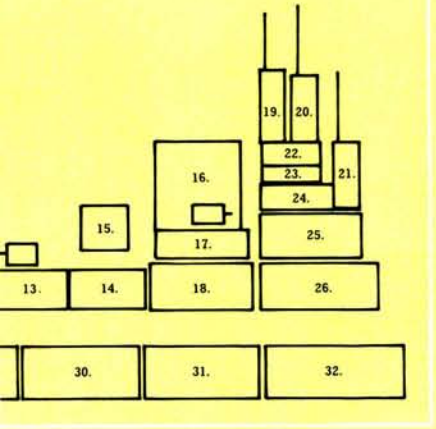

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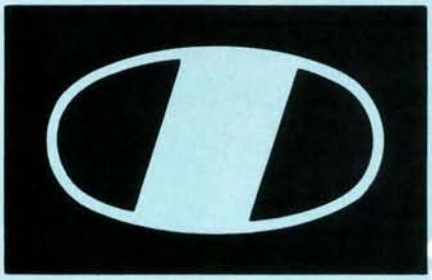

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52

Using Data from WWV

By the end of this article, I hope that the information which it contains will enable you to log some of those rare DX stations you have been longing to hear, says Barry Davies.

This information is based on my own personal observations, which now extend back to the Spring of 1979. As a basis for my research I have used the information provided by Radio Station WWV in Boulder, Colorado, USA, coupled with the loggings of many famous DXers over the past few years. This research is particularly relevant to the reception of radio stations operating on frequencies below 10MHz. My observations also extend to the medium wave band. Why have I only paid particular attention to this part of the radio spectrum? Well, for me, most of the interesting DX catches are found on frequencies below 10MHz and, of course, on medium wave.

WWV figures are broadcast at 18 minutes past the hour, every hour, twenty-four hours a day. This message is very important in acquiring the new skill of using propagational data to log those rare DX stations.

At this point, I should mention the typical WWV message, it will later be dissected and an explanation given as to how the information it contains can point the way toward the logging of those rare DX stations. The standard wording of the WWV message is quite straightforward. The variables are the date, descriptions and indices, which are enclosed in brackets in the following example. The indices will be studied in greater detail later in the article.

A Typical WWV Message

"Solar terrestrial indices for . . . (2 January) . . . follows:

Solar flux . . . (one, eight, three) . . . and A-Index . . . (nine)

Repeat: Solar flux . . . (one, eighty-three) . . . and estimated A-Index . . . (nine)

The Boulder K-Index at . . . (0900UT) . . . on . . . (3 January) . . . was . . .(two)

Repeat: . . . (two)

Solar terrestrial conditions for the last twenty-four hours follows:

Solar activity was . . . (moderate) . . . Geomagnetic field was . . . (unsettled).

Forecast for the next twenty-four hours follows:

Solar activity will be . . . (low) . . . and Geomagnetic field will be . . . (unsettled and occasionally active)"

These WWV announcements serve as a guide to predict conditions over high-latitude paths. That is, the paths of signals which travel over (or near to) the north pole. When conditions are described as "quiet", such signals are usually enhanced, and can provide some very fine DX catches for signals travelling near to the north pole on high-latitude paths. Conversely, when conditions are disturbed by geomagnetic storms, signals from the south tend to get through. I am not saying that storm conditions actually enhance signals from the south. What I am saying, is that they seem to stand a better chance of getting through to us, here in western Europe. In the WWV message reference is made to an "A-Index", which will be discussed in more detail later. For the moment, it is sufficient to note that the A-Index measures the activity of the ionosphere, as influenced by the sun, on any particular day. On some days, the sun is relatively quiet, giving rise to a low A-Index figure. This enables certain signals to be "bounced" off the ionosphere several times, providing fine high-latitude DX, especially on the low frequencies. On other days, the sun is very active, with solar flares and megaton explosions. On such days, shock waves are sent towards the earth. These shock waves cause great disturbances to the ionosphere and, under such conditions, high-latitude DX is very difficult. High-latitude signals, instead of being refracted back to earth, are simply absorbed! However, in such highly disturbed conditions, signals from the southern hemisphere often arrive in western Europe at remarkable strength.

Keeping A Special Logbook

Now I want to describe how the information broadcast by WWV can be put to practical use. First, let me dispel any fears that may be in the back of your mind. To make use of the WWV figures, you do not need to be a budding Einstein! In my experience, it is not really important to understand the scientific background to the numbers. All you need, to make the maximum use of your new skill, is to regard the figures announced by WWV as a kind of telephone number. Referring to previous loggings with similar numbers, you should have some indication as to which part of the world that you should be DXing today. The first step, in the practical use of this information, is to set up a "new-style" logbook. In it, you should record details of stations that you particularly wish to hear. You should base this new logbook on the loggings of reliable reporters located in western Europe. Such information can, of course, be easily obtained from the pages of DSWCI's magazine, *Short Wave News**, and from the logbook sections in the monthly magazines of other reputable radio clubs, such as World Radio DX Club, *Contact*, and North England Radio Club International, *Spectrum*. Your special logbook will need to record:

The name of the station in which you are particularly interested.

The frequency on which it was logged.

The time that it was logged.

The date on which it was logged.

Logbook Format

You should, of course, only record loggings of stations heard in your own area. In my case, this is western Europe. Now for the difficult part! In addition to the above information, you will need also to record the A-Index numbers which were prevailing on the day before, and on the day of, the logging. This is no problem if you are able to hear WWV every day! However, if you miss a couple of days, and this is when the station was heard, then you do have a problem. Some radio clubs, such as World DX Club, North England Radio Club International and Medium Wave Circle, publish the WWV figures in their monthly bulletins. For those who cannot hear WWV, the station operates a 24-hour tape message service on the telephone (010 1 303 497 3235). The A-Index is updated just as in the radio message, and is announced within the first 10 seconds of the tape, so the 'phone call is not expensive.

What does this special log book look like? Here is a typical extract taken from my own special logbook (right):
Prev "A" is the A-Index on the day before the logging was made.
Curr "A" is the A-Index on the day that the logging was made.
GMT is the time that the logging was made.
Freq is the frequency on which the station was logged in kHz.

Note that where there are a great many stations in an area, the logbook can be used to indicate reception from the area, rather than from individual stations.

You will appreciate that the exercise of setting up this special logbook takes time, but the results are well worth the effort. Over a period of months, you will be able to build up a wealth of information. This means that, when you tune-in to WWV's figures for a particular day, you will simply have to thumb through your special logbook, find the nearest A-Indices pattern to the one which prevailed yesterday and today and, by looking across your logbook, see which stations were heard under similar conditions in the past. This new way of tackling those DX stations does not cancel out the importance of a darkness path between yourself and the transmitter, the time of the year, nor the time of the logging. Please remember that this new skill is **additional** to all the other skills which you have previously acquired as a DXer.

Prev "A"	Curr "A"	GMT	Freq	Station or Area of Interest	Month
	8				
	8				
8	8	0500	790	WNWS, Miami	April
15	8	0300	610	NBS, Trinidad	October
	8				
	9				
10	9	2200	3250	Banjarmasin, Indonesia	November
	9				
	9				
	9				
	10				
	10				
	10				
2	10	0200	1610	Caribbean Beacon, Anguilla	September
	10				
	11				
	11				
16	11	0800	11759	Radio Cook Islands	August
	11				
	12				
13	12	2200	3000	Indonesia: East of Jakarta	January
	12				
	13				
19	13	0800	11759	Radio Cook Islands	June
	13				
	13				
	14				
	14				
	14				
	14				

WWV Message —General Consideration

It is now an established fact that there is a connection between what you can hear on the lower frequencies and the prevailing atmospheric conditions. You can of course, choose to ignore this situation and still do some very fine DX work, for example, one way is to DX every morning. Another way would be to set up a radio/tape-recorder timeswitch, which automatically monitors a frequency on a daily basis. A more scientific way is to use the WWV information to plan your DX activity on any particular day. The standard format announcement is made by WWV at 18 minutes past the hour, twenty-four hours per day. The information is updated every three hours at 0018; 0318; 0618; 0918UTC and so on. From my own observations, the best times to tune WWV are as follows:

1418UTC to 2018UTC on 20MHz
0518UTC to 0918UTC on 10MHz
2018UTC to 0118UTC on 15MHz

You must not expect to hear WWV all the time on these frequencies. If you can not hear the station at all, anywhere, then it is reasonable to assume that "unsettled" or "active" conditions are prevailing. So, unless you are particularly interested in hearing stations from the southern hemisphere, perhaps this would be the right time to do all those jobs around the house that you have been promising to do for so long!

After the current figures for solar flux, A-Index and Boulder K-Index, the WWV message continues with a description of atmospheric conditions over the past twenty-four hours and a forecast of anticipated atmospheric conditions for the next twenty-four hours. I have found these descriptions to be of little practical value, so they will not be discussed in the text which follows. We can now study the remainder of the WWV messages in greater detail. Before we start, you might like to read the typical message once again, in order to refresh your memory.

Solar Flux

The solar flux is a pointer to the level of atmospheric noise that you are likely to hear. Obviously, a very noisy background is going to make identification of that weak DX station that much more difficult. A solar flux figure below 150 usually means that you are in for a quiet night, apart from any local thunderstorms near to your area. A solar flux figure between 150 and 220 is regarded as moderate. Whenever the solar flux is announced as being in excess of 220, you are probably in for some rather noisy conditions. Generally speaking, signals travelling via northern latitude paths, over or near to the north pole, seem to prefer a low solar flux number when making their journey to receivers in western Europe. Conversely, with a high solar flux, signals from southern latitudes tend to come through, and many DXers will have heard their best Latin American catches in such noisy conditions.

A-Index

The A-Index measures the level of disturbance in the earth's geomagnetic field. It acts almost like a vast sponge which, under disturbed conditions, expands southward from the north pole, soaking up those weak DX signals. Under quiet conditions, the reverse occurs, and the sponge contracts towards the north pole allowing signals on high-altitude paths to get through to western Europe. This A-Index is updated every twenty-four hours, commencing at 1818UTC.

What this means is that the A-Index announced at 1718UTC on, say, January 31 actually refers to the atmo-

spheric conditions prevailing on January 30. However, the A-Index which is announced at 1818UTC on January 31 refers to the atmospheric conditions on 31 January. The A-Index announced at 1818UTC is an estimated value, based on a forecast of atmospheric conditions for the remainder of the day and, if necessary, this value is revised in later announcements.

The A-Index is measured on a scale which starts at "0" for very, very quiet conditions, and rises to "40", which represents astronomically disturbed conditions. An A-Index figure between "0" and "7" means quiet conditions, which are useful for logging medium wave stations from North America. These conditions are also useful for logging stations such as those in Papua New Guinea on 3 and 4MHz.

An A-Index value which lies between, say, "8" and "15" indicates that the geomagnetic field is "unsettled". These conditions are usually favourable to the reception of stations from Central America and from certain parts of Indonesia.

Whenever the A-Index figure exceeds "15", conditions are described as "disturbed" or "active". My own observations indicate that such countries as Argentina and Paraguay are heard under these conditions. Also well-heard is West Africa and most of Indonesia.

K-Index

The K-Indices are the basic components of the A-Index. The A-Index is a daily value, but the K-Index is a three-hourly value of atmospheric conditions prevailing at any particular time. By applying a mathematical formula, the eight three-hourly K-Indices are used to formulate the daily A-Index. You can see then, in many respects, these indices are much the same thing.

You may ask, "Why bother with the K-Index?" Well, the importance of the K-Index is that it is a measure of the conditions prevailing NOW. It is possible that you have a very low A-Index which, to all intents and purposes, would seem to favour high-latitude signal reception. If, however, at the time of tuning in to WWV on a low A-Index day, you discover that the announced K-Index is, say, "3" or "4", you have actually got immediate storm conditions prevailing, which should favour signals from the southern hemisphere.

Just as the A-Index has a scale of values, the K-Index has a scale of values, too, which ranges from "0" to "9".

A K-Index value of "0" or "1" indicates very quiet conditions, favouring high-latitude reception from areas such as Papua New Guinea. A K-Index value between "2" and "3" indicates mildly unsettled conditions, when one would expect to hear signals from Central America. At values between "4" and "5", the K-Index indicates quite active conditions. Under these circumstances, stations from the Falkland Islands and the Argentine sector of Antarctica have been logged. Whenever the K-Index is greater than "5", my observations indicate that reception of signals from any part of the world is poor, such conditions are often associated with severe short wave fade-outs.

Epilogue

The use of propagational data, as an aid to the logging of those rare DX catches, must be treated as an **additional** tool to those which you already possess as a DXer.

Still important are:

A good antenna.

The time of year.

The affect of a darkness path between transmitter and receiver.

The time of logging.

Propagational data is merely an additional tool to help you log that rare DX station. The method involves a system of recording reliable loggings from reputable radio club magazines and adding the A-Index details prevailing at the times when the stations were heard. A check of previous conditions against current conditions, announced by WWV at 18 minutes past each hour, should indicate which part of the world that you should be listening out for today.

Note: This feature article on the use of propagational data is based on a five-part talk produced for the DX programmes of Danish Short Wave Clubs International. These DX programmes are broadcast each Sunday morning from Sines, Portugal, on 9·670MHz at 0930UTC (GMT) (0830UTC during Summertime) via the facilities and transmitters of Adventist World Radio. ***PW***

*Danish SW Club International: DK-2670 Greve Strand, Denmark.

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 Daiwa 2 needle s.w.r. meter, Bearcat 220 scanner, Trio R600, Pentax ME Super camera plus 2× converter with lens filters, all in good condition. Would exchange for anything DXTV, antenna rotator, Spectrum computer, printer or w.h.y? Alistair. Tel: 0224 491198. *B994*

Have FT-221R muTek front end and Trio 8400 10W f.m. mobile rig. Would exchange for FT-780, w.h.y? Also have "O" gauge clockwork trains. Would exchange for a receiver, w.h.y? Mike. Tel: 051-428 2448 (home) or 051-342 6441 (work). *B996*

Have Heathkit lab oscilloscope, 5in model IO–12 with leads and manual, also Hallicrafters shortwave radio model S 38C 6-valve, old but works well, four new valves fitted. Would exchange for a green screen monitor, but could come to some arrangement. S. Deacon G6HVS. Tel: 051-334 6859. *B999*

Have Standard 8mm Eumig cine projector, excellent condition, zoom lens, autothread etc., spare bulb. Would exchange for legal CB, must be in good condition. Ron Wilson, 4 Brookside, Pathfinder Village, Exeter EX6 6DE. *C001a*

Have ZX81 fitted with "real" keyboard, 8K memory, printer (hardly used), heavy duty p.s.u., three manuals. Would like to exchange for frequency counter to 30MHz at least or legal CB base station. Tel: 06476 753. *C002a*

Have part finished ¼ scale Burrell traction engine, value about £250. Would exchange for any 144 or 430MHz gear mobile, handheld or static, any age as long as it works. S. Goodwin. Tel: 0454 414516. *C005*

Have Realistic DX400 receiver, 1·5MHz to 30MHz a.m. s.s.b. plus f.m. broadcast band. Would exchange for 144MHz mobile transceiver. Robert. Tel: 0603 419044. *C013*

Have Sanyo RO8880 9-band receiver. Would exchange for FT-290R. Dave. Tel: 0424 892062. *C016*

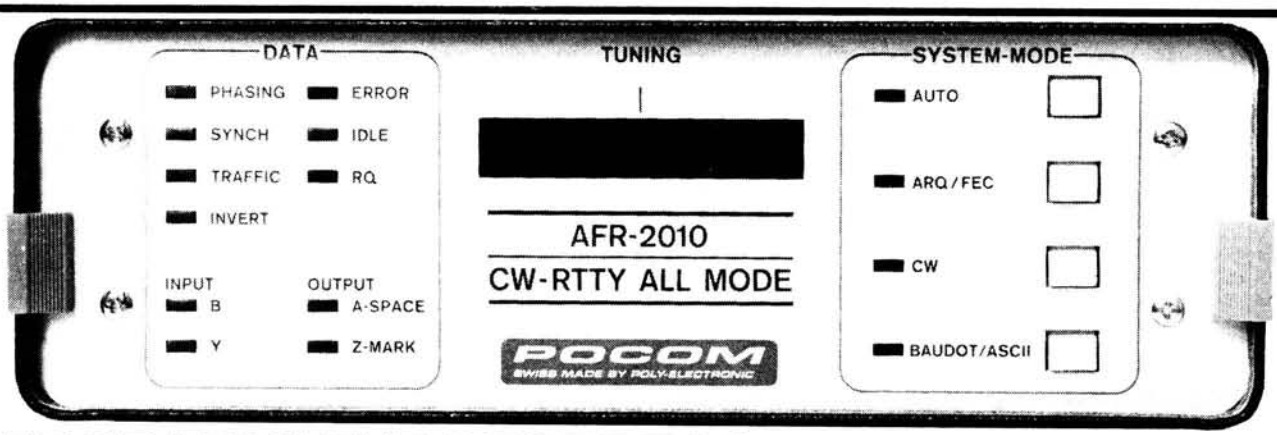
Have 144MHz 16-channel scanner (TMS6) plus two spare crystals, plus Handic 006 8-channel scanner crystalled marine band. Both new and boxed. Would exchange for DRAE SSTV RX unit. Chris. Tel: Canterbury 711172 (evenings). *B022*

Have FT-790R, antenna and NiCads, excellent condition, value £270. Would exchange for w.h.y? Tel: Bolton 852786. *C024*

Have mint Trio 9130 boxed as new. Would exchange for FT-77 or FT-707 plus p.s.u., must be mint. Or would exchange for rig plus cash for FT-757 or TS-430. Bob. PO Box 73, Luton, Beds LU1 5QD. *C029*

Have ICE Supertester 680R 20 000Ω/volt, unused. Advance SG62B signal generator, 150kHz–220MHz a.m. Would exchange for an r.f. digital frequency meter to read up to 146MHz and over. N. Porter. Tel: 01-390 2650. *C030*

Have Koyo portable receiver, 6 a.m. bands, 4 f.m. bands, a.c. or battery, 8 controls, two antennas, world time map and calculator, phone and record sockets, also Grundig mic table stand. Would exchange for Bearcat scanner or a.t.u. Tel: 0202 730599. *C032*



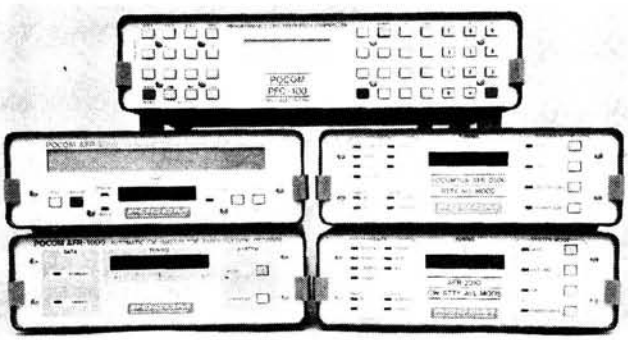
PROBABLY THE BEST DECODER IN THE WORLD

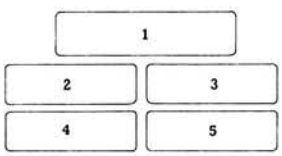
In its standard form the **POCOM 2010** is extremely versatile and capable of decoding most signals, yet it costs just **£781.** However, specialist users may want to be able to decode some of the more unusual transmissions that are around, so for them a range of expansion boards are available. These just plug straight into the **2010** and turn it into what must be the most versatile decoder on the market (the boards marked YES are fitted as standard).

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

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

INTRODUCING THE REST OF THE POCOM FAMILY





1 — PFC 100
2 — AFR 8000
3 — AFR 2000
4 — AFR 1000
5 — AFR 2010

POCOM decoders are manufactured in Switzerland by the Poly-Electronic company who are known throughout the world for the quality of their products. The **2010** is the flagship of their range and this is the one that we would recommend to professional and commercial users — it covers everything! The **AFR 8000** is similar to the **2010** (it uses the same software) but it has the added feature of a built-in LCD display which makes it ideal for mobile or marine use where a video monitor is not really practicable, although a video option available. The **AFR 2000** is again similar to the **2010** but in its standard form it is supplied without CW capability. A CW expansion board is available as an option. The **AFR 1000** is a budget priced ASCII, ARQ/FEC (SITOR/SPECTOR/AMTOR) and CW decoder which has many of the features of the **2010** but which is not upgradeable. Although it is not a decoder, it is worth mentioning that we can also supply the **POCOM PFC 100,** a versatile frequency controller for radios such as the NRD 515 and the ICOM R70/71.

Whether you are a professional user or a dedicated listener there is a **POCOM** decoder for you and, although the top of the range model costs about **£1500,** prices start from as little as **£395.** They may not be the cheapest on the market, but they are certainly the best! For more details send s.a.e. (at least 8″×6″) for a free booklet which gives the full specifications of the entire **POCOM** range of decoders.

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

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Access

1920s Time Signals

Old Timer takes a look back at Britain's 1920s chart topper—time signals

They hadn't yet invented radio programme popularity listings at the beginning of the 1920s, but if they had, the chart topper among British listeners would certainly have been: time signals. Since there were few regular radio programmes in pre-BBC Britain, the English radio buff who was not fluent in Morse had virtually nothing else to listen to; the Co-optimists and Roosters were still some years away in the future.

Listening to time signals might seem tame to us, but a third of a century before the transistor portable it was considered pretty advanced stuff. Two noted European stations that transmitted regular time signals easily received worldwide were the Eiffel Tower (FL) in Paris, France on 115kHz (2600m) and the German sender POZ at Nauen, operating on 77kHz (3900m). Both of these stations could be tuned in—separately, with luck—on a standard 30·5 metre long official GPO antenna, with a crystal or valve set utilising a De Forest No. 300 tuning inductance shunted by a variable capacitor of 500pF or 1000pF maximum value.

Naturally, these two giant spark transmitters broadcast telegraphy, but the listener needed no more than a Boy Scout knowledge of Morse to understand the time signals once he had become familiar with their regular pattern. And he couldn't confuse the two stations, even when using a receiver with no form of dial or logging: the Frenchman emitted a low note, while the German spoke with a high note and and was a little weaker. Nauen squeaked and Eiffel Tower squawked.

Their time signals—accurate to a fraction of a second—were transmitted at 12-hour intervals: Paris at 10.44 a.m. and p.m.; and Nauen at 11.55 a.m. and p.m., GMT in both cases.

Here's how it worked: Just before 10.44 Eiffel Tower would send a few "wait" signals, and precisely at 10.44 start to transmit 19 dashes, followed by a single dot exactly at 10.45. After a one-minutes silence, it began at 10.46 to send a succession of 14 "D"s and followed this with a lone dot exactly at 10.47. After another pause of one minute it transmitted eleven "6"s, followed by the dot that everybody was waiting for at precisely 10.49.

Graphically, the programme went like this:

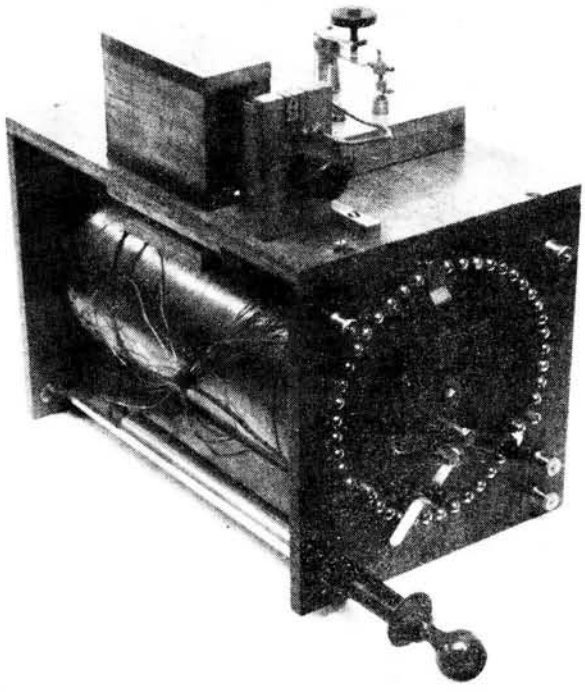
10.43 _..._ _..._ _..._

10.44 _ . (10.45)

10.46 _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. _.. . (10.47)

10.48 _.... _.... _.... _.... _.... _.... _.... _.... _.... _.... _.... _.... . (10.49)

._._. ("finish" signal) FL FL ..._._ ("end of work" signal).



The reproduction elaborate 1918 crystal set mentioned. The crystal detector is a zincite-bornite perikon arrangement

Quite a performance compared with today's five "pips" and a "peep" broadcast hourly by the BBC.

Nauen was only a little simpler. It started at 11.55 by sending several "V"s, and at 11.56 emitted the general call-up sign followed by its callsign POZ and the letters MGZ (the German initials for Greenwich Mean Time). Then came seven "X"s followed by three dashes, the end of the third dash coincident with 11.58. This was immediately followed by five "N"s and three dashes, with the end of the third dash at 11.59. Next came five "G"s and the whole formula concluded with three dashes, the end of the third dash signalling exactly 12 noon or midnight, as appropriate.

Here's the Nauen programme shown graphically:

11.55 ..._ ..._ ..._ ..._

11.56 _._._ POZ MGZ

11.57 _.._ _.._ _.._ _.._ _.._ _.._ _.._ _.._ _ _ _ (11.58)

11.58 _. _. _. _. _. _ _ _ (11.59)

11.59 _ _. _ _. _ _. _ _. _ _. _ _ _ (12.00)

A rudimentary radio produced commercially for time-signal reception was the "Tempus", a crystal set made by W. J. Badman & Co of Weston-super-Mare, at the beginning of the 1920s. It came in two versions. Type "A" had a testing buzzer and batteries but no headphones, and an overall size of 200 × 180 × 140mm (8 × 7 × 5½in) including the lid. Prices were £5 for the Workshop pattern, and £7 for the De Luxe Model. Type "B" was basically the same but had space in which to stow the headphones that were not supplied with it, so was bigger at 220 × 200 × 180mm (8½ × 8 × 7in). Costlier too, at ten shillings (50p) more than the equivalent Type "A". Browns 40kΩ double headphones were an optional extra at £2 17s 6d (£2.87½), or for those with three hands and less cash there was a Browns single 4kΩ headphone without headgear at £1 5s (£1.25).

Why the testing buzzer? So the operator could check that his crystal detector was working. The buzzer acted as a short-range untuned transmitter: if the operator could hear its rasp in his headphones, he knew the detector was fine. If he couldn't, he had to adjust the catswhisker until the buzzer became audible. Then he switched it off. Without checking with the buzzer, he might miss the time signal because of a non-functioning detector. He might even throw his "Tempus" across the room.

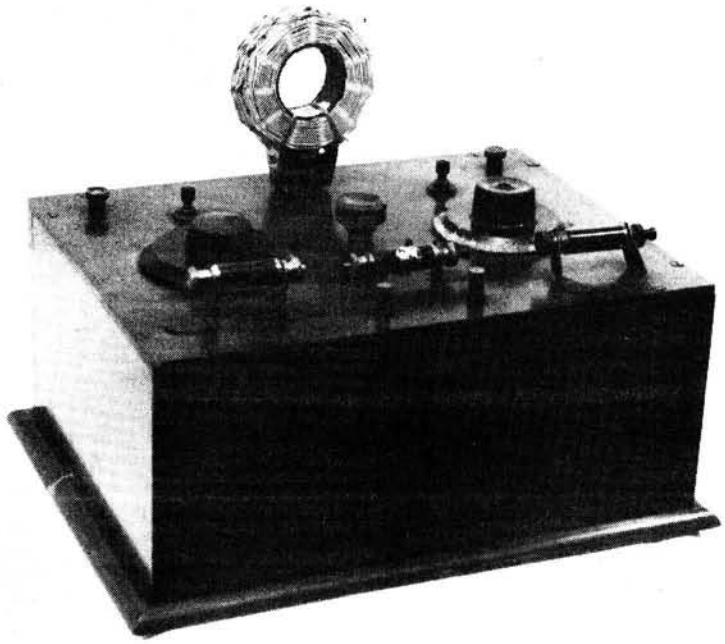
With the "Tempus" came a set of signal charts similar to the graphical programmes we have just looked at, and a booklet of operating instructions. These informed buyers ponder-

ously that "an observer with headphones on, and the Signal Chart and the watch or clock to be compared within easy vision, will have no difficulty in determining the amount of 'error' with great accuracy". Still more impressive was the information that "owing to the enormous speed of the electrical impulse (or 'wireless wave'), the transmission and reception are practically simultaneous over distances up to some few thousand miles."

Then, in excitingly technical vein, the instructions pointed out that some form of antenna was required to "collect energy from the electric waves radiated by the distant transmitting station and pass it along to actuate the detector of the receiving apparatus." Also that the Postmaster General's Regulations permitted the use of an antenna not more than 30·5m (100ft) long if it consisted of a single wire, or 43·7m (140ft) if it has two or more wires, and not more than 30·5m (100ft) above ground. As well as an antenna, buyers were told, the "Tempus" needed an Earth connection made to a water pipe—**not** a gas pipe. (Overseas readers should know that the Postmaster General was in charge of the British Mails, and ran radio affairs in Britain as a side activity.)

Easily the most evocative part of the instruction booklet was its front cover. The top half contained an artist's vivid impression of the lofty Eiffel Tower, while the bottom half depicted a busy watchmaker wearing the Browns double headphones, adjusting his "Tempus" with one hand and holding a gold halfhunter in the other, surrounded by various timepieces ranging from a "Grandfather" to an alarm clock.

Hoping to recapture the magic of that era, the present author recently expended many hours and much wire in building a massive crystal receiver to instructions published in 1918, capable of receiving wavelengths far greater than those of the two famous time-signal stations. It happens that it was designed to receive the ill-fated Irish Clifden station—later blown up by the IRA in 1922—which operated on a hefty 42kHz (7200m). Alas for the nostalgia of its sentimental modern constructor, this elaborate piece of apparatus received no time signals from the Eiffel Tower or Nauen. All it could capture was the cracked tones of Big Ben on the local BBC station and—on its very lowest tapping—the equally cracked Spassky Tower chimes of Radio Moscow on shortwave! ***PW***



A sophisticated home-built crystal set of the early 1920s, mainly for broadcast reception

Postscript

By an odd coincidence, a recent broadcast from Radio Berlin International—"the Voice of the German Democratic Republic"—has announced that Nauen is once again transmitting time signals, originating from an atomic clock in Berlin. So the 1918-style crystal set might yet assuage its maker's nostalgia by receiving time signals from Nauen. But they won't be from the famous old station POZ; Nauen's new callsign is Y3S.

NEWS EXTRA

Finland in the Early Summer

Have you ever thought of visiting the Southern part of Finland in the early summer. Well, during the first part of June, the European DX Council will be holding its Annual Conference in Espoo, a suburb of the Finnish capital, Helsinki.

The Conference will be hosted by the Finnish DX Association who joined the Council two years after its inception in 1967, and this will be the second time that the Conference has been held in Finland, the first time was in 1971 at Jyvaskyla.

This is expected to be the largest gathering at an EDXC Conference in the 21 years since the Council was formed. Each year the Finnish DX Association holds its own Summer Meeting, and on this occasion the two events will be combined. This unique event combines relaxation in a country known for its outdoor life, the meeting of many like minded enthusiasts and a host of radio personalities from around the world. There will also be the opportunity of participating in a sightseeing tour of Helsinki, and the chance of visiting a local commercial f.m. station.

The meeting itself will have three parts, the first the EDXC Meeting will have workshops on various subjects ranging from North American m.w. DXing to computers in DXing.

The second part will be the Finnish Summer Meeting which will include a video of a DXpedition to Lapland in the winter, a volleyball tournament, together with the opportunity of doing your own DXing.

The final part will involve the broadcasters, a chance to meet all the station representatives and discuss with them in a relaxed atmosphere matters of mutual interest. Last year they had stations represented from all corners of the world.

Hotel Korpilampi—Forest Lake Hotel— will be the venue between June 5 and 8 and the cost will be 950 Finnish Marks for a single room and 700 Finnish Marks for a double room. This includes cocktails on the Friday evening; Saturday breakfast, lunch and banquet; Sunday breakfast and dinner; and on the final day Monday breakfast. It is possible however to stay either side of the conference dates if you wish.

If this has whetted your appetite to attend the 1987 EDXC Conference then a brochure and registration form can be obtained from the organisers ***The Finnish DX Association, EDXC 87, PO Box 454, SF-00101 Helsinki, Finland.***

The closing date for registration is April 20.

Amateur Radio in Australia

Australia boasts about 16 000 amateur radio operators who, despite rumours to the contrary, actually speak English! Greg Baker tells us a little more about Australian amateurs

The Australian amateurs are concentrated in the south and east of the continent. By state, New South Wales (NSW) and Victoria (Vic) have about 30 per cent of amateurs each, with Queensland (Qld) at 15 per cent, and South Australia (SA) and Western Australia (WA) at about 10 per cent each. Tasmania (Tas), the Australian Capital Territory (ACT), Northern Territory (NT) and external territories make up the balance.

Licence Classes

The Australian Department of Communications (DOC) issues three amateur certificates of proficiency: the Amateur Operators' Certificate of Proficiency (AOCP), the Amateur Operators' Limited Certificate of Proficiency (AOLCP) and the Novice Amateur Operators' Certificate of Proficiency (NAOCP).

Candidates for these certificates must pass examinations on the DOC amateur regulations in force at the time of examination and on the theory of radio relevant to amateur radio. For the AOCP and AOLCP the theory examination is at a higher level than for the NAOCP. A telegraphy examination is not required for the AOLCP, but the AOCP and NAOCP must pass both sending and receiving Morse code tests. The AOCP requires ten words per minute; the NAOCP requires five words per minute.

All but telegraphy exams are multiple choice, with the candidate expected to choose the correct answer from four options to each question. The theory examination has fifty questions, the regulations examination thirty questions, and the pass mark in both cases is 70 per cent. This means a candidate must get 35/50 for the theory and 21/30 for the regulations.

Telegraphy exams are for five minutes receiving and 2½ minutes sending. Words average five letters each with each number counting as two letters. In the sending examination, more than four uncorrected or improperly corrected errors or failure to complete within the 2½ minutes results in failure. In the receiving examination, each letter or number incorrectly received counts as one error, except that no more than three errors are counted in any one word or group of numbers. For the AOCP, seven errors or less are required for a pass; for the NAOCP, ten errors or less are required to pass. The DOC by arrangement also examines Morse skills at 12 or more words per minute and issues accreditation documents to successful candidates. These are used for overseas reciprocal licensing.

The annual licence fee is currently $A21 (about £10 at current exchange rates).

The AOCP allows full privileges on all bands. Holders of the AOLCP cannot transmit on bands below the 50MHz band and obviously not in c.w. Holders of the NAOCP are permitted restricted use of the segments 3·534–3·625MHz, 21·125–21·200MHz and 28·100–28·600MHz. Power output must not exceed 120 watts mean power (NAOCP 10 watts) except for s.s.b. where peak envelope power must not exceed 400 watts (NAOCP 30 watts).

Authorised Bands

Bands where the amateur service is the secondary service are marked with an asterisk in Table 1.

Band (MHz)	Comments
1·800–1·825	
1·825–1·875*	
3·50–3·70	
3·794–3·800*	
7·0–7·1	
7·1–7·3*	
10·10–10·15*	
14·00–14·35	
18·068–18·168*	
21·00–21·45	
24·89–24·99*	
28·0–29·7	
50–52	Restricted usage: Used by Channel 0 TV in some areas
52–54	
144–148	
420–450*	
576–585	Temporary until needed for Channel 34 TV
1240–1300*	
2300–2450*	
3·3–3·5GHz*	
5·65–5·85GHz*	
10·0–10·5GHz*	
24·00–24·05GHz	
24·05–24·25GHz*	

Table 1

Callsigns

Callsigns are of the form VKnLL or VKnLLL. The digit n is 0 for the Australian Antarctic Territory, Heard Island and Macquarie, 1 for the ACT, 2 for NSW, 3 for Vic, 4 for Qld, 5 for SA, 6 for WA, 7 for Tas, 8 for NT and 9 for other external territories.

The letters LL or LLL are allocated as follows: for AOCP holders AA–ZZ, and AAA–EZZ; for AOLCP holders TAA–TSZ, TUA–TZZ and XAA–ZZZ; for NAOCP holders MAA–NZZ, PAA–PZZ and VAA–VZZ; and for those who hold both AOLCP and NAOCP JAA–KZZ. Privileges for those holding both AOLCP and NAOCP are the sum of privileges for each class. Repeaters and beacons are usually allocated letters from the sequence RAA–RZZ.

VK9 calls are allocated VK9LA–VK9LZ for Lord Howe Island, VK9MA–VK9MZ for Mellish Reef, VK9NA–VK9NZ for Norfolk Island, VK9XA–VK9XZ for Christmas Island, VK9ZA–VK9YA–VK9YZ for Cocos (Keeling) Islands and VK9ZA–VK9ZZ for Willis Island.

Beacons, Repeaters and Time Stations

The Australian 28MHz band (10m) beacon allocation is the block from 28·26–28·27MHz inclusive. Existing beacons are:

Call	MHz	Location
VK5WI	28·260	Adelaide
VK2RSY	28·262	Sydney
VK6RWA	28·264	Perth
VK6RTW	28·266	Albany
VK4RTL	28·270	Townsville

There are about 30 v.h.f. beacons, 6 u.h.f. beacons, 110 v.h.f. repeaters and 40 u.h.f. repeaters.

The Australian Telecommunications Commission operates the standard time and frequency station VNQ at Lyndhurst near Melbourne. There are three 10kW transmitters operating thus:

MHz	UTC
4·5	1000–2100
7·5	Continuous
12·0	2200–0900

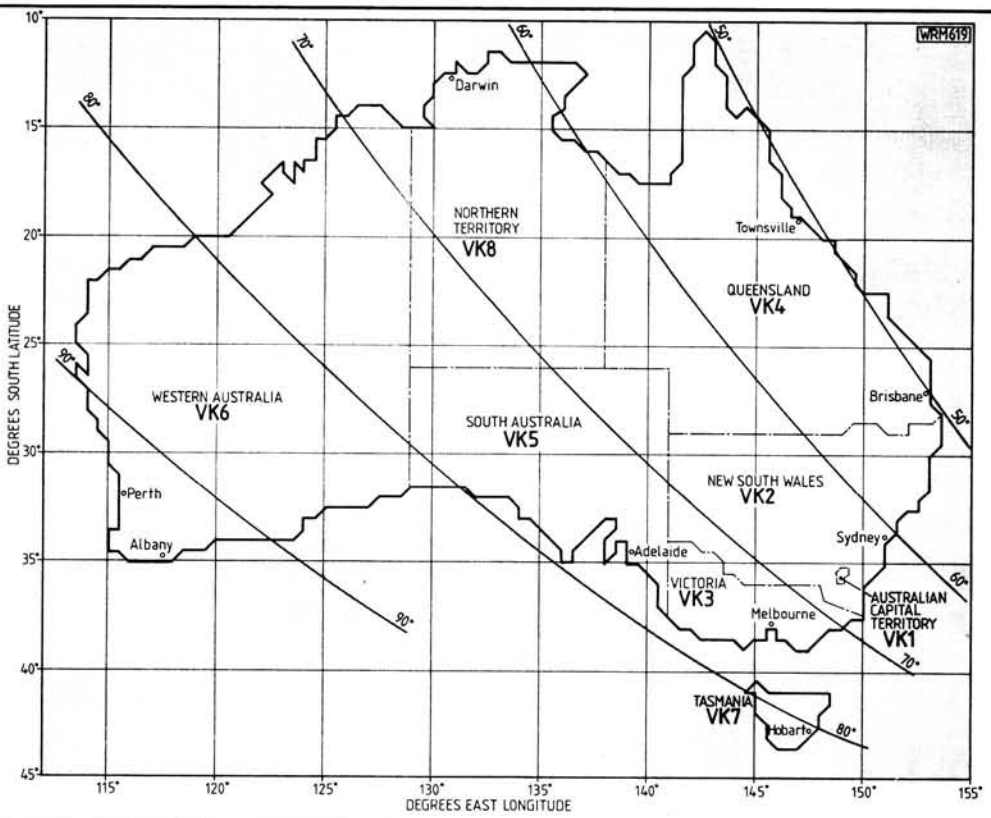


Fig. 1

Amateur Organisations

About half Australia's amateur operators belong to the Wireless Institute of Australia (WIA). Founded in 1910, it is the world's oldest amateur radio organisation. Membership tends to be old rather than young with a recent member survey showing 52 per cent of members over fifty and only 29 per cent below forty years of age. Activities include representing amateurs in discussions with DOC, education of members and prospective amateurs, organsiation of the Wireless Institute Civil Emergency Network (WICEN), provision and maintenance of beacons and repeaters, maintaining an intruder watch, organising Australian QSL bureaux and broadcasting news and slow Morse sessions. In addition a monthly journal, *Amateur Radio*, is posted to members as part of their membership fee. In 1985 these fees ranged from $A31.50 to $A39.00 depending on state division. The WIA Federal Office is at 3/105 Hawthorn Road, Caulfield North, Victoria 3161, Australia.

There are also over three hundred local area and institution based amateur radio clubs, many of which hold regular weekly club net meetings and operate v.h.f. and u.h.f. repeater stations. There are three short wave listeners' DX clubs, the largest of which is the Australian Radio DX Club, PO Box 36, North Brighton, Victoria 3186, Australia.

Special interest groups cover the broad spectrum of amateur activity including ATV, packet radio, amateur satellite, RTTY and QRP. Many of these groups issue regular newsletters to members.

From \ To	Sydney 34°S 151°E	Adelaide 35°S 138°30′E	Perth 32°S 116°E
London 51°30′N 0°W	61° 16 975km	77° 16 240km	93° 14 475km
Manchester 53°30′N 2°15′W	55° 16 985km	72° 16 330km	89° 14 630km
Glasgow 56° 4°15′W	48° 16 910km	66° 16 359km	85° 14 750km

Magazines

There are two main generalist magazines. One is the WIA's *Amateur Radio (AR)*, the other commercial *Amateur Radio Action (ARA)*. *ARA* runs to 74 A4 pages and regular content is: editorial comments, readers' letters, news on products and regulations, contest and award information, ionospheric predictions, short wave listener information and v.h.f. and u.h.f. band news. In addition to these regular subjects it runs a wide range of items of interest to amateurs. These include, among other things, product reviews and tests, construction projects, computer articles and programs, theory articles, items on amateurs in other countries, news on DXpeditions, modifications and beacon, repeater and net frequency lists.

ARA is published every four weeks. A year's subscription—thirteen issues—is $A32.50 for surface mail and $A68.90 airmail for the wealthy and impatient.

The WIA's *AR* appears smaller at about 60 A4 pages, but microscopic print makes up a similar volume of material. Articles are similar to *ARA* but more emphasis is placed on WIA activities and news, on historical material and articles on older members and on reprinting news snippets from the world's amateur and electronic press. It is only available to WIA members and as part of membership fees.

Time Zones

Standard time zones have VK1, 2, 3, 4 and 7 at UTC + 10 hours, VK5 and 8 at UTC + 9½ hours and VK6 at UTC + 9 hours. Daylight saving is usually from the last Sunday in October to the first Sunday in March. It applies in VK1, 2, 3 and 7 (UTC + 11 hours) and in VK5 (UTC + 10½ hours). VK4, 6 and 8 do not observe daylight saving time, thus in the Australian summer there are five time zones!

Beam Headings

Short path beam headings from London are shown on the map, Fig. 1, and the accompanying table includes Manchester and Glasgow as well. Bearings are not true (not magnetic) and are to the nearest degree. Latitudes and longitudes are approximate.

Hopefully you will now know a little more about the VK way of amateur radio when you next hear or work them. **PW**

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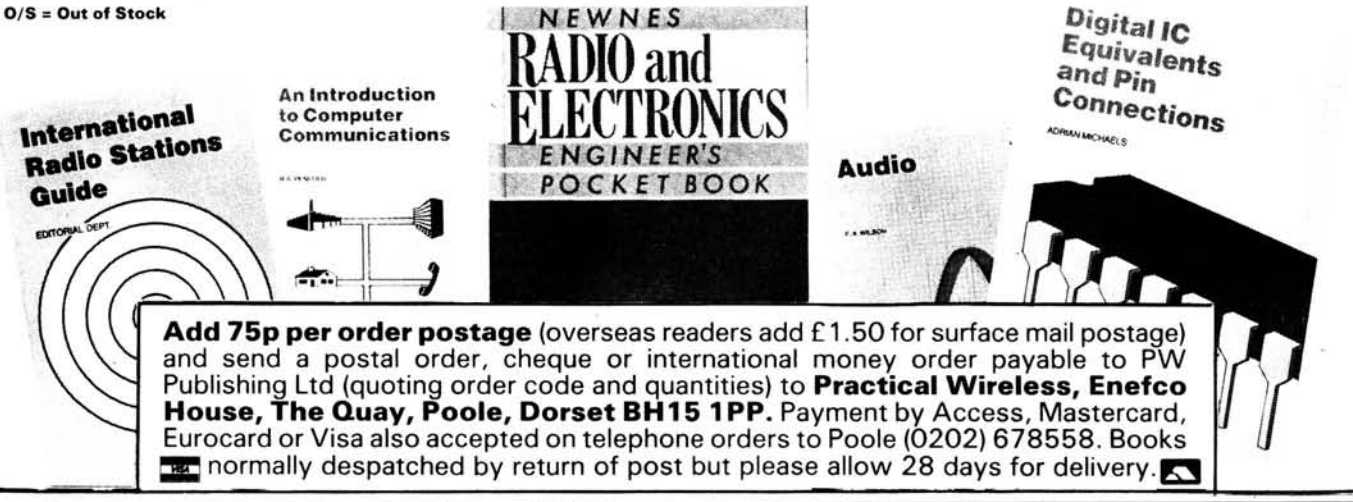

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Trials of a New Licensee

After reading recent letters in PW, Steve Bryan G1SGB put pen to paper with his own experiences

As a new licensee and a new member of the RSGB let me state some true facts, not hearsay or drum news, but my own personal experiences.

I became licensed on 27 January 1986 and set-up with the usual Slim Jim antenna for local chats with friends that were already licensed. I managed to eventually purchase a beam and started working s.s.b. but not for very long as unfortunately I caused TVI to the local community antenna system serving approximately 250 viewers. Well, I was astounded as my Trio 9130 put out 26 watts and my antenna, a 9-element Tonna, was not pointing at the TV antenna. Needless to say I had to cease my s.s.b. activity. Well, everybody was very sympathetic and full of suggestions some of which are not printable.

First I changed the antenna to a more up-to-date quad by Halbar, still no joy. So I then returned my set to the dealers and asked them to give it a full service, £29.00 lighter I tried again, still to no avail.

Threats

I then took the advice of some of the "old 'uns" who told me to carry on transmitting until the DTI came to see me, I did just that for a limited period until my wife became so fed up with the threatening 'phone calls to herself and our son that I came very close to packing it all away and forgetting about it.

The last suggestion I applied was joining the RSGB as they have the interest of the amateur at heart, they won't stand by and let an amateur get knocked about by the DTI, they offer sound advice on how to cure TVI without it costing a penny. I joined.

Help Please

I asked for help in curing my TVI, I begged for some information by letter. Eleven days later I had still not received any reply, but my friend who had suggested I join informed me that until my membership had been processed they would not reply to me. I waited, still not fully operational on s.s.b., then it arrived—a letter from the RSGB. Would this hold the answer to my problems? Not likely, just a computer printed certificate that stated I had been elected as a member.

Without further worry about the expense or delay, I 'phoned the hallowed halls of HQ and a voice answered me "This is RSGB recorded message". I called several times and was eventually lucky to get through to a human, who listened intently until I'd told her the whole story of my problems then said that she'd get someone who deals with that, hang on . . . and on and on. When a voice did return it said the young lady has told me everything you said to her and I feel that if you are experiencing that many problems from the community antenna system you should report yourself to the DTI.

I did 'phone the DTI at Leeds and spoke to a Mr Sykes, who said until they have any complaints they wouldn't act against me. He also told me to carry on and await the outcome. Next I contacted some radio and audio dealers for advice. One lengthy conversation advised me to tell the local council to fit the antenna with a channelised filter.

And So It went On!

A 'phone call to the council had the solution straight away—take down your antenna as no antennas are permitted. But I have planning permission and I am licensed, I pleaded. They agreed to send out a contractor who services the antenna.

He came along and fitted a masthead pre-amplifier into the distribution amplifier and THEN fitted a CB-100 filter and off he went. As you can no doubt imagine I was then stuck for using simplex as well as s.s.b.

I eventually called the BBC and YTV to complain of the poor reception on TV, as when I transmitted on any mode at more than 2 watts, I cleared any picture from the TVs in the area. I was advised to contact the IBA which I did. Of all the information I received, the IBA was the most useful. He told me to supply him with the name of the contractor which I did. The following day the antenna specialist (??) turned up at my door saying he had thought over the problem and decided to alter the existing system and would I give him a hand. I agreed.

He climbed up to the antenna and measured 13in into the coaxial cable from the antenna and inserted an Antiference filter. He then turned the antenna to a more northerly direction and that was that.

Problem Solved

Whilst all this had been going on I had repeatedly asked for information from the RSGB and they eventually sent me a copy of *How to Improve Television and Radio Reception*. I didn't have the heart to write back to say that the DTI had sent me 50 copies for distribution in my village or that I had already made up 150 of the filters on page 20.

One comment I heard on-air during this time was "you are a new licensee, who has only been in the RSGB 2 minutes and the ink isn't dry on your application". I agree, but surely it is likely to be new licensees who experience these sort of problems and most certainly it is the new licensee who needs assistance and encouragement on his first days of operation to ensure that he is operating a clean station. Too many people are eager to condemn and sadly too few are willing to help and encourage the newcomer. **PW**

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To *PW* readers—a special pre-publication offer on the latest book from the pen of F. C. Judd G2BCX.

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A special chapter deals entirely with ionospheric radar systems, one of which is well-known to radio amateurs and short-wave listeners the world over as the "Woodpecker". Other chapters deal with the discovery of the ionospheric regions, their characteristics, the eleven-year solar cycles and sunspot activity, ionospheric anomalies, the transmitting antenna and propagation, and radiation of radio waves, ending up with a chapter of propagation data.

The *Radio Amateur's Guide to Radio Wave Propagation (HF Bands)* is in paperback, comprising 144 pages 136 x 216mm, and will be published by Heinemann Newnes. The special pre-publication offer price to *PW* readers is £7.95 plus 50p post and packing—a total of £8.45. (Books are zero-rated for VAT).

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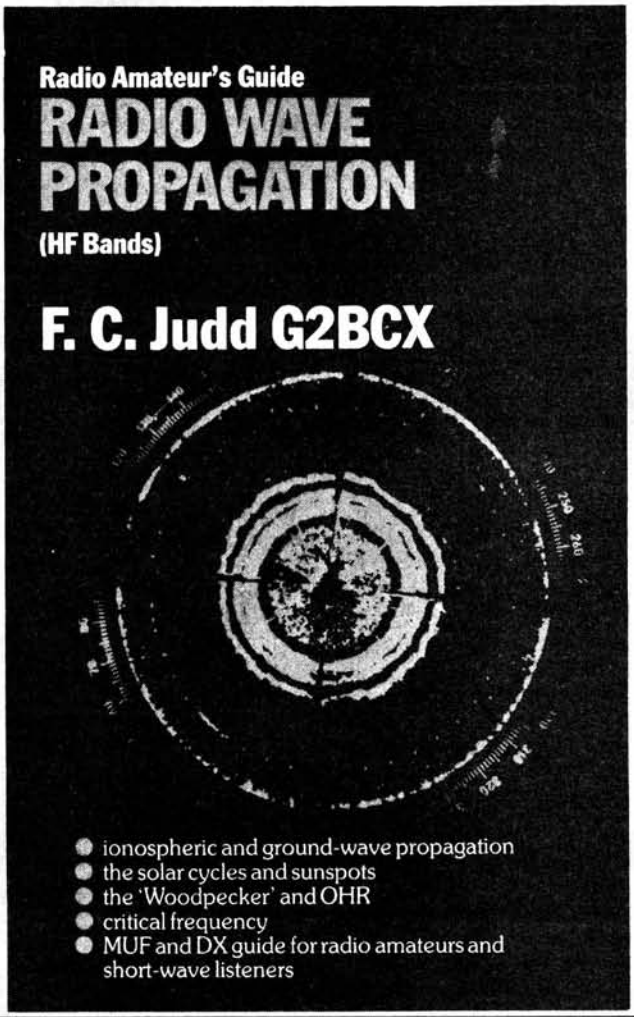

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PW REVIEW

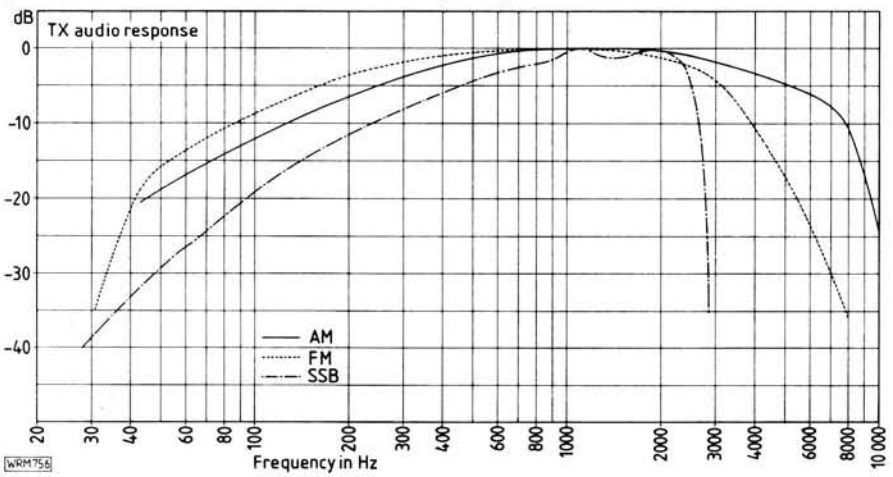
Geoff Arnold G3GSR runs the rule over the TS-440S from Trio, a versatile 100W h.f. transceiver—small enough to operate mobile, yet incorporating all the features most amateurs would look for.

The TS-440S is a triple-conversion transceiver (double-conversion only on f.m. transmit) combining a transmitter for the amateur bands between 1·8 and 29·7MHz with a general-coverage receiver tuning from 100kHz to 30MHz in 10Hz steps. A wide receiver dynamic range, specified at 102dB in a 500Hz i.f. bandwidth, is achieved by the use of 2SK125 junction f.e.t.s in the 1st and 2nd mixers, and a 3SK73 dual-gate m.o.s.f.e.t. in the 3rd mixer.

All-mode operation, covering u.s.b., l.s.b., c.w., a.m., f.m. and a.f.s.k., is provided as standard. An internal audio oscillator tells you which mode has been selected by announcing, in Morse code, its initial letter ("U" for u.s.b., for example). Transmission at a 100 per cent duty-cycle for periods of up to an hour is possible in any mode, including f.m. and a.f.s.k. Full break-in operation is possible in the c.w. mode, and the rapid transmit/receive switching makes the TS-440S suitable for data communications in the s.s.b. mode, such as AMTOR. Both r.i.t. (receiver incremental tuning) and x.i.t. (transmitter incremental tuning) are provided.

Selection of receiver i.f. bandwidth can be either automatic, in which case a filter suitable for the mode in use will be brought into circuit by the microprocessor, or alternatively manual, when the operator can choose from the various filters fitted. As standard, the TS-440S comes with two filters installed—one designated as "W" with a 6dB bandwidth of 6·0kHz, and the other as "M_2" with a 2·2kHz bandwidth. In the "auto" setting, 6·0kHz is selected for a.m., and 2·2kHz for all other modes except f.m., which always uses a 15kHz bandwidth. Positions are also provided on the I.F. Unit p.c.b. and selectivity switch for two additional filters from a range available as options.

Besides the features already mentioned, on the receive side there are separate r.f. and a.f. gain controls plus an r.f. attenuator, fast and slow a.g.c. time-constants, an i.f. shift control, an audio notch filter, a noise blanker and an all-mode squelch circuit. On the transmit side, a speech processor is provided, and there is metering of output power, a.l.c. operation, and output s.w.r.



A versatile frequency control system with two digital v.f.o.s can be tuned either from the keypad or by means of the main tuning knob. Band changing can be either in 1MHz steps or directly from one amateur band to the next, as desired. In wide-band modes, the tuning rate is automatically increased, and a fast-scan function is also provided. The dual v.f.o.s enable cross-band, cross-mode operation.

The 100-channel memory (including 10 odd-split channels) stores frequency, band and mode. Scanning of the memory channels or of either of two programmable scan ranges is possible. Also the memory channels can be scrolled through to check on their contents, whilst continuing to listen to a chosen frequency. The desired memory channel can be selected using either the main tuning knob or microphone up/down pushbuttons. The memory is backed up by an internal lithium battery with a designed operating life of five years. Tuned frequency, memory channel and other operational data is indicated on a 2-colour fluorescent display.

On the top cover of the TS-440S is a switch controlling the VOX circuit and c.w. break-in. On the rear panel are connectors for power (13·8V d.c.), antenna, earth, Morse key, external loudspeaker, a.f.s.k. input and output, remote control and several accessory functions. There are also preset controls for VOX gain and delay and for anti-VOX.

Options available at extra cost (apart from the i.f. filters already mentioned), include an internal automatic antenna tuner operating from 3·5 to 29·7MHz, a voice synthesiser unit which announces the tuned frequency in response to the touch of a pushbutton, an interface kit which allows control of the TS-440S from a personal computer

via an RS-232C port, and a tone unit which can be used in conjunction with the odd-split memory channels for 29MHz repeater operation.

A separate heavy-duty, fan-cooled, power supply Type PS-50 is available, having a regulated output of 20A at 13·8V d.c., and capable of running the TS-440S at continuous full-power key-down for up to an hour. The PS-50 measures approximately 173 × 107 × 329mm overall, and weighs some 7·2kg.

On Test

On-air tests of the TS-440S produced a very favourable impression. The receiver in particular is a joy to use, with clever use of spare microprocessor power to give automatic bandwidth selection according to mode. The review rig was fitted with the optional 500Hz c.w. filter, which is rather too narrow for casual browsing through the lower end of each h.f. band, looking for interesting signals. In such circumstances, the manual override feature is very useful to open the door a little wider until the choice DX is located!

Receiver selectivity was adequate in all modes, though not up to the standard of its bigger (and far more expensive) brother, the TS-940S, which we reviewed in November 1985. The audio notch filter is very good at getting rid of heterodynes and interfering c.w. signals, being sharp enough to be effective, yet not so sharp that the notch is hard to locate. The flexible memory system has far more channels than ordinary mortals are likely to need, and is very easy to learn to drive.

The main keypad doubles as a mode selector (with indicator lights built in) and a direct frequency input. It suffers from the same shortcoming as several of these dual-purpose keypads—it is very difficult to see figures that are engraved in black on the shiny background of a brushed aluminium button.

Reports on the transmitted signal were complimentary, and the speech processor was generally considered to give a worthwhile improvement in "punch" during s.s.b. contacts. The c.w. break-in facility is very effective. Living away from main roads and their ignition QRN problems, it was not possible to judge the effectiveness of the noise blanker circuit.

The other option fitted to the review transceiver was the voice synthesiser unit which can announce the tuned frequency selected. Though no doubt very useful to a visually handicapped operator, the pseudo-oriental female voice produced irritated me intensely, and it is not a feature that I would ever use.

In the test lab, the receiver gave a good account of itself, with very little of the tuning "glitch" problem which besets some synthesised h.f. receivers as you tune up and down the dial on c.w., due to the settling time of the v.c.o.s.

On the transmitter side, the signal purity is good, with most harmonic and non-harmonic output below −50dBc (dB below carrier), in other words less than 1mW. Harmonic output is predominantly 2nd, 3rd and 5th. The 4th harmonic is always well suppressed, while higher harmonics rarely

★ MAKER'S SPECIFICATIONS

TRANSMITTER

Frequency coverage:	1·8–2·0MHz (160m) 3·5–4·0MHz (80m) 7·0–7·3MHz (40m) 10·1–10·15MHz (30m) 14·0–14·35MHz (20m) 18·068–18·168MHz (17m) 21·0–21·45MHz (15m) 24·89–24·99MHz (12m) 28·0–29·7MHz (10m)
Power input:	c.w., s.s.b., f.s.k., f.m. 200W p.e.p. a.m. 110W p.e.p.
Antenna impedance:	50Ω (20–150Ω with AT unit)
Carrier suppression:	More than 40dB
Unwanted sideband:	Better than −50dB
3rd Order i.m.d.:	Better than −26dB below one of two tones
Spurious radiation (c.w.):	Less than −40dB
Max. deviation (f.m.):	±5kHz
Frequency response (−6dB):	400–2600Hz
Microphone impedance:	500Ω–50kΩ

GENERAL

Power requirements:	12–16V d.c. (13·8V nominal) negative ground, 1·9A receive (no signal), 20A transmit
Operating temperature:	−10 to +50°C
Dimensions:	W279 × H108 × D335mm overall
Weight:	6·3kg without AT unit, 7·3kg with AT unit

RECEIVER

Frequency coverage:	100kHz–30MHz
RIT/XIT range:	More than ±1kHz
Intermediate frequencies:	45·05MHz; 8·83MHz; 455kHz
Antenna impedance:	50Ω unbalanced
Image & i.f. rejection:	Better than 50dB (below 1·6MHz) Better than 70dB (above 1·6MHz)
Selectivity:	
c.w., s.s.b., f.s.k.	2·2/4·4kHz (−6/60dB)
a.m.	6/18kHz (−6/50dB)
f.m.	12/25kHz (−6/50dB)
I.F. SHIFT range:	More than ±0·9kHz
Notch filter:	More than 20dB (at 1·5kHz)
Audio output:	1·5W into 8Ω with 10% t.h.d.
Audio load impedance:	4–16Ω

Sensitivity (min): Input for 10dB S/N:

Mode	<150kHz	150/500kHz	0·5/1·6MHz	>1·6MHz
c.w., s.s.b., f.s.k.	2·5μV	1μV	4μV	0·25μV
a.m.	25μV	13μV	40μV	2·5μV
f.m. (12dB SINAD)	—	—	—	0·7μV

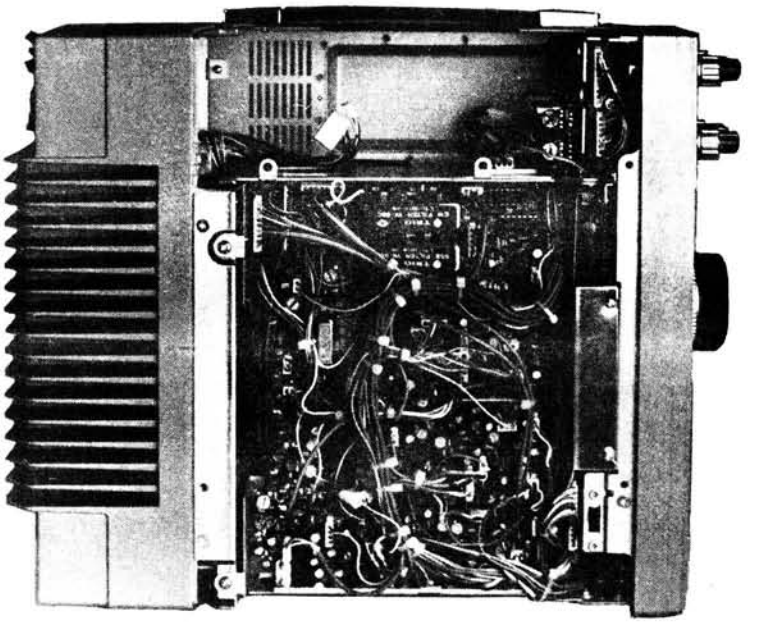
Squelch sensitivity (min):

Mode	<150kHz	150/500kHz	0·5/1·6MHz	>1·6MHz
c.w., s.s.b., f.s.k., a.m.	20μV	10μV	20μV	2μV
f.m.	—	—	—	0·32μV

rise above −70dBc, and are normally below −80dBc. Two-tone tests show adequate headroom in the p.a. stage. For a 12V rig, a typical figure for 3rd order i.m.d. is −30dBc. The higher order products fall off surprisingly quickly, which should mean a good clean signal with little "splatter". Frequency response on s.s.b. is well controlled, though possibly slightly "toppy", with a gentle roll-off below 500Hz. The a.m. response does extend rather too much at the h.f. end. Power output readings are a good indication of output, but rather low at low powers. The rig produces 100W even if the meter does not quite get there!

The Trio TS-440S in its basic form is priced at £998·00 including VAT. Our thanks go to **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE, telephone 0629 2817**, for the loan of the review sample.

PW



★ OUR LAB TESTS

TRANSMITTER

Outputs in c.w./f.m. modes

Freq. (MHz)	Max. Output (W)	Spurious outputs at 100W (dBc)			
		Harmonics			Other
		2nd	3rd	5th	
1·9	100	−54	−61	−72	−68 @ ± 1·2MHz
3·6	104	−53	−64	−67	−56 @ ± 1·8MHz
7·0	104	−58	−53	−72	−65 @ ± 4·0MHz
10·1	102	−54	−49	—	−55 @ ± 5·5MHz
14·2	106	−66	−71	—	−50 @ ± 2·5MHz
18·1	105	−47	−62	—	−54 @ ± 9 and 9·5MHz
21·2	106	−63	−64	−79	−59 @ ± 2·8MHz
24·9	103	−62	−70	—	−47 @ ± 4·8MHz
28·0	102	−67	−71	—	−56 @ ± 11·5MHz
29·7	98	−69	−72	—	−62 @ ± 15MHz

2-Tone intermodulation products:

(100W p.e.p. at 14·2MHz u.s.b. using 700 and 1200Hz tones)

Wanted signals	0dBc
3rd Order products	−32dBc/−30dBc
5th Order products	−42dBc/−48dBc
7th Order products	−46dBc/−50dBc
9th Order products	−52dBc

Frequency response: (to −6dB points)

s.s.b.	440Hz – 2·5kHz Carrier suppression 59dB Unwanted sideband suppression 67dB (both at 1kHz modulation)
a.m.	200Hz – 6·0kHz
f.m.	135Hz – 3·3kHz (with 750μs de-emphasis) Max. deviation 4·7kHz at 280Hz modulation

Power meter accuracy: (at 14·2MHz)

Indicated (W)	Measured (W)
5	8·5
10	13
50	55
95 (Max. reading)	106

RECEIVER

Sensitivity (input e.m.f. in μV for 10dB s/n)

Freq. (MHz)	c.w.	s.s.b.	Freq. (MHz)	a.m. (30% mod.)
1·9	0·11	0·24	1·25	13·2
3·6	0·11	0·22	4·95	3·5
7·0	0·31	0·36	6·10	2·1
10·1	0·12	0·22	7·25	2·9
14·2	0·13	0·24	9·60	1·7
18·1	0·11	0·22	11·70	1·8
21·2	0·12	0·23	13·60	1·8
24·0	0·17	0·32	15·30	1·8
28·0	0·14	0·26	17·70	1·8
29·7	0·15	0·29	21·60	2·0
			25·60	2·5

Freq. (MHz)	f.m. (3kHz dev.)
28·0	0·4
29·7	0·5

(for 12dB SINAD)

Selectivity:

c.w.	0·48/1·35kHz (−6/60dB)
s.s.b.	2·2/4·3kHz (−6/60dB)
a.m.	7·6/20·6kHz (−6/50dB)
f.m.	13·5/20·4kHz (−6/50dB)

S-Meter calibration: (at 14·2MHz)

Reading	Input e.m.f. required	
	μV	dBμV
S1	3·9	12
S3	10·7	21
S5	23	28
S7	56	35
S9	120	42
S9 + 20	730	57
S9 + 40	6·1mV	76
S9 + 60	62mV	96

Audio output:
1·6W into 8Ω for 10% t.h.d.

Frequency response:
(a.m.) 160Hz – 4·4kHz (−6dB)

Image rejection:
Better than 80dB

I.F. rejection:
1st i.f. (45·05MHz) 77dB
2nd i.f. (8·83MHz) 86dB

Notch filter rejection:
25dB at 1·5kHz

RIT range:
± 1·3kHz

Squelch threshold: (e.m.f.)

s.s.b.	2·1 – 36μV
a.m.	1·2 – 35μV
f.m.	0·15 – 0·6μV

AGC:
1dB gain reduction threshold 2μV (s.s.b.)

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934 MHz PERSONAL RADIO

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Trio

			P&P
TS440S	NEW Amateur band transceiver General coverage RX	998.00	(—)
PS50	Heavy Duty PSU for TS440S	198.00	(5.00)
AT440	Auto ATU for TS440S	135.48	(3.00)
TS940S	9 Band TX General Cov RX	1895.00	(—)
AT940	Auto ATU for TS940S	229.08	(3.00)
S930S	9 Band TX General Cov RX	1595.00	(—)
TS830S	160-10m Transceiver 9 Bands	981.59	(—)
AT230	All Band ATU/Power Meter	185.98	(2.00)
SP230	External Speaker Unit	56.03	(1.50)
TS530SP	160m-10m Transceiver	849.82	(—)
TS430S	160m-10m Transceiver	867.68	(—)
PS430	Matching Power Supply	151.48	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	14.78	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
LF30A	HF Low Pass Filter 1kW	30.18	(1.00)
YK88A	6KHz AM filter for TS430S/440S	46.18	(1.00)
YK88C	500Hz CW filter for TS430/440/830/530	43.10	(1.00)
YK88CN	270Hz CW filter for TS430/440/830/530	51.11	(1.00)
YK88S	2.4KHz SSB filter for TS440S	44.34	(1.00)
YK88SN	1.8KHz SSB filter for TS430/440/830/530	43.71	(1.00)
MC50	Dual Impedance Desk Microphone	43.10	(1.50)
MC35S	Fist Microphone 50K ohm IMP	20.33	(1.00)
MC85	Deluxe Desk Mic with Audio Compensator	95.45	(2.50)
MC42S	Up-Down Hand Mic 8-Pin 500 Ohm	19.70	(1.50)
MC40S	Up-Down Hand Mic 6-Pin 500 Ohm	19.07	(1.50)
MC60A	Desk Mic with built-in Pre-amp	77.60	(2.50)
MC55	Mobile Microphone with control box (up/down etc.) 6 or 8 pin	49.27	(2.00)
TM201A	2M 25W mobile	322.68	(—)
TH21E	2m Mini Handhelds	199.00	(—)
TH41E	70cm Mini Handhelds	240.79	(—)
HMC1	Headset with vox for TH21E/41E/2600/3600	30.80	(2.00)
SC8	case for TH21E/41E	11.09	(1.00)
DC21	DC/DC converter for TH21E/41E	23.40	(1.50)
PB21	Nicad pack for TH21E/41E	22.79	(1.50)
PB21H	High capacity nicad pack for TH21E/41E	30.18	(1.50)
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TS811E	70cm Base Stations	998.00	(—)
TR3600	70cm Handheld	353.48	(—)
ST2	Base Stand	72.05	(1.50)
SMC30	Speaker Mike	26.47	(1.00)
MS1	Mobile Stand	41.88	(1.00)
R2000	Synthesised 200kHz-30MHz Receiver	565.32	(—)
HS5	Deluxe Headphones	32.02	(1.00)
SP40	Mobile External Speaker	19.70	(1.00)
TL922	160/10M 2kW Linear	1350.00	(7.00)
NEW			
R5000	Receiver 100kHz-30MHz plus 108-174MHz with optional VC20 VHF converter	P.O.A.	
TR751E	**2M Multimode with DCL (mobile)**	**580.70**	**(3.00)**
MU1	DCL option for TR751E	28.95	(1.00)

Linear Amps

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MML144/50-S	inc preamp, switchable	106.95	(2.00)
MML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	159.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML144/200S	inc preamp (3/10/25w i/p)	334.65	(2.50)
MML432/30L	inc preamp (1/3w i/p)	169.05	(2.00)
MML432/50	inc preamp (10w i/p)	149.50	(2.00)
MML432/100	linear (10w i/p)	334.65	(2.50)
MMT144/28	2M linear transverter 10W output	129.95	(3.50)
MMT144/28R	2M linear transverter 25W output	236.90	(3.50)
MMT432/28S	70cms linear transverter 10W output	195.50	(3.50)
MMT1296/144G	23cms linear transverter 2W output	258.75	(6.00)
MMC144/28	2M converter	35.65	(2.00)
MMG144V	2M RF switched GASFET preamp	37.90	(2.00)

B.N.O.S.

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

Yaesu

FT757GX	HF Transceiver	969.00	(—)
FC757	Auto A.T.U.	349.00	(2.00)
FP757HD	Heavy Duty PSU	239.00	(2.00)
FP757GX	Switched Mode PSU	199.00	(2.00)
MMB11	Mobile Bracket	37.50	(1.00)
NC11	Charger	10.50	(1.00)
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NC9C	Charger	10.35	(1.00)
PA3	Car Adaptor/Charger	20.50	(1.00)

Royal Blue

Photo Acoustics have pleasure in presenting the ROYAL BLUE — a Short Wave Listeners folded dipole antenna that covers 2-30MHz. Its neat and compact design (just 6' tall) makes it ideal for unobtrusive outdoor or indoor use. It will work quite happily on your roof or stood in the corner of your shack. It is a truly versatile antenna that will pull in the DX and which works exceptionally well with modern receivers such as the Yaesu FRG8800, Icom R71, Trio R2000 and so on.

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Yaesu (cont.)

			P&P
YM24A	Speaker Mike FT208/708	27.00	(1.00)
FT726R	2m Base Station	999.00	(—)
430/726	70cm Module for above	349.00	(2.50)
SAT726	Duplex unit for FT726R	130.00	(3.00)
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SB2	PTT Switch Box 290/790	18.00	(1.00)
SB10	PTT Switch Box 270/2700	21.00	(1.00)
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Icom

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PS15	P.S. Unit	158.00	(4.00)
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CP1	Car Charging Lead	6.90	(1.00)
DC1	12v Adaptor	17.25	(1.00)
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IC3200	2M/70cm Mobile Transceiver	556.00	(—)
SPECIAL OFFER			
IC505	50MHz multimode 10W ONLY	349.00	(3.00)
NEW			
IC48E	10W 70cms FM mobile	449.00	(3.00)
IC28E	25W FM mobile (Tiny)	359.00	(3.00)
IC28H	45W FM mobile (Tiny)	399.00	(3.00)
IC-Micro	2 mini hand portable LCD display 1W	269.00	(2.00)

Power Supplies

DRAE			BNOS		
4 amp	40.50	(2.00)	6 amp	69.00	(2.50)
6 amp	63.00	(2.50)	12 amp	115.00	(3.00)
12 amp	86.50	(3.00)	25 amp	169.00	(4.00)
24 amp	125.00	(4.00)	40 amp	345.00	(4.00)

Aerial Rotators

DAIWA MR750E	Heavy Duty rotator. Can have up to 4 motors	254.10	(4.00)
KR400	Med/H Duty	139.00	(3.50)
KR500	6 core Elevation	149.95	(3.50)
KR400RC	5 core Medium Duty	169.00	(3.50)
KR600RC	6 core Heavy Duty	219.00	(3.50)
KC038	lower mast clamps	17.45	(2.00)
KS065	Rotary Bearing	26.00	(2.50)
AR1002	Lightweight VHF Rotator	52.95	(3.50)

CW/RTTY/Equipment

			P&P
BENCHER			
BY1	Squeeze Key, Black base	67.42	(2.00)
BY2	Squeeze Key, Chrome base	76.97	(2.00)
HI-MOUND MORSE KEYS			
HK708	Straight Key	21.50	(2.50)
HK702	Deluxe version of above on Marble Base	42.50	(3.00)
HK706	Straight key	23.00	(2.50)
HK707	Straight key	22.25	(2.50)
MK704	Squeeze paddle	20.00	(2.50)
MK705	Squeeze paddle on Marble Base	32.20	(3.00)
NEW			
RTTY-EQUIPMENT			
PK-232	Packet, Amtor, RTTY, CW, ASCII transceive in one unit. Works with any computer equipped with an RS232 interface. 12V operated	269.95	(3.50)
FAX-1	NEW HF Fax receiver. Obtain weather maps, press photographs and satellite cloud cover detail on any Epson FX-80 compatible printer. 12V operated	269.95	(3.50)
AMT-2	Terminal Unit RTTY/AMTOR/ASCII/CW	245.00	(3.00)
AMT-2/CBM64	Software for the above for the Commodore 64	51.75	(2.50)
AMT-2/VIC20	Software for the above for the Commodore VIC 20	51.75	(2.50)
AMT-2/BBC B	Software for the above for the BBC B	44.85	(2.50)
Soon to be available software for the Amstrad 644 series.			
KEYERS & ACCESSORIES			
Star Master Key	Electronic Keyer	54.70	(3.00)
NEW Star	Masterkey electronics CMOS memory keyer	95.00	(3.00)
TRX3	Morse Oscillator	13.65	(1.50)
Datong	D70 Morse Tutor	56.50	(2.50)

Switches

Sigma	2 way SO239	17.50	(1.00)
Sigma	2 way 'n' Skts	22.95	(1.00)
Welz CH20A	2 way SO239	30.75	(1.00)
Welz CH20N	2 way 'n' Skts	54.00	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)

Aerials

TONNA			
Tonna	5 element 50MHz	41.70	(5.00)
Tonna	9 element fixed 'N' socket 144MHz	30.90	(5.00)
Tonna	2×9 element 'N' socket 144MHz	57.85	(5.00)
Tonna	9 element portable 144MHz	33.15	(5.00)
Tonna	13 element portable 144MHz	46.00	(5.00)
Tonna	17 element 'N' socket 144MHz	61.55	(5.00)
Tonna	9 element 435MHz 'N' socket	28.65	(5.00)
Tonna	19 element 435MHz 'N' socket	34.35	(5.00)
Tonna	2×19 element 435MHz	39.70	(5.00)
Tonna	21 element 432MHz 'N' socket	44.60	(5.00)
Tonna	21 element 438MHz ATV	44.60	(5.00)
Tonna	23 element 1250MHz	30.25	(3.00)
Tonna	23 element 1296/1269MHz	30.25	(3.00)
Tonna	55 element 19 1296/1269MHz	46.20	(5.00)
12 ele ZL	special for 2 metres	25.00	(3.00)
G5RV	Full size 102'	16.75	(2.00)
G5RV	Half size 51'	14.25	(2.00)
HB9CV	2 metres	3.95	(3.00)
HB9CV	70cms	3.95	(2.00)
2 metre	Slim Jim	8.95	(2.50)
1–1 & 4–1	Baluns	12.95	(2.00)
3.7 and 7.1MHz	Traps (pair)	9.50	(2.00)
Dipole	Centrepieces	2.25	(0.50)
Copper wire	50M rolls hard drawn	7.95	(2.00)
2NE	2M 5/8 wave 4.5dB gain	24.50	(3.00)
2E	2M 5/8 wave	14.75	(3.00)
320E	2M 1/4 wave	3.50	(1.50)
430E	70cms 3×5/8 wave 6.3dB gain	27.75	(3.00)
Oscar 720	2M/70cms mobile	24.75	(3.00)
70N2DX	High Gain 2M/70cms mobile	37.75	(3.00)
Gutter Mounts		6.50	(2.00)
4M Leads		6.50	(2.00)
Limpey Mag Mounts		20.50	(3.00)
G-WHIP	Tribander helical mobile HF antenna 10/15/20 metres	34.95	(3.00)
	Coils for above for 40/80/160M	8.40	(1.50)
	Telescopic whip for above coils	5.60	(1.50)
	Basemount single hole fixing with 5M of coax	8.25	(2.00)
	Flexiwhip 10M antenna mobile	25.25	(3.00)
	Coils for above for 15/20/40/80/160M	8.40	(1.50)
	Multiselect 86 10/15/20M mobile auto selecting antenna	38.00	(3.00)
	Coils for above for 40/80/160M	8.40	(1.50)
	Telescopic whip for above coils	5.60	(1.50)
	Extendarod for fixed use with above aerials, improves LF band performance	14.55	(2.00)
	PL259 base loaded single band mobile aerials for 10/15/20/40	17.75	(2.00)
	PL259 base loaded single band mobile aerials for 80/160M	19.25	(2.00)
	(Above PL259 aerials will fit on normal SO239 mag mounts or SO239 gutter mounts.)		
BOOKS	Confidential Frequency List (NEW Edition)	5.95	(0.75)
	Air Traffic Radio	2.00	(0.75)
	VHF/UHF airband frequency list	3.95	(0.75)
	The Complete guide to VHF/UHF frequencies 25-2000MHz (NEW)	4.95	(0.75)
	The International VHF FM guide	2.00	(0.75)
	SCANNERS	7.95	(0.75)
	Towards the RAE	4.25	(0.75)
	Logbooks	3.50	(0.75)
SPECIAL OFFER			
Alinco ALM203E	2 metre handheld with 30W amplifier ONLY	269.95	(3.00)
Alinco ALR206E	25W FM mobile transceiver	249.95	(3.00)
Tonna	21 ele ATV old style (few only left)	27.90	(5.00)

NORTH LONDON AGENT: JIM SMITH G3HJF, 64 Galley Lane, Arkley, Barnet, Herts. EN5 4AL. For a demonstration of selected equipment, please **Tel: 01-449 7135** 10am-7pm Monday-Saturday. Only 2 miles from M25.

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ON THE AIR

AMATEUR BANDS

Reports to: John Fell G0APJ, 14 Rectory Avenue, Corfe Mullen, Wimborne, Dorset BH21 3EZ.

by John Fell G0APJ

One of the odd things about solar cycles is that you never know when they have started, or finished, until some months after the event. The good news is the confirmation that the minima was passed during June/September '86. From now on, seasonal variations aside, conditions on the upper h.f. bands will progressively improve with increase of the maximum usable frequency (m.u.f.). It will be some $5\frac{1}{2}$ years before the maxima of solar cycle 22 and I guess we all hope it will be a good one, with vast DX available due to propagation via the elevated F2 layer. In previous maxima periods the m.u.f. has exceeded 70MHz with direct and "backscattered" signals heard.

I recently mentioned the Six Metre Group Newsletter *Six News* and the article in the latest issue from Olaf Karlsson SM6PU, details many interesting aspects of propagation during this last solar cycle. Auroral propagation accounts for much of Olaf's observations which were made on bands up to 500MHz, but concentrated most on Band I TV at 49·75MHz. The most favoured months for this DX propagation phenomena are December/January with durations of anything from several minutes to several days. If you have not experienced this type of propagation, which occurs with far greater frequency and duration at the more northerly (and southerly) latitudes, listen out for c.w. (beacons, etc.) with a note that sounds uncharacteristically rough or raspy. The higher the frequency, the rougher will be the note which owes its characteristics to the continuously varying path between the originating station and your own. Auroras tend to peak at between 1700–2000UTC, but with some of the stronger events 1500–1700 is best. SM6PU believes that in general, high geomagnetic field levels increase the probability of aurora and, contrary to some opinions, years of quiet solar activity can produce an increase in auroral occurrence.

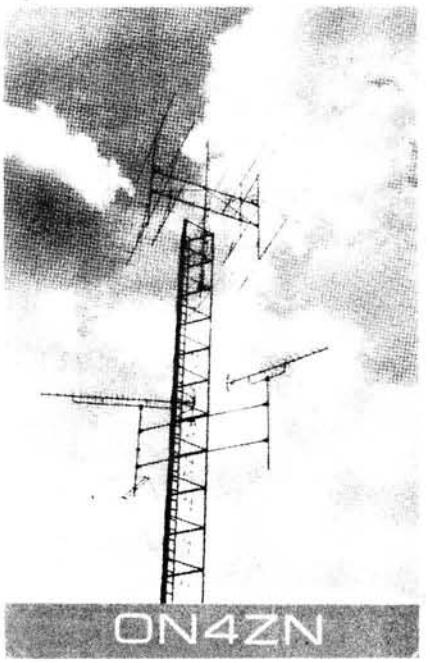
February 1986 produced a very sizeable aurora, (possibly the strongest of cycle 21), which affected bands as high as 430MHz here in the UK together with an associated effect known as auroral-E. This occurs as the main aurora declines and may be several hours after the event. The difference in propagation is quite noticeable because multipath flutter distortion is absent. T9 (pure) c.w. and normal sounding s.s.b. signals from K1TOL in Maine were heard in Sweden by this mode as was the Anglesey 50MHz beacon GB3SIX on 50·020MHz—possibly the first recorded time that amateur band auroral-E signals have spanned the Atlantic. Equally fascinating is a connection between auroral activity and meteor trails. SM6PU has observed that on some occasions a meteor "ping", or brief burst of high level signal reflected from the short lived ionised patch caused by a meteor trail at an altitude of 90–140km, has acted as a "trigger" for an auroral event. At other times the reverse has occurred and the auroral propagation is cut off by meteor action. Has anyone else observed this effect?

In his conclusions about auroral-E, Olaf mentions monitoring signals from 35 and 43MHz paging stations in the USA which operate around the clock and are identifiable by c.w. ident when clear of traffic. On many occasions when aurora is present, signals from these stations has been detected and it has been impossible to find a peak beam heading, signals appear to be coming "out of the sky". However, the signals at such times are originated from within very well defined geographical areas at the DX end of the circuit which suggests the possible existence of a low-loss waveguide/duct mode of propagation within the ionosphere, possibly along the F2 layer base.

A similar mode of propagation to aurora, known as transequatorial propagation (t.e.p.) has been used by amateur stations located at 10–15 degrees north and south of the equator. Contacts can be made if both ends of the link are equally placed about the magnetic equator on a path that cuts the equator at right angles. Stations around the Mediterranean have worked Southern Africa on 144 and 432MHz. Lower frequencies can allow propagation via t.e.p. between stations at greater distances from the equator. The peak t.e.p. will occur around solar cycle maxima so it will be very interesting to find out if the 50MHz band will produce the first contacts between northern European stations and very southern points in Africa. With the recent news that Norway is to allow more amateur activity on 50MHz and hopefully UK Class B, this part of the amateur bands is certainly a growth area.

Leaving aside all this potential DX, a letter from the secretary of the Derby and District ARS informs us that 15 March is the day chosen for their annual v.h.f. contest. Open to licensed amateurs and s.w.l.s alike the aim is to exchange callsigns (RST), serial number (starting at 001) and the administrative county (Region for GM ops). Final score is calculated by adding total number of contacts at 2

QSL card received for a contact on 50MHz during the aurora of 7 February 1986



ON4ZN worked during VHF NFD in July—not all ON stations are QRT or QRP on 430MHz

points each and multiplying by the number of counties heard. Countries outside UK count as extra counties and if you manage to work G3ERD, the DDARS club call, that is worth 10 points in its own right. Contacts on recognised calling frequencies or via repeaters are not allowed. Winners and runners up of the three sections, full legal, 25W max output and s.w.l. will receive certificates. Further details and/or your log entries go to: DDARS, 119 Green Lane, Derby DE1 1RZ, to arrive by 1 April. Even if contests are not your scene (I suppose there could be some?) this and similar events are a good way of increasing your chances of working some good DX on 144MHz. Good luck and I will be interested to hear of your results.

To the Bands

Not much reported activity at the upper and lower ends of the amateur spectrum but the first s.w.l. report from **Graham Johnson**, Nuneaton, mentions hearing G4TYM on 3·5MHz during October via a Panasonic DR-49 receiver fed by its telescopic whip.

Down in Stevenage, **Angie Sitton BRS 88639** continues to monitor most h.f. bands. Using the B.28 receiver, Angie logged 5N26BAV on 1·8MHz in the day, using s.s.b. from Nigeria. She also heard HZ4NA Saudi Arabia and ZL3GQ at 0646 on October 25. Angie asks about equipment and wonders if it is possible to convert 27MHz multimode gear for 28MHz. This is possible and I would recommend contacting a specialist such as Spectrum Communications of Dorchester. The 28MHz rig thus obtained could readily form the driver for a transverter, allowing access to the 50, 70, 144, 430 or even 1296MHz amateur bands.

On 3·5MHz the Stevenage and District ARS were active with the special event

callsign GB4SNT to celebrate 30 years of club activity and 40 years since the creation of the first New Town.

The 7MHz band once again features prominently in your reports with **Robert Watters**, St Austell, logging T77T at 2127 on November 1 together with VU2XX on the 3rd, both with an FRG-7700 plus a.t.u. and 20m inverted "L" longwire antenna. **Brian Fields G4XDJ**, a regular QRP fan, lists 14 stations on 7MHz, all c.w. Brian notes finding many DX stations but admits finding it sometimes hard in pile ups. However, with improving conditions he is being heard in the US with his 1W *PW* Severn and looks forward to the improvement as we climb towards sunspot peak. A 559 exchange with IT9UCS at Catania on 19 October preceded 2-way QRP contacts with GW0FJV and G3XUO on the 23rd. Called, but not worked was ZL4IN on October 30. Other "got-aways" were CP1XC and PY2ESU on November 2, but EA3GR in Barcelona and EA3JJ Lerida, were successful.

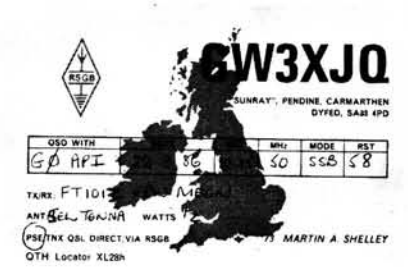
Angie Sitton noted W3YW at 0200 on October 25 with activity coming in from 1, 2, 4 and 8 US call areas. DS7SU in Korea was working OY6FRA at 1859 on 25 October with HK1LDG Columbia and YV2M Venezuela at 0001 on October 2. In answer to your question Angie, I served an 8-year "apprenticeship" as G8MCP before convincing myself that c.w. was well worth the effort! The "switchmode" style of communication is a great asset for weak signal working, but don't neglect v.h.f. and above where much amateur experimentation/DX working continues to thrive. As the Chairman of a local radio society, I know that a large proportion of newcomers to amateur radio hold or have held CB licences. Often this has only awakened or re-awakened a basic interest in radio communication. Providing that operating standards comply with recognised amateur band practice I welcome all but would always recommend an initial introductory period of listening only—what do you say?

On to 14MHz where Graham Johnson finds the bulk of s.w.l. log. After 3 years he heard his first two Swiss stations in the form of HB9AVT and "DX club" HB9BA. Graham queries V3AS and V3PT which I believe would be Belize.

Robert Watters noted A82EN on November 15 with the following day providing JA2BIV and JA6RCH around 0800. November 3 brought V44KAR whilst VK7AZ and VS6DO were logged on the 16th. A group of ZLs including ZL1BMV, ZL2AMP and ZL3ASP were heard around 0800 on November 16. A hastily written log appendix shows that things were still happening on the 17th with JA1JX, JJ1TZK, JH1XYR, KL7CUN and VK2CLB all on s.s.b. between 0713 and 0856.

Angie Sitton notes activity from Botswana on October 25 as well as KH6CD on Hawaii, VK4BJD and V3NAP Belize. FM7VSQ Martinique and VB2MW Brunei (QSL via N3BHF) were heard on the 26th.

The CQWW 'phone contest is always guaranteed to produce some exotic DX activity and the 1986 event held over the weekend of 25/26 October was no exception. Angie logged masses of stations on both 21 and 28MHz. On 21MHz HL6AA was a 54 signal at 1400 on October 25 with the Sunday opening at 0844 with JA6XMM at 59 in contact with G3RTE. JY72 in Jordan was also 59 with PZ1DV Suriname, PJ1B Netherlands Antilles (QSL via N2MM), JG1FUZ/P/5N26 Nigeria and



A barefoot *PW* Meon transverter can work DX! Over 200 kilometres on ½W at 50MHz

JW5E at Svalbard at 57.

On 28MHz the October 25 had N4EJV working an LZ as was 3WH3U, Vietnam —both 55. Next day JA3HEJ, T54ZL Somalia and J3MJ on Grenada, plus many Europeans and weak US stations. **Phil Dykes G4XYX** in Poole notes 28MHz being "wide open" for DX during most of October with many locals heard working into VK, JA and YC. The band opened almost every day to Africa, Middle East and South America and is probably the best October for DX since 1983.

Using 10W p.e.p. and 2-element quad, Phil was very pleased with the QSO made with UL7AC!, KA2AKH on the 18th at 1035 and UB5VIE Ukraine at 1010 on the 30th. Others worked during the month include CE2GQB, EA8ACH, LU6EJP, PY4OY, SV1NA, TA2BK, YEOX Indonesia and 9H1GY. I must agree Phil, not bad for a "dead" band.

As I conclude this report with the barometric pressure hovering at 1030mb and according to the TV weather report, covering most of northern Europe and Scandinavia things are looking good for v.h.f. and above tropo. My XYL has just complained about QRM on the domestic TV, but the rolling picture and interlaced frame can't be coming from this shack—yet, hi!

May I wish you all very best season's greetings and a happy, healthy 1987—may it bring you plenty of DX, send me the details.

Reports must arrive by January 24 please

RTTY

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


by Ron Ham BRS15744

Trevor Tugwell G6TJT, in Christchurch, tells me that the Winchester Packet Radio repeater GB3HP, using the standard AX.25 protocol, was operational on 144·650MHz from midday on November 22. This repeater was built by members of the Amateur Radio and Computer Club and consists of a standard 25W f.m., p.m.r. rig with a PK-80 TNC, feeding an Isopole antenna. "The AMRAC project leader, Lloyd Arrow G1JAR, is interested to receive reports from licensed amateurs and s.w.l.s, so that we can get a better idea of its performance and coverage area," wrote Trevor, the AMRAC secretary. The repeater's ident will be transmitted every 12 minutes in Morse code and packet. Reports should be sent with as much detail as possible to G1JAR, QTHR.

Despite frequent poor conditions on the 14MHz band between October 20 and November 24, **Len Fennelow G4ODH**, Wisbech, and I copied RTTY signals from the 45 countries listed in Fig. 2. This includes two new ones, Bermuda VP9 and Gibraltar ZB2 for Len and one, Egypt SU, for me.

"AMTOR traffic has been noticeably absent throughout this period and I wonder if they have all taken up packet, as this mode of data is becoming increasingly popular on h.f.?" asked Len. He pointed out, for the benefit of newcomers, that the weird "screeching" noises around 14·102MHz are packet transmissions. However, reference to Fig. 1 shows that Len copied AMTOR signals from two countries on 3·5 and 7MHz, 12 on 14MHz ranging from North America through Scandinavia to Sudan and South Africa and three on 21MHz.

One object of a contest is to increase the number of operators on the bands for a given period, which in turn provides all competitors with the chance of working and/or hearing rarer stations. I found a good example of this during the contest on November 8 when, between 1934 and 2000, I copied RTTY signals from seven countries—EA, G, GM, HG, OE, OH and UZ on 3·5MHz.

My advice to readers, who are first time users of a RTTY program with their home computer, is to first gain experience by carefully tuning around 14·090MHz where a variety of interesting signals are usually found. Then take a look at 3·590 and 7·090MHz for local and medium distance traffic. When open, 21·090 and 28·090MHz can produce some real DX.

Do make sure that you understand the instructions supplied with the program, especially about the selection of speeds, normally 45 baud, and the switching between the normal and reverse styles of transmissions.

Country (Prefix)	Frequency (MHz) 3·5	7	14	21
Austria (OE)			X	
Canada (VE)			X	
Canary Is (EA8)			X	
England (G)	X		X	
Germany (DF, DJ, DL)	X	X	X	X
Italy (I, IK, IT)		X	X	
Norway (LA)			X	
Poland (SP)			X	
South Africa (ZS)				X
Spain (EA)			X	
Sudan (ST)			X	
Switzerland (HB)			X	
USA (W)			X	X

Fig. 1: The AMTOR stations received by Len Fennelow

Country (Prefix)	Frequency (MHz)			
	3·5	7	14	21
Austria (OE)	X		X	
Balearic Is (EA6)			X	
Belgium (ON)	X			
Bermuda (VP9)			X	
Brazil (PY)			X	X
Bulgaria (LZ)		X	X	X
Canada (VE)			X	X
Canary Is (EA8)			X	X
Chile (CE)			X	
Costa Rica (TI)			X	
Czechoslovakia (OK)			X	
Denmark (OZ)	X		X	
Dominican Rep (HI)				X
East Germany (Y2)	X	X	X	
Eire (EI)		X		
England (G)	X	X	X	X

Country (Prefix)	Frequency (MHz)			
	3·5	7	14	21
Egypt (SU)			X	
Estonia (UR2)			X	
Finland (OH)	X	X	X	
France (F)	X	X	X	
Germany (DF, DL)	X	X	X	X
Gibraltar (ZB2)			X	
Gozo & Comino (9H4)			X	X
Hungary (HA, HG)	X		X	
Israel (4X)			X	X
Italy (I)		X	X	X
Korea (HL)			X	
Kuwait (9K)			X	X
Luxembourg (LX)	X		X	
Moldavia (UO5)			X	
Monaco (3A)			X	
Netherlands (PA)	X			

Country (Prefix)	Frequency (MHz)			
	3·5	7	14	21
Norway (LA)			X	
Panama (HP)			X	
Poland (SP)	X	X	X	
Portugal (CT)			X	
Rhodes (SV)			X	
Rumania (YO)			X	
Sardinia (IS)			X	
Scotland (GM)	X		X	X
Sicily (IT9)			X	
South Africa (ZS)			X	
Spain (EA)	X	X	X	X
Sweden (SM)	X		X	
Switzerland (HB)		X	X	
Ukraine (UT)			X	
USA (W)			X	X
USSR (UA, UB)	X	X	X	X
Yugoslavia (YU)			X	

Fig. 2

Please make sure all your reports arrive by January 24

It is with regret that I have to report the death of a contributor, Norman Jennings from Rye. Norman was a keen computer and RTTY enthusiast and, before his illness, his reports were always full of detail. We wish to extend our sympathy to his family and many friends.

SPACE & SATELLITES

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

by Pat Gowen G3IOR

Current Satellite News

JAS-1/FO-12: Our latest satellite continues to improve all the time in use, flexibility, stability and signal strength. The deep QSB present while the spacecraft was toppling and tumbling has all but disappeared now that magnetic stabilisation is being effected, leaving a fairly constant signal from horizon to horizon, especially if the correct thread of circular polarisation is employed by the receiving station.

The digital "JD" mode beacon has successfully transmitted the telemetry down as a very strong signal, again with no evident QSB. Your scribe had quite a shock when he first heard it, having been used to the normal S5 to 6 c.w. telemetry beacon. The signal was S9 plus some 6dB over the entire pass, an increase which could not be accounted for from the mere 10dB expected from the difference between the 100mW c.w. beacon and the 1 watt p.s.k. downlink! It was some time later that G3IOR realised that he was listening on r.h.c.p., when of course the "thread" is correct for the Mode "JD" beacon, but many decibels down for the "JA" mode, it being fed from the other end of the phasing matrix at the satellite.

The p.s.k. system was successfully carried out by Mori JK1VXJ and Saya JR1FIG, who arranged the sending of two frames, one carrying the realtime ASCII telemetry, the other being message 0, which will be changed from time to time. Observers should note that initially the real time clock constantly read 86/08/01 00.00:00, but this will be corrected to run true to time as soon as other experiments permit.

The final allocation of days for analogue, digital and re-charge has not been finally decided, and will change according to the eclipse battery charging limitations in any case. It is hoped that three days of "JA" transponder mode, two days of rest with no operation, and two days of "JD" Mode per week, the latter probably Wednesdays and Saturdays, will eventually result. At this time, only some six or seven consecutive orbits of the higher power digital mode can be run before a change of mode or switch off to recharge, as the eclipse is still upon us. As the p.s.k. program is loaded on the first Japanese window of the day, and turned off again before the last window of the same day, this currently means that stations in north eastern USA and north Europe are unable to get the t.l.m. This problem is being addressed, and the incremental westerly drift, i.e. the first pass coming a little earlier each day, will soon overcome this difficulty.

More and more stations are coming onto the satellite and using the analogue system on c.w. and s.s.b., and the general standard of use has now improved dramatically. Most stations are now adjusting their transmitters to overcome the pronounced downward Doppler shift, with the result that "collisions" between adjacent passband users are reducing. Furthermore, the general level of power escalation seems to have reduced, as operators are learning that the a.l.c. limitations mean that QRO gives little more downlink power and less stations to work, whereas an improvement of the antenna, feedline and front end of the receiver effects far better communications for all concerned.

G4DF has calculated the basic requirements for a reasonable signal from the Fuji downlink, given 1000mW of downlink power to a 3dBi gain antenna on the satellite, at 1500km (nearest) range, thus a 148·6dB path loss with a 90K sky temperature. With a 15dBi gain antenna and a 1dB cable loss, going to a 1·7dB noise figure RX, we get a signal to noise ratio of 38·7dB. When the satellite is at the horizon at 4500km, then the path loss becomes 158·8dB, assuming a sky temperature now of 150K, we are still left with a 28·5dB signal to noise ratio, which is ample. Thus, if you are having hearing problems, you know just what to aim for to optimise.

G3RUH has now designed a FO-12 demodulator p.c.b. for the mailbox facility to provide all that you need betwixt the TX/RX and the AX.25 TNC. It comes with full instructions on building and alignment, and features a modem, digital a.f.c. and p.s.u. The cost is £16.50 to the UK and Europe, or £17.50 airmail elsewhere through AMSAT-UK, London E12 5EQ. The details and circuit only are available for a SASE and 30p in stamps or 3 × IRCs.

RS-5 and 7: The limitations of the eclipse schedule of only three orbits per morning for RS-7 and one for RS-5 certainly had its effect upon activity, as evidenced by regular listener **Bill Kelly** of Belfast. He listed activity from DJ5AI, DL1HAE, F9EA, G3IOR, IN4DJZ, IV3LCZ, G1SNF and HG0RF only, contrasting to his usual two pages of listings. RS-5 was heard to be issuing orbital data, but the ROBOT was silent. Poor RS-5 was just coming over the European horizon when it would promptly go off, as soon as a high power station hit the transponder and caused a voltage drop to the depleted battery. The satellites came back into full sunlight charging on December 10, but the bad news is that they will both return to eclipse conditions and limited schedule operation again in early January, with RS-7 coming into part shadow on January 5, and RS-5 on January 10.

Leo Labutin, UA3CR reports that 4K0D will be looking for contacts on the RS birds as from December 10 onwards, from his QTH on North Pole Station 28, which is located on an Arctic floating ice station presently located at 82 degrees North latitude and 167 degrees East longitude.

RS-9 and 10 progress: UA3CR reports that the two new satellites are raring to go, but that RASA are not yet ready to take them aboard the launch vehicle, and at the end of November still no confirmed launch date could be given. The Geneva based International Frequency Registration Board were informed that one or two new Radio satellites would be in orbit by 31 December 1986, but this is now most unlikely,

with January through early February 1987 a much better bet to place them into the 105 minute 1000km circular 83 degree inclination orbit.

The uplink power requirements are given as needing no more than 100W e.i.r.p., e.g. some 100 watts to a crossed dipole, or 10 watts to a 4-element crossed Yagi, with the satellite receiving this with a 2dBi gain half wave dipole with a 80 degree beamwidth to the 3dB points, and a 2000K receiver noise temperature.

For all modes, "A", "K" and "T", the transmitting antenna at the satellite will be a linear omnidirectional with 1dBi gain, giving a maximum spectral density of −41 dBW/Hz on 29·360 – 29·500MHz and −39dBW on 145·857 – 146·000MHz. All of this means that you will have an adequate signal both to the satellites and from them, the receiving station needing a gain of only 1 to 2dB, e.g. a dipole or better crossed dipole, with a noise temperature of from 1000 to 15 000 Kelvin, e.g. at least as good as RS-1 to RS-8 series. Readers are asked to listen out for the possible sudden appearance of the beacons on 29·360, 29·403, 29·407, 29·453,29·457 and 29·500 in the 28MHz band, and on 145·857, 145·903, 145·907, 145·953, 145·957 and 145·997MHz in the 144MHz band from the pair, and to alert G3IOR and the AMSAT nets if heard.

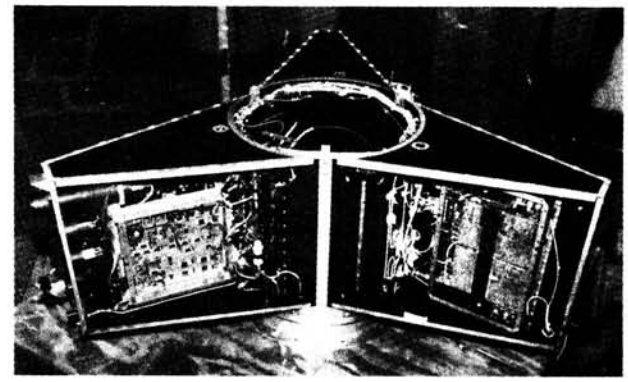
ISKRA-4: As reported last month, ISKRA-4 was having its frequencies changed. It most certainly has, as now the satellite will no longer employ amateur-radio frequencies, instead using aeronautical bands like the first ISKRA-1. Orbiting is not expected until 1987, the exact date as yet unknown.

Phase III-C: From ESA comes news that the earliest date for the new elliptical orbiter will be June next year, with the actual target date set for August. DJ2EV feels that the earliest realistic launch time for the next AMSAT elliptical orbiter will be October 1987 with the first Ariane-IV rocket from FY7. As the date draws nearer, we shall be updating our news to cover the means of operating through this satellite under our series for beginners, as the requirements are a little more demanding than those for the "RS" type Mode "A" circular 1600km spacecraft, and the uplink powers more than for these or FO-12. The downlink is also somewhat more defined, but more of this in the next issue.

The latest photograph (Fig. 1) from AMSAT-DL, and shows the Phase III-C satellite ready for the recent thermal vacuum tests, with the solar cell panels removed. The sensor equipment and electronics are in the left hand housing, and the new modulator and transmitting circuitry in the right. The cavity for the kick motor necessary for final elliptical orbit emplacement will fill the round space seen at the top of the satellite.

Phase IV: From the Annual General Meeting of AMSAT comes news that the project is to have a pair of geostationary transponders at 47 and 145 degrees West (as mentioned in the December 1986 column) is to go ahead if all resources can be found. Groups have been established to cover the requirements of the technology, ways and means, and the applications, and will report back within the year.

Fig. 1: Phase IIIc and its contents under thermal vacuum tests. From AMSAT-DL



Accurate Elements

Avid trackers will notice that we regularly put in the latest Keplerian elements for the main satellites of interest on a bi-monthly basis, in order to maintain good tracking that tends to "drift" incrementally with the small inaccuracies that compound through time. If a precise set were given, and a constant drag factor maintained, there is no reason as to why a set should not give precision for many years.

The elements that we print originate from NORAD, via NASA, thence KA9Q of AMSAT, and are based on the latest individual RADAR findings. It will be discovered that from time to time calculations based on the last set vary marginally from those obtained using the latest. Whilst these variables are not even noticeable by the average amateur, being well within the limitations of his beam, uneven horizon, signal ducting and timepiece, it is of consequence to those who are interested in the fine study of propagational anomalies by observing the sub-horizon angled signal paths.

Satellites in low orbits, such as OSCAR-9 and 11 can change considerably in the drag rate, which increases dramatically with the climb of solar flux due to atmospheric expansion, but, satellites in high orbits like OSCAR-10 suffer very little from atmospheric drag, which can almost be discounted, and are in fact in very stable long term predictable orbits. They suffer more from the vagaries of the individually found regular sightings, and the incremental inaccuracy as the error compounds itself with time.

Jim Miller G3RUH of Cambridge, an avid satellite enthusiast is shown in his shack in Fig. 2. He says, in *Amateur Satellite Report No. 135,* "... all those decimal places create a sense of false security ... self consistent to facilitate tracking for a very short time ... a few days or weeks ..." With this in mind, Jim set to work with his faithful computer to evolve a set of smoothed elements, that can be, and in fact have been, used for a long period without straying. These elements follow for OSCAR-10, just in case life is sustained, and we can use the transponder again.

Epoch Year:	86
Epoch Day:	247·02632
Inclination:	26·7980
RAAN:	61·5180
Eccentricity:	0·6031
Argument of Perigee:	141·1207
Mean Anomaly:	0·00
Mean Motion:	2·05856082
Decay Rate:	0·00
Epoch Rev:	2426
Semi-major Axis:	26104·0

The set is made up from a smoothing of eleven NASA Keplerian sets for OSCAR-10 given between April 1 and September 4, and are holding spot on so far.

Fig. 2: James Miller G3RUH and his satellite operating position. From AMSAT

ARSENE Progress

Ross Forbes WB6GFJ, and **Richard Ley FO5HL**, have together translated some news on the coming AMSAT-F ARSENE satellite, first published in the French language in *Megahertz* magazine. Discussions are being held with Arianspace to obtain the earliest launch opportunity for the satellite, which is aimed for completion (plus a full command station) by the time you read this news. Already the students working on the project have been commended and have been presented with the gold medal first prize by the Federation Aeronautique International for their work.

The satellite has dimensions of 880mm in height and 884mm in diameter, with an addition of the 1079mm high and 1920mm base diameter, 937mm top diameter of the adaptor fitting, giving a total weight of 100kg. It will carry two linear transponders with good dynamic range, each with an associated beacon, on Mode "B" and Mode "F", the latter being a completely new satellite mode.

"B" Mode: Uplink: 435·050–435·150MHz, as four contiguous 25kHz segments.
Downlink: 145·850–145·950MHz.
Beacon: 145·830MHz.

"F" Mode: Uplink: 435·050–435·100MHz, as two contiguous 25kHz segments.
Downlink: 2246·490–2246·540MHz.
Beacon: 2246·470MHz.

The transponders will not operate simultaneously, but will alternate with each period of operation according to plan based on user and power demand. The idea of forming a total passband made up of individual 25kHz segments is to help overcome the continuing problem of those who persist in employing excessive uplink power to the satellites. With individually

controlled adjacent 25kHz wide systems sections, separate a.g.c. control will be applied to different parts of the passband according to where the problem lies, e.g. a plan could be evolved to give a QRO section and a QRP section to the transponder band, or, if an alligator (or alligators) were operating in one of the segments, they would not destroy the communications of those working with more modest powers in another section. By this means, one of the gravest problems of satellite operation would be overcome, giving a far greater chance for stations using the required e.r.p. levels to have good QSOs without their signals being attenuated out by indiscriminate and non-aware users. Multiple access for stations employing bandwidths of up to 5kHz will be encouraged (e.g. c.w., s.s.b., RTTY and SSTV, but not f.m. or wide a.m.).

Already the structural design of the spacecraft has been completed, and it has been subjected to full initial vibration tests. (This is specified for all users of the ESA launch vehicles in the guide *Manual de l'utilsatuer d'Ariane* (MUA for short) translated as "Guide to the use of the Ariane Vehicle" to ensure compatibility and safety of the launcher and its load whilst under the severe stresses, vibrations and accelerations of lift off). Compatibility of the design is such that it will be possible to use the launch facility of both the Ariane-3 or Ariane-4 rockets. The satellite has been successfully mounted onto the 0937 type adaptor cone that was developed for ARSENE by the team working with the APEX Ariane-4, The last news given was that the ARSENE might not be completed and tested in time to fly with the Phase III-c Ariane-4 launch later this year, but it is hoped that the new amateur spacecraft may be in orbit within eighteen months or so.

UoSAT

The main updated bulletins are now being carried on UoSAT-2 OSCAR-11, and the new schedule proposed has been implemented. Software is now available for testing the Digitalker, and should be uploaded to have this mode operating by the time you read this column, giving regularly updated text messages.

A series of exposure tests of the c.c.d. camera are being undertaken by the light of the full moon, and some of the pictures downlinked recently have been rather disappointing due to the stability problems taking the camera off target. Checks will be made on accuracy of the forthcoming "snaps". Look for your pictures from 1500 on Wednesdays until 1500UTC the following day.

The particle wave experiments in conjunction with the Viking spacecraft are now completed, and most of the surveys have shown a steady stream of electron beams entering the auroral ova which will be analysed by the University of Surrey scientists.

Fig. 3: Temporary QSL for DPOSL propagation experiment. From Peter Cardwell and ESA

AMSAT News

The AMSAT elections for the Board of Directors resulted in the incumbants WA2LQQ, W3IWI, and JA1ANG being re-elected. WA2LQQ continues as President, with W0RPK first board alternate, and K8OCL second. Runners up were WA5ZIB, WB0RLY and KE3D.

HAMSAT News

Nico Jansen PA0DLO, who runs HAMSAT with its regularly updated satellite scene news magazine, and the Saturday morning 14·280MHz AMSAT European net, has been honoured by VERON with the "Ham of the Year" award for outstanding services to amateur radio. Nico is a regular contributor of topical space news to all of the AMSAT nets, both national and international, and to the information in our column.

DP0SL

The story of the Spacelab D-61-A Shuttle mission is still not quite over, as many keen listeners who sent reports, findings and tapes of the VERON propagation experiment still await the results of the contest and their QSL cards. The only known acknowledgement to date has been sent to Peter Cardwell of Sheffield, as a fine card showing a view of earth taken from the 36 000km Meteosat, our Fig. 3. On the back, **Bob Caron PE0BCC,** the VERON Space Experiment Project Manager, has written "... A QSL card will come ..."

UA/W Space Co-op

Early 1987 should see the signing of a new space pact between the Soviets and the Americans establishing a new co-operation agreement. The older 1972 agreement brought about the Apollo/Soyuz mission, but the US allowed this earlier agreement to lapse in 1982, and no joint projects linking the advanced technologies of the two countries have come about since then. One of the main hopes among the sixteen programmes envisaged is the projected Mars Mission, although this is likley to be unmanned, and the Phobos flight already planned by the USSR. One of your author's biggest shocks in amateur radio was to hear, just below the 14MHz band edge, some many years ago, a station calling "CQ Mars". An even bigger shock resulted when a reply came back, as yours truly did not then know of the Military Amateur Radio Service. With amateur radio now having a firm foothold in space, it would not be surprising to have a real QSO with Mars in the not so distant future!

AMSAT Media

For those who enjoy the written word on the satellite scene, in addition to *Practical Wireless,* two excellent sources packed with regular satellite information, hint, tips and knowledge are recommended to those who join the AMSAT and/or National AMSAT organisations. Membership of AMSAT itself provides *Amateur Satellite Report* every two weeks, sent by bulk airmail from AMSAT HQ to G3IOR and then posted out to Europe by first class mail. *ASR* comes at $16, inseparable from AMSAT annual membership dues of $24 per annum. Membership forms are available from AMSAT, P.O. Box 27, Wahington DC 20044, USA, or for an s.a.s.e. to G3IOR QTHR.

OSCAR NEWS is the organ of AMSAT-UK, the National Society, who nevertheless has many members outside the UK. It comes quarterly, includes a booklet of predictions for orbital passes of the main OSCAR and RS spacecraft, and a wide range of aids, trackers, p.c.b.s and books are available to members at low cost. Donation costs and details, and a membership form are available from AMSAT-UK, London E12 5EQ, for a s.a.s.e. or s.a.e. plus 2 IRCs.

Please make sure your reports arrive by January 24

VHF BANDS

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

by Ron Ham BRS15744

"Despite our high hopes the sun is still sleeping in the depths of solar minimum," wrote Bob Anderson at his end of August report for *Canopus*, the monthly newsletter of the Transvaal Centre of the Astronomical Society of Southern Africa. My thanks to their secretary, H. Homer, for my regular copy. However, since then sunspot activity has increased and despite overcast skies (which prevented observations on Ocotober 16, 17, 25, 28, 29 and 31), Bob's team in Johannesburg observed 14 sunspots in a single group on the 18th, 22 in two groups on the days 21 and 22, 40 in three groups on the 24th and 16 spots in four groups on the 30th.

"In general the sun is beginning to wake

up again," wrote **Cmdr Henry Hatfield** in Sevenoaks on November 17. That was following frequent studies of the solar disc, and finding filaments near some of the spots, with his spectrohelioscope between October 23 and November 17. "The high latitude spots of the new cycle are really back," remarked Henry. He also located four groups on the 29th and told me that two of them were in latitudes 26°N and 24°S. "It is interesting to note that one half of the sun is quite 'spotty', whilst the other half is still spotless," he said.

In Bristol, **Ted Waring** counted 7, 10 and 2 sunspots respectively on November 2, 4 and 15.

Len Fennelow G4ODH in Wisbech reported that signals from the 50 and 144MHz beacons, GB3NHQ and GB3VHF, were weak and watery on October 22 and November 10, 12 and 14. He received auroral signals from GB3NHQ on October 28 and an h.f. blackout on November 4. There were similar conditions of h.f. blackouts on the 5th, 7th and very bad on the 13th.

"Visual aurorae manifesting in active forms, glows and rays were seen from Caithness, Hebrides, Orkney and north Scotland on the nights of October 23/24, 27/28, 29/30, 30/31 and November 1/2," wrote **Ron Livesey**, Glasgow. He is auroral co-ordinator for the British Astronomical Association. The magnetometer used by Karl Lewis in Saltash was unsettled from October 19 to 21 and 28 to 30 and Ron's instrument showed a small magnetic storm on November 15/16. The observatory at Boulder, Colorado, reported "unsettled and active" conditions from October 20 to 22 and "storm high latitudes" for the period 27 to 28.

The 28MHz Band

Early on October 26, **John Muzyka G4RCG** in Wakefield was warned that 28MHz was open. He worked VK6HD who was operating in the CQ World Wide DX Contest (October 26/27). During the morning, John worked stations in Cyprus, Greece, India, Israel and Turkey. Then, between 1315 and 1330, he chatted to VK6RO.

While working a VK6 on 14MHz later in the week, John learnt that VK6RO had worked 30 countries in $3\frac{1}{2}$ hours.

Following a phone call from John, G0CEW had a QSO with VK5NNT, a station that was working into the UK for about 5 hours.

"Band conditions were good during the CQ WW Contest," wrote **Don Hogdkinson G0EZL**, Hanworth. In addition to working stations in Cyprus, Jordan, Mali, South Africa and Turkey, between October 25 and November 7, Don heard signals from Australia, Botswana, Canada, Costa Rica, India, Indonesia, Iraq, Kuwait, Lebanon, Mauritius, Oman, Peru, Uruguay, USA and Zambia. "Easy to hear, but hard to work," he said.

"CQ WW fell just at the right time, the band was in great shape over that weekend and on the following Monday," said **Dave Lingard G0CLH**, Northfield. "Propagation to the USA on the 26th and 27th was the best I've seen, 59+ reports both ways. I worked a bag full of Ws one after another, great fun!" said Dave. From January 1 to November 17 he received signals from 107 countries on 28MHz. Recently he added a horizontal dipole, for 28MHz, to his antenna farm and is currently making signal comparisons between horizontal and vertical polarisation.

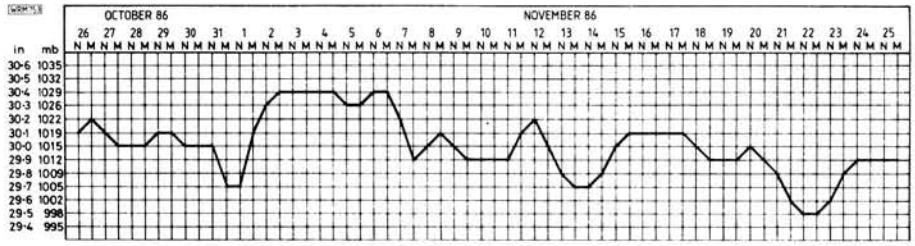


Fig. 1 ▲

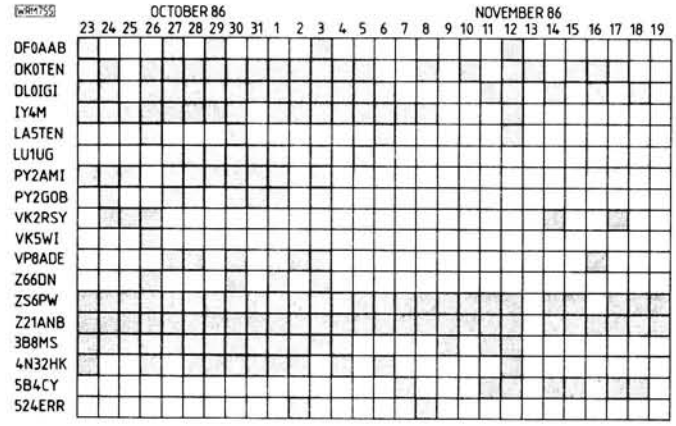


Fig. 2 ▶

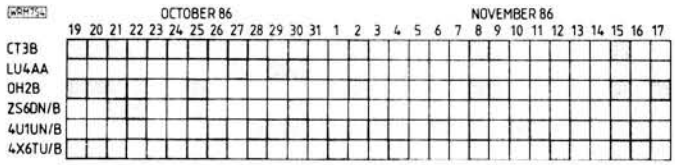


Fig. 3 ▶

Angela Sitton BRS 88639 in Stevenage has developed a special interest in the propagation of 28MHz signals while seriously s.w.l.ing during the past year. She plans to extend this activity when that RAE pass slip comes through the door. A list of stations appears in Amateur Bands.

Propagation Beacons

First my thanks to **Chris van den Berg** from The Hague, Len Fennelow, Don Hodgkinson, **Norman Hyde G2AIH** from Epsom Downs, **Bill Kelly** in Belfast, Dave Lingard, **Ted Owen** in Maldon, **Fred Pallant G3RNM** from Storrington, **Gordon Pheasant G4BPY** in Walsall and Ted Waring, for their 28MHz beacon logs. These have been used to compile the monthly chart of beacons heard in the UK (Fig. 2).

John Parry G4AKX of Northwich sent photographs of the 5B4CY equipment, Fig. 4 and antenna, Fig. 5, following a visit to Cyprus. "I had the good fortune to have a conducted tour around the station and afterwards I met Mike 5B4CW, seen standing by the beacon's antenna," said John.

"5B4CY reappeared after a long absence, two VK beacons logged on October 26 and a new one, 5Z4ERR, made listening worthwhile," wrote Dave Lingard.

Don Hodgkinson reported hearing a couple of new ones in the beacon band. There was 5Z4ERR sending "DE KENYA BEACON 5Z4ERR 5Z4ERR . . . AT QTH OF 5Z4RT. PLEASE QSL VIA P.O. BOX 14425, NAIROBI TNX" on 28·240MHz, between 1109 and 1126 on November 2. There was also EA4CGN sending "DE EA4CGN MADRID" on 28·285MHz, at 1039 on the 15th.

During the month prior to November 16, Gordon Pheasant heard some good signals from VK6, especially VK6HD and VK6RO. He wonders if the Perth beacon, VK6RWA, is QRT. "I did not hear the Adelaide beacon VK5WI at all last year, but on October 26 it was a very good signal until well after midday," he said. Also added to his list was ZS6DN.

Both Gordon and Bill Kelly received good signals from other beacons in Southern Africa.

Between October 20 and November 18, Norman Hyde logged signals, almost daily, via meteor scatter from the Anglesey 50MHz beacon, GB3SIX.

The result of Len Fennelow's monitoring of the 14MHz beacons, over a similar period, is listed in Fig. 3. "Very disturbed conditions have characterised the 14MHz band this period," commented Len. He continued, "Beacons heard early in October became quite sparse later including most of November, a trend which the chart shows quite clearly."

Tropospheric

The slightly rounded atmospheric pressure readings for the period October 26 to November 25, Fig. 1, were taken from a Short and Mason Barograph installed at my QTH. A similar report, showing a peak of 30·4in (1030mb) in early November came from Ted Owen. **Harold Brodribb**, St. Leonards-on-Sea, sent the weather chart for the 3rd and 5th from his daily paper, showing the positions of this high pressure system.

No doubt this movement was responsible for Chris ven den Berg receiving signals from the 144MHz repeaters in Danbury, GB3DA on R5, daily from days 2 to 7, Dover GB3KS R1 on 5 and 6, Maidstone GB2KN R4 on days 2, 4 and 7, Tacolneston GB3NB R1 on days 4, 5 and 7, and the French repeater FZ2THF on the 2nd.

Band II

"I have witnessed occasional tropo lifts during the afternoons and early evenings," wrote **Andrew Lomas** in Barnsley on November 3. Andrew noted with great

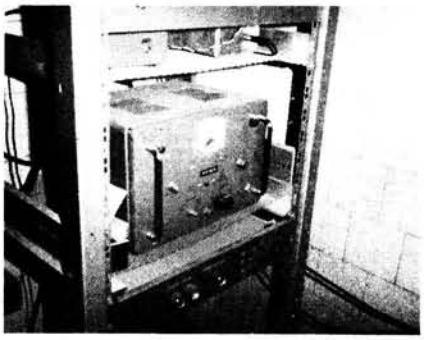


Fig. 4: The equipment of 5B4CY seen on a visit to Cyprus by John Parry

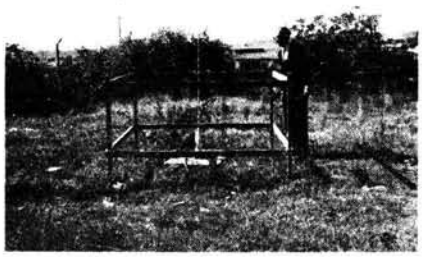


Fig. 5: The antenna used by 5B4CY in Cyprus

interest that the signal from BBC Radio Cleveland, 96·6MHz, at 1928 on October 23 suddenly increased in strength, followed by heavy rapid fluttering, which at times was about 8–10 cycles per second. "I have also experienced similar happenings with Radios Derby, Manchester and WM," said Andrew. He added, "Although I have no new DX to report, I have identified four v.h.f. transmitters carrying BBC Radios 1–4 at Belmont, Holme Moss, a Sheffield relay station and, most likely, Sutton Coldfield." He wishes to thank the BBC's Engineering Information Dept. for sending him data on the domestic service stations as well as the interesting details of how their programmes travel, by landline, between their studios and transmitters.

Early in October, **Graham Johnson** from Nuneaton heard BBC Radio Norfolk, on his hi-fi tuner, fighting through the strong signals of Hereward Radio and Mercia Sound on nearby channels. Graham's main receiver is a Panasonic DR49 which he supports with a Philips D8112 stereo radio cassette recorder.

In Bury, **Roy Trent** has spent the last year experimenting with various antennas for Band II and he found that a discone came out best with a 0·25λ ground plane second. "We are lucky in this area to have so many radio stations within about 130km, so I can listen to 39 different transmitters, 24 hours per day and 75 per cent in stereo." Roy emphasises the importance of antenna polarity and suggests that DXers who use beams should try mounting them vertically and see what extra stations they can hear. Roy found that his reception of signals from Radios Aire, City, Cumbria, Derby, Hallam, Leeds, Pennine, Sheffield, Shropshire, Signal, Stoke and York was far better with his 5-element beam mounted vertically instead of horizontally. There are so many ifs and buts on the subject of antennas, therefore any suggestions, especially those resulting from practical experiments like this, are always welcome and will no doubt help the growing band of newcomers.

Harold Brodribb reports that Band II conditions were generally poor from October 23 to 30 and November 10 to 17. However, between the 31st and the 8th, he received a large number of stations from both the national and private networks in France. Harold has really studied the French radio system and says that reception from there was very good on the 5th and on the 8th, some rare stations were heard early in the day, but by evening conditions had deteriorated. In a graph which accompanied his report, Harold showed how the numbers of French stations increased between the 2nd and 8th and varied daily as the prevailing high pressure ebbed and flowed.

General

On October 25, GB8AER was on the air from the Winter Garden, Blackpool, for the 44th anniversary 8th Army Veterans Association, 10th anniversary 1986 El-Alamein Reunion. It was operated by **George Haylock G2DHV** from Sidcup with Len Parsons G3JFE and G4BLG/P, on behalf of the Royal Signals Amateur Radio Society. The RSARS celebrated their 25th anniversary in 1986.

During the event, using 1·5W f.m. to a 0·25λ dipole, George worked G0FVQ/M in Leeds, G1MEJ in Cumberland, G3FJQ (RSARS) in Cheshire, G4RQC/M (RAF/RNARS) in Lancashire, and GD4XTT.

Reports must arrive by January 24

TELEVISION

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

At this time of year it requires consistent searching to find any DX at all in Band I, owing to the small number of out of season, Sporadic-E events which are likely to take place. So, thanks to **Mike Bennett** (Slough), **Harold Brodribb** (St. Leonards-on-Sea), **Simon Hamer** (New Radnor), **Edwina** and **Tony Mancini** (Belper), **David Meredith** (Dudley), **Ian Smith** (Paisley) and **Noel Smythe** (Caerphilly), for their interesting and detailed television logs. It proves that regular checks in Bands III, IV and V are also essential to catch those short life tropospheric openings, which often occur due to frequent and sometimes rapid changes in the autumn and winter weather.

Band I

During the month prior to November 18, references to programmes and test-cards from television transmitters in Austria, Czechoslovakia, East and West Germany, Holland, Hungary, Italy, Norway, Poland, Rumania, Spain, Sweden, Switzerland and the USSR appeared in the logs. Although a few events lasted a short time, some signals only appeared in the form of bursts, or rapid QSB. It takes that sharp eye, developed by DXers, to spot in-a-flash those station idents enscribed on captions and test cards.

However, the PRAHA insignia from Czechoslovakia was seen by David Meredith. Test cards scribed SR1 Saar, Grunten and Ochsenkopf from W. Germany were logged by Ian Smith. The Norwegian regionals Bremanger, Kongsberg and Melhus were bagged by the Mancinis and credit for the Spanish regionals Aitana, Madrid and Valencia goes to Simon Hamer, the Mancinis and Noel Smythe. The German news caption, Tagesschau, the Hungarian advertising title TV Reklam and Spain's Teletexto were copied by Simon and the Mancinis.

Signals from Poland TVP and Spain TVE are usually found while even the mildest of Sporadic-E disturbances is in progress. Fine examples of this are seen in Figs. 1 and 2, received by **Len Eastman** in Bristol last June and the less common E. German test card, Fig. 3, caught by the Mancinis. Note the digital clock at the bottom of Figs. 2 and 3, this can also be seen on most Norwegian regional test cards.

Mike Bennett logged the TVR logo from Rumania at 1730 on November 1. Harold Brodribb reports seeing negative pictures from the French TV6 at Lille on Ch. F4, via tropo, on November 2 and 6.

Tropospheric

Conditions were right for DX around 0700 on October 17 when Noel Smythe received pictures from Canal Plus, on Ch. F5, for about 4 hours. In Aldershot, **Peter Lincoln** logged a German test card, Fig. 4, in good colour on Ch. E30 in the u.h.f. band. The high atmospheric pressure, during the first week of November, enabled Harold Brodribb, Mike Bennett, The Mancinis and Noel Smythe to receive pictures, mainly in Band III, from Belgium, France, East and West Germany, Holland and Luxembourg. These were identified by their logos, BRT/TV1 and RTBF-1, Canal Plus, FR3 and TF1, PTT-NED-1, DFF DDR-1, ARD and RTL, respectively.

Under similar conditions, during the summer of 1985, **Brian Buckley** watched u.h.f. pictures from Scotland, Fig. 5, at his QTH in Dungannon.

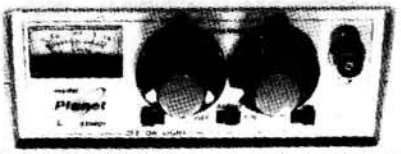
SSTV

"I look forward to the days when the 21 and 28MHz bands are at their peak again. I started SSTV just at the end of the last sunspot maximum and although I only copied a few signals on 21MHz, the 28MHz band was active most weekends with very strong signals from the Americas and Africa and, at times, VK and ZL," wrote Peter Lincoln from Aldershot. During October Peter logged pictures, on 14MHz, from stations in Bulgaria, Hungary and Switzerland as well as pictures and graphics from Germany DF3UO, Figs. 8 and 9 and Italy IO3XQW, Figs. 10, 11 and 12, while Jamboree-on-the-Air was in progress on the 19th.

News From India

Between 1245 and 1415 on June 19 **Major Rana Roy** received a Russian test card, the caption TB CCCP and, at 1330,

UHF Signal Strength Meter Model SSMU1



The **SSMU1** is a portable, battery-powered, signal strength meter for use in the setting up of aerials and distribution amplifier systems within the specified frequency range of coverage. The unit may be operated either with standard HP7 batteries or with rechargeable Ni-Cads, with the adaptor. Signal strength is measured in millivolts or decibels and indicated on a meter with 3 gain settings. The meter can be illuminated when required. To aid video and sound identification a low level sound source is built into the case. A carrying case is also supplied equipped with shoulder strap.

Specification
Frequency Range . . . Channels 21-69 (470-860MHz) . . . Varicap Tuned, measures 20µV to 40mV in three ranges, with an accuracy of ±4dB. Power source is 12 volts derived from 8 × HP7 batteries or 10 size AA rechargeable Ni-Cads.

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Paul Wilson
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232 VAUXHALL BRIDGE ROAD
LONDON SW1V 1AU
TEL: 01-630 0344

S.E.M.

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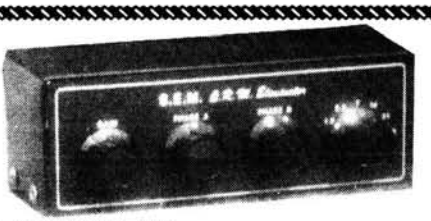

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Fig. 1: Band I MR logo from TVP Poland

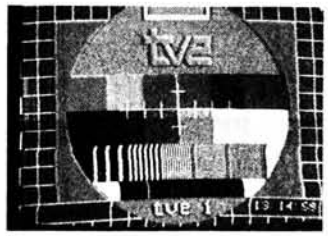

Fig. 2: Band I TVE Spain test card with clock

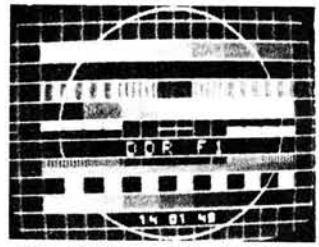

Fig. 3: Band I E. German test card with clock

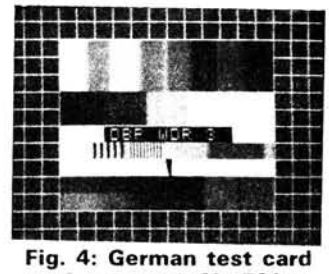

Fig. 4: German test card via tropo on Ch. E30

Fig. 5: Scottish IBA station

Fig. 6: Signal from USSR via Es

Fig. 7: Signal from Pakistan on Band III

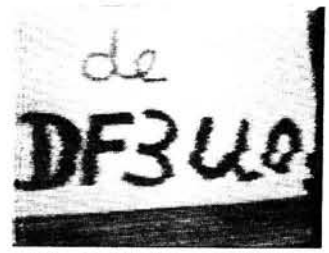

Fig. 8: SSTV on 14MHz

Fig. 9: SSTV from JOTA station on 14MHz

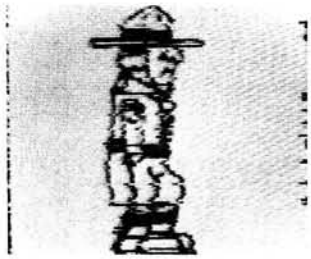

Fig. 10: SSTV graphics from JOTA station

Fig. 11: JOTA SSTV signals

Fig. 12: JOTA SSTV signal

their news programme, when he noted that the clock on the HOBOCTN caption was indicating 1200. While in Bikaner, he received strong signals from the USSR, Fig. 6, in Band I via Sporadic-E at 1530 on June 23. Then at 2000 on July 1 he received from Pakistan TV, Fig. 7, in Band III during a tropospheric opening.

Tropospheric enhanced signals from Pakistan TV were again received by Rana on Ch. 10, from about 1700 until late at night, almost daily, from July 1 to 10 followed by a few events, producing weak pictures, between the 14th and 24th. Among the items seen from Pakistan were various adverts, an animated film called *Clue Club*, an episode of *Knight Rider*, a feature film, an Urdu serial and the news in Urdu. Rana received pictures from Jallandhar and Mussoorie on Chs. 9 and 10.

Your reports must arrive by January 24

MW BROADCAST BAND DX

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

by Brian Oddy G3FEX

Following my comments in the January issue about European interference, a loop antenna is not the only solution. A look at the receiver in use may lead one to conclude that other reception methods could be employed. For example a receiver capable of s.s.b. reception would enable interference from a station on one sideband to be rejected by selecting the opposite sideband of a wanted signal. Many other ideas are possible—no doubt you have thought of a few already! If you have any suggestions which you consider would help transatlantic DXers to overcome the problems to be faced in the future, please send them along to me for inclusion in this series.

DX Report

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

Transatlantic DX: The combination of the long periods of darkness just now and the present solar sunspot minimum period is resulting in some rare transatlantic DX being received in the UK during the night. While this period of the solar cycle is of particular interest to the dedicated medium wave DXer, it also provides an excellent opportunity for anyone new to the hobby to enjoy the thrill of hearing signals for the first time from Canada, N. America, the Caribbean and S. America!

During one night of these especially good reception conditions **Gary Lane** of Lancing picked up New York's WINS on 1010 when using either of his two portable receivers plus their internal antennas! Gary has been DXing for about 15 years and has heard this station before, but only when his Grundig Satellit 1000 or Sony ICF2001 are connected to an external wire or loop antenna. Another DXer, **Kevin Jackson** of London, managed to log three stations which have not been reported before in this series, so they are subject to confirmation by QSL, namely KSL in Salt Lake City, Utah 1160; KFBK in Sacramento, California 1530 and Canadian CFUN in Vancouver B.C. 1410. Kevin uses a Realistic DX300 receiver plus a 30m wire antenna and a.t.u. He says that during his 10 years of DXing he has never known such good conditions! The stations on the East coast of the USA that night were audible on his transistor portable with internal ferrite rod antenna—however, not one North American station could be heard the next night!

In Grimbsy, **Jim Willett** quickly logged CJYQ 930 of St. John's, Newfoundland, as SIO 444 at 0020 and then heard Radio Globo in Sao Paulo, Brazil 1100 at 0025 followed by Boston's WMRE 1510 at 0027; WBAL in Baltimore 1090 at 0030 and finally a station which may have been WZAM in Norfolk, Virginia on 1110 at 0035, but it quickly faded out before a positive ident could be obtained.

Starting at 2345, it took only 35 minutes for **Roy Spencer** of Nuneaton to log four stations from the USA, namely New York's WHN 1050, WINS 1010; WCAU 1210 in Philadelphia and WMRE 1510 in Boston—three of them were new to him! However, not every night has been good, George Morley in Redhill, only received CJYQ 930, WHN 1050, WINS 1010 and WCAU 1210—they were all poor signals!

Dave Mayhew has once again been putting his "Sooper Loop" to good use in

Freq (kHz)	Station	ILR or BBC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
603	Invicta Sound	I				D	N		X	N									
630	R. Cornwall	B						D				D			N		X		D
630	R. Bedfordshire	B	D			D	N		X			D							
657	R. Clwyd	B					D	D	X			D		D					
657	R Cornwall	B										D							
666	Devonair R.	I										D							D
666	R. York	B					D		X								X		
729	R. Essex	B		D		D			X			D	D						D
756	R. Cumbria	B							X										
756	R. Shropshire	B							X										
756	R. Essex	B	D	D	D	D			X				D						D
774	R. Kent	B				D													
774	R. Leeds	B							X			D							
774	Severn Sound	I																	D
792	Chiltern R.	I				D			X										
801	R. Devon	B						D	X			D					X		D
828	2CR	I										D							
828	R. Aire	I							X										
828	Chiltern Radio	I	D																
837	R. Leicester	B	D				N		X										
855	R. Devon	B										D							D
855	R. Norfolk	B				D		D	X								X		
873	R. Norfolk	B	D																
936	GWR	I		D					X										
954	Devonair R.	I										D							D
954	R. Wyvern	I							X										
990	Hallam R.	I							X										
999	R. Solent	B										D					X		D
999	Red Rose R.	I					D		X										
999	R. Trent	I							X										
1026	Downtown R.	I					D												
1026	R. Jersey	B										D						X	D
1026	R. Cambridgeshire	B	D			D			X										
1035	R. Sheffield	B							X										
1035	R. Kent	B	D			D		D				D							
1035	West Sound	I					N												
1107	Moray Firth R.	I					D												
1107	R. Northampton	B	D						X			D							
1116	R. Derby	B						N	X	N		D							
1116	R. Guernsey	B										D			N		X		D
1152	LBC	I				D						D							D
1152	R. Clyde	I					N	D											
1152	BRMB	I							X										
1152	Piccadilly R.	I							X										
1152	R. Broadland	I	D			D													
1161	R. Sussex	B				D													D
1161	R. Tay	I					N	N											
1161	Viking R.	I							X								X		
1161	R. Bedfordshire	B							X										
1170	R. Tees	I							X										

Freq (kHz)	Station	ILR or BBC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1170	R. Orwell	I	D			D													
1170	Ocean Sound	I									X	D							D
1170	Signal R.	I							X		D								
1242	Invicta Sound	I				D			X									X	
1251	Saxon Radio	I	D			D			X			D							
1260	Marcher Sound	I							X										
1260	Leicester Sound	I							X			D							
1260	R. York	B													N				
1278	Pennine R.	I													N				
1305	Red Dragon	I						N	X									X	
1305	R. Hallam	I							X										
1323	R. Bristol	B							X		N				D			X	
1323	Southern Sound	I							X		N	D						X	D
1332	Hereward R.	I	D						X										
1359	Essex R.	I	D			D	D		X										
1359	R. Solent	B									N								D
1359	Red Dragon	I					N		X										
1359	Mercia Sound	I							X										
1368	R. Lincolnshire	B							X			D						X	
1368	R. Sussex	B																	D
1431	Essex R.	I				D			X			D							
1431	R. 210	I										D							D
1449	R. Cambridgeshire	B							X							D			
1458	R. London	B	D	D		D	D		X	N	N	D							D
1458	R. WM	B														D			
1458	R. Manchester	B							X										
1458	R. Newcastle	B					N		X										
1458	R. Devon	B													N				
1458	R. Cumbria	B						D											
1476	County Sound	I					N	D	X	N		D						X	D
1485	R. Merseyside	B						N	X							D			
1485	R. Oxford	B										D							
1485	R. Sussex	B										D						X	D
1503	R. Stoke-on-Trent	B							X										D
1521	R. Mercury	I										D							
1521	R. Nottingham	B							X										
1530	Pennine R.	I							X										
1530	R. Essex	B			D	D	D		N										
1530	R. Wyvern	I										D					D		
1548	Capital R.	I	D	D			D					D							D
1548	R. Forth	I						N	D										
1548	R. Hallam	I							X										
1557	Hereward R.	I							X								D		
1557	Ocean Sound	I						N											
1584	R. Nottingham	B							X										
1584	R. Shropshire	B															D		
1584	R. Tay	I						N											
1602	R. Kent	B							X										D

Key: D—Day; N—Night; X—Heard but no details

1 David Aldred, Eye
2 Michael Banbrook, London
3 Reg Billing, Rochester
4 Geoff Blakey, Deal
5 Rab Freeman, Port Glasgow
6 Bill Kelly, Belfast
7 Ken Lancaster, Rotherham
8 Alexander Little, Glasgow
9 Eileen Mainwaring, Cowes
10 David Mayhew, Yapton
11 George Morley, Redhill
12 John Parry, Northwich
13 Tim Shirley, Bristol
14 Roy Spencer, Nuneaton
15 Geff Taylor, London
16 Steven Woods, Nottingham
17 Tim Wright, Bristol

Yapton, Sussex, and picked up seven new stations* to add to his already extensive transatlantic DX list. Some of them have not been mentioned before in this series and are subject to confirmation by QSL. Canadian stations noted were *CJFX 580 in Antigonish, N.S.; *CKEY 590 Toronto, Ont; VOCM 590 St. John's, Nfld; CBN 640 St. John's, Nfld; *CHYQ 670 Musgravetown, Nfld; CIYQ 680 Grandfalls, Nfld; *CBNM 740 Nfld; *CJBC 860 Toronto, Ont; CJYQ 930; *CFBC 930 St. John N.B.; CBM 940 Montreal; CKCW 1220 Moncton N.B.; New York's WNBC 660; WABC 770; WINS 1010; WHN 1050 and WNEW 1130 were all logged, while those from other areas of the USA included Boston's *WHDH 850; WBZ 1030; WMRE 1510; WBAL 1090 in Baltimore; WCAU 1210 and WTOP 1500 in Washington. Two stations noted from the Caribbean area were VOA 1580 in Antigua and the Caribbean Beacon, Anguilla 1610. Dave says he was very surprised to find CFBC pushing CJYQ out of the way on 930!

Using a DX400 receiver in conjunction with a home-brew loop antenna in Bristol, **Tim Shirley** says he has been checking the transatlantic DX scene there during the night. He was surprised to find three new stations to add to his list of DX from the USA, namely KRSP 1060 in S. Saltlake City, Utah, logged at 0200; KAAY 1090 in Little Rock, Ark at 0230 and WHUE 1150 in Boston at 0140. Since these stations have not been previously reported in this series, they are subject to confirmation by QSL.

Writing from Rotherham, **Ken Lancaster** says things have come along well since he erected a 40m wire antenna and installed a really good earth. He also built a "Sooper Loop" and changed his Vega 215 receiver to a Sony ICF2001D! His log includes two Newfoundland stations, VOCM 590 and CJYQ 930 and four from the USA, WINS 1010; WHN 1050; WCAU 1210 and WTOP 1500. Ken has also logged many other DX and local radio stations—see later.

The arrival of the summer period in Randburg, S. Africa, has brought with it the high static levels which make medium wave DXing virtually impossible. So, **Leo Gieske** has only logged two stations from the USA this time, WLAC 1510 in Nashville which was a weak signal at 0329 and WKBW 1520 in Buffalo, N.Y. which was a fair signal at 0345.

Over in Belfast, **Bill Kelly** has been listening until well into the night to some of the interesting programmes broadcast by stations in Canada, North and South America and the Caribbean. At the same time he has been testing out his new NRD525 receiver! Two of the stations he received from Newfoundland are less often mentioned—CHCM in Marystown 560, which could be heard as early as 2330 and CBT in Grand Falls, heard at 0100 on 540. He also tuned into two regulars from St. John's—CJYQ 930 which was S7 on the meter of the NRD525 at 0045 and VOCM, broadcasting adverts and a record programme on 590 at 0110.

From the USA, Bill received news of the Philadelphia area at 0002 via WCAU 1210, followed by a stock market report. He listened to a talk about baseball at 0010, broadcast by WHN in New York on 1050 and at 0025 tuned into WBAL on 1090 for news from the Baltimore area. A phone-in film quiz attracted his attention to Boston's WMRE on 1510 at 0035. Later, he picked up WTOP 1500 playing records at 0220 and listened to a baseball commentary via WCAU around 0300. Bill has also been hearing a talk in Spanish from Radio Vibracion, Venezuela 1470 at 0050; Evangelical programmes from the Caribbean Beacon on 1610 at 0135 and a football commentary in Spanish from XERC in Mexico City 790 at 0140.

Other DX: Leo Gieske has achieved another remarkable feat of reception by picking up the BBC Radio London 50kW transmitter on 1458 over 9000km away near Johannesburg at 0340, naturally the signal was weak! Others in his log include the VOA relay in Rhodes, Greece on 1260, noted as a fair signal at 0330 and two stations located on Islands in the Mozambique Channel—Mayotte on 1458 and Comoro on 1089. Leo is extremely happy to have received QSLs from Radio Ascension—this is a BBC 500 watt transmitter operating on 1485 from Ascension Island; also from Radio Mauritius on 684 and from Radio Botswana on 972, who seldom

QSL!

Another DXer to hear BBC Radio London outside the UK was **Michael Banbrook** on holiday to Lloret De Mar in Spain. He took with him his Akai PM-R2 with FAM-1 radio pack and to his surprise found their signal on 1458 during a listening session on the first night there, but it was very faint. To his amazement however, the signal from ILR Capital Radio on 1548 was extremely strong and did not fade at all! He found on subsequent nights that he could hear their signal from 1800 and upon awakening one night at 0400 he discovered that it was still just as strong as earlier! Michael listened to a complete breakfast show one morning until 0830 and has now received his first ever QSL to prove it! It certainly pays to take your receiver on holiday, no matter what time of year!

While tuning across the band with his Grundig Satellit 1000 receiver at 0030, Gary Lane heard a full identification from Radio Las Palmas, Canary Islands—their signal on 1008 is seldom reported by DXers. Two stations which have not been mentioned before in this series were detailed by **Philip Rambaut** in his report from Macclesfield, namely UAE Radio Dubai on 1481, heard with Arab songs at 1851 and Vatican Radio, Rome on 1611 at 1852. Some other interesting stations were logged by Tim Shirley—Radio Amman, Jordan 801 at 0100; Radio Quryat, Saudi Arabia 900 at 2359; Radio Sophia, Bulgaria 1296 at 2300; Radio Moscow World Service 1323 at 2000; DDR Berlin, E. Germany 1359 at 2300 and Radio Moscow Foreign Service on 1386.

Using a Realistic DX360 portable, Tim checked the long wave band and logged Allouis, France 162 at 1800; Kaliningrad, USSR 171 at 2100; Radio Kiev, Ukraine 209 at 1600; Warsaw, Poland 227 at 2200 and Kalundborg, Denmark 245 at 0130. The report from Jim Willett, who used a Marconi Kestrel 387A receiver to monitor the l.w. band between 2000 & 2030, included Brasov, Roumania 153; Kaliningrad, USSR 171; Polati, Turkey 182; Azilal, Morocco 209; Konstantinow, Poland 227; Kalundborg, Denmark 245; Tipaza, Algeria 254; Moscow, USSR 263; Topolna, Czechoslovakia 272 and Minsk, USSR 281. At 0215 he picked up Erzurum, Turkey on 245.

In his first report from Pagham, **Tim Wright** says he has been checking the extent of the ground wave coverage of many m.w. stations between 1200 and 1500UTC and was surprised at what he could hear. His extensive log includes Waver-Overijse 540; Paris 585; Frankfurt 594; Warve-Overijse 621; Liblice 639; Lopic 675; Rennes 711; RFI 738; Flevoland 747; DLF Braunschweig 756; DDR Burg 783; Limoges 792; Nancy 837; Roma 846; Paris 864; AFN Frankfurt 873; Milano 900; Wolvertem 927; Bremen 936; Toulouse 945; Flevoland 1008; SWF Wolfsheim 1017; Kalundborg 1062; Lille 1071; Katowice 1080; Solvesbourg 1179; Kuurne 1188; Bordeaux 1215; Leige 1233; Marseille 1242; DLF Neuminster 1269; Strasbourg 1278; Kvitsoy 1314; Roma 1332; Nice 1350; Lille 1377; Kaunas 1386; Saarbrucken 1422; Manach 1440; Monte-Carlo 1467; BRT Wolvertem 1512; Kosice 1521; DLF Mainflingen 1539 and Langenberg 1593. **Ken Lancaster** also logged many of these stations when testing his new Sony ICF 2001D receiver.

Another first report came from **Geoff Blakey** of Deal, Kent, who uses either a Vega 206 or a Sharp 28H TV/Radio/Cassette receiver when hunting for DX. His list includes AFN Frankfurt 873 at 1430; VOA Munchen-Ismaning 1197 at 1330; Duchanbe 1296 at 0317; Kaunas 1386 at 0304; Monte-Carlo 1476 at 0448; Leningrad 1494 at 0440 and BRT Wolvertem 1512 at 1044. Geoff also mentioned three stations in Ireland—RTE-1 Tullamore 567, SINPO 34454 at 1603; RTE-2 Dublin 1278, SINPO 13222 at 1348 and BBC Radio Ulster 1341, SINPO 24433 at 0925. **Rab Freeman** has been listening to the RTE stations around 0930 in Port Glasgow and noted them as SINPO 35544 and 23222 respectively—he also logged RTE-2 Athlone 612 as SINPO 45554 and RTE-1 Cork 729 as SINPO 23333 at that time using a Trio R2000 receiver plus active loop antenna.

Robert Taylor of Edinburgh, says that the signal from Kvitsoy, Norway on 1314 is better than BBC Radio Scotland around 1600! He has been listening to some of the European stations during the evening and three W. German stations, DLF Neuminster 1269; DLF Mainflingen 1539 and Westdeutscher Rundfunk, Langenberg 1593 along with RBI Berlin, E. Germany 1359 all have SINPO 44444 ratings in his log! Others noted include Solvesborg 1179; Radio Tirana 1359; Manx Radio 1368; Stargard 1503 and BRT Belgium on 1512—their programme *Brussels Calling* is very popular with **Sheila Hughes** of Morden, Surrey, and with **Wyn and Eileen Mainwaring** in Cowes, IOW. Wyn wonders if the increase in strength of the BRT signal, mentioned by **John Greenwood** of Evesham, is due to a planned increase in transmitter power at that time —apparently the power of the BBC Radio Wales transmitter used to be increased at

QSL card sent in by Roy Spencer

dusk some years ago.

The news in brief from "Down Under" is that 2YA in Wellington, N.Z., has been well received by **John Ratcliffe** in Southport, Queensland, around 2300 local time. Two Japanese stations and one from Malaysia were also heard, but since they were not broadcasting in English, John could not identify them!

Local Radio DX

There are several new DXers results detailed this time—see Fig. 1. Some of the comments were: "One Sunday between 1000 and 1200 my son Clint and I logged 13 stations using an Aiwa portable radio, which has no provision for an external antenna" from David Aldred of Eye, Suffolk. "My present objectives are building the Sooper Loop and the Reflex receiver by John Ratcliffe"—Geff Taylor of London. John Parry of Northwich—"Radio Clwyd on 657kHz has good ground wave coverage all over mid and west Cheshire." A. Lomas—"ILR Radio Hallam makes reception of Red Dragon Radio on 1305 impossible in Barnsley, S. Yorkshire." "I am sorry to say despite many sessions I have been unable to hear the Red Dragon"—Reg Billing of Rochester. 'Red Dragon seems to be a bit elusive in this part of Kent . . ." —Geoff Blakey.

QSL Addresses

ILR North Sound, 45 King's Gate, Aberdeen AB2 6BL.

ILR Moray Firth Radio, P.O. Box 271, Scorguie, General Booth Road, Inverness IV3 6SF.

ILR LBC, P.O. Box 261, Communications House, Gough Square, London EC4P 4LP.

Reports before January 24 please

SW BROADCAST BANDS

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

by Brian Oddy G3FEX

For the Newcomer SWL

Some of the basic facts about resonant Halfwave or Hertz antennas have already been discussed in this series (*PW* September '86). A subsequent article discussed antennas which contain two or more out of phase halfwaves at a particular operating frequency and depicted the radiation patterns associated with them (*PW* December '86). While it is possible to erect these antennas in the form of a simple **Inverted L** configuration, this method is not always convenient The end of the wire which enters the building will have to be carefully insulated at the point of entry and also kept well clear of all nearby objects on its way to the receiver. Otherwise the tiny signals will be quickly lost through leakage due to either poor insulation or capacitive coupling to earth—it may prove difficult to overcome these problems.

There are also a number of other factors which need to be taken into consideration when erecting an Inverted L antenna. One of the most important of these is the fact that the end of the antenna will enter the noisy electrical environment of the house where copious interference is likely to be radiated by the house wiring, TVs, home computers, as well as domestic appliances. Even if the interference level is low, it may well prevent reception of the weaker signals. Another factor to be considered is that the radiation patterns depicted in the December text will not hold true with the Inverted L system, since part of the antenna is vertical and part is horizontal.

So what, then, is the answer to all this? Obviously the solution to these problems will depend upon local circumstances but, if space and conditions allow, then the ultimate solution is to erect the antenna as far away as possible from the house, so that it is high up, in a straight line and well clear of all surrounding objects. This will

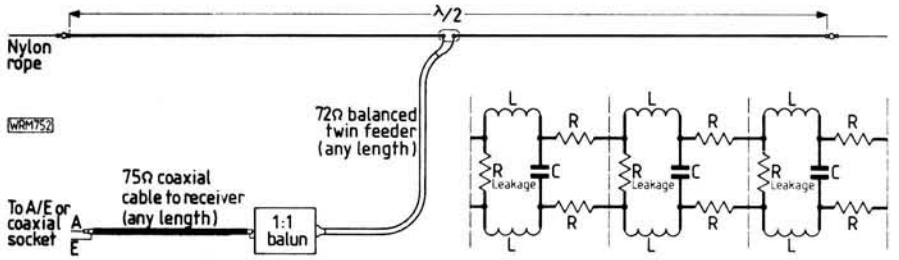

Fig. 1b

Fig. 1a

involve two supports, such the chimney of the house and a pole or tree at the far end of the garden. An **r.f. transmission line** or **feeder cable** is used to convey the signals from the antenna to the distant receiver —thus obviating the need to bring one end of the antenna wire down into the house.

A feeder cable generally consists of two parallel conductors so arranged as to ensure that the field from one wire exactly neutralises that from the other, so that no radiation or pick up takes place on the feeder. It is, therefore, called a **balanced (or twin) feeder**. Another type of r.f. transmission line, called **coaxial cable,** consists of an inner central conductor supported inside, but insulated from, an outer tube which surrounds it. The tube is usually formed by plaiting a number of fine copper wires together, so as to make it flexible. The outer flexible tube, which can be earthed, effectively screens the inner conductor to prevent pick up of signals —hence this is called an **unbalanced feeder.**

A balanced transmission line consists of distributed constants of resistance (R), inductance (L), capacitance (C) and leakage conductance—see Fig. 1a. The value of inductance and capacitance per unit length of line depends upon the size of the conductors and the spacing between them—their values determine the impedance of the line, called the **Characteristic Impedance** (Z_0), since it can be shown that:

Characteristic Impedance $Z_0 = \sqrt{L/C}$
(Neglecting resistance and leakage)

Note: Close spaced large conductors give high C, low L and hence a low value of Z_0, whereas small conductors give low C, low L and a high value of Z_0.

The value of Z_0 represents the impedance of a line of theoretical infinite length —however, a practical line will obviously be very much shorter! Provided a short length of line is terminated with a purely resistive load of value equal to Z_0, then the line will behave as though it is infinitely long and all r.f. energy fed into the line will be absorbed by the terminating load. The voltage and current at any point along the line will then have the same value and the line is said to be **matched**—correct matching is important if losses are to be avoided. Balanced transmission lines are commercially available with Characteristic Impedance of 72 or 300Ω and coaxial cables are available with 50 or 75Ω values. So how then may they be used to connect an antenna to a receiver?

The December article mentioned that a low impedance, essentially a pure 72Ω resistance, exists at the centre of a half-wave antenna at resonance. By cutting the antenna wire at this point, 75Ω coaxial cable could be directly connected to the open centre point wires of the antenna to form a centre fed **dipole antenna**—however, since the two arms of the dipole are symmetrical and coaxial cable is unbalanced, a better plan is to connect a balanced 72Ω twin feeder to the open centre point wires to form a truly balanced and matched system—see Fig. 1b.

The lightweight twin feeder, which may be any length, should drop down from the antenna at right angles to the wire to a convenient point in the garden where it is attached to a wideband balanced to unbalanced 1:1 transformer, called a **1:1 balun.** The balun enables the balanced feeder to be connected to an unbalanced 75Ω coaxial cable which can be buried, attached to a fence or walls and pass through a metal windowframe with impunity to reach the receiver, since its outer screen will be earthed at the coaxial socket of the receiver. Note: Some receivers have only terminals marked "A" and "E"—in this case try connecting the inner wire of the coaxial cable to "A" and the outer braiding to "E". It is important to understand that a dipole antenna can only be used on its fundamental frequency or odd harmonics, e.g. a 7MHz dipole can be used as a three halfwave centre fed antenna on 21MHz. There are methods of overcoming this problem, which will be explained in a future article in this series.

Conditions on 25 and 21MHz

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

The 25MHz (11m) band remains very silent here in the UK, which is hardly surprising for it could be that the lowest point of the last solar cycle has been reached. Let's hope the upward slope of solar cycle 22 is soon in evidence! No doubt it will be quite a while before broadcasters consider it prudent to provide a service on this band.

There are a number of interesting stations broadcasting on the 21MHz (13m) band which can be heard in the UK during daylight hours. One of the most frequently mentioned is UAE Radio Dubai, who beam programmes in Arabic and English towards Europe on 21·605 from 0615 until 1500. Their signal is often very strong here around midday. **John Nash** of Brighton was one of the many DXers to log it as SIO 555!

John Parry of Northwich has been listening around 1500 to some of the many interesting programmes from Radio RSA in Johannesburg, S. Africa on 21·590.

Their broadcast in English and French to Europe, Africa and the Middle East commences at 1100 and closes at 1556. It is not always well received in the UK, as reception conditions on this band are rather unstable just now. Some idea of the likely variations in reception can be ascertained by comparing the report from **George Morley** who logged them as SINPO 23322 in Redhill, on a day when conditions were poor, with that from **Robert Taylor** who noted them as SINPO 44444 in Edinburgh on a subsequent day. If you hear their signal for the first time and wish to send them a report with a view to obtaining their QSL, it may be helpful to them if you check their signal on several occasions and detail any variations present.

Ron Pearce of Bungay has now got his little 1 valve receiver (pictured in September '86 *PW*, page 68) working on the 13m band! The News broadcast from the first station Ron heard at 1241 came from Radio Bangladesh, Dhaka on 21·630. He also heard a DX programme from Radio RSA, over 9000km away in Johannesburg on 21·590. Later he picked up the News from Radio Japan via their relay station in Moyobi, Gabon on 21·700 at 1547—a very creditable performance. Ron would like to see more reports from other DXers using simple receivers, so how about it?

While making a quick check on the band in Dendermonde, Belgium between 1230 and 1300, **Maurice Andries** found that the RFE/Radio Liberty programmes on Russian relayed via Gloria, Portugal on 21·530 and 21·570 were being jammed. Other stations logged were VOA, broadcasting in French to Africa via their relay in Monrovia, Liberia on 21·550; Radio RSA on 21·590; UAE Radio Dubai 21·605 and RFI Allouis, France on 21·620 with programmes intended for S.E. Africa in French.

It seems that the broadcast to Asia at 1130 from Radio Nederlands via their relay in Madagascar on 21·480 is reaching its target! Writing from Selangor, Malaysia, **Mat Jusoh** says that it reaches him at SINPO 55444—he is also hearing Radio RSA on 21·590 with a similar report at 1230.

Reporting from Johannesburg, S. Africa, **Simon Illingworth** says that conditions have improved dramatically there as they move into summer. He has been hearing the BBC broadcast to Africa from their relay at Masirah Island, Oman on 21·470 at 0900 and has been surprised how well he can receive the BBC UK based transmitter on 21·710 from 1100 until 1345. He says that Radio Moscow is usually quite good on this band on 21·545 at 0730 and also on 21·725. A strong signal in the early mornings at 0700 stems from RFI in Allouis, France on 21·620—it spreads 7kHz either side of the nominal carrier, however. Radio Prague, Czechoslovakia can be heard on 21·705 beaming to Asia and the Middle East at 0900 and on 21·505 at 1430. Although reception of Radio Nederlands via Madagascar on 21·485 is only fair at 0945, their broadcast via Bonaire, Nederlands Antilles on 21·685 can now be heard at 1830. VOA on 21·485 is a poor signal late at night.

An interesting log from **Philip Rambaut** of Macclesfield detailed several other stations using the band—Vatican Radio, Rome on 21·485 broadcasting in French to Africa at 1100; RDP Portugal on 21·700 at 1114; Radio Moscow on 21·465 in Russian, also their World Service on 21·545 at 1305; RFE/Radio Liberty via Gloria, Portugal with a programme in Bulgarian on 21·500 at 1636; Radio Nederlands beaming Dutch to Africa via Bonaire on 21·540 at 1620 and WYFR via Okeechobee, Florida USA beaming to Africa on 21·525 and to Europe on 21·615 at 1615.

The 17 and 15MHz Bands

During the hours of daylight, signals from several continents can usually be heard on the 17MHz (16m) band, but reception conditions tend to be unreliable.

Freq (MHz)	Station	Country	UTC	DXer
2·495	R. Madagascar	Madagascar	1830	L
3·215	BCC Taipei	Taiwan	0130	L
3·230	R. RSA	S. Africa	0315	C,G,M
3·270	SWABC 1	Namibia	2255	M
3·295	SWABC Windhoek	S. Africa	2123	F
3·315	R. Fort de France	Martinique	1830	L
3·315	R. Pastaza	Ecuador	0130	L
3·320	R. Suid Afrika	S. Africa	XXXX	E
3·340	R. Altura	Peru	0130	L
3·355	R. Botswana	Gabarone	1825	K
3·380	R. Malawi	Malawi	0458	D
3·395	ZBC Gweru	Zimbabwe	2320	M
3·905	AIR Delhi	India	1635	H
3·915	BBC Kranji	Singapore	2210	H,M
3·925	AIR Delhi	India	1650	H
3·930	R. Capital	Transkei	2030	H,L
3·955	BBC WS Daventry	England	0700	L
3·955	R. Orion	S. Africa	XXXX	E
3·975	BBC WS Skelton	England	0700	L
4·500	Xinjiang	China	0020	G
4·725	BBS Rangoon	Burma	1800	L
4·735	Xinjiang	China	0005	M
4·740	R. Afghanistan	Afghanistan	1815	G
4·750	R. Bertoura	Cameroon	1930	G,J
4·755	R. Educ CP Grande	Brazil	0430	L
4·760	ELWA Monrovia	Liberia	1915	J
4·760	TWR	Swaziland	1730	J
4·765	Habana	Cuba	0817	H
4·770	FRCN, Kaduna	Nigeria	2130	B,G,J,M
4·775	RRI Jakarta	Indonesia	1600	L
4·780	R. Pakistan	Pakistan	1830	L,C
4·795	R. Douala	Cameroon	1945	J,M
4·800	AIR Hyderabad	India	1645	C
4·810	RSA	S. Africa	2100	B,J,K,M
4·810	R. Yerevan	USSR	1740	C
4·815	R. Diff TV Burkina	Ouagadougou	2000	J,C
4·820	R. Botswana	Botswana	1840	G
4·820	Khanty-Mansiysk	USSR	0008	M
4·825	R. Ashkhabad	USSR	2130	C
4·830	Africa No. 1	Gabon	2200	A,G,J,M
4·830	R. Tachira	Venezuela	0220	C,G,M
4·832	R. Reloj	Costa Rica	0445	M
4·835	RTM Bamako	Mali	2145	G,I,J,L,M
4·840	AIR Bombay	India	0125	G
4·845	ORTM Nouakchott	Mauritania	2025	A,C,G,J
4·845	R. Nacional, Manus	Brazil	0200	C,H,M
4·850	R. Columbia Pt	Costa Rica	0255	M
4·850	R. Yaounde	Cameroon	1815	L
4·855	R. Mauritius	Mauritius	2000	L
4·865	V of Cinaruco	Columbia	0400	L
4·865	PBS Gansu Lanzhou	China	2310	G
4·870	R. Cotonou	Benin	2025	A,H,J,L,M
4·880	SABC R. Suid Afrika	S. Africa	1845	J,K
4·890	ORTS, Dakar	Senegal	2255	H,M
4·895	Ashkhabad	USSR	1750	C
4·900	R. Diff Nat Conakry	Guinea	2120	C,J,K
4·905	R. Abu Dhabi	UAE	1800	C,J
4·905	R. Beijing	China	2045	H
4·905	N'djamena	Chad	1815	G
4·915	Accra	Ghana	2000	J
4·915	Voice of Kenya	Kenya	2147	M
4·920	R. Afghanistan	Afghanistan	1900	B,K,L
4·920	R. Nat N'djamena	Chad	1850	C,G,J
4·925	R. Nacional, Bata	Eq. Guinea	2150	M
4·930	Ashkabad	USSR	0310	G
4·930	4VEH	Haiti	2235	M
4·935	SWABC Windhoek	S. Africa	2153	M
4·940	R. Abidjan	Ivory Coast	2303	H
4·940	Kiev	USSR	1857	C,H
4·945	RSA	S. Africa	2000	J
4·958	Azerbaijan	USSR	1850	C
4·965	SWABC Windhoek	S. Africa	0355	L
4·970	R. Rumbos	Venezuela	0240	C,M
4·970	R. Yaounde	Cameroon	0045	G
4·980	Ecos del Torbes	Venezuela	2320	G,M
4·990	FRCN, Lagos	Nigeria	1845	J,M
4·990	Yerevan	USSR	2110	C
5·005	R. Nacional, Bata	Eq. Guinea	1830	I,J,M
5·005	R. Nepal	Khumalter	2350	M
5·010	R. Garoua	Cameroon	2120	C,G,J
5·020	ORTN Niamey	Niger	2205	M
5·025	R. Rebelde Habana	Cuba	0438	L
5·035	R. Bandui	C. Africa	2200	G,J,K,M
5·047	R. Togo Lome	Togo	2215	G,J,M
5·057	Gjirokaster	Albania	2200	G
5·060	R. Nac Progr	Ecuador	0423	L
5·065	R. Candip	Zaire	0340	L
5·095	R. Sutatenza, Bogata	Colombia	0355	C

XXXX—No Time Given.

Fig. 2

DXers

A	Leslie Biss, Knaresborough
B	Alan Curry, Stockton-on-Tees
C	Neil Dove, Lockerbie
D	Davy Hossack, Winchburgh
E	Simon Illingworth, Johannesburgh, SA
F	Mat Jusoh, Selangore
G	Bill Kelly, Belfast
H	George Morley, Redhill
I	Kari Nieminen, Turku, Finland
J	Fred Pallant, Storrington
K	Philip Rambaut, Macclesfield
L	Tim Shirley, Bristol
M	Jim Willett, Grimsby

The level of illegal jamming seems to have been stepped up, especially during the morning and this makes reception difficult from some areas—it is noticeable, however, that the broadcasts on this band from Radio Moscow are unaffected.

Radio Australia broadcast to Asia and the Far East on this band in the early morning from their transmitter in Carnarvon, W. Australia—**Tim Shirley** has been hearing their 17·715 signals around 0600 in Bristol during some mornings. However, this band is certainly not the one to choose for the best reception just now. Tim has also been listening to the broadcasts in English, intended for Australia, from FEBA located in the Seychelles—look for them between 0715 and 0850 on 17·795.

Amazing as it may seem, Ron Pearce has been hearing the News from India on his little 1 valve set at 1007 via All India Radio on 17·875. Their transmission in English is beamed towards Australia.

In Eyemouth, **David Middlemiss** has also been hearing signals not intended for the UK. He picked up the Voice of Greece at 0945 during a transmission to Australia on 17·565 and the BBC World Service transmitter located in Limassol, Cyprus one morning at 0900, beaming towards Africa on 17·885.

The programmes in Urdu and English from Radio Pakistan, Islamabad have been attracting the attention of **Alan Curry** around 0920. They beam their 17·660 signals towards Europe from 0715 until 1115 and Alan logged them as SINPO 43333. John Nash has also been listening to them at 1100 and noted them as SIO 344 in his log at that time. Later, he picked up Radio Cairo, Egypt on 17·675 at 1315—their programmes are really intended for Asia and are in English and Bengali, which may be of interest if you are making language identification recordings.

Using a Vega receiver in Morden, **Sheila Hughes** listened to a talk about Moslem Law broadcast by UAE Radio Dubai on 17·865 at 1335—their daily transmission between 1000 and 1500 is intended mainly for listeners who speak Arabic in Europe, but some items are in English and these are often quite interesting.

Philip Rambaut logged several stations using foreign languages in the afternoon and early evening, namely Vatican Radio beaming programmes in Portuguese and Spanish to S.America on 17·870 at 1326; RCI, Montreal, Canada with a transmission in Russian intended for Europe on 17·820 at 1630; Radio Morocco on 17·595, broadcasting in Arabic to the Middle East at 1635; VOA beaming programmes in Spanish to S.America on 17·765 at 1800 via Delano, W. USA and on 17·710 at 1825 from Greenville, E. USA.

The conditions on the 15MHz (19m) band are generally more stable than on the higher frequencies and good signals from several continents are audible during the day. However, much illegal jamming also takes place on this band. Radio Australia broadcast on 19m to Asia and the Far East via their transmitter in Carnarvon, W.Australia in the morning from 0900 until 1100. Although their 15·415 signal can often be heard in the UK, it is subject to interference and jamming. **Donald Wood** in Kingston-upon-Thames picked them up at 1000 using his Sony ICF2001D receiver and noted SINPO 42243 in his log. Later, he found that he was able to improve things to SINPO 43344 by switching to the s.s.b. mode on his receiver. For those with s.s.b. receivers this technique can often prove very helpful, since either of the sidebands of the signal can be selected to avoid interference problems.

If you like rock music and looking up unusual places on the map, then be sure to look out for KYOI in Saipan, North Mariana Islands in the morning on 15·190. Their transmission from 0300 is really intended for the Far East, but it can often be heard well in the UK. **Davy Hossack** logged it as SINPO 44344 in Broxburn from 0500 and has now received their attractive QSL card. Davy now monitors their signal most mornings with very good results. David Middlemiss also listens to their programmes, usually around 0730—their transmission ends at 1000. If cricket is more your scene, then tune to Radio Pakistan, Islamabad on 15.605 for the latest news when a Test Match is in progress. **Mike Kitchener** of Hitchen has been enjoying their commentaries and other programmes at 1000. Their programme in Urdu and English are beamed towards Europe from 0715 until 1115.

Mike is also a regular listener to AFRTS because he is interested in the US Space scene—he finds their coverage of this subject is much better than VOA. AFRTS can be heard on 15·430 from 1100–2200UTC via their station in Greenville, USA. When conditions permit, their transmitter in Bethany, USA can also be heard beaming to Africa on 15·330 from 1100–1700 and on 15·345 from 1700 until 2300. Another transmitter at Bethany beams their programmes to the Caribbean and Central America on 15·330 from 1300–2200. Their transmitters in Delano, USA cover the Far East on 15·345 from

Pennant from Voice of Vietnam sent in by Keith Fernie

2100–0000 and on 15·355 from 0000–0700. A relay in Munich, Germany beams AFRTS to the Middle East on 15·265 from 0800–1400, while AFRTS in Tokyo on 15·260 operates 24 hours a day—all this can be very confusing unless you know the facts!

Some of the other interesting stations using the 19m band include the Voice of Israel, Jerusalem on 15.640 at 1100; the Voice of Greece from Athens on 15.630 at 1235, and WYFR via Okeechobee, Florida on 15·566 at 1900—all noted by Alan Curry; UAE Radio Dubai on 15·320 at 1600, mentioned by **Julian Wood** of Buckie; Radio Portugal, Lisbon on 15·235, logged at 1600 by **Darren Taplin** in Tunbridge Wells; Radio Korea in Seoul, S. Korea on 15·575 at 1100 and RNB Brasilia, Brazil on 15·265 at 1800—all noted by John Nash.

Writing from Anglesey, **Alwyn Evans** says he managed to pick up the transmission from RCI in Montreal, Canada which is beamed to W. Africa on 15·260 at 1800. However, reception conditions changed and it faded out within five minutes. Their main transmission to Europe commences at 1900 on 15·325 and a second transmitter is brought into use at 2000 on 15·105. **Neil Dove** has been listening to this one in Lockerbie and noted it as SINPO 35443 at 2020. He also heard two stations from the USA, namely WRNO in New Orleans on 15·420 at 1900 and WINB in Red Lion Pa. on 15·185 at 2000. The programmes from HCJB in Quito, Ecuador on 15·270 at 1900 have been attracting the attention of **Leslie Biss.** He uses a Trio R600 receiver plus trap dipole in Knaresborough.

The 13MH (22m) Band

In addition to Radio Moscow, who occupy a large number of frequencies during the day, there are now several other broadcasters using this band. Radio Monte-Carlo, logged by **A. Taylor** of Lincoln, beams programmes in Arabic and French to the Middle East on 13·695 from Nador, Morocco between 0700 and 1600. His interesting report compiled over a two month period confirms that Radio Moscow continues to dominate the band and mentions their operation on four new frequencies, namely 13·645, 13·655, 13·665 and 13·680.

His report also mentions that three jammers are used in an attempt to eliminate the Voice of Israel, who occupy 13·725 from 0400 until 2300 and jamming of a different kind takes place on the three frequencies used by Radio Baghdad, Iraq—13·600, 13·650 and 13·700. However, Radio Nederlands broadcast at 1430 to Asia and the Middle East on 13·770 appears to be in the clear. A programme from Iceland to Europe at 1215 and to N. America at 1315, can be found on 13·775. Robert Taylor has been hearing Radio Prague on 13·715 at SINPO 43333, beaming to Asia at 1430—their programme in Czechoslovakian and English can be heard between 1400 & 1625.

The 11, 9, 7 and 6MHz Bands

The 11MHz (25m) band has been wide open in the morning and most of the stations mentioned last month have been audible. **Colin Rolls** of Pulborough logged two new ones—FEBC Manila, Philippines on 11·850 at 0830 and Radio Japan on 11·955 at 0910. KYOI in Saipan on 11·900 at 1010; UAE Radio Dubai on 11·955 at 1637; RNB Brasilia, Brazil on 11·780 at 2020 and AIR New Delhi, India on 11·620 at 2127 were all logged by George Morley. Sheila Hughes listened to Vatican Radio, Rome on 11·740 at 1445. A slow speed news broadcast from VOA, via Greenville, E. USA was logged by Leslie Biss on 11·760 at 1845.

The reception conditions on 9MHz (31m) have also been good in the morning —George Morley has picked up Radio New Zealand's bird call on 9·600 at 0848, station announcement at 0853, time signal at 0900, followed by the News—SINPO 12322. Radio Australia's transmission to Europe on 9·655 has been very good, **Brendan Murray** has been listening to their programmes every morning before going to school at 0830 in Co. Derry, N. Ireland. Radio Nacional, Paraguay has been logged on 9·735 by **Alexander Little** in Glasgow at 2230.

Despite the overcrowding, signals have also been good on the 7MHz (41m) band —**George Markwick** has been listening to Radio Australia on 7·205 in Thornaby, Cleveland and **Bill Stewart** noted their transmission as SIO 333 at 1520 in Lossiemouth. **Al Dupres** of Cardiff has been listening to the News from Radio Damascus, Syria on 7·455 at 2110—he says their standard of news reading is excellent! Bill Stewart has also been listening to the excellent 6MHz (49m) signals from Radio HCJB on 6·205 at 0815.

The 5, 4, 3 and 2MHz Bands

Conditions here have been good—there are several DXers new to these bands in the chart this time!

Station Addresses

Broadcasting Corpn. of New Zealand, P.O. Box 98, Wellington, New Zealand.

Radio Canada International, P.O.Box 6000, Montreal, Quebec, H3C 3A8, Canada.

WRNO Worldwide, P.O.Box 100, New Orleans, CA. 94621, USA.

Reports must arrive with Brian by January 24

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Have SEM Tranzmatch with Eazitune. Would exchange for Eddystone EC10 or similar receiver. Must be in working condition. Tel: 01-794 9790. *C115*

Have Yaesu FT-757GX h.f. transceiver with Yaesu FP757HD p.s.u., FC757AT auto a.t.u., fist mic, iambic key and headphones. All as new and boxed, only one month transmit use! Would exchange for h.f. communications receiver plus cash difference. G4WBT, 97 Redland Drive, Northampton NN2 8UG. *C123*

Have AR88D general coverage receiver with original handbook in full working order. Would exchange for Revco PA2, receive in-line pre-amp from 10MHz to 1GHz or would consider 144/430MHz receive in-line pre-amp. Mike. Tel: 0704 892088. *C128*

Have Sony ICF2001 receiver, as new condition with p.s.u. Would exchange for Icom IC2E in similar condition, other handhelds considered. G6TFC, QTHR. Tel: 0204 651183. *C129*

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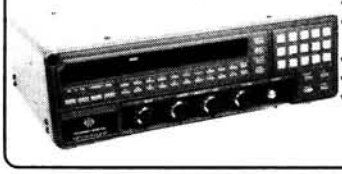

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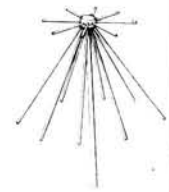

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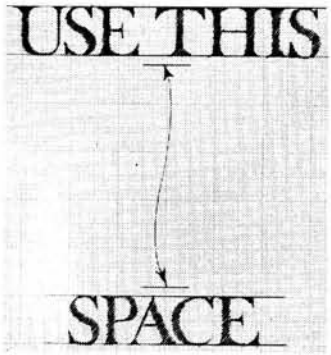

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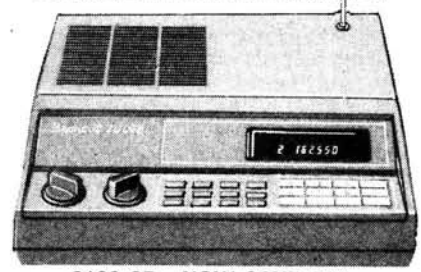

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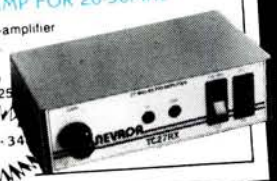

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