

RADIO TODAY

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a veritable Paragon...



HOMEBREW LCR BRIDGE

An informative guide to building an accurate, low cost bench test unit

SHORTWAVE BOOK CROP

Essential reference for listeners

LONG LINE, NO SEE

Very restricted space antenna for indoors or out

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100W, 1.8-30MHz Ham band TX, GCRX, 32 mems, Internal ATU & PSU, DFM mixer, 105db dynamic range
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ICOM IC-725



RIG OF THE MONTH! 100W, 1.8-30MHz Ham band TX, GCRX, SSB/CW, AM/FM operation, DDS system
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0.1-30MHz RX, 32 mems, keypad entry, SSB/AM/RTTY/CW (FM option), DFM system, a classic receiver
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ICOM IC-32E



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YAESU FT-23R/FT-73R



Yaesu's classic compact HT's, 144-146MHz or 430-440MHz, 10 mems, SW on 2/70, 0.25uV for 12db SINAD, many options
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General coverage receiver, 0.15-30MHz all mode, 118-174MHz option, 12 mems, CAT system, keypad entry, 0.4uV sensitivity
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VHF/UHF all-mode transceiver, 144-146MHz and 430-440MHz (50MHz and 1.2GHz options), 115 mems, 60 watts, TV option
FT-736R £4300.00

FT-747GX



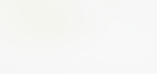
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VUHF all mode RX, call for info on our exclusive mods, MK2 60-950MHz, MK5 100kHz-950MHz inc. free ROYAL disc and PSU
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VHF 25W mobile, 144-146 MHz, 12.5/25 KHz steps, IARU channels, R0-R7, S8-S23, auto repeater shift/tone burst, digital S-meter
NAVICO AMR1000/S from £247.25

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CTE 1600



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PK-232 £279.00

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AV3 vertical 10/15/20 £56.02
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Ranger ARX-450B, 70cm, 5.5dBd £42.73
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BUTTERNUT
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ICOM
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FT-811 70cm/5W/keypad £290.00
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Bearcat BC200XLT

THE BEST HANDHELD VHF/UHF SCANNER



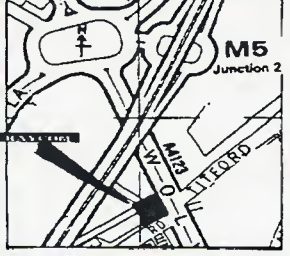
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HAM RADIO CONTENTS

TODAY

VOLUME 7 NO 6 JUNE 1989

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AC141 0.28	BC108B 0.10	BC213 0.09	BD137 0.50	BD588 0.50	BF337 0.29	BR103 0.55	AJES20 0.48	RC1A6029 0.85	TIP3055 0.55	2SC789 0.55
AC141K 0.34	BC109 0.10	BC213L 0.09	BD138 0.50	BD598 1.95	BF338 0.32	BR303 0.95	AJES2955 0.95	RC1A6039 0.85	TIS91 0.20	2SC921D 0.95
AC142K 0.45	BC109B 0.12	BC214 0.09	BD139 0.50	BD619 0.50	BF355 0.37	BR339 0.45	MPSA19 0.29	RC1A6181 0.85	TV106 1.50	2SC927 1.95
AC176 0.22	BC114 0.09	BC214C 0.09	BD140 0.50	BD632 1.50	BF356 0.37	BR4443 1.15	MPSA29 0.30	RC1A6334 0.90	TV106/2 1.50	2SC1034 4.50
AC176K 0.31	BC115 0.55	BC237B 0.15	BD144 1.10	BD632 1.50	BF357 0.37	BR539 0.45	MPSA92 0.30	RC1A6335 0.85	ZRF0112 16.50	2SC1096 2.50
AC187 0.25	BC116A 0.50	BC238 0.15	BD150C 0.29	BD633 1.65	BF394 0.19	BSX60 1.25	MPRA27 0.95	RC1A6572 0.85	2N1100 6.50	2SC1106 2.50
AC187K 0.28	BC117 0.10	BC239 0.15	BD159 0.65	BD634 1.50	BF422 0.32	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188 0.25	BC119 0.24	BC251A 0.15	BD166 1.50	BD635 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252A 0.15	BD179 0.72	BD636 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252B 0.15	BD182 0.70	BD637 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252C 0.15	BD182 0.70	BD638 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252D 0.15	BD182 0.70	BD639 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252E 0.15	BD182 0.70	BD640 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252F 0.15	BD182 0.70	BD641 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252G 0.15	BD182 0.70	BD642 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252H 0.15	BD182 0.70	BD643 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252I 0.15	BD182 0.70	BD644 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252J 0.15	BD182 0.70	BD645 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252K 0.15	BD182 0.70	BD646 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252L 0.15	BD182 0.70	BD647 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252M 0.15	BD182 0.70	BD648 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252N 0.15	BD182 0.70	BD649 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252O 0.15	BD182 0.70	BD650 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252P 0.15	BD182 0.70	BD651 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252Q 0.15	BD182 0.70	BD652 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252R 0.15	BD182 0.70	BD653 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252S 0.15	BD182 0.70	BD654 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252T 0.15	BD182 0.70	BD655 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252U 0.15	BD182 0.70	BD656 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252V 0.15	BD182 0.70	BD657 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252W 0.15	BD182 0.70	BD658 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252X 0.15	BD182 0.70	BD659 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252Y 0.15	BD182 0.70	BD660 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AC188K 0.27	BC125 0.25	BC252Z 0.15	BD182 0.70	BD661 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AD142 2.50	BC141 0.25	BC284 0.30	BD201 0.50	BD662 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AD149 1.50	BC142 0.25	BC300 0.30	BD202 0.50	BD663 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AD161 0.50	BC143 0.24	BC303 0.30	BD203 0.50	BD664 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AD162 0.50	BC147B 0.12	BC303 0.30	BD203 0.50	BD665 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF106 0.50	BC148A 0.09	BC307B 0.10	BD204 0.70	BD666 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF114 2.50	BC149 0.09	BC327 0.10	BD204 0.70	BD667 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF115 1.95	BC153 0.50	BC328 0.10	BD222 0.44	BD668 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF116 2.50	BC157 0.12	BC328 0.10	BD222 0.44	BD669 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF117 2.50	BC159 0.09	BC338 0.09	BD223 0.59	BD670 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF118 3.50	BC161 0.55	BC347A 0.13	BD225 0.48	BD671 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF121 0.60	BC170B 0.09	BC461 0.35	BD225 0.48	BD672 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF124 0.60	BC171 0.09	BC478 0.20	BD225 0.48	BD673 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF125 0.65	BC172B 0.10	BC527 0.20	BD225 0.48	BD674 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF126 0.45	BC173B 0.10	BC547 0.10	BD225 0.48	BD675 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF127 0.65	BC174 0.09	BC548 0.10	BD225 0.48	BD676 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF139 0.40	BC177 0.15	BC549A 0.10	BD225 0.48	BD677 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF150 0.40	BC178 0.15	BC550 0.14	BD225 0.48	BD678 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF178 1.95	BC182 0.10	BC557 0.08	BD225 0.48	BD679 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
AF239 0.42	BC182LB 0.10	BC558 0.10	BD225 0.48	BD680 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
ASV27 0.85	BC183 0.10	BC639/10 0.30	BD225 0.48	BD681 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95
ASV77 1.50	BC183L 0.09	BCY33A 19.50	BD225 0.48	BD682 1.50	BF423 0.25	BSX64 0.95	MPRA45 17.50	RC1A6572 0.85	2N1308 1.35	2SC1124 0.95

Integrated Circuits

AN103 2.50	AN7145M 3.95	LA4102 1.50	MB3756 2.50	SAS590 2.75	STK437 7.95	TA7609P 3.95	TBA550Q 1.95	TD1001 2.95	TD2591 2.95	UPC1181H 1.25
AN124 2.50	AN7150 2.95	LA4140 2.95	MC1307P 1.00	SL901B 7.95	STK439 7.95	TA7611AP 2.95	TBA560C 1.45	TD1003A 3.95	TD2592 2.95	UPC1182H 1.50
AN124 2.50	AN7151 2.50	LA4031P 1.95	MC1310P 1.95	SL917B 6.65	STK461 11.50	TA7629 2.50	TBA560Q 1.45	TD1006A 2.50	TD2593 2.95	UPC1185H 3.95
AN214Q 2.50	BA521 1.50	LA4000 3.50	MC1327 1.70	SL1310 1.80	STK463 11.50	FAA310A 3.50	TBA570 1.00	TD1010 2.15	TD2600 2.50	UPC1191V 1.50
AN236 1.95	CA1352E 1.75	LA4420 3.50	MC1327Q 0.95	SL1327 1.10	STK0015 7.95	TAA320A 3.50	TBA651R 2.50	TD1005 2.25	TD2610 2.50	UPC1350C 2.95
AN239 2.50	CA3086 0.46	LA4422 1.50	MC1351P 1.25	SL1327Q 1.10	STK0029 7.95	TAA350A 1.95	TBA673 1.95	TD1035 2.50	TD2611A 1.95	UPC1353C 2.45

RADIO TODAY

Steam and Culture In Glasgow

On May 13 1983 the last triple-expansion engine seagoing paddle steamer in the world, PS Waverly, will be celebrating the Centenary year of the Caledonian Steam Packet Co. by cruising down the Clyde, starting from the Waverly terminal at Glasgow at 9.30 and calling at Helensburgh, Gourrock, Dunoon, Wemyss Bay, Rothesay, Brodick (Arran) and back again to Gourrock.

The West of Scotland ARS are manning the demonstration station GB0WAV/mm all day on HF (CW, 7020MHz and excursions to other bands), 2m and 70cm. This is a test run by kind permission of the Waverly Steam Navigation Co. Ltd. in association with the Paddle Steamer Preservation Society, and it is hoped that it will be repeated. A colour QSL will be sent to contacts. For direct QSL or sailing information, send an A5 (4x6in approx.) before the end of May to **Allan Buchan GM0EFH/WAV, West of Scotland Amateur Radio Society, PO Box 599, Glasgow G1 1EW.**

Glasgow City has been designated Cultural Capital of Europe for 1990. The West of Scotland RAS is operating a number of special call signs during 1990. A fortunate amateur who logs all these stations could win a trip to Glasgow courtesy of the Scottish Tourist Board, from any DXCC country, visiting cultural events in and around Glasgow.

For ongoing information about the 1992 plans, lodge 3 SAEs with GM0EFH, address above.



Shop By The Clock

Paul Stott G0HEU is opening an amateur radio and electronics retail shop on April 3 (which should be well established by the time you read this) at **Unit 1, Black Road, Hebburn, Tyne & Wear, 'near the Clock public house'**, says Paul, very sensibly providing an

unequivocal landmark for his new business. Trading as Star Electronics, the shop will be stocking 'all the usual amateur radio products, including Howes kits, Standard transceivers, Mutek and ERA', as well as acting as the authorised northeastern dealership for MET antennas.



The Maplin Co-ax crimp tool operates on connectors for RG58 and RG59 coaxial cable, and is made from 3mm steel plate with plastic handles. Price £24.95 inc. VAT (No. JK34K). A heavy duty version operates on red, yellow and blue insulated crimp terminals, and costs the same (No. JH19V).

Smarter Than Gold Taps

Gordon Crowhurst of G4ZPY Paddle Keys is now offering his New Supreme Grand Luxe twin paddle key and pump key, complete with gold plated keys. Gordon will be displaying his made-to-order keys at Elvaston Castle, Longleat and other major rallies, and

hints that 'the depth of your pocket may not need to be as deep as we first thought'.

He has also worked improvements on his MK4 Single Paddle Key, contrary to his original beliefs. For a full colour brochure, send a 4½ x 6¼ in SAE to **G4ZPY Paddle Keys, 41 Mill Dam Lane, Burscough, Ormskirk, Lancs L40 7TG.**

First Morse Convention

The **Arnold and Carlton College of Further Education** (also known as **Digby College**, they tell us) ARS is holding a Morse Seminar on Saturday May 27, an unusual opportunity for CWers to get together, meet fellow key-pounders, have some amusement and learn something new. Planned activities include a serious key-trial stand, speed tests, including a test against computer-sent morse, a tuition clinic, syncopated morse, and a series of short talks. The afternoon speaker is Tony Smith G4FA1 on *The Origins of Morse*. The fee for the day is £1, and any profits will be donated to RAIBC. The day's events run from 10 to 4, with light refreshments available during most of the day, and local pubs for lunchtime, as well as the city of Nottingham and various attractions for non-radio-active members of the family close by.

'As a first attempt we are shooting in the dark, but with the hope that we will be able to supply something of interest to all', says Ron Wilson G4NZU.

The college is in Digby Avenue, parallel to Westdale Lane, off the B684 (Palins Road) Mapperley, Nottingham (NGR SK 602432), on the north side of Notts close of junction 26 of the M1. Talk-in on S22 from 9.30 on.

Hercules Gets The Tunes

America's Ten-Tec have introduced the appropriately named Hercules II 'no-tune' 500W HF solid state amplifier. Features include 12-14VDC operations, no-tune broadband final amp, 10ms TS/RX switching time, remote control and style matching to Ten-Tec's Paragon, Corsair II and Omni V. Peak output is indicated by a 10-element LED bargraph, and the unit includes a front-panel speaker. The Hercules with its PSU is expected to retail at £1499.00.

Other useful new items from Ten-Tec are the MFJ 3kW 'Differential-T Tuner' roller inductor tuner, using a differential capacitor and designed to minimise retuning. SWR indication uses a crossed needle meter, switchable for peak or average power readings. The tuner incorporates a six position switch to select two co-axial lines, two wire aerials, a balanced feeder, and an external dummy load. The balanced output incorporates a current balun to minimise interference. The price is £235.

The MFJ-1704 antenna switch has lightning and surge protection, replaceable protector, centre ground position, covers 1-500MHz for a 50 ohm system, auto-ground on unoccupied positions, and average isolation of better than 50dB. The price is £62.

Ten-Tec and other USA import equipment is supplied by **HRS Electronics, Garretts Green Lane, Birmingham B33 0UE. Tel. 021 789 7171.** Detailed specification leaflets are available from HRDS.

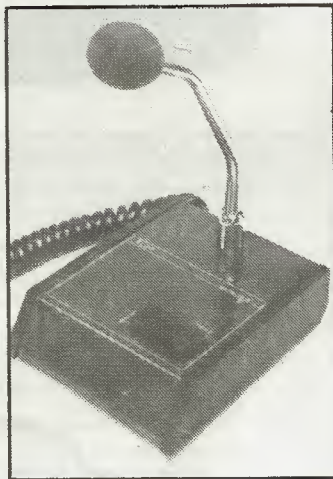
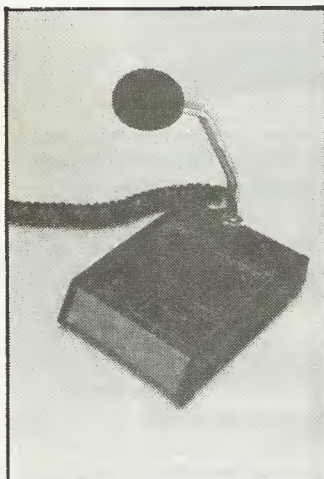
Electret Equipment

Nevada are marketing two new electret base microphones with a tailored audio response specially suited to amateur transceivers. With Kenwood equipment the microphones can be powered directly from the Transceiver's microphone socket. Where this is not the case, a 9V PP3 battery can be fitted.

Of the two mics, the XL

30 (£46.50) is the basic unit and the CM 40 (£55.75) has volume and tone controls. Both mics give output between 0V to 1.5V, frequency response 1-200-3000Hz, impedance 1k, 40dB gain, and have an isolated PTT switch.

Enquiries to Mike Devereaux at **Nevada, 189 London Road, North End, Portsmouth, Hants PO2 9AE. Tel. 0705 660036.**



Wave Guides

Denys Hall GD4OEL, communications adviser to the Isle of Man Scout Association, put on a Thinking Day On The Air in February at East Baldwin in the IOM. Guides attended from all over the island to pass greetings on the special event station GB4MGR (Manx Guide Radio) to guides in the UK, Canada, USA and the Falklands.

The photograph shows Scott Kewley GD7BMF and guide Laura Critchley of the 1st Arbory Guides passing a greeting message to the UK.

Yaesu 102 Newsletter

The Yaesu FT 102 User Group Newsletter has been taken over for the time being by Jim G4VBU, who hopes to bring out six issues for £3.50 (DX members £4.50). Subscriptions to **Jim Brown**

G4VBU, 10 Brinmead Walk, Withywood, Bristol BS13 8SF, UK. Technical helpline 0272 781265.

The group holds a weekly net for UK users on Sundays, 7.06MHz 11am. The Group would like to hear from any general Yaesu user groups operating in the UK.

Hybrid Filters

Cirkit have added lowpass and bandpass ICs from Toko to their list. The THB127B and THB128A are hybrid ICs comprising a lowpass filter cut off at 20kHz and an op amp. The THB111A and THB112A are hybrids consisting of a 300Hz to 3kHz bandpass

filter and op amp. Both units were developed for use in cellphones and are expected to find applications in other comms areas including amateur radio.

More information and catalogues from **Cirkit Distribution, Park Lane, Broxbourne, Herts EN10 7NQ.**

North Wales Rally

The Third North Wales Radio Rally will be held on the 4th and 5th November 1989 at the Aberconwy Conference Centre in Llandudno, North Wales. The rally opens at 11am on both days. Talk-in is on S22 and 70cm, and the entrance fee is £1 (under 14s and OAPs free).

The planned attractions will include all classes of radio including packet, computer hardware and software, CB, marine radio, aerials and towers and accessories, not forgetting the bar and refreshments.

Trade and visitor information can be had from **Edward Shipton GW0DSJ, 34 Argoed, Chester Avenue, Kinmel Bay, Rhyl LL18 5AY Tel. Rhyl 336939, Siggy Ferguson GW0DYH, 37 Station Road, Old Colwyn, Clwyd LL29 9EL Tel. 0492 517875 or Tony Wilkinson GW4PVU Tel. 0492 49121.**



Grand Old Lady Gets New Rig

The Fareham DARC will be operating a special event station GB4HMS on HMS Warrior 1860 during the and summer of this year, particularly at weekends on VHF and HF, with the emphasis on phone operation.

HMS Warrior 1860 is a three masted square rigger with a twin cylinder steam engine. Warrior was Britain's first ironclad warship, launched in 1860 and (like many pioneer devices) obsolete within a few years.

She was rescued from obscurity as a storage hulk eight years ago and after a £M7 restoration scheme, is on display at Victory Gate in Portsmouth (Hants) Dockyard. Thanks are due to Portsmouth City Council and South Midlands Communications Ltd. for sponsorship in publicity and equipment.

For information about the even station, contact Rodney Smith GOERS, 59 High St., Soutwick, Fareham, Hants PO17 6EF. Tel. 0705 373572 after 6pm.

Greenweld Electronics' spring catalogue supplement is out and about, with special offers including free headphones with orders over £10. Send an A4 SAE to Greenweld Electronics, 443J Millbrook Rd., Southampton SO1 0HX. Tel. 0703 772501.

Scoptics Delight

Maplin Electronics are assisting electronics fanatics in their universal ambition to have an oscilloscope on the bench by introducing a 'professional quality, precision' 20MHz three-trace scope for £287.49 including VAT (product number XJ61R). The scope features a 1mmV/div vertical amp-

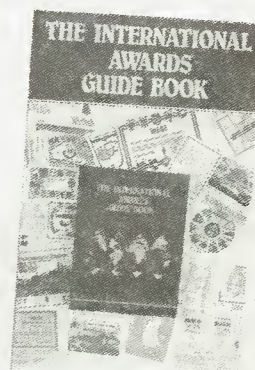
lifier, 150mm CRT with percentage markers and internal graticule, TV sync separator and holdoff function among others.

A 40MHz triple trace scope is also available for £499.95 inc VAT (XJ60Q), featuring a 12kV tube and delayed sweep time base.

Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel. 0702 552911.

750 Awards In One

The International Awards Guide Book is now available. The guide features over 750 awards, most in colour on 422 pages on good quality glossy paper, format 8½in × 11½in. Copies cost US\$37 post paid surface mail. Registered air mail costs an additional US\$33.50 (Africa, both Americas), US\$22 (Europe) US\$15.50 Japan, Australia, NZ, US\$4.50 (Asia). Payment by US\$ notes/bank transfer/inter-



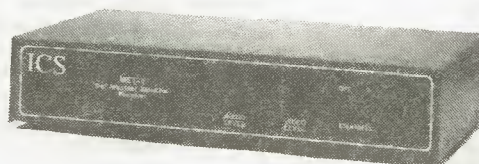
national money order only to M.S. Lumbrano gaol YBOWR, J1. Garuda 62, Jakarta 10620, Indonesia.

Orbits Give More Bits

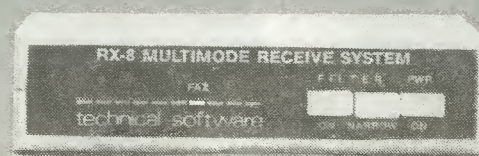
The picture shows the MET-1 geostationary weather satellite receive system for use with the Meteostat satellite orbiting above West Africa. It gives noise-free visible and infrared pictures of Europe every half hour. Software and

interfaces are available for the Amiga, Archimedes, PC and Atari computers. The MET-1 costs £399.95, and £119.95 for the matching preamp, including VAT.

ICS Electronics, Unit V, Rudford Industrial Estate, Ford, Arundel, W. Sussex BN18 0BD, Tel. 024 365 655.

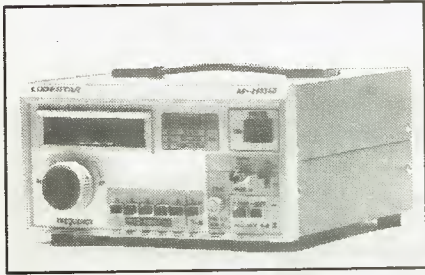


The pic shows the RX-8 Multimode Receive system from Technical Software, as featured in HRT May Radio Today. Information from Technical software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF Tel. 0286 881886.



Cirkit NEWS

YOUR CHANCE TO WIN...



Once again, you'll need all your wits about you to identify the six items we've picked from the catalogue, and a Lodestar audio signal generator worth more than £180.00 is waiting for the sender of the first all-correct entry drawn in this season's competition.

Second and third prizes are top-of-the range multimeters from Cirkit's outstanding new range, offering frequency and capacitance measurement and transistor test, and valued at £55.00 each.

Fourth and fifth prize-winners will receive recently published books to the value of £30.00.

Cirkit

Cirkit Distribution Ltd

Park Lane
Broxbourne
Herts
EN10 7NQ

Telephone (0992) 444111
Fax (0992) 669021

Also at

53 Burrfields Road
Portsmouth
Hants

PO3 5EB
Telephone (0705) 669021
Fax (0705) 695485

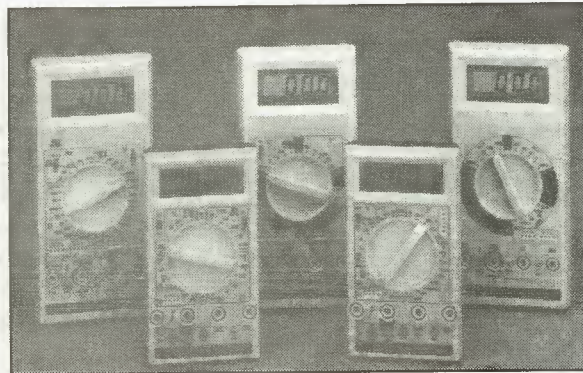
NEW CATALOGUE OUT 25th MAY

Over 3,000 product lines feature in the Summer 1989 edition of the Cirkit Constructors' Catalogue, available from most larger newsagents or direct from the company priced at £1.50. The latest books, an RF frequency meter, two new PSU designs and a 3.5MHz converter are among the innovative new kits this issue, while our construction project - a 2 Watt stereo amplifier - is bound to prove an absorbing activity for dedicated constructors. In the test equipment section there's a whole new range of multimeters, a bench DVM and a triple output PSU.

For eagle-eyed readers who enjoy a challenge of a different sort, there is the opportunity of winning an audio signal generator worth more than £180.00 in the latest fiendish competition. All prices now include VAT for quicker, easier ordering; and Cirkit's same-day despatch of all orders, combined with value-for-money discount vouchers, makes the line-up even more attractive.



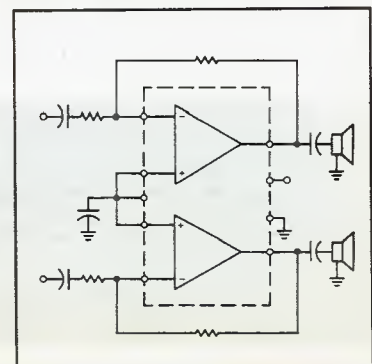
D-MM GOOD VALUE!



Cirkit's six new digital multimeters are packed with sophisticated extra facilities: capacitance measurement, frequency measurement up to 20MHz, temperature reading, transistor test and logic test in addition to the usual volts, current (DC and AC) and resistance measurement - and all unbeatable value with prices ranging from £20.00 to £55.00!

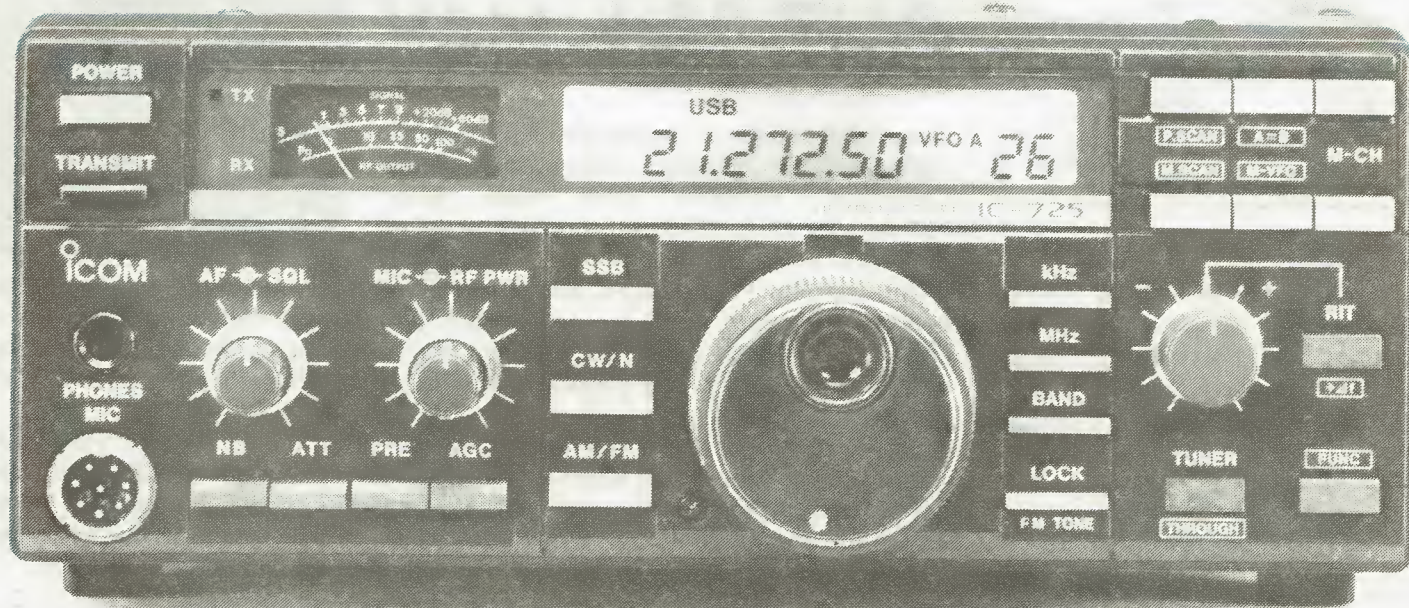
FEATURE PROJECT: 2W STEREO AMP

Our construction project this issue is for a straightforward but very effective 2 Watt stereo amplifier. Based on the LM1877, it is the perfect amplifier for a 'Walkman' cassette deck and equally suitable for AM/FM radios or mixer desks. Featuring 2W per channel and 75dB channel separation, it operates from a 10-26 volt supply, making it ideal for in-car applications. The catalogue includes full details of this economical kit.



ICOM

IC-725 Budget HF



- General Coverage Receiver
- 105dB Dynamic Range
- 100W Output
- DDS System
- 26 Memories
- Scanning
- CI-V Computer Control
- Semi Break-in

The new ICOM IC-725 budget H.F. has been produced due to the demand for a simple, high specification transceiver. Despite the limited features, compared to more expensive equipment this set retains a superior level of technical performance necessary to operate on the H.F. bands today.

Additional features include Noise Blanking, Pre-amp, Attenuator, AGC and RIT. The DDS System (Direct Digital Synthesizer) ensures fast Tx/Rx switching times, ideal for Data Communications. An A.T.U. controller is built

into the IC-725 for use with the AH-3 H.F. Automatic Antenna Tuner for mobile or base station operation.

Accessory options available are the PS-55 20A P.S.U., AH-3 Auto Antenna Tuner, UI-7 AM Tx. FM Tx/Rx Unit, FL-100 500Hz CW Filter, FL-101 250Hz CW Narrow Filter and SP-7 External Loudspeaker.

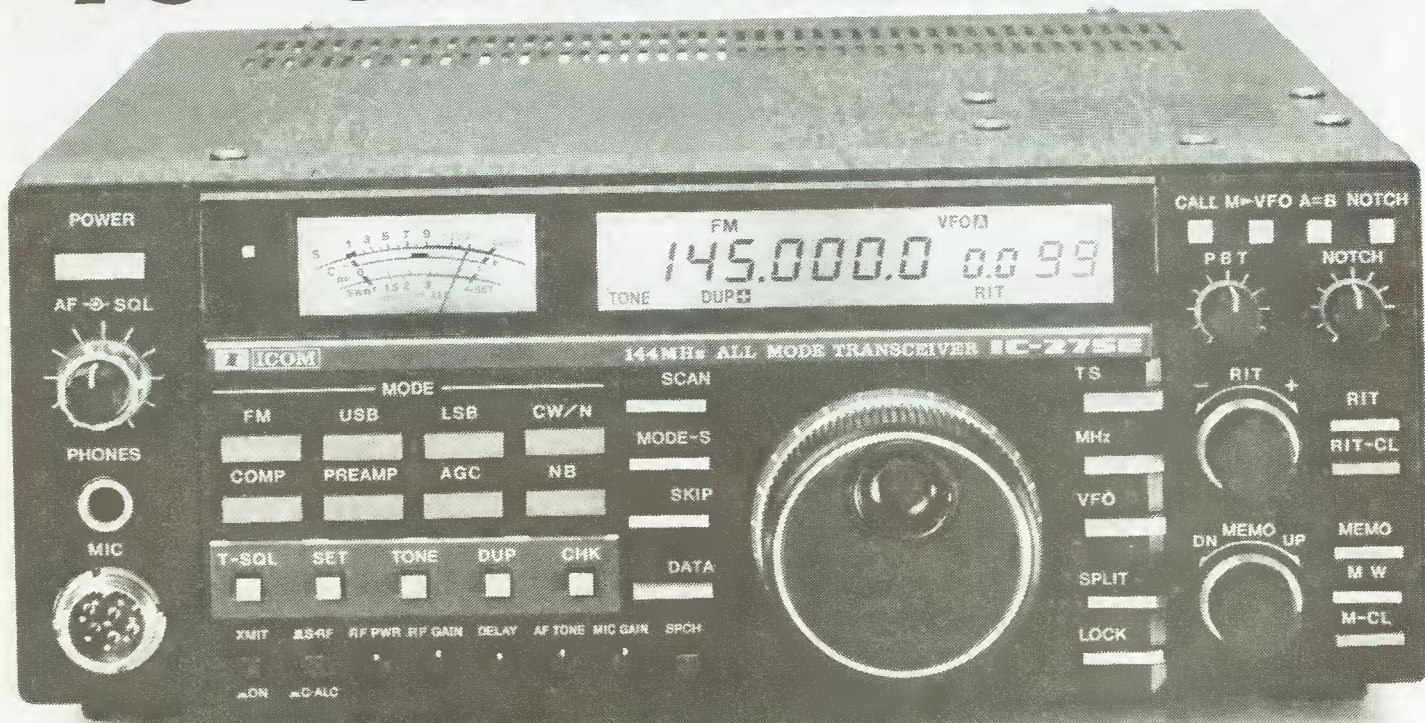
For more information on the IC-725 budget H.F. and other ICOM amateur equipment contact your nearest authorised ICOM dealer or phone us direct.

Icom (UK) Ltd.

Dept HRT, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

"75" Series Transceivers



ICOM have a winning line-up for fixed, portable and mobile operations. The deluxe "75" series of transceivers offers a new standard of excellence from VHF to UHF communications. Each compact all mode unit delivers maximum performance, reliability and ease of operation.

The "75" series transceivers feature 99 tunable memories, twin VFO's, pass band tuning, I.F. notch, noise blanker and CW break-in. The scanning modes include memory scan, mode scan, programmable scan and frequency skip. These transceivers can be used in a variety of ways, for propagation experiments, satellite communications, moonbounce, D'xing or straight rag chewing contacts. When high speed digital systems such as PACKET or AMTOR data communications are used then the ICOM DDS system provides a lock-up time of just 5msec.

2 Meters

ICOM's 25 watt IC-275E is a superb transceiver for contest operating and for general DX working. This prestige

144MHz multimode is also available as a IC-275H 100 watt version, which requires an external AC supply.

70cms

Enjoy 430MHz operation with the 25 watt IC-475E, or go high power using the IC-475H. An optional CT-16 Satellite Interface Unit is available for combining ICOM "75" transceivers for easy tuning.

6 Meters/10 Meters

The 10 watt IC-575 covers 28-30MHz and 50-54MHz and includes the AC supply. Join in with the recent openings to the U.S.A. with this superb transceiver. Also to be released soon is the IC-575H 50/100 watt high power version, which will operate with an external AC supply.

With the introduction of the "75" series you now have all the technical quality you'll need to enjoy VHF and UHF communications. For more detailed information on these transceivers contact your local ICOM dealer or ICOM (UK) Ltd.

Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30. This service is strictly for obtaining information about or ordering Icom equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders. thank you.
Datapost: Despatch on same day whenever possible.
Access & Barclaycard: Telephone orders taken by our mail order dept, instant credit & interest-free H.P.



LETTERS

Letter of the Month

With the demise of the /A suffix to the amateur licence from the beginning of this year, I thought you might be interested in the following list of suffixes heard on 2m FM phone by me in 1988

"G6 . . . stroke portable static mobile"

"G4 . . . stroke A stroke P"

"G6 . . . stroke static portable"

"G6 . . . stroke portable static marine"

"G3 . . . stroke at home"

"G6 . . . stroke pedestrian mobile"

"G3 . . . oblique mobile static"

"G4 . . . stroke static mobile portable"

"G1 . . . stroke car-park mobile"

Enough to give one a stroke! So I hope that the "/" will now only be used in CW and that the suffixes mobile, portable and mobile-marine will be used directly after the callsign without the stroke on phone. Hoping this may be of interest and best wishes to HRT.

— C. J. Fairchild G3YY, Brighton, E. Sussex.

Suffix it to say that 2YY you be, G3YY. A similar list for Brighton just after the Great Gales should make interesting reading — "G3 . . . stroke marine static car-park"? Or "G6 . . . stroke pedestrian airborne"? Or let us suppose that the RSGB moves to propose a Household Pet licence to keep the numbers healthy . . . "G0 . . . stroke cat"? The latter OTs and YQs would certainly have to stick to CW. Next door's candidate can do "anybody home?" at 60 wpm on our cat-flap already.

Shall We JCB to 10m?

I am writing to tell you about a radio amateur friend of mine whose radio operations may be of interest to you and your readers because of the unusual station set up he runs.

Keith Russell G4RZQ lives on the Isle of Wight and drives a JCB "Backhoe" for a living. He operates only on 10 metres and runs a converted CB radio with 15 watts output and a CB antenna as a mobile station from his JCB. Not only have I monitored his operations from my own station, but I have also operated with him in his vehicle and have seen his log book so can testify that the information that I am giving you is true.

Somehow, his setup seems to produce very good signals and I have heard DX stations giving him 5/7-9 reports while only giving me 5/4-5 when working from my QTH just across the water from Keith, a distance of only 6 to 8 miles.

Some of the stations he has worked and are entered in his log include JAs (Japan), VKs (Australia), HL3s (Korea), HKOs (Malpelo Is.), HHs (Haiti), YJ8s (New Hebrides), and the stations J6LQG (St. Lucia), CP6XE (Bolivia), BY5RT (China), YC3OSE

(Indonesia), and YJ8NJS (Port Villa, Vanuatu).

In addition, Keith has worked a couple of airbourne amateurs, WD9BFW/Airbourne, on a flight between Heathrow and Texas, and KB2GJO/Airbourne, operator Sam, somewhere over the South China Sea.

Another phenomenon is his ability to make his antenna directional and increase its gain.

"How can a vertical dipole antenna have direction and gain?" I hear you say: Keith raises the mechanical bucket on the front of his JCB and turns the vehicle in the required direction. Raising the bucket on the JCB, the signal strength seems to go up a couple of "S" points.

Keith's radio activities, carried out during lunch breaks, have so much interested his foreman, Ian

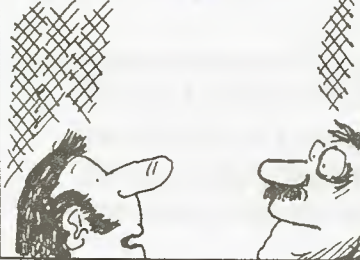


SOVELCH 8942

HAVEN'T HEARD
BILL ON LATELY.



NO....NOT SINCE
HE GOT THAT JOB
AS A
BEER TASTER!



NNNGG.... STILL CAN'T
REACH!!



Fleming, that Ian is a serious Short Wave Listener and is going to take the RAE himself in the near future.

Enclosed is a photo, taken by myself, of the JCB with Keith G4RZQ on the left, and Ian, SWL on the right.

— Brian W. Wells G0JEZ, Hayling Island, Hants.

I would say that Keith is having a lot of luck with his set-up . . . having several tons of ground plane (the JCB) and a freely rotatable resonator/reflector (the bucket) of the type that most of us can't fit in our back yards without the neighbours complaining. Has he tried Moonbounce with it? We're glad to hear that Ian is coming into the business. Perhaps, if he gets enthusiastic enough, he could set up as an amateur radio backhoe supplier! — G3YZW

Richer and Puzzled

Regarding the informative article by Chris Lorek (the Tatung TMR 7602 review) in the February issue of HRT, I was contemplating purchasing (as a raw beginner) the Realistic World Band receiver from Tandy, price £149. I shopped around after reading the review and found the SW5000 (Dixons, Saisho) selling at £99.95. Thus my £1.40 purchase of HRT saved me fifty pounds.

To improve reception I have installed a hundred and thirty-two foot wire. This has increased the signal level considerably but appears to have multiplied the interference enormously. Further to

this, the set operates better with the telescopic aerial fully extended and the external aerial plugged in (with the internal/external aerial switch at the InA position). Is this normal, or do I have a set with idiosyncratic abnormalities?

— F. Costello, Scunthorpe.

This is a reasonable thing to expect. The receiver simply cannot handle the signal from a long wire aerial, and it crossmodulates. Every strong signal beats with every other strong signal to produce sum and difference frequencies, and any which fall within the receivers range are heard. As far as I know, the best of the portables for strong signal performance is the Sony one, but none of them can beat a good "tabletop" model.

Setting the switch to internal aerial on your set allows just a little signal from the long aerial to break through and improve reception, without overloading the set. An attenuator could achieve the same result more controllably. If you still end up short of signal on some bands, a narrow preselector could help, by rejecting signals far from the wanted frequency. — G3YZW

Zepp Zapped

I was interested to see Fred Simmons' comments regarding the "Bonzai" aerial published in your March issue.

The aerials which he describes are very interesting but both are far larger than a typical "Bonzai" which is intended to give optimum results from a very small space.

In any resonant aerial design, the high voltage section of the aerial contributes very little to the overall radiation, so that extending the section beyond the coil would be of little assistance in this aspect.

The purpose of the multiwire section is to increase the overall capacitance, reducing the size of the loading coil and its losses, yet decreasing the Q of the system with consequent increase in bandwidth.

The twin wire section of the "upside down zepp" has probably much the same effect, although I would estimate that it contributes very little to the radiation, the main vertical component being a result of the connection between the ATU and the horizontal section.

— Brian Kendal, G3GDU

£10 FOR THE LETTER OF THE MONTH

You've got a gripe about the bandplans, or you're sick of being wiped out by next door's microwave. Or maybe you've been bowled over by the excellent service from your local radio shop.

Whatever you've got to say about amateur radio say it here in the letters column and you could win yourself £10 for writing the letter of the month.

Sent your epistles to: Letters Column, Ham Radio Today, ASP Ltd, Argus House, Boundary Way, Hemel Hempstead, Herts HP2 7ST.

Packet Radio

Roundup

First of all, my thanks to all out there in HRT land for your kind messages received over the packet network. It appears this feature is going to be very popular. I have recently moved house, with the first priority of course to place the VHF and HF packet stations on air (my carpets and curtains are still not in . . . good job I have an understanding family who realise the meaning of priorities!). Moving from one side of the country to another has shown that different areas have different problems on packet, although all of them stem from packet's sheer popularity.

Network Congestion

In most areas of the UK, the 2m frequency of 144.650MHz is buzzing with activity day and night. For the sleepless amateur there is always a BBS (Bulletin Board Station) to 'connect' to in the early hours of the morning, or the TNCs of other amateurs. However, for real time one-to-one communication things can get very slow, and sometimes grind to a halt. Much of this is caused by BBS forwarding and listing activities, as well as 'DX Chasing' through network nodes currently linked on 144.650MHz.

As we detailed in the recent *Beginner's Guide to Packet Radio*, there is certainly light at the end of the tunnel. Interlinking between nodes on 1296MHz using a high data speed of 9600 baud is planned for many areas; in the Midlands one port on a network node already exists on the national trunking system. Yours truly is also planning to run the net nodes on 2m, 70cm and 23cm to aid forwarding from my three local BBS stations. Once the bulk of traffic in busy areas is shifted away from 2m, much of the congestion should reduce. Remember, societies such as the RSGB do NOT pay for the TNCs, transceivers, site and electricity costs for these services, so you know what the moral is if your local group is trying to raise funds!

Another service which is often provided by the generosity of individuals is the BBS. I recently visited the sysop of my local BBS, with his computer, hard drive, twin TNCs linked to separate transceivers on 2m and 70cm, not forgetting the outdoor aerial system, all in permanent use for the service of local amateurs.

Chris Lorek G4HCL reports on the latest Packet Radio scene

Remember that a quick message of thanks never goes amiss!

9600 Baud Modem

Last month I revealed that the G3RUH modem is now available in chip form, allowing it to fit inside a standard TNC case. The latest is that the packet radio TNC manufacturers Pac-Comm have purchased the rights. The result is that a commercially produced unit is now available off the shelf for the packet radio addict as well as public spirited groups who intend to set up links on 1296MHz. Remember that this system employs direct modulation of the transceiver's oscillator, and so *does* require you to go inside your rig!

Portable Packet

I recently had great pleasure in using what must be the world's smallest TNC, the Telereader TNC-u21. Measuring 20mm x 60mm x 100mm, it has a built-in NiCad power pack, sockets and leads provided for direct connection of a 2m of 70cm handheld, and a 25-way RS232 connector that just about covers the rear panel! A built-in mailbox is provided, and the unit is TNC-2 compatible. This means that a *complete* packet station may be fitted into your pocket, linked to one of the many handheld terminals such as a Psion Organiser. I have used it successfully now for a couple of weeks linked to an FT411 handheld and Z88 laptop computer. It is currently only available abroad; in the USA, for instance, it is marketed as the Heath HK-21 Pocket-Packet at \$219.95, but could this be the *next* generation of TNCs in the UK? If demand warrants it, an exclusive HRT review will follow!

TheNode

As well as the numerous KA-Nodes in use, together with formal Network (NetROM and TheNet) nodes and several Digicom nodes using Commodore computers, yet another node has been unveiled. The latest here is 'TheNode', a

copyrighted program written by G8BPQ with a facility to link several RF ports as well as a BBS system. Regular users of NetRom and TheNet nodes will find it is broadly similar to these apart from the requirement of prefixing your ongoing 'Connect' request with the desired Port number, in the form:

C 'Port number' Call eg "C 1 G4HCL will send a Connect out on port 1."

To check available ports, use the command 'P'.

Once connected to TheNode, to connect onto the first free BBS port, simply type 'BBS'.

Other commands are:

- USERS or 'U' - lists other users connected.
- INFO or 'I' - gives a short information text.
- NODES or 'N' - lists other known Nodes (no port no. required).
- ROUTES or 'R' - list of direct routes.
- LINKS or 'L' - gives current links to TheNode in use.
- STATS or 'S' - list of Frames TX, RX, etc.

Upgrades

In view of the recent requirements for periodic CW indents and third party message inhibit on PBBSs, a note of caution to amateurs who are sending eproms in the post for re-programming upgrades would not go amiss. If you stick your old eprom in an envelope with the legs pushed into a piece of foam, the Post Office automatic sorting machine will flatten it nicely, perforating the envelope with the sharp IC pins, resulting in a lost IC and possible personal injury and sorting machine damage. If you *do* send ICs through the post, make sure you use a length of one of the plastic IC tubes or put the IC in a non-crushable box. One UK TNC retailer tells me he has a lovely pile of empty envelopes that once held eproms!

On the hardware front, as well as the new TNC 325 (re-named from the TNC 225) which I hope to review next month, the latest news is that the Kantronics KPC-4 has dropped substantially in price. This is a dual-port TNC with simultaneous



1989 Data Symposium

This annual RSGB event has now been re-scheduled (due to a double-booking error) to a different date and venue. The latest information is that it will take place at the University of Surrey in Guildford, run jointly with the AMSAT-UK Satellite Colloquium over the 28-30 July. The first day will concentrate on Data, the second on combined Data/Satellite activities (the two having much in common), and the third on satellite subjects. If any data whizz-kids out there would like to contribute a paper at the Symposium, I'm sure Mike Dennison G3XDV at the RSGB headquarters would like to hear from you.

End of Message — CTRL-Z

I'm always pleased to hear from readers of this column, if you'd like a mention given to your group's activities, or want to air your news in the world of packet, I can be reached via the network with a message routed to G4HCL @ GB7XJZ, or via Prestel Mailbox 011138096. If you prefer pen and ink, then letters addressed to Chris Lorek, c/o HRT Magazine at the editorial address will also get to me, but please note that my callbook address is *not* correct. Till next month, 73 de G4HCL.

operation facility, which could be of interest if you're thinking of expanding your packet station by adding a further

port on 70cm, 6m or whatever, or wishing to run a node, gateway and personal maildrop without tying up your computer.

C.M. HOWES COMMUNICATIONS



Mail Order to: **EYDON, DAVENTRY
NORTHANTS NN11 6PT
TEL: 0327 60178**

BUILD A RECEIVER!

Building your own receiver is one of the most satisfying aspects of amateur radio. Nothing quite beats the thrill of hearing stations from far away on a set you constructed yourself. The first contact on a homebrew transmitter comes a close second though! Fortunately we offer kits for both, but it's the receivers' turn to be featured this month:—

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER

The *HOWES DcRx* series of receiver kits offer amazingly good performance for simple, easy to build equipment. These receiver kits have made an excellent introduction to amateur radio for many newcomers, as well as providing the basis of a QRP station for thousands of licenced operators around the World. These are single band receivers, and as such avoid complexity and expenses, whilst offering very pleasing results for both SSB and CW reception. Versions are available to cover the 20, 30, 40, 80 and 160m amateur bands, plus a 5.4MHz HF airband variant. A case and a couple of tuning capacitors are the only major parts you need to add. We can supply suitable capacitors at £1.50 each for all but the 160M version. The DcRx receivers can form part of a transceiver in conjunction with one of our transmitters, and there are many other interlinking modules that can be added as you built up your station.

DcRx Kit: £15.60

Assembled PCB: £21.50

MBRX H.F. MARINE BAND COMMUNICATIONS RECEIVER

The *HOWES MBRX* is a more sophisticated Direct Conversion receiver offering full coverage of the HF marine band from 1.6 to 3.95MHz, including the 80 and 160M amateur bands, international distress frequency, coastal stations etc. Additional features include a switched RF attenuator, RF amplifier stage, two stage active filtering, fine tune control, and an AGC system. As with the DcRx kits, up to 1W audio output is available for loudspeaker or headphones. Two 365pF (or 500pF) tuning capacitors are required. This kit will enable you to build an SSB and CW receiver with good facilities and performance at a sensible price.

MBRX kit: £29.90

Assembled PCB: £44.90

TRF3 SHORTWAVE BROADCAST RECEIVER

This little set is designed principally for AM Broadcast reception, but SSB and CW signals can also be resolved with a little careful tuning. Frequency coverage is 5.7 to 12.8MHz in three switched bands. This gives reception of the busiest part of the shortwave broadcast spectrum, plus 30 and 40M amateur bands. The set features a switchable input stage that enables very short antennas to be used as well as full size ones. This kit is a very popular present for the 'junior op', and has good educational value as well as being great fun to build and use. A suitable 50pF tuning capacitor is available at £1.50.

TRF3 Kit: £14.80

Assembled PCB: £20.20

NEW! — ACTIVE ANTENNA

AA2 ACTIVE ANTENNA KIT

Surprising as it may seem, there is no need for large receiving antennas at frequencies below 30MHz. Good results can be obtained by using the new *HOWES AA2* active antenna kit and just a few feet of wire or metal rod. The AA2 can be used with a single wire or a miniature dipole, indoors or out and covers 100kHz to 30MHz applications. Direct or coax powering can be used, and there are two selectable gain settings. Ideal for use with a 'black box' general coverage receiver or one of our kits!

AA2 Kit: £7.50

Assembled PCB: £11.50

If you would like more information on any item, or the rest of our range, simply drop us a line enclosing an SAE. We have an information sheet on each kit, plus a catalogue showing the full range.

All *HOWES KITS* come with full clear instructions, good quality PCB, and all board mounted components. Delivery is normally within 7 days. Please add £1.00 P&P to your total order value.

73 from Dave G4KQH, Technical Manager.





Listening On...

HRT's wandering ear catches some programme information from English language stations across the globe.

In the February *Listening On . . .* we gave the winter times and frequencies of many international broadcast stations' programmes in English. As this is being written the weather outside is still rather wintry, but we change our clocks to summer time on 26th March and many broadcast stations take the opportunity of revising their programme and transmission schedules on the same date. This time, however, very few of them have sent me the required details in time for the *HRT* deadline, so instead we take a look at some of the *programmes* you can expect to hear on these stations that have sent out their information in good time.

Until a year or two ago, anyone tuning in at random to a short-wave broadcast in English for the first time would probably not have stayed tuned for very long. Many of the programmes were exceedingly boring. Some stations have hardly changed today from the dark days of the cold war, and Radio Tirana is perhaps the best example. This station now actually has a cult following, mainly among students and "trendy intellectuals", who find feature programmes such as "The Marxist-Leninist Movement Throughout the World is Growing in Scope and Strength" almost surrealistic. However, many other stations have improved their programmes dramati-

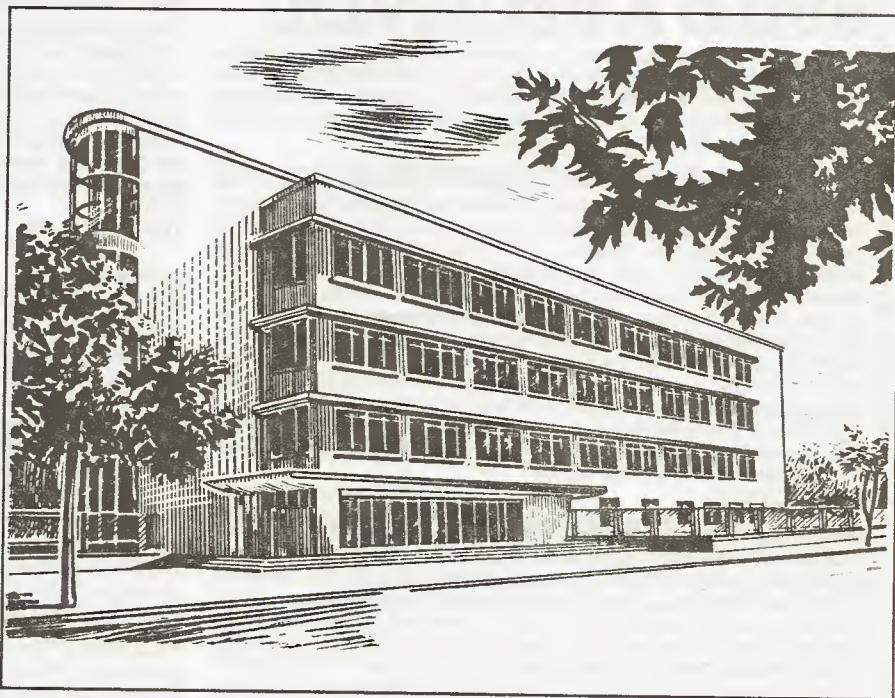
cally in recent years, and one of the first to do so is Radio Beijing which, incidentally, used to be relayed by Radio Tirana for listeners in Europe and the Middle East in the old days.

These days, Radio Beijing is relayed instead by Swiss Radio International and Radio France International from transmitters in both France and French Guiana, South America. More recently, Radio Moscow's programmes have undergone a subtle change. The old hard-sell

propaganda is out, and a more "friendly" style of presentation and content is in. Radio Moscow's World Service in English, which has been broadcasting 24 hours a day for several years now, was joined on 1st January by a Radio Moscow World Service in Russian, intended mainly for the growing number of people learning Russian, but also for Russian emigres and seamen etc.

In addition to the World Service in English, though, Radio Moscow still has its regional programmes, for listeners in Africa, North America and of course Great Britain and Ireland. The British service is one which shifts its timing depending on local summer or winter time, so in the winter months it is at 2000-2100 GMT, while in the summer it is broadcast one hour earlier.

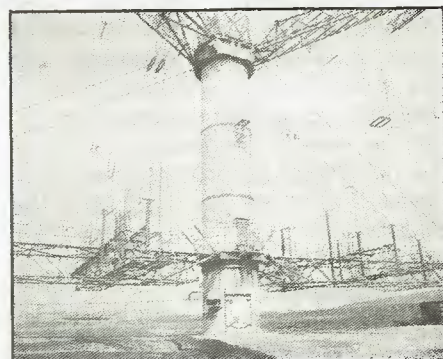
In addition, news in brief is broadcast daily at 1930 and *In the News Today* (an analysis of the latest news developments) just before the close of



Pen and ink drawing of Radio Tirana's Broadcasting House.

Radio Moscow British Service — Some programmes

News	1900 GMT daily
Observer's Commentary (an analysis of some major development at home or abroad)	1910 GMT Mon Wed Thu Fri
Glance at the British scene (developments in Britain as seen from Moscow)	1910 GMT Sat
Commentator Answers Listeners' Questions (an answer to some thought-provoking questions from a listener)	1910 GMT Sun
European Reporter (a discussion programme on issues of European importance)	1910 GMT Tue
Vantage Point (Moscow viewpoint on major developments, presented by political commentator Boris Belitsky)	1925 GMT Mon Fri
Soviet Panorama (the Soviet scene and Soviet-British exchanges)	1935 GMT Wed
Moscow Mailbag (your questions answered, whatever the subject)	1935 GMT Sat Sun
You Write to Moscow (ongoing correspondence with listeners)	1935 GMT Mon
Request Concert	1935 GMT Thu
Round About the Soviet Union (visits to various parts of the country)	1940 GMT Fri



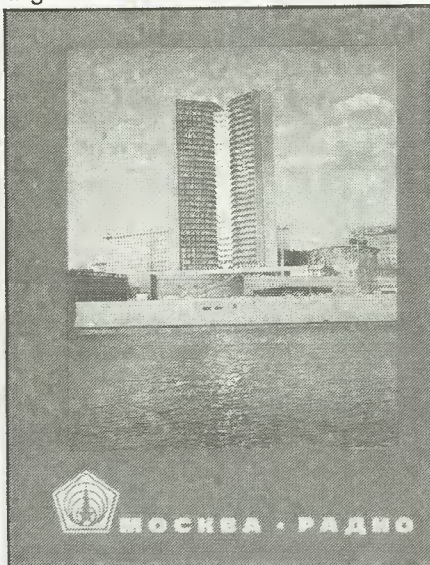
The Voice of Turkey's impressive new rotatable antenna system at the Cakirlar transmitter site near Ankara. The whole structure rotates and can complete a 180° turn in three minutes.

the broadcast at 2000 GMT. There are also occasional programmes specifically for Irish listeners, folk music programmes, science and engineering features and so on. Listen on 1143, 7240, 7250, 9450, 9685 and 9740 kHz.

Radio Moscow's World Service has similar programmes to the British service, with a ten minute news bulletin on the hour, every hour, and a short news in brief on the half-hours. Programmes are rather more general, however, with features explaining the thoughts behind Perestroika, or "restructuring", and more music features, especially from the various Soviet Republics.

Radio Australia's 24-hour a day English-language service is best heard in Britain at 0700-1030 GMT on 9655 kHz, although it is sometimes also heard in the afternoons and evenings on 6035 and 7205 kHz (Radio Australia's schedule suggests these frequencies between 1530 and 2030 GMT). Generally speaking, though, co-channel interference and

splash from stronger European stations only 5 kHz away makes listening at those times difficult.



Radio Moscow World Service and British service can both be heard with English language programmes. This QSL shows the Council for Mutual Economic Assistance building in Moscow.

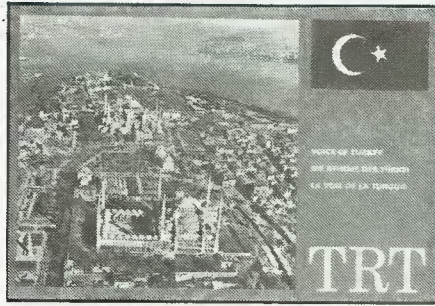
We have dealt so far with two of the largest international broadcast stations, albeit with very different styles of programming. One much smaller station which has an enthusiastic band of listeners is the Voice of Turkey. Despite being a comparatively small station it broadcasts in quite a few languages of neighbouring countries, such as Greek, Albanian and even Azerbaijani, and has recently added broadcasts in Chinese to its schedule. The Voice of Turkey's English-language programmes are quite varied and interesting and can be heard between 2100-2200 GMT on 9825 kHz and again at 2300-2400 GMT on 7160, 7250, 9445 and 9680 kHz. The broadcast opens with the news, followed by different features on different days of the week.

Every year, the Voice of Turkey organises an essay contest, the prize being an all-expenses paid trip to Turkey. In 1988, there were only 156 entries, and five prize-winners, so you would stand quite a good chance of winning if you entered. The topic is announced in the broadcasts, so you

have to listen to stand any chance of getting a free trip! Generally speaking, the Voice of Turkey is received at excellent signal strength, thanks to their two 250 kW and two 500 kW transmitters, 500 kW being just about the most powerful transmitters in use on short wave anywhere in the world at present. At the end of 1987 they put into operation a new revolving antenna system at their transmitter site at Cakirlar, Etimesgut, about 17 km from Ankara. It is 46 metres high, 80 metres in diameter and weighs in at some 170 tons, and with 500 kW going into the antenna, the erp is several Megawatts, so it is perhaps not surprising that such good signals are received from the station.

Some DX Tips . . .

With the improvement in propagation conditions caused by the upturn in the sunspot cycle and, co-incidentally, the reduction in interference problems thanks to the decision of the USSR and several other countries to cease jamming of Radio Free Europe, Radio Liberty and certain other Western broadcasters, reception of rare DX stations has become somewhat easier of late. Thanks to those sunspots, the 11 metre band, long neglected by broadcasters, has once again sprung into life, with Radio France International, BBC World Service, Radio Denmark, Radio Norway International and others once again using this band. However, even higher frequencies are propagating right up to (and probably



The magnificent Blue Mosque in Istanbul, with the Bosphorus in the background.

even beyond) 30MHz — my receiver will not tune any higher than this! Kazakh Radio's second programme, in Kazakh, is audible almost daily on 29800 kHz, this being the fifth harmonic of 5960 kHz.

When conditions allow, the upper part of the 10 metre amateur band has been quite full of harmonics of

broadcast stations, mainly coming from Soviet Central Asia. At the other end of the frequency scale, though, one station which has been very difficult to hear for many years has recently made an appearance again. This is the regional station at Bukavu in Zaire, which broadcasts in Swahili and French on a frequency varying between 4843 and 4846 kHz. The station identifies itself in French as "Office de Radiodiffusion-Télévision Zairienne, station Bukavu" and has been heard around 0430 with a news broadcast in French, and also occasionally at sign-off around 1830 GMT. When looking for this station, beware of the more powerful Nouakchott, Mauritania on 4845 kHz: this also broadcasts in French from time to time, but is mainly in Arabic and the music broadcast by the two stations is quite different.

Voice of Turkey — English Language broadcasts

Saturday: "Outlook" followed by "DX Corner" alternating with "From Turkey with Love".

Sunday: Turkish-Greek relations in the past and today, followed by "Oldies but Goodies"

Monday: "Turkey: A Secular Country" (about the influence of Islam in Turkey today)

Tuesday: A feature about Ataturk (the "father of modern Turkey") followed by "Turkish Artists of International Fame" and "Turkish Album"

Wednesday: Letter-box

Thursday: "The Turkish Constitution and Constitutional Institutions" followed by "What Do You Know About Turkey?"

Friday: "All About Turkey followed by "Turkish Cuisine"



The gate of heavenly peace, as depicted on a Radio Beijing QSL card.

Also in the 60 metre "tropical" band, "RFO Guyane" from Cayenne, French Guiana, has been heard often recently in the early mornings around 5055 kHz. When not carrying its own local programmes, this station relays a satellite feed of France Inter, so if you have two receivers you can check your catch against 62 kHz long wave — the Guianian station should be delayed by a fraction of a second. France Inter is also relayed for long periods by "RFO Tahiti" which can sometimes be logged in Europe on 11826 kHz around 0700 or 0800 GMT.

Finally, another station which had disappeared for a long while has also recently made a re-appearance.

This is the "Voice of Free Sahara", a clandestine operation believed to be coming from a transmitter in Algeria. It broadcasts in Arabic between 2200 and 2300 GMT on 15215 kHz, although apparently only irregularly. The "Sahara" that they are trying to liberate is the Western Sahara, that part of West Africa formerly belonging to Spain and now occupied by Morocco.

Schedule changes

I have received a schedule from Radio RSA in Johannesburg, which gives their transmission schedule for the summer months. Interestingly, they are again expanding their broadcasts and are now on the air daily between 1100-2100, except for a break between 1600 and 1800 GMT. Not all of this period is specifically beamed to Europe, but the frequencies used suggest that the broadcasts should be well heard here: 1100-1200 on 21535 and 21590; 1200-1300 on 21590; 1300-1400 on 17755 and 21519; 1400-1600 on 17755, 21590, 21670 and 25790; 1800-1900 on 17795 and 21535 and 1900-2100 GMT on 17795 and 21590 kHz. Note the use of 25790 kHz in the 11 metre band, which so



Radio Netherlands' evening English transmission at 1830-1925 GMT is no longer broadcast from transmitters in Holland to listeners in Europe. It has proved easier to hear their relay stations on Bonaire and Madagascar!

Radio Australia — morning reception

World and Australian News	0700-0713 and 0900-0913 GMT daily
Window on Australia (looking in on people and places all over Oz)	0713 GMT Mon-Fri
AgriNews (agricultural programme)	0713 GMT Sat
You Asked For It (answering listeners' questions about Oz)	0713 GMT Sun
Feature programmes — a different feature programme every day of the week broadcast between 0730-0800 and 0930-1000 GMT. Especially recommended are "Communicator" 0730 Sun and "Taim Bilong Masta" 0730 Thu repeated 0930 Sun. The former reports on the latest developments in communications and DX news, the latter traces Australia's involvement in Papua New Guinea over more than 100 yrs.	0730 GMT daily and 0930 GMT daily
International Report (background to, and interpretation of, regional and global issues, including correspondents' report)	0800 GMT daily and 1000 GMT daily
Propagation report (latest news of sunspot groups, "A" indices and propagation forecast for next 24 hrs.)	0827 GMT daily except Sun
Sports Results	0830 GMT daily
Music of Radio Australia ("live" presentation of middle-of-the-road music, with weather reports around the country)	0845 GMT daily and 0913 GMT Mon-Fri
Boomerang (your enquiries about Radio Australia answered)	0913 GMT Sat
Book Readings (serialised readings from popular books)	0913 GMT Sun

far has proved to be an excellent frequency; I expect we will see more stations using this frequency band soon.

Another small station which has been very difficult to hear in Europe until fairly recently is RAE, Radio-difusion Argentina al Exterior, in Buenos Aires. They have recently changed their schedule and now broadcast to Europe at 2200-2300 on 15345. The programme is in English, except on Tuesdays and Thursdays, when it is in German for some reason. RAE also broadcasts on 11710 and 9690 kHz, frequencies which have not been changed for more than 20 years, but due to

transmitter problems they can only use one frequency at a time at present. On Wednesdays at about 2235 there is an amusing mailbag-type programme, which sounds entirely unscripted, with the presenter ripping open envelopes and attempting to read out the letters at first sight.

Finally this time, fans of Radio Netherlands should note that they have given up the fight of attempting to put a good signal into Europe for the 1830 English-language broadcast. They no longer use the Lopik site in Holland for this programme, but listeners in Europe could try on 17605 or 21685 from Bonaire or 15560 from Madagascar.

FILL IN THE GAPS

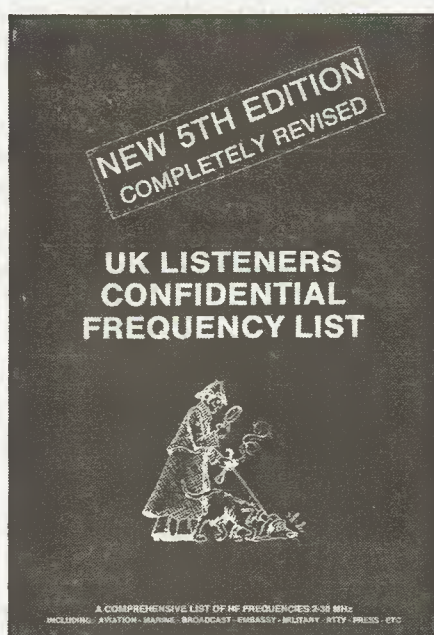
Chris Lorek G4HCL reviews a set of guides to the "other" bands.

Nowadays, many HF transceivers have general coverage receive as standard, but what goes on in the frequency ranges between the amateur bands? Some may say, "Some broadcast stations, and besides that not a lot", others could say "Lots of funny noises, and the odd fish-phone station". After spending a large amount of money on such a transceiver, or a general coverage HF receiver, the novelty of tuning around the bands often wears off, and the set stays put on a few broadcast frequencies or the amateur bands.

But have you ever wanted to know what Concord pilots talk about half-way across the Oceans, or what tomorrow's weather map is going to look like? Many amateurs already have the gear, all they need to know is what to do with it. Many all-mode terminal units, ie AMTOR/RTTY/ Packet/WEFAX decoders, used by forward-thinking amateurs of the future, are capable of receiving many other signals apart from those originated by amateurs!

Scanner Owners Start Here

If you're an aircraft buff, sometimes visiting observation platforms at airports or going to air shows, you'll undoubtedly either own, or be considering the purchase of, an airband receiver. The scanner type is the more popular amongst serious enthusiasts, and rather than search the entire frequency band for signals, storing these in memory channels as required with one of the many frequency listings available could save a



lot of time. Alternatively, you may wish to find out which sections of each frequency range covered by your multi-band scanner are allocated to which types of users, such as Marine VHF, Airband Navigation and the like. Here we detail one or two books that may be of use.

Don't End Up Inside

It must be remembered that it is often illegal to listen and/or make use of information from certain non-broadcast stations, the rules often depending on which country you live in. Our North American readers for example have different laws to those of our Eastern European readers. In the UK for example, one can obtain a

letter of authority to receive off-screen Weather Fax pictures for your own personal use, and listening to aircraft communications is often tolerated without a fuss, however tuning into your local Embassy or Military frequency (and especially telling everyone about what you hear later on) could bring about an undesired result! So please don't take comments expressed here as to the content of these books as an invitation to break your law; if in doubt check first.

UK Listeners Confidential Frequency List

This book, currently the most expensive of those detailed here at £6.95, is in my opinion worth every penny to the active HF listener. I've had a copy of this book from the very first issue many years ago. The latest issue covers the frequency spectrum of 2MHz-30MHz, with a comprehensive listing in frequency order of a large number of broadcast and non-broadcast stations to be found within this spectrum, with each frequency band detailed according to its use. For instance, 3500-3800kHz is shown as amateur, with spot non-amateur frequencies within this range detailed with the user and mode of operation. Taking the example of 3737kHz, this is shown as being used by Kalingrad on CW with the callsign UJY, to explain the strange reply to your CQ call on that frequency last week. Further up, in the band 3800-4000kHz we see that you can find the AM transmissions of the BBC on 3955, 3970 and 3975, with adjacent transmissions from other users on modes such as SITOR, FAX and so on being detailed as appropriate to explain what the weird noises we

sometimes hear on the bands really are.

At the beginning of the book, several pages explain to the beginner what to look for in a receiver, such as an RF gain control, attenuator, slow motion tuning, slow/fast AGC and so on, and an explanation of what these do. A selection of commercial receivers are described together with simple aerial construction details. Finally, modes of operation such as RTTY, facsimile and the like, together with users such as marine and aeronautical services, and the many unusual transmissions such as 'Numbers' stations are described. At the end of this 150 page A4 sized book are several personal log sheets to help you keep a record of your listening activities.

Pocket Guide to RTTY and Fax Stations

This A5 size guide lists details, in order of operating frequency, of data communication stations operating in the HF spectrum, with RTTY, SITOR, ARQ, and FAX stations in a similar manner to the previously detailed guide. Priced at £2.95 with 46 pages, it would provide a useful guide next to the receiver and terminal unit for those mainly interested in these forms of digital communication.

HF Oceanic Airband Communications

This 29 page guide is of particular interest to the airband enthusiast who wishes to expand a little further

afield than line of sight VHF range, giving details of HF airband usage over the 2MHz-23MHz range. The frequency listings are very similar to those contained in the *UK Listeners Confidential Frequency List*, but with a very readable introduction section detailing HF airband communications, search and rescue operations and so on. The inertial navigational, Selcall and Volmet Systems are described, with suggestions for plotting aircraft co-ordinates at home. Again, details on typical receivers to be found on the market, and simple aeriels are given, but with special reference to their use and suitability for airband reception. This publication is A4 and is priced at £3.95.

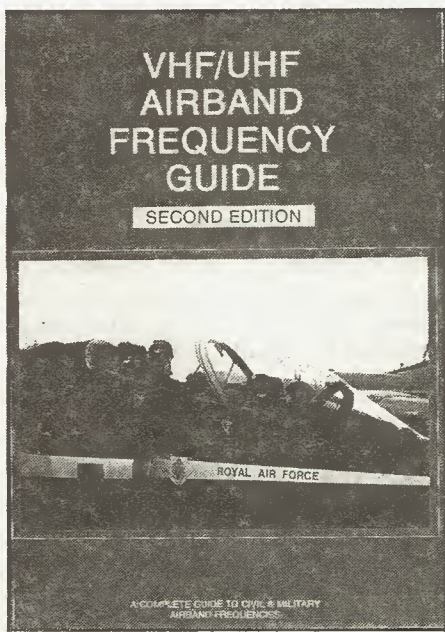


Again, a readable introduction section is included, with details of modes of transmission, channel spacings, typical commercial scanners and wideband aeriels for the VHF/UHF spectrum. The book is A4 size and is priced at £5.95. I feel that as with its HF counterpart it would provide an invaluable companion to the active VHF/UHF amateur or listener, again I've had a copy of this book from the very first issue many years ago.

VHF/UHF Airband Frequency Guide

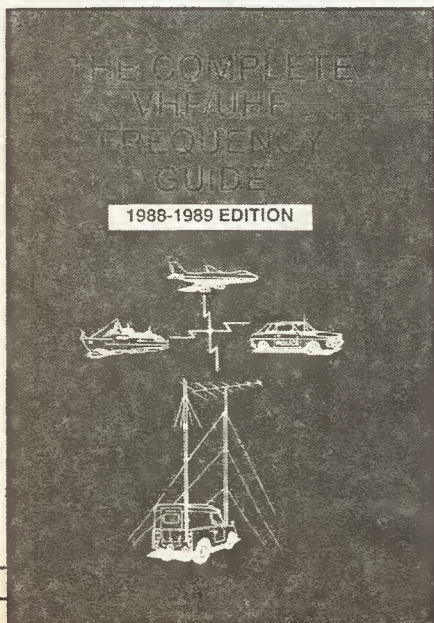
This publication could easily be described as a complete listening guide; as well as detailing the frequency bands channel by channel, just as the *Complete VHF/UHF Guide* contains in its aircraft band sections, it gives frequencies and their use for each individual control site location, hence simplifying what would otherwise be a long search through many pages of listings when visiting a particular air show. Details on receiving airband signals, receiver requirements, aeriels and so on are given, with typical airband receivers detailed. A further chapter on airport control and information, radar, Volmet, company frequencies, ground services, aircraft circuit patterns and the like follows, with such abbreviations as VFR, VMC, IFR and IMC explained. This 101 page guide is again in A4 format, and is currently priced at £5.95.

My thanks go to Waters and Stanton Electronics for the loan of the above publications.



The Complete VHF/UHF Frequency Guide

This 87 page book gives details of band use over the range 26MHz to above 47GHz, although it must be admitted that not too much is likely to be received at the upper end of this frequency range! The allocated UK use of each individual band segment is described, and in many instances channel-by-channel details are given, for example in the CB, amateur, terrestrial and satellite TV, marine and aircraft bands. Complete details are given of the amateur band UK repeaters, and international amateur beacons likely to be received in the UK, making this a useful amateur radio guide as well.



70cm DIPLEXER

*A simple diplexer for 70cm broadcast use
by G Packer, G3UUS*

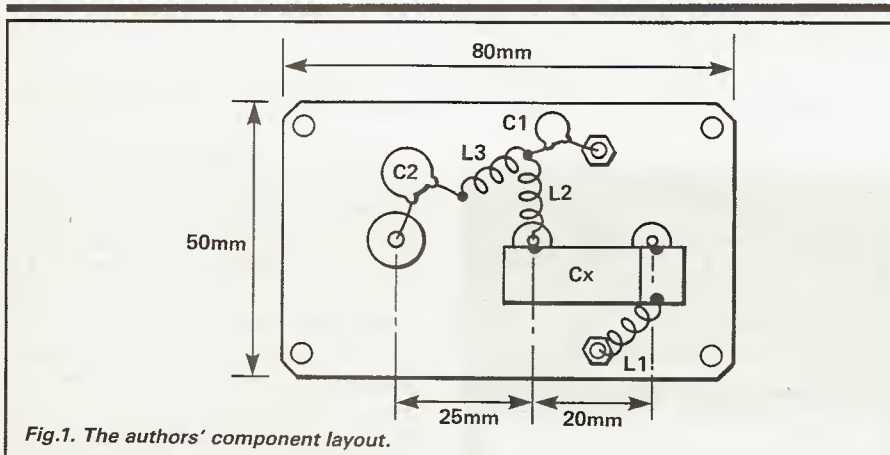


Fig. 1. The authors' component layout.

Since the acquisition of a new car with FM radio, the 'BC' output of my 2m/10m/BC multiplexer has been of little use.

This simple diplexer allows the use of a 5/8 over 5/8 70cm collinear (physically around 90cm long) for 70cm and all the broadcast bands from long wave to VHF/FM.

Construction

Anybody building this is advised to follow up the UHF part of the diplexer construction closely, but any small suitable enclosure may be used, and the sockets changed for those that match the builder's other equipment. SO239/PL259 connectors are NOT advised at UHF (even though

some 70cm rigs come with them fitted as standard — BNC and N-Type are always preferable.

Installation and Testing

Unlike the previous unit for 2m/10m/BC, this diplexer requires no setting up and is easily reproducible by any amateur with the minimum of tools. After installation it may be advisable to check the VSWR if an accurate UHF VSWR meter is available (most of the cheaper VSWR meters give up around 200MHz), but units built to date have shown no measurable degradation of the VSWR and less than 0.1dB through loss to the transmitted signal.

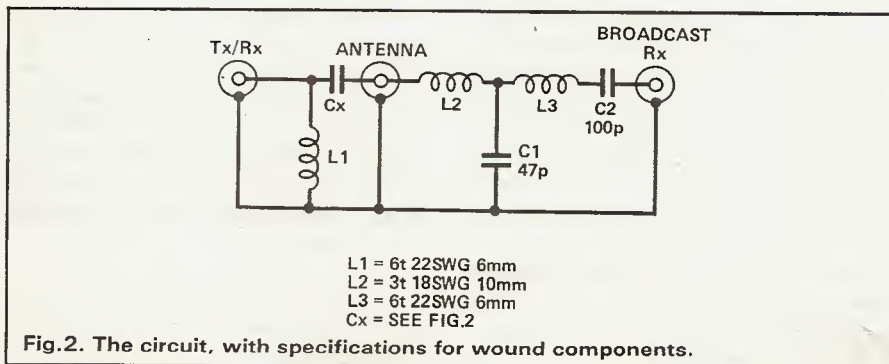
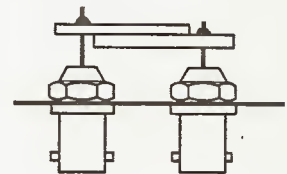
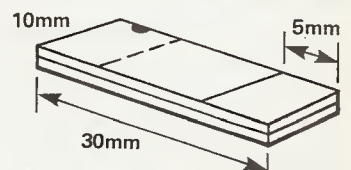


Fig. 2. The circuit, with specifications for wound components.

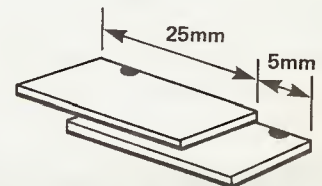


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(ANT)



SOLDER ON BOTTOM
(L1, Tx/Rx SKT)

5mm OF Cu REMOVED EITHER END,
TOP AND BOTTOM



2 SLIPS OF SINGLE-SIDED
PCB SUPER GLUED TOGETHER

Fig. 3. Methods of constructing Cx.

Warning

Cx is constructed by Supergluing two slips of single sided PCB board together. (Epoxy resin can also be used, if you can wait long enough for it to cure.)

Superglue heated by a soldering iron produces extremely irritating fumes that affect the eyes and nose, so solder the PCB boards at arms' length with a slight airflow away from you.

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VRS ANTENNA

Richard Q. Marris G2BZQ rigs an "invisible" indoor/outdoor aerial — over the ceiling or out of the window.

antenna is physically about $\frac{1}{8}$ long, but it is, in fact, capacitive linear loaded by virtue of the core-to-core capacity of about 13.2 pf/meter (ie 132 pf total). The far ends of the ribbon cable are shorted together and suitable plugs fitted to the twin core ends at the ATU. One core is connected to the ATU L-match, and returns to ground at the ATU — the antenna is folded back.

Try Alternatives

The L-match ATU consists of inductance L, a good quality 500pf airspaced variable capacitor C1, a series high voltage 350pf ceramic capacitor C2, all in a metal screening box with suitable plug and sockets. C1 could be 250/350 pf. L1 is made from a 3m (7.5cm) length of $\frac{1}{2}$ o/d ABS plastic waste pipe, onto which are wound 20 close turns of 1x0.6mm PVC covered wire (1.2mm o/d) 1 Kv, the winding being about 2m (5 cm) wide. A short length of RG58 coaxial feedline connects the ATU to the Tx which has a pi-network output. 15 feet of stout flex is connected from the ATU to a metal waterpipe.

Bearing in mind that the antenna can be erected in a few minutes, it is a good idea to experiment with alternative physical configurations, but at all times keeping the antenna as far as possible from walls, ceiling, wiring, metal pipes etc. Outdoors; keep it as clear and as straight as possible.

High Tx power is not advisable

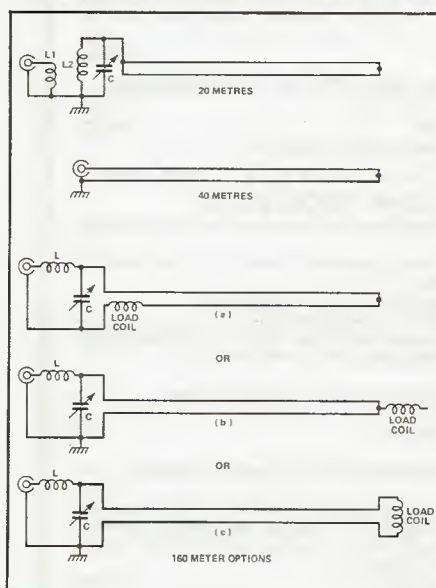


Fig.3. The VRS on different loads.

VRS stands for a Very Restricted Space antenna designed for use, indoors, in any room. It can, of course, be used elsewhere, such as outdoors under the eaves, in a postage stamp size backyard or garden; simply hanging out of a window. It should, therefore, be of interest to that largely ignored ethnic majority of HF Tx-ers who have antenna space problems — or official restrictions.

Though specifically required for 80 meters CW, it can also be used on 20, 40 and 160 meters (and no doubt on other HF bands) by simple matching/loading changes. Details later.

Zig-zag on the Line

The first configuration used was a zig-zag diagonally across the room, achieved by running two lengths of

fishing line from opposite corners, with the antenna attached between these lines, to an overall physical length of about 10 feet (3.3 meters). This compacted antenna was easily loaded and worked quite well. It had a pronounced figure-8 radiation pattern. It would be useful in the UK in a very small room, where it could be run roughly north-south to give maximum radiation east-west.

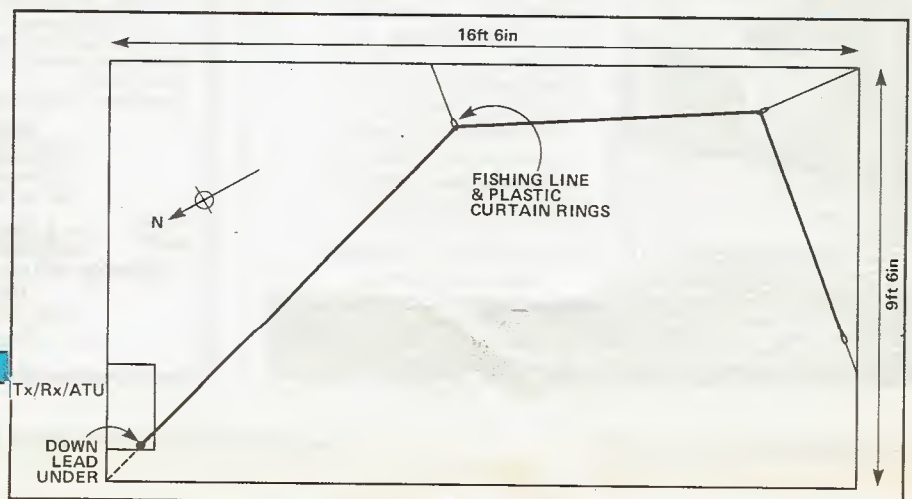
Figure 2 shows the layout ultimately used. The antenna sweeps around in an approximate arc, with a drop down to the ATU at one end and a short drop down at the far end to facilitate adding 160M loading coils later.

The antenna position relative to a compass bearing is shown, and it appears to be omni-directional apart from some signal fall-off ex NNW, which may be due to buildings.

The antenna is fed through plastic curtain rings supported by lengths of nylon fishing line. These rings facilitate simple free running erection, without twists in the cable, which occur otherwise.

It will be seen that, on 80M, the

Fig.2. The layout used at the author's QTH.



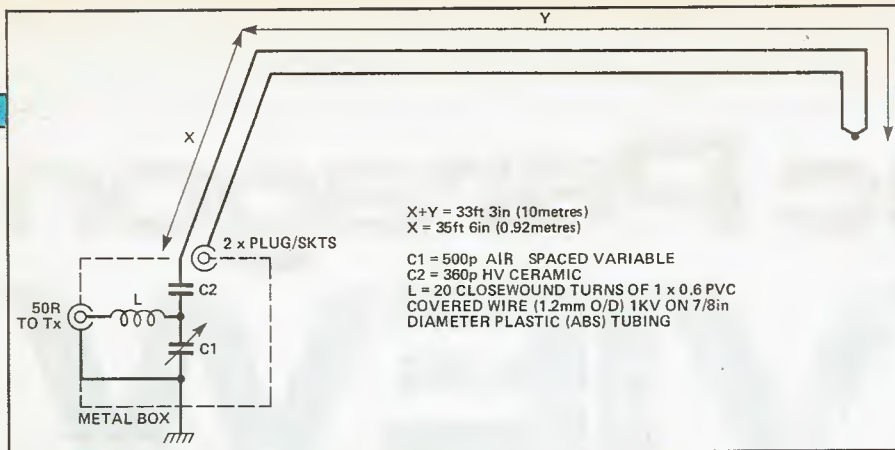


Fig.1. The VRS antenna — 80 metre version.

indoors, for safety reasons, but 10/15 watts CW will be adequate to work some DX. By setting up the ATU/Tx at 3550 kHz, it has been found that C1 requires no further adjustment between 3500 and 3650 kHz. A small adjustment is required 3650 (to 3800 kHz).

Other Bands

Using the same flat twin antenna (see Figure 3) you can work 20 metres. By shorting both ends of the 300 ohm ribbon feeder, the VRS works as an end-fed antenna with a suitable ATU. 40 Meters. On this band no ATU is required when using a transmitter with a pi-network output.

The VRS works as a folded $\frac{1}{4}$ and matches to the coaxial feedline. **Top Band (160M)** — Again using the same flat twin antenna, there are three alternatives, each of which has advantages and disadvantages.

Figure 3 (160 A) is similar to the 80 M version, with a load coil inserted at the ground end of the antenna. This with a suitable ATU, works well, but it was found that the large load coil was a nuisance near the transmitter. **Figure 3 (160 B)** has a far end loading coil. The coil can be wound on a large diameter former — or high grade ferrite rod. It is a convenient arrangement as the coil can be simply clipped on when required. The ar-

range loads well. **Figure 3 (160 C)** uses a far end series loading coil. Tuning can be facilitated by fitting a small VC across the coil. The great disadvantage of this is the necessity to proceed backwards and forwards to far end VC to make adjustments. It is easy to load the antenna, however.

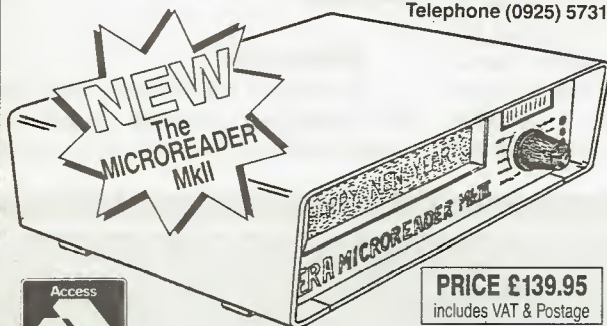
10/15 meters: On 10 meters both ends of the 300 ohm feeder antenna should be shorted together and treated as a full-wave antenna, whereas on 15 meters the 40 meter arrangement should work. Neither band has been tried, but this is how I would proceed, initially, making any minor loading adjustments.

Conclusion

It will be seen that the VRS has much potential for the many Tx-ers who either cannot, or are not permitted, to erect a large antenna. It can be zig-zagged or compacted into a small space in a small room, and give good results. Even better results will be achieved if it is constructed as **Figure 2**, or absolutely straight. No doubt it could be discreetly hidden under the eaves.

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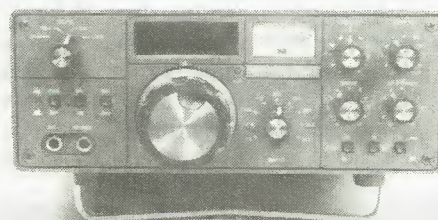
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Ten-Tec Paragon

REVIEW

We were promised the first UK review sample of the Paragon some time ago, but when a total consignment of no less than seven boxes arrived at the HRT review department, we were

brief technical test. Future issues of HRT will feature other accessories that would be of interest to readers thinking of expanding their HF operating system.

the low-power merchants, and claims to offer a fast changeover time of less than 30ms to provide for spectrum-efficient digital modes of communication.

Not only is the new HF base station from Ten-Tec a Paragon, but it hath virtues too, says Chris Lorek.

quite taken aback! Not only was the Paragon supplied, but a complete Ten-Tec lineup including the Hercules solid-state linear, aerial tuner, power supplies and even a desk microphone and CW keyer. The boxes were unpacked, the station assembled, and the ether rapidly excited with HF waves from equipment which this time did not come from the land of the rising sun! The 'Paragon' transceiver, gives microprocessor controlled operation of virtually everything you could think of over the entire HF range. A complete review of the entire line-up would easily fill the magazine, so an overview and on-air operating review of the transceiver will be featured here together with a

Features

The transceiver offers transmit capability on all amateur bands from 1.8MHz to 30MHz, with a HF general coverage receive capability over 100kHz to 30MHz. LSB, USB, CW and FSK modes are provided for transceiver operation, an AM reception facility is fitted with FM transceiver as an option. Receiver IF filter widths of 2.4kHz and 6kHz are provided as standard, together with 15kHz on FM when fitted; optional filters which are independently selectable may also be installed for 1.8kHz, 500Hz and 250Hz bandwidths. The transmitter has a power output of 100W with a variable reduction facility down to 10W for

Tuning within a selected band is performed with the large tuning knob, stepping the synthesiser in 10/20Hz increments on SSB/CW, and 50/100Hz steps on AM and FM. This speeds up when the knob is rotated quickly. Front panel mounted up/down buttons step in either 1MHz increments for general coverage reception or in amateur band segments for operating range selection. Direct frequency entry is also possible by using the panel mounted numeric keys and 'enter'. The receive frequency is shown on a vacuum fluorescent blue-green display, with a resolution to the last 100Hz or 10Hz step as you prefer. The current time or date may be selected for log keeping purposes.

Memories

A total of 62 memory channels are provided, storing frequency, mode, receiver bandwidth, and an



optional 7 digit alpha-numerical display flag in place of the time or date on the main display. This facility would for example allow you to store the names of broadcast stations, or an indication of net frequencies, such as 'WAB 80M', to remind you what the channel is used for. As well as recalling individual channels, you may step through the memory channels manually or let the set scan them; any number of channels may be locked out of this scan as required. A 'scratch pad' memory is also fitted for quick storage and recall of a given channel.

Two digital VFOs are fitted, with split frequency operation between the two possible. Both TX and RX offsets are fitted, each with a maximum offset range of +/-99.9kHz for RIT or DX split-frequency use. An optional speech synthesiser may be fitted which announces the current receive frequency at the press of a button.

Controls

Many of the rig's operating functions such as the mode and band selections use push buttons, the only rotary switch being the meter selector between forward power, reverse power, PA collector current, and processor level on transmission. Concentric rotary controls are however fitted for AF and RF gain, an all-mode squelch, audio and RF bandpass tuning, notch, tone, mic gain, and a 'fade' control to vary the width of the receiver audio response. Further rotary controls vary the noise blanker pulse width and transmit speech processing level.

Round the back of the set are fitted a number of further controls, such as the CW sidetone pitch and level, VDX gain, level and anti-vox, keypad beep level and the TX monitor level which allows you to listen to your transmitted audio from the set. A number of phono sockets are also provided, for transverter RF in/out, FSK keying, PTT and CW keying, and TX/RX audio in and out. An optional RS232 interface unit may also be fitted, to provide facilities for remote frequency selection and the like, useful for either computer control or remote radio control as now permitted under the UK licence. A useful provision is a 2A 13.8V DC output to power accessories such as a data terminal unit or CW keyer.



"... never been any good at small talk ..."

Lightweight

The set is constructed on an alloy chassis which keeps the weight of the set down to 7.25kg. As the transceiver operates from a 13.8V supply there is of course no mains transformer to weigh it down, but this does mean that for base station operation a hefty 20A supply must be provided. A matching supply is available as an optional extra. The transceiver itself measures 273mm (W) x 146mm (H) x 432mm (D), the optional matching DC supply adding 185mm to this width. The transceiver comes with a DC supply lead, a selection of connectors, and a bound manual giving complete operating and servicing details including board layouts and detailed schematics.

On The Air

After having a read of the manual I started tuning around the amateur bands. The first thing that struck me was that the transceiver had an extremely nice feel to it, the weighted VFO knob tuning through the stations very smoothly. At first, I found the lack of a band change switch, or at least large band up/down buttons, a little difficult to get used to, but quickly learned to operate the keypad

to change the frequency in large steps when needed. The review transceiver was generously fitted with the complete set of optional filters, which were a delight to use. The 1.8kHz SSB filter used in combination with the IF passband is very useful in crowded band conditions on 20m, albeit with a lack of received fidelity. I did however find this useful for data communication, where the narrow filter could be centred onto the required passband range to reduce SSB and CW QRM. The optional speech synthesiser which was also fitted gave a very clear indication from the internal speaker, though I found I rarely used this facility.

The receiver appeared very good at rejecting adjacent signals, and I detected no trace of blocking effects even on 40m at night. I never needed to switch in the fitted receiver attenuator. I did however notice some degree of noise increase when tuning into strong signals, due to reciprocal mixing with internally generated synthesiser noise, although I must confess I was looking for this effect, and it did need a very strong signal to exhibit it. As I tuned the set, I also noticed large clicks every 50kHz which caused S9+ deflections on

the meter, again caused by the transceiver synthesiser. These effects, to be fair, were no worse than other transceivers I have tested in the past.

On transmit, the SSB signal when using the supplied desk mic was reported as being of very good quality, the speech processor introducing little distortion to the signal. Coupling my all-mode terminal unit to the set gave very good results on AMTOR, the set having sufficiently fast TX/RX switching speed required of modes such as this, CW addicts may also like to know that full break-in operation is available up to around 40wpm. I did however find that the FSK facility used the odd American shift centred on 2125/2295Hz tones, rather than the standard of 1275/1445Hz as used by the rest of the world. Luckily many terminal units can be switched to these tones if required, but users of homebrew RTTY/AMTOR demodulators would need to use AFSK or to set the receiver offset accordingly. On the 20m packet radio section the setup operated very well, even as I write this the Paragon/Hercules combination is being simultaneously used under automatic control by stations in Portugal, W. Germany, Italy and the UK through my packet node/gateway, with the set remaining very cool to the touch. Although not tested for long periods with continuous carrier power modes such as RTTY or SSTV, the set is rated for 20 minutes continuous transmit on full power which should prove adequate for most needs.

When operating using the set into a 20m dipole in close proximity, I occasionally found the matching Paragon power supply to cut out when the set was placed on transmit. Testing with a dummy load showed this to be due to RF feedback into the power supply caused by a high RF field level in the shack. I eventually used the set powered from the external Hercules amplifier supply (100A at 14V!), which resolved the problem.

As a final point, I must say that I found the fitted noise blanker most effective, especially in suppressing over-the-horizon radar. A quick adjustment of the rotary width control was often all that was needed to restore perfect copy to signals that were otherwise drowned in QRM.

Insides

The internal construction of the set uses an alloy chassis with internal fibreglass plug-in printed circuit boards, multiple plug and socket arrangements connecting the individual units. The front panel of the set hinges to allow access to most parts of the internal circuitry for servicing needs. An internal 9V battery may be fitted if required for memory backup, although this is not necessary if 13.8V DC is kept supplied to the set when it is switched off.

The receiver RF amplifier uses no less than *four* paralleled J310FETs to provide a bombproof front end, switched low pass and high pass filters are used prior to this wideband stage to provide a degree of RF

bandpass selectivity. A single balanced mixer follows, using a pair of J310 FETs, giving upconversion to a first IF of 75MHz. A two pole crystal filter is used here, the second IF of 9MHz having 8 pole filters fitted with a bandwidth dependant upon whether AM (6kHz) or SSB (2.4kHz) has been selected. Further signal filtering occurs at the third IF of 6.3MHz, with individually switched narrow filter widths as selected from the front panel of the set. On transmit, at the final RF frequency a two stage wideband amplifier operated in class AB is used, with a pair of MRF 476 transistors being used in the driver and a pair of MRF 458 transistor in the output stage. Switched bandpass filters follow to reduce the level of unwanted harmonics and spuri.



Laboratory Tests

The receiver measurements performed confirmed the excellent dynamic range found from the on-air tests, the performance of which even



stretched the limits of the cavity tuned signal generators used for measurement. The blocking performance at offsets of greater than 20kHz was extremely good, but within that range the effects of synthesiser reciprocal mixing were evident. The intermodulation rejection, where adjacent signals combine in the receiver to form unwanted mixing products on the tuned frequency, was likewise very good. The receiver sensitivity was reasonable on the amateur bands, but fell off at frequencies below 1.6MHz where the front end amplifier is not used. The squelch sensitivity was a little disappointing, limiting its use to reasonably strong signals rather than weak though perfectly readable signals.

On transmit, the set gave just over the specified 100W carrier power, drawing 16.5A DC at 100W RF output. The transmit/receive switching time in QSK mode was measured at just over 35ms, this was done using a function generator driving a switching transistor across the PTT line, the recovered receiver audio monitored together with the keying signal on a fast triggered oscilloscope. This result is slightly longer than the specification of 30ms, but should be ample for most purposes.

Conclusions

The Ten-Tec Paragon lives up to its flagship image, the receiver performance being very good indeed which should enable the set to stand its ground in heavy QRM conditions. Only the synthesiser reciprocal mixing performance lets this down. The facility for optional extra filters offers the benefit of a lower initial equipment cost, and these may be added as required as one's interests and finances allow. The facility for transverter use as well as optional FM extends its use further to allow

VHF/UHF coverage with other add-ons.

In use the set was a pleasure to operate: its styling is different from the usual, and its light weight could prove useful in portable and temporary station installations without the need to sacrifice RF performance. Remember that the set requires an external DC power supply to operate it, which of course must be borne in mind when doing your purchasing sums.

My thanks go to HRS Electronics for the loan of the review equipment.

LABORATORY RESULTS

RECEIVER

Sensitivity

Input level required to give 12dB SINAD, measured using SSB 2.4kHz BW

Freq. MHz	Signal Level
1.2	2.32uV pd
3.5	0.105uV pd
7.0	0.115uV pd
14.0	0.130uV pd
28.5	0.140uV pd

Squelch Sensitivity

Measured using SSB 2.4kHz BW at 28.5MHz

0.72uV pd

Notch Filter Rejection

42.0dB

Blocking

Measured as increase over 12dB SINAD level of an unmodulated carrier interfering signal spaced at +100kHz, causing 6dB degradation in 12dB SINAD on-channel signal

10.7MHz;	> 120dB
21.4MHz;	> 120dB

TRANSMITTER

Max TX Power

Freq MHz	Power
3.5	102W
7.0	105W
14.0	109W
21.0	107W
28.5	104W

3rd Order Intermodulation Rejection

Increase over 12dB SINAD level of two interfering signals at 14MHz spaced at 50kHz intervals giving identical 12dB SINAD on-channel 3rd order intermodulation product: 100.5dB

TX/RX Switching Time

Measured at 14.2MHz, time to recover 80% RX audio, Fast AGC

36.5mS

S-Meter S9 Level

Freq. MHz	Sig. Level
14.0	47uV pd
28.5	62uV pd

Current Required

DC supply current needed, at 13.8V to provide 100W TX carrier power, measured at 14.2MHz

16.5A

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TS-440S

As many of you know, Kenwood have a current policy of running three HF lines; the '1' series which started with the TS-120, went on to the TS-130, and now crowned by the TS-140; the top of the range '9' series having the TS-930 and TS-940; and the '4' series which began with the TS-430 and is now completed with the TS-440S.

The TS-440S is designed to be a compact version of the TS-940S, and in RF performance it proves to be so. Chris Lorek, when reviewing the TS-440S said "There was no suggestion of the dreaded reciprocal mixing . . ." and went on to say "Trio engineers have done well considering the standard TS-940S performance — the TS-440 actually outperforms it in this respect." What this means in down to earth listening terms is that the receiver presents you with a quiet background, with signals simply appearing and disappearing when you tune across them, with none of the "sharsh" noises as you approach a strong signal. Kenwood engineering at its best.

Whilst on the subject of the receiver, Geoff Arnold said in his review in *Practical Wireless*, "The receiver in particular is a joy to use, with clever use of spare microprocessor power to give automatic bandwidth selection according to mode." Again this typifies the Kenwood belief that their equipment is designed to be used by a human being, and they want to make it as easy as possible for you to enjoy your hobby.

The TS-440S is designed to be the all-purpose transceiver for the man on the move. Small enough to carry around, yet with all the performance of its big brother, the TS-940S, the TS-440S is perfect for today's fast moving methods of communication. Unseen advantages such as 100% duty cycle transmit, and fast receive/transmit changeover make the TS-440S the ideal packet radio transceiver, and of course with full BK it's equally at home in demanding CW contests.

There are other excellent but unobtrusive design features to which your attention should be directed. Typical of these is the frequency readout and the way it behaves. Sounds silly? Then consider tuning to 3750 kHz and chatting on lower sideband to Fred. The

readout on the transceiver reads 3750 (of course). Then Fred says "Check me on the upper sideband", and you move the mode switch to USB. If you are using a Kenwood rig, the readout still shows 3750 and you are indeed listening and transmitting on 3750 upper sideband. BUT — many other transceiver leap sideways by 3 kHz and you then have frantic retuning to find Fred. Small point you may say, but it is intensely irritating in use, and Kenwood make sure that it does not happen in their equipment, not HF, not VHF, not UHF.

I absolutely guarantee that you will be impressed by the TS-440S when you sit down and use it; and that is best accomplished by going to one of our branches or your nearest Approved Kenwood Dealer. Don't bother with anyone who clearly doesn't have the background or connections to understand what the equipment is all about, because transceiver like the TS-440S are better explained by someone with genuine product knowledge and a willingness to do more than simply take your money.

For full details of the TS-440S, Kenwood produce an 8 page brochure which is yours for the cost of postage and packing. For full details of all the Kenwood range, simply send £1 and we will fill an envelope with info. and send it right back. If it takes 8 pages to describe the TS-440S there is no way in which I can adequately cram it into this space — send for the brochure.

73. John Wilson G3PCY/5N2AAC

TS-440S £1138

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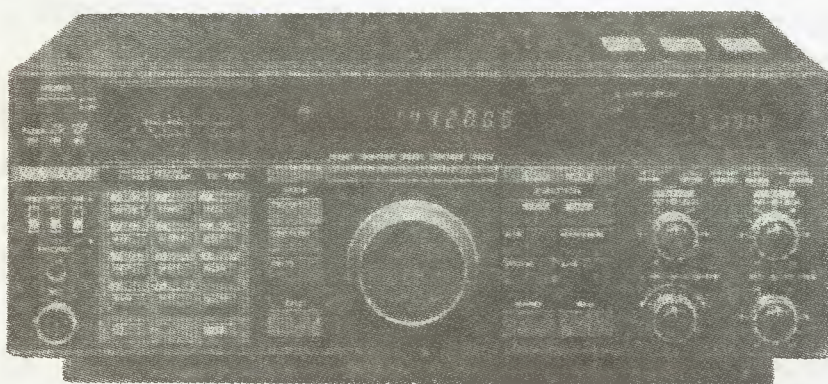
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TS-140S £862

The TS-140S was in effect designed by our customers, who demanded Kenwood performance and facilities at modest cost. The TS-140S has all mode, all band HF coverage, and of course a high performance general coverage receiver. 100W output and a first class receiver combine to make the TS-140S a really satisfying rig to own. It's also available in the form of the TS-680S which has all the bands and modes of operation of the TS-140S but with the 6 metre band as well.

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Although most folk think of us as the Emporium in Matlock and enjoy coming to see us, we do appreciate that travel can be difficult these days, particularly for those who have to drive (sorry, park) on the M25. That is why we have branches around the country.

Each branch carries a full range of everything that we stock and sell, and is run by an experienced radio amateur who is ready with the same good advice and assistance which we try to offer at Matlock. Why not call in and have a word with Sim, GM3SAN in Glasgow; Hank, G3ASM in Darlington; Tony, G4NBS in Cambridge; Ceri, GW0CJB in Barry (our new branch transferred from Cardiff); Dave, G3IKG in Eastcote, London; or Colin, G3XAS in Bournemouth.

You could of course pop in and talk to our front line manager Richard, G4NAD here at Matlock, ably assisted by Bill, G8LXN. Lurking behind the scenes you might find Alan, G3MME or myself G3PCY, or even Bill, G3UBO on a flying visit. For technical queries you might find yourself talking to Barrie, G8OTY; or Rob, G8MPT; or Keith, G8YQX; or Bob who preceded Keith by getting G8YQL. In a technical world of his own we have John, who doesn't have an amateur licence, but with an M.A. from Cambridge he hardly needs one, does he?

You may get the impression that I'm trying to tell you something — and that is the simple fact that we know what we are doing when it comes to radio communication, and you won't get better advice anywhere in Europe.

73. John Wilson. G3PCY/5N2AAC

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Construction LCR Bridge

Test equipment is the backbone of amateur radio, says Roger Alban. This LCR Bridge project has extra information for designers.

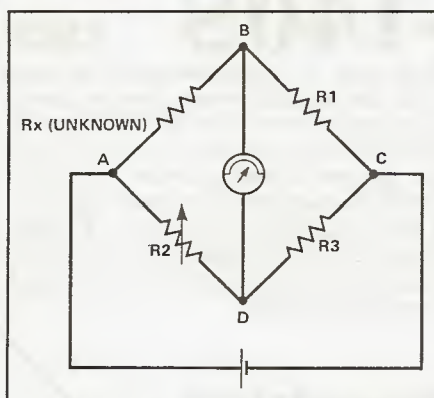
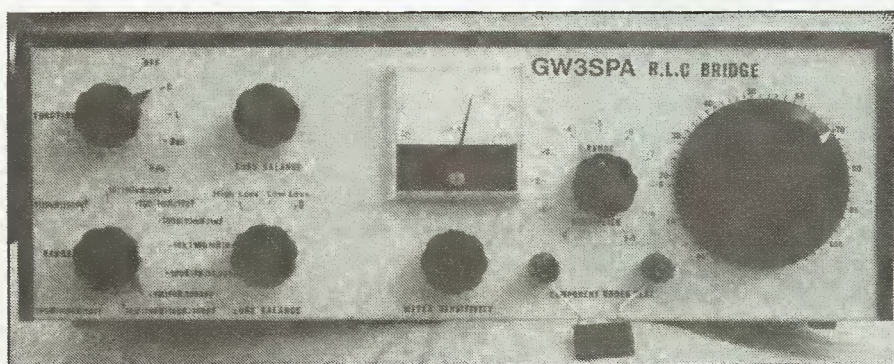


Fig. 1. A basic Wheatstone Bridge

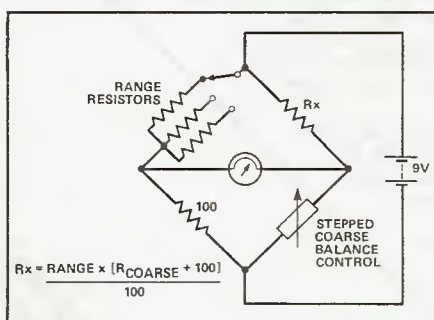


Fig. 2. A practical resistance bridge

Test equipment is a valuable aid in constructing amateur radio equipment. Some items, such as multimeters, are usually better bought than constructed,

The LCR Bridge with a component on test

but it can be worthwhile to construct an LCR bridge. Equipment to measure capacitance and inductance is not particularly cheap.

Balanced Dividers

The circuit of the basic Wheatstone bridge is shown in Fig. 1. The two arms of this bridge are two potential dividers: R1/R2. When the ratio of R2 to R3 is adjusted to be the same as the ratio of Rx to R1 the voltage at point B is the same as at point D. In this condition the bridge is said to be balanced, and the value of Rx may be calculated from: $R_x/R_1 = R_2/R_3 \rightarrow R_x = R_1 \times (R_2/R_3)$, by simple Ohm's Law.

If the values of Rx and R1 are very different then the available voltage to drive the meter is low, and the sensitivity of the bridge is reduced. To extend its useful range R1 could be replaced by a range of switched range setting resistors. This gives rise to the circuit of Fig. 2.

If the coarse balance control is made adjustable from zero to 1000 ohms, in steps of 100 ohms, and the range resistor varies from 0.1 ohms up to 10 Mohms in multiples of ten, then the value of Rx can be accurately measured from zero to about 1 Mohm.

The balance equation for Fig. 2 is:

$$R_x = \frac{[R_{\text{coarse}} + (0 \rightarrow 100)]}{100}$$

If the range resistor is 0.1 ohms, the maximum measurable value of Rx will be:

$$R_x = \frac{0.1 \times 1100}{100} = 1.1 \text{ ohms}$$

The next value of range resistor is 1 ohm and this will give an operating range between 0 and 11 ohms, and so on. The accuracy of the bridge will be determined by the accuracy of the resistors which comprise the bridge.

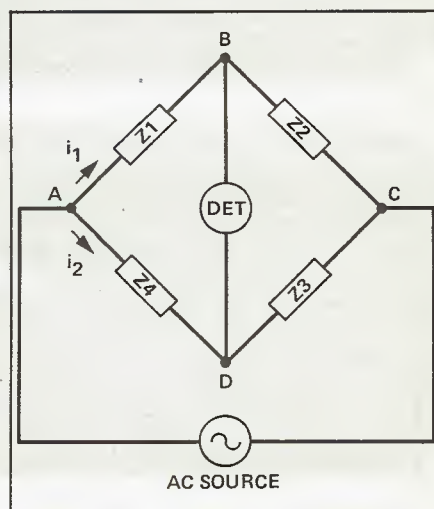


Fig. 3. General AC bridge

The AC Bridge

The same principle can be used to measure capacitance and inductance if the bridge is driven with AC instead of DC, and an AC balance detector is used. The general form of this is shown in Fig. 3.

The same criteria for balance hold true, but because Z1 to Z4 are complex impedances both amplitude and phase must balance. Balance occurs when the voltage across Z1 is the same in amplitude and phase as the voltage across Z4. If we designate the currents flowing in the two arms of the bridge I1 and I2, we have:

- 1) $I_1 Z_1 = I_2 Z_4$ and
- 2) $I_1 Z_2 = I_2 Z_3$

Dividing Equation 1 by equation 2 to cancel the I terms:

$$Z1/Z2 = Z4/Z3 = Z1.Z3 = Z2.Z4$$

(remembering that the impedances are represented by complex numbers).

This equation represents the balance conditions for the bridge. Normally one arm of the bridge will contain the unknown impedance while the other arm will contain known fixed or variable values of resistance and reactance. It is common for only two elements within the arms of the bridge to be varied to obtain a balanced condition. To obtain a balance condition the real and imaginary terms on each side of the equation must equate. Balance will obviously be achieved quickly if there is only one variable in the reference terms, and the other variable in the imaginary terms.

Loss Adjustment

You may ask why we need to design an AC bridge that will balance complex impedances instead of simple reactance when measuring the values of inductance or capacitance? The reason for this is that the inductor or capacitor you are trying to measure will have losses which may be represented by resistances. Therefore it will be necessary for the bridge to have two variable arms besides the range arm to balance for reactance and resistance losses. The loss balance control will enable the resistive losses of an inductance or capacitance under test to be balanced out so that the true reactance of the component may be measured accurately.

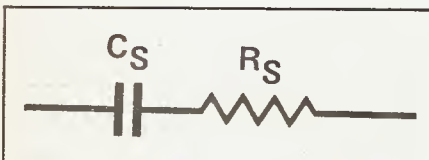


Fig. 4. Representation of an imperfect capacitor

Capacitor Losses

A perfect capacitor when discharged will give up all the electrical energy that was supplied to it in charging. Actual capacitors only deliver part of the energy delivered. Most of the loss in ordinary capacitors occurs in the dielectric, although at very high frequencies skin effect also causes appreciable loss.

The dielectric loss of a capacitor can be expressed as the phase angle of the current in capacitor. The power factor is the sine of the phase angle. The tangent of the phase angle ($\tan \delta$) is termed the

dissipation factor D. The reciprocal of the dissipation factor is called the capacitor Q and is the ratio of the capacitor reactance to the equivalent series resistance Fig. 4. A bridge to measure capacitance must balance out the series loss resistance Rs.

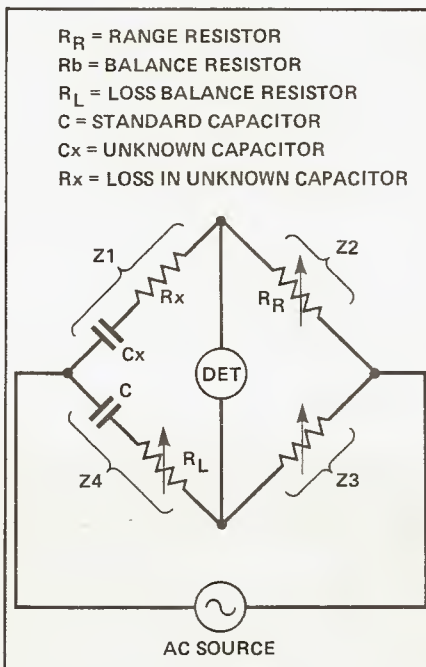


Fig. 5. Basic capacitance bridge

Capacitance Bridge

The basic capacitance bridge is shown in Fig. 5. The ammeter has been replaced by a sensitive detector capable of operating at the frequency of the AC source.

The balance equation for the bridge is:

$$Z1.Z3 = Z2.Z4$$

which will be represented in complex form as follows:

$$(R_x - j/\omega C_x).R_b = R_r.(R_l - j/\omega C)$$

$$R_b.R_x - j.R_b/\omega C_x = R_r.R_l - j.R_r/\omega C$$

For balance to occur the real and imaginary terms on each side of the equation must balance.

Taking real terms:

$$R_b.R_x = R_r.R_l$$

$$\text{Therefore } R_x = \frac{R_r.R_l}{R_b}$$

Taking imaginary terms:

$$R_b/C_x = R_r/C$$

$$\text{Therefore } C_x = \frac{C.R_b}{R_r}$$

The imaginary term gives the value of the unknown capacitance Cx. If the fixed capacitor is 100n. The value of Cx in farads is:

$$C_x = \frac{0.1 \cdot 10^{-6} \cdot R_b}{R_r}$$

If we now use the values of Rr and Rb described earlier for the resistance bridge, and if the range resistor is 0.1 ohms, then the maximum value of capacitance for this range is when the balance resistor is 1100 ohms. Then:

$$C_x = \frac{1100 \cdot 0.1 \cdot 10^{-6}}{0.1} = 1100 \mu F$$

If the range resistor is now increased to 1.0 ohms, the maximum value for this next range will be 110 μF . If the range resistor is increased to 10 M ohms, the maximum value of capacitance will be:

$$C_x = \frac{1100 \cdot 100 \times 10^{-9}}{10 \cdot 10^6} = 11 \text{ pF}$$

Capacitance values of between 0.5 pF up to 1100 μF may be measured using an internal AC source operating on a frequency of 1kHz. Care must be taken when measuring capacitance values below 10 pF. The bridge itself will contain internal capacitance and can be determined by balancing the bridge without the capacitor under test being connected to the test terminals.

The required range for Rl depends on the range of values of Rx likely to be encountered. The value of this variable resistor will be chosen by experiment.

Inductor Losses

The bridge can also be adopted to measure inductance. Again, the losses must be balanced out if accurate inductance measurements are to be made. The principal cause of energy loss in air cored inductors are skin effect in the conductor, proximity effect resulting from the interaction between nearby turns, dielectric losses associated with the distributed capacitance of the coil, and eddy current losses shields and other neighbouring metallic objects. In the case of coils with magnetic cores, the principal cause of energy loss is usually core loss.

The coil losses are commonly expressed in terms of an equivalent resistor, which when placed in series with the coil inductance will account for all the power losses. The most convenient way to express the merit of the coil is in terms of the ratio of the reactance $\omega.L$ of the coil to the equivalent series resistance Rs. This ratio approximates the reciprocal of the coil power factor and is designated Q. It is convenient to use Q because this value does not vary greatly with frequency. Q remains almost constant with frequency

because as the frequency increases, all the losses also increase approximately proportionally to frequency.

The loss in inductors is very dependent on the core loss. Normally air cored coils are measured on the bridge in terms of the series inductance L_s and series resistance R_s . High Q coils, such as ferrite cored coils are measured in terms of parallel inductance L_p and parallel loss resistance R_p .

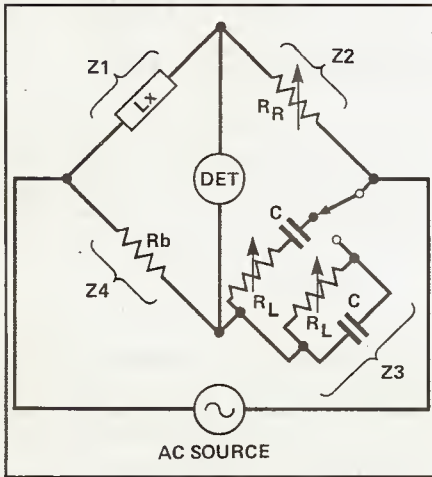


Fig. 6. Basic inductance bridge

Inductance Bridge

The basic inductance bridge is shown in Fig. 6. Where R_r is the range resistor, R_b is the balance resistor, and R_l is the loss balance resistor. C is a fixed value standard capacitor. L_x represents the unknown inductor source.

The balance equation for the bridge is:

$$Z1.Z3 = Z2.Z4$$

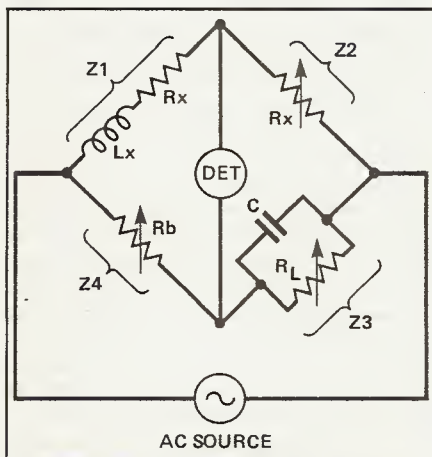


Fig. 7. Inductance bridge for RF coils and transformers

which will be represented in complex number form. Let us assume that the

losses associated with the inductor are such that they are best represented by series resistance. The loss balance resistor will therefore be in parallel with the reference capacitor C .

Then balance will be achieved when $Z1.Z3 = Z2.Z4$ for Fig. 7. Then

$$\frac{(R_x + j.\omega.L_x) - \frac{j.R_l}{\omega.C}}{(R_l - j/\omega.C)} = R_r.R_b$$

$$\frac{-j.R_l.R_x + L_x.R_l}{\omega.C} = (R_l - j/\omega.C).R_r.R_b$$

$$\frac{L_x.R_l}{C} - \frac{j.R_l.R_x}{\omega.C} = R_l.R_r.R_b - \frac{j.R_r.R_b}{\omega.C}$$

Equating real terms:

$$\frac{L_x.R_l}{C} = R_l.R_r.R_b$$

$$L_x = C.R_r.R_b$$

Equating imaginary terms:

$$\frac{R_l.R_x}{\omega.C} = \frac{R_r.R_b}{\omega.C}$$

$$R_x = \frac{R_r.R_b}{R_l}$$

$$= R_r.R_b.R_x + j.\omega.L_x.R_r.R_b$$

Equating real terms:

$$\frac{L_x.R_x}{C} = R_r.R_b.R_x$$

$$L_x = R_r.R_b.C$$

Equating imaginary terms:

$$\omega.L_x.R_x.R_l = \omega.L_x.R_r.R_b$$

$$R_x = \frac{R_r.R_b}{R_l}$$

It will be noted that the equation to determine the values of L_x and R_x are the same for both series and parallel inductance losses.

We can now use the same set of variable values of range resistor R_r , balance resistor R_b , and standard capacitor C described earlier for the resistance and capacitance bridge. That is, the range resistor will vary between 0.1 ohms and 10 Mohms in steps of 10. The balance resistor will vary between zero and 1100 ohms, giving a minimum value of measurable inductance of zero henry. The maximum measurable inductance on the lower range will occur when R_r is 0.1 ohms, and R_b is 1100 ohms.

$$L_x = R_r.R_b.C = 0.1.1100.0.1.10^{-6} = 11\mu H$$

The maximum value of measurable inductance on the highest range will occur when R_r is 10 Mohms and R_b is 1100 ohms.

$$L_x = R_r.R_b.C = 10.10^6.1100.0.1.10^{-6} = 1100H$$

The 10 M range resistor will not be very useful on resistance and inductance measurements because the signal level at the detector will be too low to obtain a clear indication of balance. However, the 10 M range resistor allows measurements of capacitance values between zero and 11 pF. The practical lower limit of this range will be determined by stray capacitance.

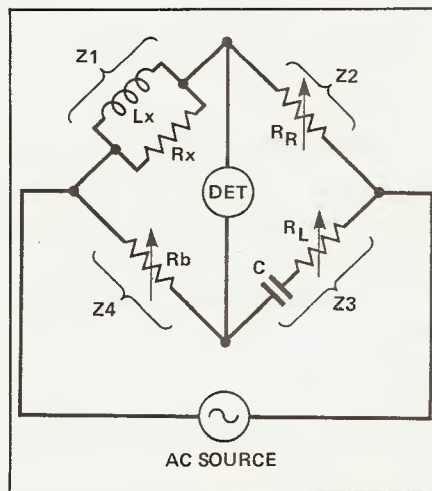


Fig. 8. Inductance bridge for High Q coils

To measure the inductance of high Q coils, we can represent the losses by a parallel resistance R_x . To obtain balance with the bridge network, it will be necessary to put the reference capacitor C in series with the loss balance resistor R_l , as show in Fig. 8.

Balance is achieved when:

$$Z1.Z3 = Z2.Z4$$

$$\frac{(j.\omega.L_x.R_x).(R_l - j/\omega.C)}{(R_x + j.\omega.L_x)} = R_r.R_b$$

$$j.\omega.L_x.R_x.R_l + \frac{L_x.R_x}{C}$$

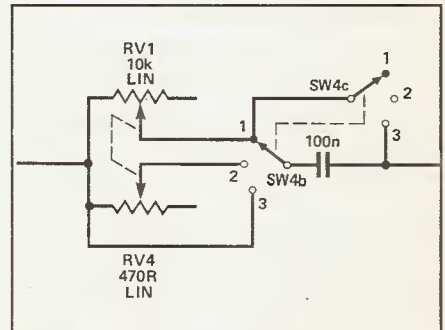


Fig. 9. Loss control arm circuitry

Variable Loss Resistance

As yet we have not determined the value of the loss control, which will be determined both by the losses of the component under test and by the values of the range and balance resistors. It is logical to assume that the larger the value of inductance or capacitance, the larger will be the losses.

For series inductance losses the value of Q is given by

$$\frac{X_L}{R_s}$$

inductance and series loss resistances. From our earlier calculation we know that R_s is equal to R_x which is in turn equal to

$$\frac{R_r R_l}{R_b}$$

substituting the equation for R_x into the equation for Q, we obtain

$$Q = \frac{\omega L_x R_l}{R_r R_b}$$

It can be seen that Q is proportional to the value of R_l . To choose a value for R_l , we must make some assumptions. First let us assume that the frequency of the AC source is a constant 1kHz. We will also assume that the maximum Q value to be measured in this mode is 6. If the range resistor is 1 M and the balance resistor is 1100 ohms. Then the value of measured inductance L_x will be equal to $R_r R_b / C$, where C is the 100n standard capacitor. Therefore L_x will equal 110 H. The maximum value of:

$$R_l = \frac{R_r R_b Q_{max}}{2 \pi f L_x} = \frac{10^6 \cdot 1100 \cdot 6}{2 \pi \cdot 10^3 \cdot 110} = 9.55 \text{ kohms}$$

For practical purposes make R_l a 10 k potentiometer. For inductances which has values of high Q, parallel resistance losses can be considered. Fig. 4 showed the representation of losses associated with an imperfect capacitor. The same is true for that of an imperfect inductor, where:

$$R_s + j \omega L_s = \frac{j \omega L_p R_p}{R_p + j \omega L_p}$$

Cross multiplying and collecting real and imaginary terms gives the following equations:

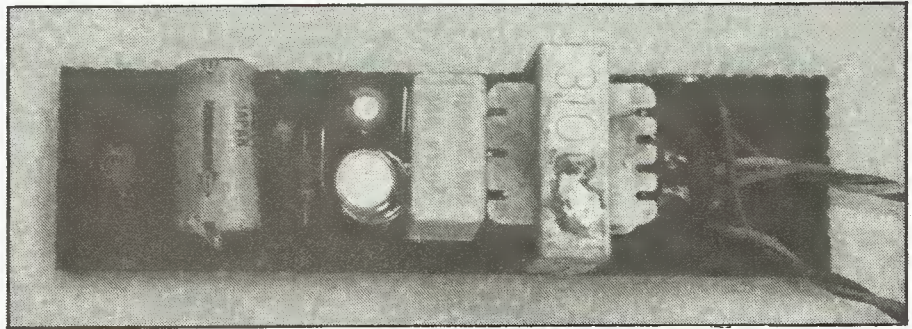
$$Q = \frac{\omega L_s}{R_s} = \frac{R_p}{\omega L_p}$$

As shown previously, $R_p = R_x$, which for inductance is given by:

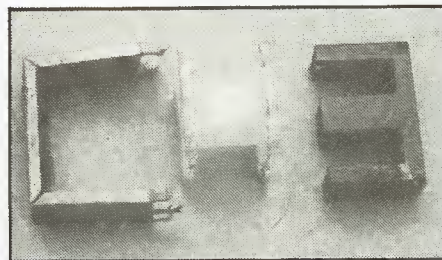
$$R_p = R_x = \frac{R_r R_b}{R_l} \Rightarrow Q = \frac{R_r R_b}{\omega L_x R_l}$$

where Q is now to R_l . Therefore minimum value of Q will be measured when R_l is 10 kohms. Therefore:

$$Q_{min} = \frac{R_r R_b}{2 \pi f L_x R_l(max)} = \frac{10^6 \cdot 1100}{2 \pi \cdot 10^3 \cdot 110 \cdot 10^4} = 0.159$$



The audio oscillator, constructed on Veroboard



In most practical cases, where q is greater than about 6, a potentiometer can be used in place of R_l . Its value should be:

$$R_l(max) = \frac{R_r R_b}{2 \pi f L_x Q_{min}} = \frac{10^6 \cdot 1100}{2 \pi \cdot 10^3 \cdot 110 \cdot 6} = 265R$$

To make loss balance easy, it would be convenient to have a low value pot on the same spindle as a high value one, with switching to select the appropriate one for a particular range. Because twin gang potentiometers with different values on the same spindle are not available as standard parts, it was necessary to piece one together.

The rear track was removed from an Omeg P20 twin gang 10k pot from Electrovalue, and was replaced by a spindle from a similar design of single gang 470R pot. The tracks are retained by four press over lugs, and care is needed to avoid snapping them off. If difficulty is anticipated, the instrument could be made using two separate single gang controls.

AC Source

The frequency of the AC excitation signal (1kHz) has been chosen to give practically measurable results with the range of components to be encountered.

In the circuit configuration chosen the excitation signal must be floating relative to ground, so a transformer

coupled oscillator is used (Fig 10a). The primary of the transformer resonates with C3 to set the oscillation frequency, as shown in Fig. 10b. The secondary of the transformer is tapped to give extra signal on the two upper ranges where low sensitivity might otherwise be a problem.

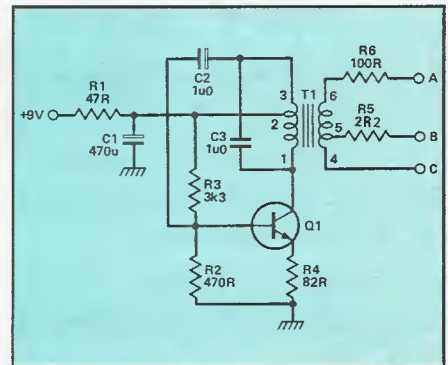


Fig. 10a. The 1kHz audio oscillator circuit

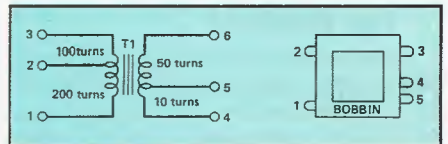


Fig. 10b. Winding details for the modified CB audio output transformer

T1 was made from an old CB audio transformer, which had the conventional EI core configuration. The metal clamp should first be removed from the laminations, and then the lamination stacks should be separated to permit removal of the bobbin. The final stage of dismantling is to remove the old wire from the bobbin.

To wind T1, first put on 200 turns of 34 SWG (or thereabouts) enamelled copper wire, take out a loop to form the tap, and wind a further 100 turns. Cover this layer with insulating tape and wind 10 turns, followed by another tap, followed by another 50 turns. Another layer of tape should be applied, and the wires should be connected to terminals formed from tinned copper wire (eg clipped component legs).

The order of connection is shown in Fig. 10b. The transformer should then be

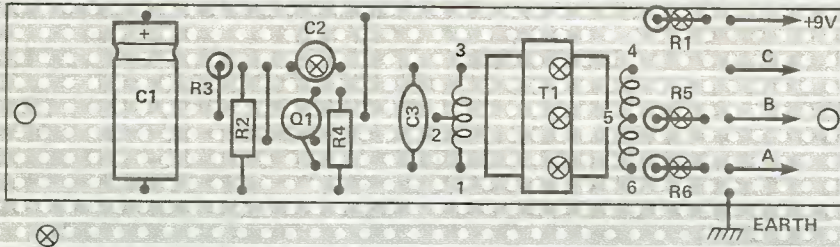


Fig. 11. Component layout for the oscillator circuit

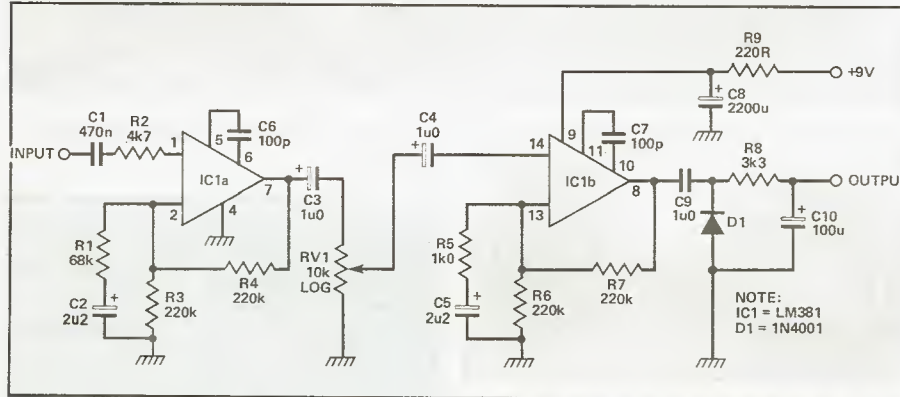


Fig. 12. The Detector circuit

reassembled, and the clamp tightened using pliers.

The oscillator was built on Veroboard to the layout shown in Fig. 11.

The Detector

The balance detector uses both parts of an LM381 preamplifier IC, as shown in Fig. 12. One half is used as an input preamplifier, with a gain of approximately 5. The second half of the IC is used to drive a rectifier, and has a gain of 220. Note that C9 must be a non-electrolytic capacitor as drawn. The leakage current through an electrolytic capacitor could cause meter offset.

Between the two amplifiers is the sensitivity control, VR1. Because the AC detector is not used on DC measurements, a second gang on the potentiometer is used as the DC sensitivity control. As with the loss balance control, different values are used, in this case 10k and 2k2. The same technique can be used to make this potentiometer as with the loss balance one.

As can be seen in Fig. 16, the overall circuit, the meter is protected from overload by a pair of diodes connected in antiparallel. The meter moves only in one direction on AC measurements, of course, but can deflect either way on DC measurements.

The detector circuit was built on Veroboard using the layout in Fig. 13. An

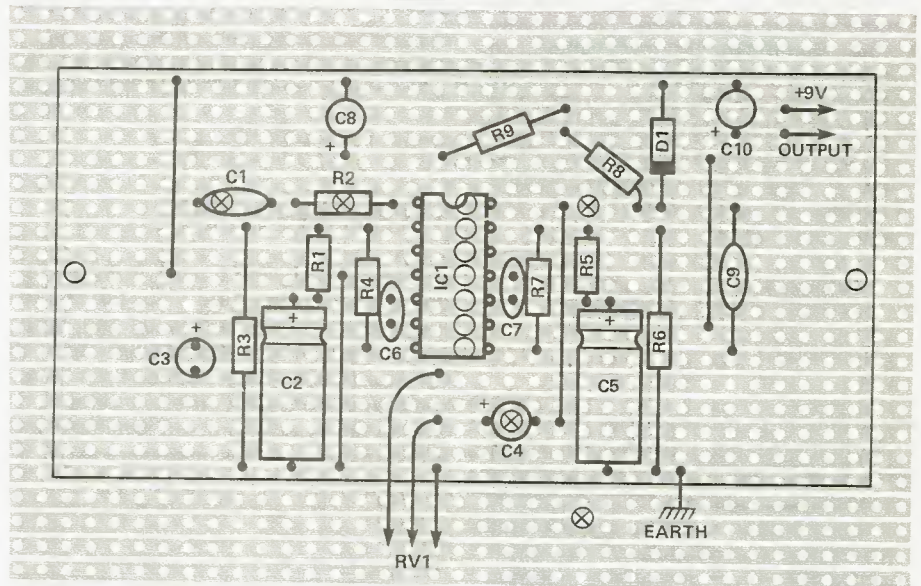


Fig. 13. Component layout of the detector circuit

IC socket was used for the LM 381, so that the voltages on its pins could be checked before it was inserted.

The detector is sensitive to interference, which would reduce the sensitivity of the bridge. To avoid such problems, the detector was mounted in a metal box and its input was connected using screened cable.

Bridge Building

As mentioned above, the range resistor must cover OR1 or 10M in decade

steps. The range switching circuit is shown in Fig. 14. The balance resistor, on the other hand, must be continuously variable from 0 to 110R, and the circuit to achieve this is shown in Fig. 15.

All the parts have now been described. The overall circuit of the instru-

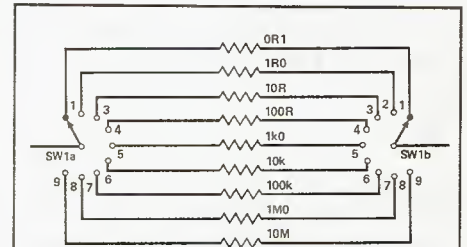


Fig. 14. The range resistors

SW1 POSITION	RANGE VALUE		
1	1R0	10uH	1000u
2	10R	100uH	100u
3	100R	1mH	10u
4	1k0	10mH	1u0
5	10k	100mH	100n
6	100k	1H	10n
7	1M0	10H	1n0
8	10M	100H	100p
9	100M	1000H	10p

ment is shown in Fig. 16. To obtain good performance from what is, after all, a measuring instrument, close tolerance resistors should be used in the arms of the

SW2 POSITION	RANGE MULTIPLIER
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.0

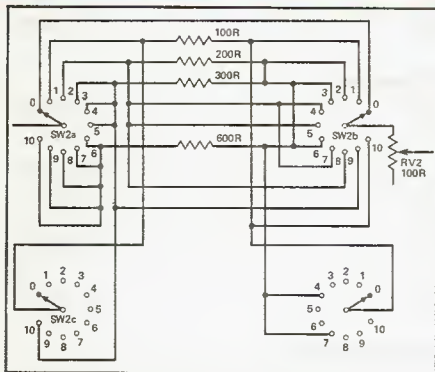
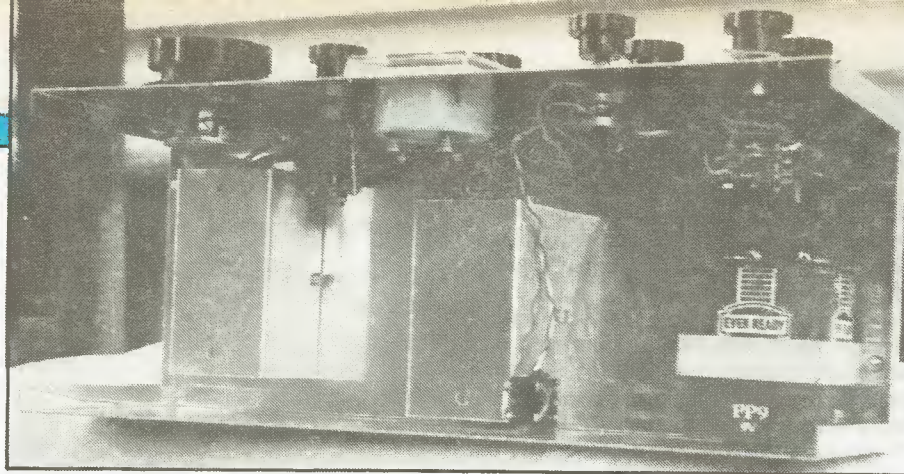


Fig. 15. Coarse and fine balance controls



The inside of the bridge, seen from rather an odd angle

bridge. A suitable tolerance is 0.1%, and such resistors are available from HB Electronics Ltd, Lever Street, Bolton BL3 6BJ (Tel. 0204 386361). The resistors used were Welwyn type RC55, at a cost of £0.76+VAT each.

Construction

The complete bridge was built in an aluminium box manufactured by Minfford

small aluminium boxes containing the oscillator and detector PCBs were bolted to the floor of the case.

When the interconnecting wiring has been completed, the 9 volt battery can be connected to check that the circuitry has been assembled correctly. When you are satisfied, all the components should be removed from the aluminium case without unsoldering any of the wires. All the holes in the box should be covered with masking tape, and it should be painted with several coats of car spray paint. The front panel, with the exception of the fine balance control, were labelled using rub

rotating the fine balance control knob. Mark the piece of cardboard where balance was obtained, as this will represent zero. Now change the range switch to 10 ohms and with the fine balance control pointing at zero, adjust the value of the 1 ohm range resistor to obtain balance. This exercise is necessary to take into account the resistance of the internal wiring. Follow the same procedure for the 0.1 ohm resistor by switching to 1 ohm and adjusting the 0.1 ohm resistor value to obtain balance. Both the 0.1 and 1 ohm range resistors were made from an odd length of wire first approximately measured using an ohmmeter.

The remaining calibration marks for the fine balance control can be obtained by connecting known values of resistance to the test terminals.

When the piece of cardboard has all eleven calibration marks from 0 to 10, they can be transferred to the front panel of the bridge and the lettering completed.

With the remainder of the front panel masked, the new lettering can be sprayed with lacquer. The accuracy of the bridge measuring resistance will be within one per cent, adequate for most amateur applications. You can check the accuracy of the capacitance and inductance ranges by using components of known value and tolerance.

Note that for small values of capacitance, internal stray capacitance adds to the error. If the error on larger capacitance values exceeds 1%, the value of the reference capacitor should be adjusted. Small value parallel capacitors should be added to correct the overall capacitance. If the original value was too large, a smaller value capacitor should be substituted for the reference capacitor before parallel capacitors are added.

When calibration is complete, attach the PP9 battery using a home made U shaped bracket.

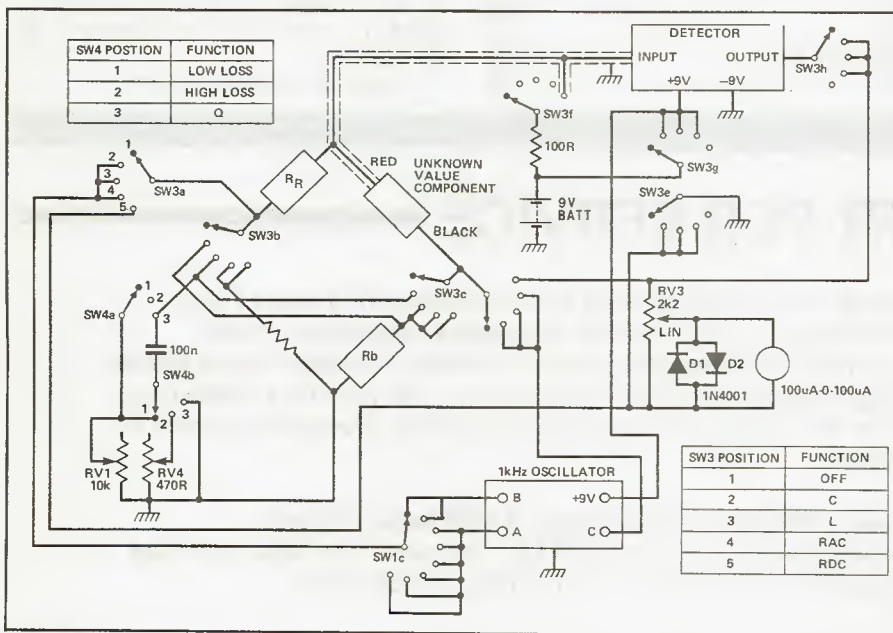


Fig. 16. Full circuit diagram of the LCR bridge

Engineering, Sun Street, Ffestiniog, Gwynedd LL41 4NE, Tel. (076676) 2572, also obtainable from Sandpiper Communications, Pentwyn House, Penyard, Llwdcoed, Aberdare, Mid Glamorgan, CF44 0TU, Tel. (0685) 870425. The case used was a type J45, 380mm by 153mm by 127mm, and cost £5.60 at the time. The close tolerance resistors were soldered to the coarse balance switch prior to installation. The function and range switches were also pre-wired before mounting on the front panel. The two

on lettering, then sprayed with clear lacquer. The front panel should be left to dry hard for a couple of days before the bridge components are re-installed into the case. Prior to fitting the fine balance potentiometer, fit a piece of cardboard to the front panel underneath the fine balance control to mark the calibration points.

Calibration

Reconnect the battery and switch to Resistance DC. With the range switch at 1000 ohms, and the coarse balance control facing .0, short circuit the output test terminals and balance the bridge by

Balancing Act

You may experience initial difficulty in balancing the bridge on capacitance and inductance, due to incorrect setting of the loss balance controls. To balance the bridge, first adjust the main balance, then the loss balance, and repeat this

procedure until there is little meter deflection even with the sensitivity set to maximum. Note that the meter will always deflect to the right on AC measurements, but on DC resistance it will swing either side of zero.

Inadequate balance on AC resistance measurement will probably be caused by stray capacitance or inductance of the resistor under test. Ill defined balance on capacitance and inductance ranges may be because the loss of the component under test is too complex for the simple loss balance to compensate for. Another possible cause of problems is pick up of interference.

When measuring air cored inductors, set the loss balance switch to the Q setting.

Conclusions

The LCR bridge has done sterling service over a period of twelve months so far, and its accuracy has proved valuable. It is worth emphasising once again that in order to produce a useful piece of test equipment, it is necessary to use good quality components. Otherwise the bridge may give misleading results.

The only addition made to the original was to add a jack socket to apply a bias so as to measure the capacitance

of varicap diodes. This modification is illustrated on the circuit diagram.

PARTS LIST

AUDIO OSCILLATOR

Resistors

R1 47R
 R2 470R
 R3 3k3
 R4 82R
 R5 2R2
 R6 100R

Capacitors

C1 470µf electro
 C2 1µf electro
 C3 1µf

Semiconductors

RT1 BFY 50

Transformer

T1 self wound
 — see text and fig 10b

DETECTOR

Resistors

R1 68k
 R2 4k7
 R3,R4,R6,R7 220k
 R5 1k

R8 3k3
 R9 220R

Capacitors

C1 470n
 C2 2µ2 electro
 C3,C4 1µf electro
 C5 2µ2 electro
 C6,C7 100pf
 C8 2200µf
 C9 1µf
 C10 100µf

Semiconductor

TR1 LM381

OTHER COMPONENTS

D1,2 IN4001
 SW1
 SW2
 SW3
 SW4
 RV1 10k lin
 RV2 100R
 RV3 2k2 lin
 RV4 470R lin
 Meter 100µA — 0 — 100µA
 External resistors 0.1R (1), 1R (1), 10R (1), 1k (1), 100R (4), 200R (1), 300R (1), 600R (1), 100k (1), 10k (2), 470R (1), 1M (1), 10M (1)
 External capacitor 1µf (1)

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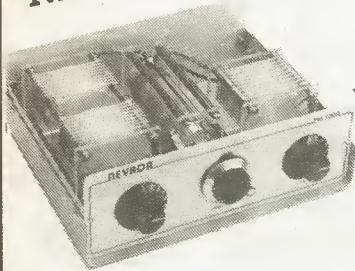
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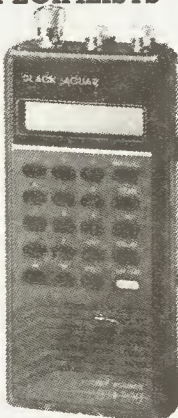
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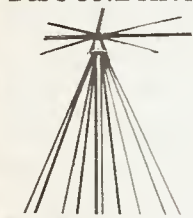
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DX in Paradise

The idea of a DXpedition to Cocos Keeling first came to me in 1985, when I met Cress, VK9YC/VK6YX, at the NEC in Birmingham, having spoken to him several times when he used to live on the islands. Cress is married to the former Lissa Clunies-Ross, a direct descendent of Captian John Clunies-Ross, a British sailor who first landed on the islands in 1827. Cocos Keeling became a British territory

the land from the family with the exception of their estate. Six generations after the first John, another John Clunies-Ross (VK9YC's brother-in-law), now in his early 30s, lives in Oceania House with his wife, Vicky and their three young children. Cress's well-equipped station, complete with antennas mounted on two separate towers, is still in situ, so it is an ideal location for a DXpedition, without having

Cocos Keeling from Europe. The cheapest way would be to take a cheap "bucket shop" flight to Singapore, fly to Christmas Island (VK9X), spend a few days there, fly on to Cocos and then return the same way. But because of the timings of the flights it would have meant spending one or three weeks on Cocos Keeling — two weeks was impossible. It would also have meant spending several days in both directions on Christmas Island — fine for a DXer, but not much fun for my wife, Eva, for whom this was meant to be a holiday of a lifetime, as there is nothing on Christmas Island apart from guano and there are great difficulties in finding accommodation there unless you "know" somebody, which we didn't. So, it was decided to go the other way to Cocos: to fly to Perth in Western Australia and take the weekly Australian government chartered flight from there. This had the added advantages of permitting a two week stay on Cocos and allowing us to see a part of VK in their bicentennial year.

After phoning several bucket shops in London and elsewhere we eventually got a very good low-price return ticket to Perth, which turned out to be with Garuda, the Indonesian national airline. It permitted stop-overs at no extra expense in Jakarta and Bali, which we obviously took advantage of. In Jakarta we were met by YBOWR, Lumban gaol, who was extremely generous and took us sight-seeing around the city in his chauffeur-driven air-conditioned brand-new BMW. He owns the Garuda Metropolitan Press, producing six of Indonesia's most popular glossy magazines and has his station at the GMP headquarters. It has the largest antenna system in Asia. Lumban gaol was putting the finishing touches to his first amateur radio publication, *The International Awards Guide Book*, which was literally hot off the press (the temperature was well over 100°F!). He hopes this will become the standard reference for amateur radio award hunters, as it lists over 750 awards from more than 70 countries, of which 630 are illustrated in full colour. The book is professionally produced and printed, and is available for 37US dollars from M S Lumban gaol, J1 Garuda 62,

A holiday of a lifetime is also a DXpedition opportunity for Steve Telenius-Lowe, VK9YG.

and later Queen Victoria granted ownership of all the islands to Clunies-Ross's grandson, George, a situation which remained unchanged until 1978, when the Australian government purchased all

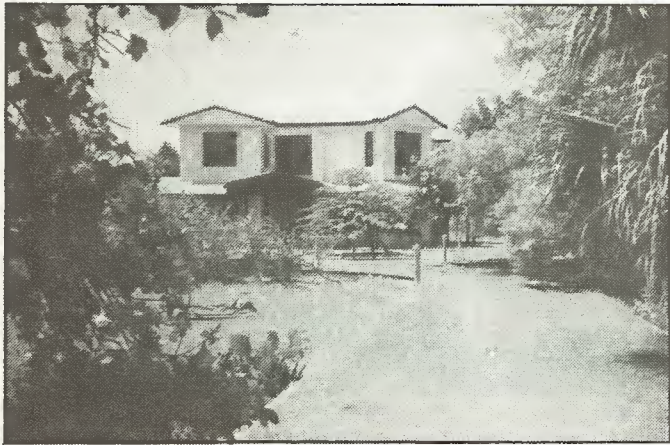
to lug heavy equipment half way around the world.

Ways To Go

There are only two ways to get to



Traditional Barong dance on Bali.



Oceania House on Home Island.



John Clunies-Ross and Catherine presiding over the Coconut Barbie.

Jakarta 10620, Indonesia. End of free plug.

Bali is a beautiful green island with a lot of interesting sights, including batik factories, traditional dancing and semi-active volcanoes. It is also a very cheap place to live in luxury: the 5-star Sanur Beach Hotel cost only £16 per night for bed and breakfast. Bali has a thriving tourist industry (it has been called Australia's Benidorm as it is cheaper to fly to Bali from Perth than to fly to the Eastern states of Australia) yet it remains relatively unspoiled.

From Bali we flew on to Perth, where we were met by Cress and Lissa, who spent a lot of their valuable time in showing us around and making us feel very welcome. Perth, on the Swan River, must be one of the most beautifully-located cities of around a million people in the world. Eventually the day came when we were at Perth airport again for the flight to Cocos. We arrived, as requested, 1½ hours before departure time to find the airport virtually deserted. I have never seen an international airport with so few people around. We thought the place must have been evacuated, but it transpired that the flight to Cocos was the only one in or out that morning and there were only a handful of passengers. Passengers were out-numbered by airline staff, security guards and duty-free shop staff by a factor of about 10:1. We were checked-in in minutes and spent 90 minutes browsing through the duty-frees. (We needn't have bothered: Cocos is entirely tax and duty free and must be one of the cheapest places on earth). The islands are almost 3000 km north-west of Perth (almost back up to Indonesia) and the flight took about four hours. Although there were not many passengers, the Australian Airlines DC-10 was full of mail sacks, fresh food and other cargo, even in the passenger cabins.

Savile Row Suit

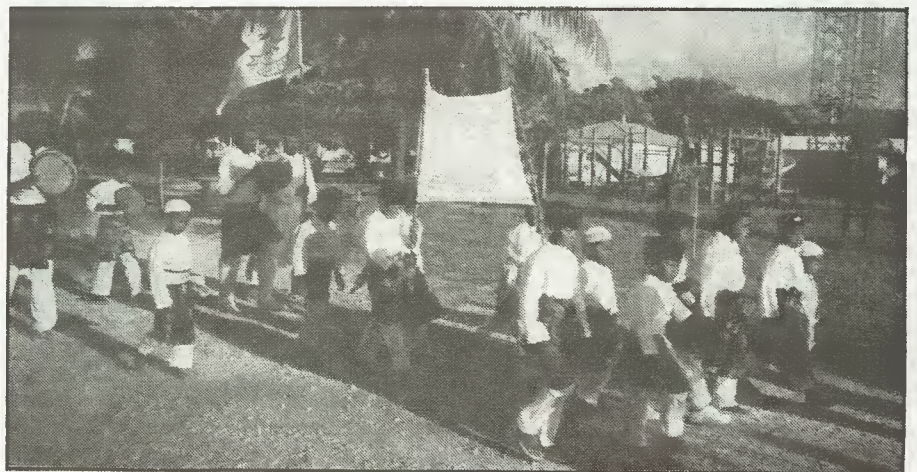
At Cocos airstrip ("Altitude 10 Feet") we were met by Peter, Maxine and

Catherine, three of John and Vicky Clunies-Ross's staff, who again made us feel very welcome and bought us several cold beers (or "tinnies" — I never once heard them called "tubes") at the Cocos Club while we waited for the ferry that would take us from West Island, where the airport and Australian settlement is, across the lagoon to Home Island. West and Home are the only two inhabited islands in the group of 26, which form a horse-shoe shaped ring of palm-fringed coral around the calm central lagoon. Apart from the inhabitants of Oceania House, Home Island is also home to 350 Cocos Malays, descendants of labourers brought to the islands in the last century to work the coconut plantations.

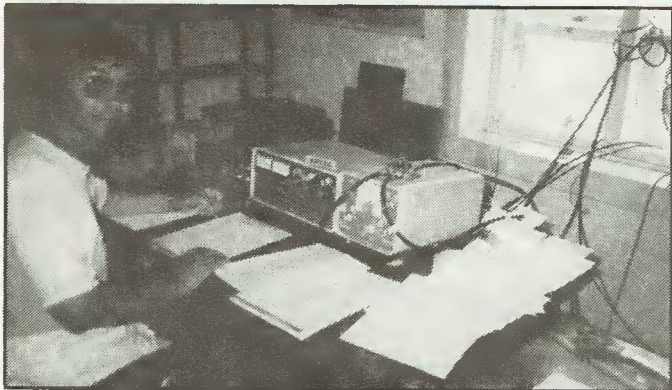
Oceania House is now run as a private hotel, where informality is the name of the game, carrying on a tradition made famous by John's father (yet another John Clunies-Ross), who would walk around his island clad in a Savile Row suit, but always barefoot and with a traditional Malay dagger thrust in his belt. John senior entertained HM Queen Elizabeth and the Duke of Edinburgh at Oceania House in 1956; these days guests are more likely to be young Australian honeymoon couples — or radio

amateurs! These days too the Savile Row suits have gone and guests are greeted by John, looking like a cross between a Royal Marines officer and Tarzan, wearing just his swimming trunks, or are served their breakfasts by Vicky, wearing only a skimpy bikini. The children run around completely naked most of the time, at least within the confines of the estate, and have all-over tans that would be the envy of any Mediterranean holiday-maker. Since there are no restaurants, bars, discos or hotels on Home Island, the arrangement at Oceania House is very much full board, to the extent that guests can help themselves to whatever drinks they want, whenever they want them, at no extra cost. Refrigerators are kept well stocked with several varieties of Aussie beer, champagne and soft drinks, and Scotch, gin and vodka are always to hand. John's maxim is "excess is not enough" and despite his British public school upbringing, he would come out with some choice Australian phraseology if he thought that you were not eating or drinking to excess. One German guest apparently put on almost 2 stone during his stay at Oceania House!

The Oceania House shack is located in a separate building, a disused Malay



Procession of Cocos Malays on Mahammed's birthday.



G4JVJ operating as VK9YG in the Contest.



G4JVJ outside the Cocos Keeling shack. The antenna in the foreground is the six-element LPY on the 60-foot tower.

school block within the grounds. A new Kenwood TS-440S is provided, along with a rather old Yaesu FL-2100B linear. When we arrived, there were only two antennas working, an 8-element log periodic yagi for 10-15-20 metres (rotatable) atop a 70 foot tower and, about 140 feet away, a 6-ele LPY for 10 and 15m only on a 60 foot tower. The second beam was not rotatable, but was fixed on north, from where almost all signals come. The station had not been used for over six months and in the tropical conditions of high winds and high humidity corrosion is quite a problem (this is why log periodic beams, rather than trapped yagis, had been selected). None of the wire antennas were in working order, so another of John's staff, Chris, and I spent a couple of days hacking through undergrowth with machettes to retrieve bits of co-ax and wire which had blown down or were hanging from the towers. Eventually we had a two-element delta loop for 40 metres working after a fashion, along with a half-wave dipole for 80 metres strung between the two towers. I made a quarter-wave inverted-L for 160 metres, John climbed the 70 foot tower and finally we were in business on all bands.

I had intended to be very active on

40, 80 and 160 metres at around sunrise (2300 GMT) and sunset (1130 GMT) most days, but after the first few days gave it up as a bad job. I was never convinced that the 40 or 160 metre antennas were working as well as they should have done. It proved very difficult to make DX QSOs on 40m, even though I was hearing signals quite well, they could not hear me. It proved next to impossible to get a pile-up going on 40m, even working the JA's I would lose the frequency to a stronger station after just a short run. 160 metres was even worse: after skeds with VS6DO and VK6HD failed, I gave up. On 80 metres, I think the dipole was working as well as you would expect a dipole at 60 feet to work, but Cocos Keeling is so far from anywhere apart from Indonesia that QSOs were few and far between — even Western Australia was about 3000 km away. Being only 12 degrees south of the equator, the favourable "grey-line" propagation paths at sunrise and sunset were over in a flash. One morning, I spent the whole of my sunrise period trying to break into a QSO between a GI and an EI station on 3797kHz. They were nattering away, not listening for DX and blissfully unaware that a VK9 station was calling them.

Unfortunately the VK phone band is only 3795-3800, so I could not even use another frequency as no-one in Europe would have heard me through the Irish QRM. After a lot of hard work I did work several of the better-equipped U.S. and Canadian stations on 80 metres, a handful of USSR stations, and just one other European (OH0MM), during my two weeks of activity.

Unfortunately the FL-2100B linear had an input matching problem, presenting a high SWR to the TS440S, which therefore cut back on its output power. The problem was at its most severe on 20m, when it was difficult to get more power out of the linear than when using the '440 barefoot. Even the built-in ATU in the '440 could not match the rig to the linear. However, for general operating on 20m this did not matter too much as even with 100 watts the pile-ups were gratifyingly large. Nevertheless, for 40 and 80 metres I am convinced that a TL-922 or something similar would have made all the difference.

QSO Rations

1988 being Australian bicentennial year meant that I could use the rare AX9 prefix, and so I used the call AX9YG between 18th-28th October. During this time I deliberately "rationed" the number of QSOs, as I intended operating seriously in the CQ World Wide DX contest on 29th and 30 October and didn't want to work everybody who was interested in contacting Cocos Keeling before the event. Far more time was spent in exploring the delights of the islands. With a total population of only around 600, it is easy to find an island all to yourself and often we would spend the day on Direction Island ("DI" to the locals), a fifteen-minute ride away by dinghy. We land on D.I. and John goes off to the Indian Ocean side of the island to catch crayfish, while we explore "the rip" — a gap in the reef which produces a strong current flowing from the ocean into the lagoon. Wearing a face mask and snorkel it is necessary only to float on the surface and be carried along at a startling pace by the rip while

Confirming Our QSO/Ur SWL Rprt							
To Radio	Date	Month	Year	UTC	MHz	2 Way	RST
		October	1988			CW/SSB	<input type="checkbox"/> 59 <input type="checkbox"/>

The Cocos (Keeling) Islands were settled in 1827 by a British sailor, Captain John Clunies-Ross. Fifty-nine years later Queen Victoria granted all land on the islands to the Clunies-Ross family and their heirs, a situation which remained largely unchanged until 1978, when the Australian government bought all the land with the exception of the family home, Oceania House, and its grounds.

This single-operator DXpedition made about 5000 QSO's, of which just over 3000 were in the CQ World Wide DX contest, resulting in a score of 3.67 Million points. For details about visiting these beautiful islands and operating from the historic Oceania House, write (enclosing return postage) to Cress Thursby-Pelham (VK6YX/VK9YC), 107 Melvista Avenue, Nedlands 6009, Western Australia.

Thanks to John and Vicky Clunies-Ross and Peter, Maxine, Catherine, Chris and Abe on Cocos (Keeling); Cress and Lissa Thursby-Pelham and John and Daphne Clunies-Ross in Perth; and to the Northern California DX Foundation and M.S. Lumban gaol YB@WR for help with QSL's.

RIG: KENWOOD TS440S
YAESU FL2100B
300 WATTS pep

ANTENNAS: 8-ELE LOG PERIODIC YAGI 13-30MHz at 21 m
6-ELE LOG PERIODIC YAGI 18-30MHz at 18 m
20 m DIPOLE at 18 m High
40 m 2-ELE DELTA LOOP at 21 m High
80 m DIPOLE at 20 m High
160 m QUARTER-WAVE INVERTED-L at 21 m High

PSE/TNX QSL VIA G4JVJ

Operator: STEVE TELENUS-LOWE G4JVJ
Photo: G4JVJ
Printing: YB@WR.

If, having read this, you would like to visit Cocos Keeling and operate with a VK9 callsign, write (enclosing return postage) to Cress Thursby-Pelham VK9YC, 107 Melvista Avenue, Nedlands 6009, Western Australia, for full details.

underneath thousands of multi-coloured fish swim by.

Meanwhile, John has started a "barbie" from dried coconut husks and after a while the aroma of grilling steaks and freshly-caught sea-water crayfish (larger than European lobsters) comes wafting across to us. We are joined for lunch by several "yachties" who are sailing around the world and have called in to DI to wait for favourable winds. One yachtie turns out to be Sam, an American amateur who last year operated as 3DX2DX/VK9 from Mellish Reef. His yacht, appropriately enough, is also called "DX". Following a most leisurely lunch, and after an hour or two of sunbathing the effects of a bottle of champagne gradually wear off and it is time to return to Home Island.

The next morning I was woken at 0500 by the muezzin's call to prayer, hideously amplified through loudspeakers on top of the mosque in the Cocos Malays' kampong or village. We had been told that it was the prophet Mohammed's birthday, so there would be an early morning procession from the Imam's house to the mosque. All the village children, dressed in red and white robes, were carrying banners and singing to the beat of tambourines and drums. This was not a performance for tourists — this was the Real Thing.

The day before the CQ World Wide contest, I was checking out the performance of the 8-ele beam on 20 metres, as I had intended doing a 20 metre single band entry, to try for the Oceania 14MHz record, which looked as if it could be beaten by a concerted effort. On a couple of occasions during the previous ten days, I had noticed that the SWR suddenly flicked up to infinity for a fraction of a second, or the signal strength of received signals dropped momentarily. However, it happened so infrequently I ignored the problem. On that day, though, a strong wind had been blowing all day and the antenna packed up altogether. It still worked well on 10 and 15 metres, so I think the feed to the rear-most element (which had been hanging at an angle to the other elements all the time) must have become completely disconnected.

This disaster put paid to the idea of doing a 20 metre single band entry, and I had to spend the next six hours making and putting up a 20 metre dipole in the dark so as to be able to use the band at all. (Why it took me six hours is another story, but after several disasters I was again QRV on all bands.) Since I could not do a 20 metre single band entry, I decided to operate on all bands.

10m Pile-Up

During the contest I used the call VK9YG, so as to prevent time-wasters asking what country AX9 was. It quickly became clear that 10 metres was in

excellent shape. With just a dipole and only 100 watts on 20 metres I could not make much impression on that band. 15 metres was better, but whenever I went on 10 metres there was a huge pile-up and it was very easy to work 4 or 5 QSOs per minute for hour after hour. At times the band was open to Japan, Europe and the whole of the States simultaneously. Since I was doing a multi-band entry, though, I had to try to work as many multipliers as possible on the other bands and here I wasted a lot of time calling stations who could not hear me on the lower frequency bands.

On 80 metres it was only possible to make 33 QSOs, whereas from Europe several hundred QSOs could be a achieved with ease. It was good to work the DXpedition to Vienna, 3W8DX, with

ease on all five bands. On 10 metre I made of 2000 QSOs (including duplicate contacts) with just over 1000 QSOs on the other bands put together. Because of the difficulties of making QSOs at all on 20, 40 and 80 metres, I feel sure that if I had operated 10 metres single band, I could have made well of 4000 QSOs, probably close to 5000, which could have given me a good chance of a 10 metre record.

After hours of intense concentration of working 200-250 QSOs an hour, by the Sunday afternoon I was so tired that I went to sleep at 1700, with the intention of getting up again for the final two hours of the contest, but of course I slept through the alarm and so missed the last seven hours of the contest. However, it was good fun and I obviously made a lot of people happy by giving them the Cocos

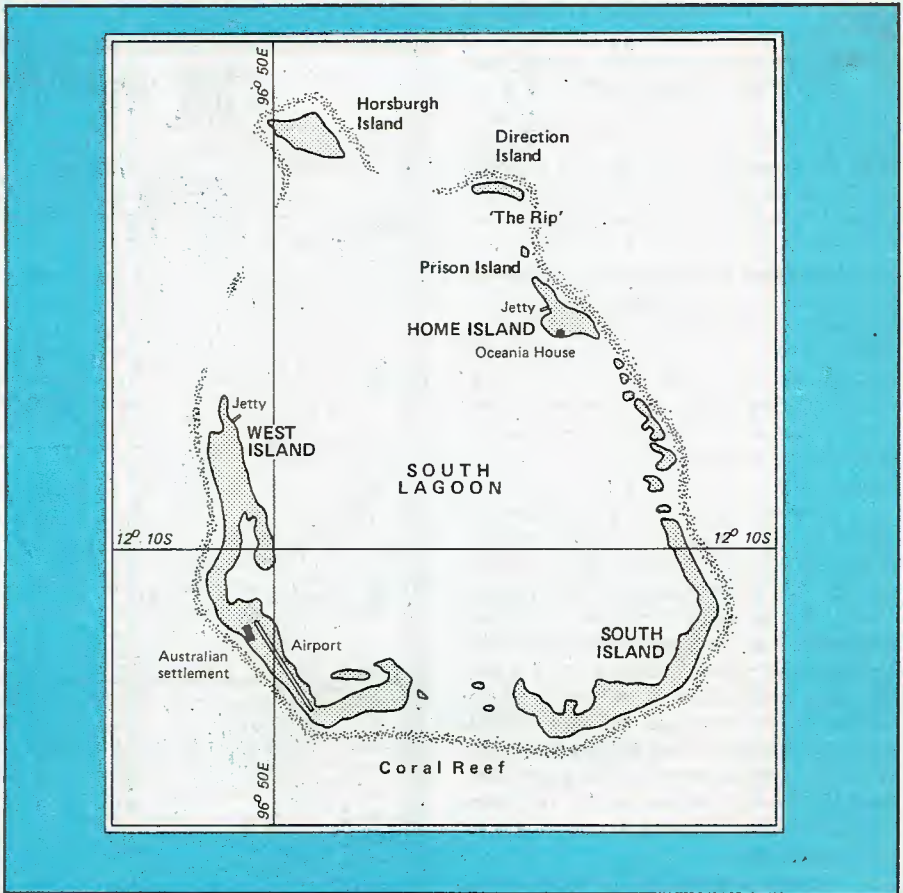
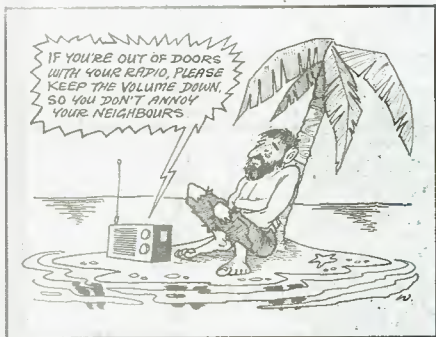
World Wide DX Contest													
Last Full Weekend of October (Phone) & November (CW)													
Call Sign		SERIAL NUMBER		New Multipliers Only	QSO	TIME GMT		SERIAL NUMBER		New Multipliers Only	QSO		
30 th OCTOBER 1988		SENT	RCVD	Zone	Px of Country	POINTS	GMT	STATION	SENT	RCVD	Zone	Px of Country	POINTS
VK9YG		5929	5915				0925	CN4IR	5929	5914			
13	G4BUO		14				25	JA2PDQ		25			
13	G3NBS		14				25	ON5JY		14			
14	PA3DYN		14				25	IK4GR0		15			
14	DF7ZH		14				26	OK2FD		15			
14	IK0IHA		15				26	G3JFH		14			
15	I7PXV		15				26	DL4ZBU		14			
15	DL0WH		14				27	UJ8XDH		17	UJ		
15	OK2PAY		15				27	G3TJW		14			
15	ON4KDO		14				27	Y24VF		14			
15	IK0LLK		15				27	FBI MCC		14			
16	DL6DK		14				28	DL3ZBJ		14			
16	G0IMR		14				28	I7PXV		15	DUPE	O	
16	DJ5YV		14				29	G3DZB		14	GM		
17	PA3DZN		14				29	DL1DAS		14			
17	G3MY		14				30	DK4DW		14			
17	G4VPD	5414					30	DK9DL		14			
18	I1CCA	5915					31	I21AU		15			
18	SM0EAI		14				31	DL8FBH		14			
19	UV3HD		16				32	QR75CP		14			
19	IT9HLR		15				32	DK4DX		14			
19	G3VZT		14				32	SP9AHE		15			
20	JA4VUQ		25				33	Y25YD		14			
20	JY4QIV		25				33	G3UMV		14			
20	IO3MBL		15				34	SP9CTV		15			
21	DF1IK/P		14				34	UQ0A		15			
21	DK7DN		14				34	I17TK		15			
21	O2CXO		14				35	Y24YH		14			
21	I1PBT		15				35	G3KYF		14			
21	OX3SQ		40	OX			35	GD4XJZ		14	GD		
22	DF7XE		14				35	JH1NBV		25			
22	DF0XZ		14				36	Y26BLA		14			
22	VP2VIN/VK9		29	VK9	O		36	HIS9COP		14			
23	RA3RQT		16				36	OK1VAM		15			
23	GW3HGJ		5714				37	F8RU		14			
23	G3JJZ		5914				37	G3ALI		14			
24	G3ATK		14				37	JH2ESL		25			
24	DK6IE		14				37	J120QP		25			
24	OK5W		15				38	TA2RK		20	TA		
24	PA3ECJ		14				38	DF2UQ		14			

Can you spot your callsign?

Keeling multiplier and possibly a new country.

Back in Perth I was entertained by George, VK6NKG (who had been on the previous DXpedition to Cocos Keeling) and Nick, VG6PAT. Both are keen DXers on 10 and 15m and are planning a DXpedition this year to Willis Island and Mellish Reef in the Pacific.

The 37 hour flight with Garuda Indonesia from Perth to London, via Bali, Jakarta, Singapore, Bangkok, Abu Dhabi, Rome and Amsterdam was uneventful but gave me plenty of time to consider where to go next. Now, it is a long time since anyone operated from Clipperton Island, and I have always wanted to see the Pacific...



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2SA673	£0.13	2SC1312	£0.09	2SC2099	£19.25	3SK97	£2.08	BD292	£0.51
2SA678	£0.38	2SC1318	£0.22	2SC2166	£0.95	40673	£1.50	BF244	£0.39
2SA683	£0.20	2SC1359	£0.13	2SC2236	£0.22	BC107	£0.13	BF245	£0.29
2SA684	£0.31	2SC1384	£0.27	2SC2290	£24.55	BC108	£0.07	BFY50	£0.25
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Radio Propagation and The Sun

Ham Radio Today brings you the last part of Propagation and the Sun — the MUF listings.

These are the listings of the computer programs for calculating the maximum usable frequency (MUF), and HF band conditions and auroral probability, described in Propagation and the Sun in the November issue of

Ham Radio Today. The programs have been written in Microsoft Basic, and have been tested on the Dragon 32, BBC and Commodore 64. They should be easily translatable to nearly any other computer.

Apologies to readers who were expecting them last month — we held them over so that we could catch up with some of our regular columns. Here they are:

Program One.

MUF Calculator

```
10 CLS
20 GOSUB 1000
30 GOSUB 2000
40 GOSUB 3000
50 GOSUB 4000
60 GOSUB 5000
70 END
999 REM
1000 REM opening screen
1010 CLS
1020 PRINT"This program will calculate the Maximum Usable Frequency (MUF)
and the Frequency of Optimum Traffic (FOT) for single hop F-Layer
propagation."
1030 PRINT:PRINT"Follow the screen instructions carefully."
1040 PRINT"Enter the Critical Frequency - EG. 4 or 8.9"
1050 INPUT CF
1060 IF CF<1 OR CF>25 THEN GOTO 1050
1070 FOR P=1 TO 1000:NEXT
1080 RETURN
1999 REM
2000 REM height of F-Layer. (See magazine text)
2010 LET H=0:CLS
2020 PRINT"From the menu, select the number of the wanted month."
2030 PRINT
2040 PRINT"    <1>-JAN        <2>-FEB"
2050 PRINT"    <3>-MAR        <4>-APR"
2060 PRINT"    <5>-MAY        <6>-JUN"
2070 PRINT"    <7>-JUL        <8>-AUG"
2080 PRINT"    <9>-SEP        <10>-OCT"
2090 PRINT"    <11>-NOV       <12>-DEC"
2100 PRINT"Enter Month - (1 to 12)":PRINT
2110 INPUT M
2120 IF M<1 OR M>12 THEN GOTO 2110
2130 IF M=1 THEN H=140
```

```

2140 IF M=2 THEN H=146
2150 IF M=3 THEN H=163
2160 IF M=4 THEN H=185
2170 IF M=5 THEN H=200
2180 IF M=6 THEN H=224
2190 IF M=7 THEN H=230
2200 IF M=8 THEN H=224
2210 IF M=9 THEN H=208
2220 IF M=10 THEN H=185
2230 IF M=11 THEN H=163
2240 IF M=12 THEN H=146
2250 FOR P=1 to 1000:NEXT
2260 RETURN
2999 REM
3000 REM path distance
3010 CLS:LET D=0
3020 PRINT"From the menu, select the number corresponding to the distance
of the target country.":PRINT
3030 PRINT"    <1>-1000 miles    <2>-2000 miles"
3040 PRINT"    <3>-3000        <4>-4000"
3050 PRINT
3060 INPUT Y
3070 IF Y<1 OR Y>4 THEN GOTO 3090
3080 LET D=(Y*1000)
3090 PRINT"Distance selected is ";D;" miles"
3100 FOR P=1 TO 2000:NEXT
3110 RETURN
3999 REM
4000 REM number crunching and results
4010 CLS:LET MUF=0:LET FOT=0
4020 PRINT"Height of the F-Layer for the ";M;" month is ";H;" miles"
4030 PRINT"Distance to target country is ";D;" miles"
4040 PRINT"Critical Frequency is ";CF;"mHz"
4050 LET MUF=CF*SQR(((D/(2*H))^2)+1)
4055 LET MUF=MUF*10:MUF=INT(MUF):MUF=MUF/10
4060 LET FOT=MUF*0.85
4070 PRINT"Calculated Maximum Usable Frequency is ";MUF;"mHz"
4080 PRINT"Optimum Frequency is ";FOT;"mHz"
4090 RETURN
4999 REM
5000 REM run again
5010 PRINT"Run again??? (Y/N)"
5020 INPUT A$
5030 IF A$<>"N" OR A$<>"n" THEN RUN
5040 RETURN

```

NOTE!!! Line 4050 - symbol after the " $(2*H)^2$ "-is raise to the power

program is standard Microsoft Basic, and should run on any computer without modifications.

Test data

Enter 5MHz as the Critical Frequency. Select height of 200 miles-(Apr in the program). Select distance of 1000 miles. If everything is OK, then the MUF should be 13.4 MHz and the FOT should be 11.39 MHz.

Program Two. HF Band Conditions and Auroral Probability.

```
10 CLS
20 LET A$="Band conditions are expected to be ": LET B$="Auroral
probability is ": LET PROB=0: LET SFX=0: LET K=0
22 PRINT"Predicted HF band conditions and Auroral Probability Prog-
ram":PRINT
30 INPUT"Enter Solar Flux units. ";SFX
40 INPUT"Enter 'K' Index Value. ";K
50 IF SFX >= 70 AND SFX <= 130 AND K=1 THEN PROB=5:GOSUB 1000:GOTO 20
60 IF SFX >= 130 AND K=1 THEN PROB=5:GOSUB 2000:GOTO 20
70 IF SFX >= 70 AND SFX <= 120 AND K=2 THEN PROB=5:GOSUB 1000:GOTO 20
80 IF SFX >= 120 AND K=2 THEN PROB=5:GOSUB 2000:GOTO 20
90 IF SFX >= 70 AND SFX <= 130 AND K=3 THEN PROB=20:GOSUB 2000:GOTO 20
100 IF SFX >= 130 AND K=3 THEN PROB=25:GOSUB 3000:GOTO 20
110 IF SFX >= 70 AND SFX <=130 AND K=4 THEN PROB=35:GOSUB 4000:GOTO 20
120 IF SFX >= 130 AND K=4 THEN PROB=60:GOSUB 5000:GOTO 20
130 IF SFX >= 70 AND SFX <=140 AND K=5 THEN PROB=75:GOSUB 6000:GOTO 20
140 IF SFX >= 140 AND SFX <= 180 AND K=5 THEN PROB=85:GOSUB 6000:GOTO
20
150 IF SFX >= 180 AND K=5 THEN PROB=96:GOSUB 7000:GOTO 20
160 PRINT"+++ DATA OUT OF RANGE +++":GOTO 20
170 END
999 REM SUBROUTINES
1000 PRINT A$; " EXCELLENT"
1010 PRINT B$; PROB; "%"
1020 PRINT"-----"
1030 RETURN
2000 PRINT A$; " VERY GOOD"
2010 PRINT B$; PROB; "%"
2020 PRINT"-----"
2030 RETURN
3000 PRINT A$; " AVERAGE"
3010 PRINT B$; PROB; "%"
3020 PRINT"-----"
3030 RETURN4000 PRINT A$; " POOR"
4010 PRINT B$; PROB; "%"
4020 PRINT"-----"
4030 RETURN
5000 PRINT A$; " VERY POOR"
5010 PRINT B$; PROB; "%"
5020 PRINT"-----"
5030 RETURN
6000 PRINT A$; " VERY DISTURBED IONOSPHERE"
6010 PRINT B$; PROB; "%"
6020 PRINT"-----"
6030 RETURN
7000 PRINT A$; " SEVERE IONOSPHERIC STORM"
7010 PRINT B$; PROB; "%"
7020 PRINT"-----"
7030 RETURN
```

TEST DATA

Enter Solar Flux of 100, and 'K' Index of 3.

Program should show -

*Band conditions are expected to be VERY GOOD
Auroral probability is 20%*

RADIO Tomorrow

On these club contacts and forward diary pages, dates are shown approximately from the week of publication to the end of the cover month, and further into the year where dates have been supplied. If we get a yearly schedule, we will incorporate half-yearly slabs, to save space and admin and allow for alterations. We need dates at least three calendar months in advance to get them into the nearest issue. For example: the last possible issue for dates from mid-August to mid-September is the September issue. The September issue normally appears on the first Friday in August, and we need club dates by the second Friday in June. Club dates received well in advance will normally be run in more than one issue. Also, please write and let us know if your club has ceased, or changed its name or contact.

SCOTLAND

Aberdeen ARS. Contact: Don Tel. 04676 251.
Ayr ARG. Contact: GM4CUB Tel. Ayr 262496.
Dunfermline RS. Contact: GMODYD Tel. 0383 413440.
Galashiels DARS. Contact: GM3DAR Tel. 0896 56027.
Glenrothes DARC. Contact: Sep 16 Scottish National AR
Convention at Fife Institute of Physical Recreation,
Glenrothes. Contact: John Hardwick GM4ALA Tel. 0592
742763 (hm) 0506 410677 (wk).
Inverness ARC. Contact: Brian Tel. 0463 242463.
Lothian RS. Contact: P. J. Dick GM4DTH, 21 West Maitland St,
Edinburgh EH12 5EA, Prestel mailbox (NOT phone)
314471210. Meetings: 2 and 4 Thursday 7.30pm at the
Orwell Lodge Hotel, Polworth Terrace, Edinburgh. May 10
Construction competition and DF tuneup; May 24 DF hunt;
Jun 14 AGM; Jun 28 Barbecue.
Louth DARC. Contact: G1IZB Tel. 047286 595.
Mid Lanark ARS. Contact: David Williams GM1SSA, Tel.
Holytown 732403. Open Day 1989 Sunday June 11,
Community Education Centre, Newarthill, by Motherwell
A723, 1½ miles south of Newhouse interchange M8/A73.
Traders, bring and buy, packet radio demos, RTTY, QRP,
lectures, EHI annual trophy award. Talk in on S22.
Refreshments. Book Morse tests with RSGB Potters Bar in
good time.
Westside SWC. Contact: Bernie Lyford Tel. 0703 893937.
Westmoorland ARS. Contact: G. Chapman Tel. 0539 28491.

NORTH EAST ENGLAND

Barnsley ARC. Contact: Ernie G4LUE, 8 Hild Av, Cudsworth.
Bourne DARS. Contact: Vince G4ODG Tel. 0778 422795.
Denby Dale DARC. Contact: G3SDY Tel. 0484 602905.
Derby DARC. Contact: Kevin Jones G4FPY Tel. 0332 669157.
Meetings: 119 Green Lane, Derby. 7.30pm. Most Wednesdays.
May 17 Video show; May 17 Satellite TV by Paul G8JGF; May
24 Visit by Birketts of Lincoln; May 31 Japanese morse by
Norman Kendrick G3CSG; Jun 7 Junk sale; June 14 2m
direction-finding in Allestree Park; Jun 21 Barbecue, Drum
Hall, Little Easton; Jul 5 Junk sale.
Doncaster ARC. Contact: K. McMahon Tel. Doncaster 852938.
Gt. Lumley ARES. Contact: G4MSF Tel. 091 4693955.
Halifax DARS. Contact: D. Moss Tel. 0422 202306.
Hornsea RC. Contact: Richard Tel. 0401 62498. Meetings: The
Mill, Atwick Rd, Hornsea. 8pm.
Hoyland ARC. Contact: M. Wardle, 11 Sokwell Ave, Barnsley.
Keighly ARS. Contact: K. A. Conlon G1IGH. Tel. Bradford
496222. Meetings: Wednesdays, 8pm, The Clubroom, rear of
Victoria Hall, Keighly, Yorkshire. May 16 Annual foxhunt; May
30 Programmable devices by G3YEE; Jun 27 Wildlife on the
Falklands, slides by G0FRQ.
Leeds DARS. Contact: G1EBS Tel. 0274 665355.
Loughborough ARC. Contact: Philip Tel. 0509 412043.
Mansfield ARS. Contact: J. M. Coates G4GYU Tel. 0623 27257.
Meetings: Fridays.

Morecambe Bay ARS. Contact: G4ZJL Tel. 0524 52042.
Pontefract DARS. Contact: Colin Mills G0AAO Tel. 0977 43101.
Rotherham ARC. Contact: F. Moody Tel. Rotherham 552925.
Rugby ATS. July 30 AR Car Boot Sale, Lodge Farm, Walcote, Nr.
Lutterworth, Leics (near M1) £5 pitch 10am. Contact: Kevin
G8TWH Tel. 0203 441590 David G4DDW Tel. 0455 52599.
Scarborough ARS G4BP. Contact: I. G. Hunter G4UQP, Station
Road, Scalby, Scarborough, N. Yorks YO13 0QA. Tel. 0723
376847. Scarborough ARS Rally 1989, 30 July at the Spa,
Scarborough, on the south shore seafront. Open 11am. Talk-in
on S22. Trade stands, bring and buy, refreshments and bar.
Near the town entertainments.
Sheffield ARC. Contact: Alan Pemberton. Tel. Sheffield 670866.
Sheffield Packet Group. Contact: P. Green, 6 Yews Close, Worrall.
Spalding ARS. Contact: Terry G4TWR Tel. 0775 2940. 4 Jun
Rally at Springfield Gardens, Spalding, Lincs. 10am.
Stockton DARS. Contact: G. Noble c/o Causeway Community
Centre, Billingham, Stockton on Tees Meetings: Wednesdays
Causeway Community Centre 7.30. RA and morse tuition
regularly.
Tyneside ARS. Contact: G. Lindsay G4KOT, 12 Augusta Court,
Harrian Park, Wallsend, Tyne & Wear NE28 9QZ.
Wakefield: North Wakefield RC. Contact: J. M. Hotchin, White
Horse Inn, Fall Lane, East Ardsley, Wakefield.
Wigston ARC. Contact: G6HAJ Tel. Leicester 403105.
Worksop ARS. Contact: John Huggins G0DZX Tel. 0909
565856. Meetings: The Clubhouse, West St, Worksop.

NORTH WEST ENGLAND

Aire Valley RS. Contact: G6NPT Tel. 0532 44597.
Bolton ARC. Jun 4 1989 Rally, CANCELLED DUE TO LACK OF
TRADER RESPONSE. OH DEAR.
Chester DRS. Contact: Dave Tel. 0244 336639.
E. Lancs ARC. Contact: Stuart Tel. 0227 68913.
Fylde ARS. Contact: Frank G4CSA Tel. St. Annes 720867.
Meetings: South Shore Lawn Tennis Club, Midgeland Road,
Blackpool. 2 and 4 Thursdays. NB new venue. May 11
Equipment sale; May 25 Prep for field day.
Isle of Man ARS. Contact: J. Wrigley, 20 Fairy Hill Close,
Ballafession, Port Erin, Isle of Man. Tel. 0624 834257.
Kirby ARC. NEW CLUB. Contact: Meetings: Wednesdays Kirkby
Sports Centre, 17 Valley Road, Westvale, Liverpool 7.30.
Liverpool DARC. Contact: W. H. G. Metcalfe G6VS, 38 Kempton
Road, Wavertree, Liverpool. Meetings: Tuesdays, Conservative
Club, Church Road. May 9 Construction and club on air; May
16 G3IQO DF Foxhunt Cup event; May 30 NFO preparations;
Jun 6 Magnetic loop by George G6VS; Jun 13 Construction/
on-air; Jun 20 VHF NFD preparation; Jun 27 Surplus sale
Morecambe Bay ARS. Contact: D. H. Wood G4ZJL Tel. 0524
52042. Tuesdays 7.30. Trimpell Sports and Social Club, Out
Moss Lane, Morecambe, Lancs.
Preston ARS. Contact: George Tel. 0772 718175.
Staffs ARS. Contact: Bill G4WPT Tel. 0782 514741.

Stockport RS. Contact: John Verity G4ECI Tel. 061 439 3831. Meetings: Dialstone Community Centre, Lisburne Lane off Dialstone Lane, Offerton, Stockport. 8pm. 2 and 4 Wednesdays.

Todmorden DARC. Contact: Esde Tyler GOAEC Tel. Halifax 882038. Meetings: 1,3 Thursdays. May 15 Surplus/junk sale; Jun 5 Simple electronics for simple folk by G4HYY.

Warrington ARC. Contact: Paul GOCBN Tel. 0925 814005.

Wirral ARS. Contact: A. Seed G3LCI Tel. 051 644 6094.

WALES

Abergavenny and NH ARC. Contact: GW4XQH Tel. 0873 4655.

Aberporth ARC. Contact: GWODPR Tel. 023987 274.

Bridgend DARC. Contact: D. E. George GW10UP Tel. 0656 723508.

Conwy Valley ARS. Contact: R A Hinton Tel. 01 301 1864.

Delyn RC. Contact: Stephen Studdart GW7 AAV Tel. 0244 819618. Meetings: Daniel Owen Centre, Mold, Clwyd. Every other Tuesday.

Newport ARS. Contact: GW7BSC Tel. 0633 62488. **2nd Grand Surplus Equipment/Junk Sale**, Brynglas House, Newport. 11 (10.30 disabled) to 4. Auction 12 to 3. Refreshments, talk-in. Proceeds to support Project YEAR. Details: NARS, P.O. Box 33, Newport, Gwent.

North Wales: Dragon Amateur Radio Club/Clwb Radio Amatur Y DDraig GW4TTA. Contact: Tony Rees Tel. 0248 600963. Meetings: At the Four Crosses, Pentraeth Rd., Menai Bridge. 7.30pm. 1 and 3 Mondays. May 15 Demonstration on metostat by Peter Higgs GW4IGF; Jun 5 Aerials for DX by Bert Hewit GW3YNN; Jun 19 Security in the home and shack by John Parry GW3VVC.

THE MIDLANDS

Birmingham: Midland ARS. Contact: Paul O'Connor G1ZCY Tel. 021 443 5157. Meetings: Thursdays 7.30 at Unit 16, 60 Regent Place, Jewellery Quarter, Birmingham. **Drayton Mobile Rally at Drayton Manor Park and Zoo, 14 May 10am. Parking, talk-in. Disabled parking not open till 11am.** May 23 Raynet; May 29 BBC computer club. **19 Nov Mars Mini Rally at Stockland Green, Birmingham. Details to come.** Regular morse tuition.

Coventry ARS. Contact: Johnathan Ward G4HHT Tel. 0203 610408. Meetings: Baden Powell House, 121 St. Nicholas St., Radford, Coventry. 8pm. Fridays. May 19 Indoor direction-finding contest (cup qualifier); Jun 2 on-air portable; Jun 16 Canal trip; Jun 30 2m direction-finding contest. Regular on-air/morse tuition.

Mid Warwickshire ARS. Contact: G4TIL Tel. Southam 4765. Stourbridge, West Midlands DY9 0YH.

Rugby ATS. Contact: Kevin Marriott G8TWH, 77 Lloyd Crescent, Stoke Hill, Coventry CV2 5NY. Meetings: Cricket Pavilion, BT1 Radio Station, B entrance, A5 Trunk Rd., Hillmorton, Rugby. Tuesdays 7.30. May 16 DXpedition to Lundy by Lionel Parker G5LP; May 23 DF hunt under new rules; Jun 13 Prep for VHF NFD; Jun 20 DF Hunt under new rules; Jun 27 Top band DFing by Geoff Foster (provis).

Stratford on Avon DRC. Contact: David G0HWZ. Tel. 0789 750584. Meetings: 2 and 4 Mondays, 7.30pm, The Baptist Church, Payton St., Stratford on Avon. May 8 The heyday of Wireless; May 22 Technical topics; Jun 12 Foxhunt on 2m; Jun 26 Worked all Britain by Dr. Robert Nash G4NEE; Jul 10 Amateur satellites; Jul 24 Constructors competition.

Stourbridge DARS. Contact: C. Brunn G1WAI Tel. 0562 885602. Meetings: Robin Woods Centre, Beauty Bank, Stourbridge, Worcs. 1 and 3 Mondays.

Telford DARS. Contact: Tom Crosbie Tel. 0952 597506.

West Bromwich Central RC. Contact: Bill Oakes G1YQY Tel. 021 556 3183.

Wolverhampton ARS. Contact: Keith Tel. 0902 24870.

Worcester DARC. Contact: D. Batchelor Tel. 0905 64173.

Wythall RC. Contact: Chris Pettitt G0EYD. Tel. 021 430 7267.

SOUTH WEST ENGLAND

Bath DARC. Contact: G4UMN Tel. Frome 63939.

Bristol: North Bristol ARC. Contact: Alan Booth Tel. 0272 690404.

Bristol: South Bristol ARC. Contact: Len Baker G4RZY Tel. 0272 834282. Meetings: Whitchurch Folk House, East Bundry Rd., Whitchurch, Bristol BS14 0LN. Most Wednesdays. May 17 Construction evening; May 24 Club station; Jun 7 Lecture; Jun 14 Microwave activity on Dundry Hill; Jun 25 Longleat.

Cornish RAC. Jul 15 Cornish RAC Rally, Richard Lander School, Truro. Trade, bring and buy, computer display and demo, refreshment, parking. Family attractions. Contact: Rolf Little Tel. 0872 72554.

Dorset: Aug 13 Hamfest '89, Flight Refuelling Sports Grounds, Wimbourne, Dorset. Trade, crafts and gifts, field displays. 10am. Parking, camping. Contact: John GH0API 0202 691649, Rob G6DUN 0202 479038.

Evesham: Vale of Evesham DARS. Contact: John G3DEF Tel. Evesham 6407. Meetings: 1 Thursdays at 7.30pm at the MEB Club, Worcester Road, Evesham (B4084).

Exeter ARS. Contact: Roger Tipper Tel. 0392 68065.

Plymouth ARC. Contact: G4SCA Tel. 0752 337980 **Plymouth RC Mobile Rally, Plymstock School, Church Road, Plymstock, Plymouth. May 28 from 10am. Large free car park, refreshment, raffles, usual trade stands, demonstrations and talk-in on S22. Contact: Joe G1RXR Tel. 0752 509855.**

Poole ARS. Contact: G0EQV Tel. 202 674802.

Salisbury RES. Contact: Neil Tel. 0980 22809.

Salop ARS. Contact: Fred Hall G3NSY Tel. 0743 790457.

Meetings: 2, 4 Thursdays, The Olde Bucks Head, Frankwell, Shrewsbury 8pm. May 11 Junk Sale at Beauchamp Hotel, The Mount, Shrewsbury; May 25 Fox hunt; Jun 8 Quiz vs Powys.

Thornbury DARC. Contact: Tom Cromack G0FGI, Rose Cottage, The Naite, Oldbury on Severn, Bristol. 1 and 3 Wednesdays, 7.30 United Reform Church, Chapel St., Thornbury, Evesham. May 17 HF activity.

Torbay ARS G3NJA, G8NJA. Contact: Bob McCreadie G0FGX Tel. 03646 233. Meetings: the ECC Club, Ringslade Rd., Nr. Highweek. Natter nights most Fridays. 7.30pm.

Trowbridge DARC. Contact: Ian Carter G0GRA. Tel. 0380 830383. Meetings: Usually 4 Wednesdays, 8pm, TA HQ, Bythesea Road, Trowbridge. Jun 21 6.30am 2 metre fox hunt; Jul 19 6.30am Picnic.

Yeovil ARC. Contact: David Bailey G1MNM, QTHR. Meetings: The Recreation Centre, Chilton Grove, Yeovil. 7.30pm, every Thursday. May 11 enrolment for RAE class; May 18 Great circle propagation by G3MYM.

SOUTH EAST ENGLAND

Basingstoke ARC. Contact: D. Deane G3ZOI Tel. 0734 332777 (hm) 0734 787930 (wk). Meetings: The Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. 7.30pm. 1 Mondays. Club net Sunday evenings on 144MHz.

Bedford DARC. Contact: Ray G0EYM Tel. 0234 244506. **Special Event Stations GB2WW and GB4BOB commemorating World War 2 during 1989.** Locations include RAF and USAF bases in the Bedford area.

Biggin Hill ARC. Contact: Geoff Milne G3UMI, 142 Hayes Lane, Hayes. Meetings 3 Tuesdays, Victory Social Club, Kechill Garadens, Hayes. May 16 Quiz; Jun 20 G2 MI souvenirs; Jul 18 PCBs.

Braintree DARS. Contact: N. Willicombe Tel. 0376 45058. Meetings: Braintree Community Association Centre, Victoria St. 7.30pm. 1 and 3 Mondays. Club net C6BRH or G4JXG, 2m 2 and 4 Mondays, 8pm.

Bredhurst RTS G0BRC, G7BRC. Contact: Kevin Fay Tel. 0634 376991.

Brighton DARS. Contact: Peter Tel. 0273 607737. Meetings: 1 and 3 Wednesdays, Roast Beef Bar, Brighton Racecourse, Elm Grove, 8pm.

Bromley, Kent: Tel. 01 462 2689. Meetings: The Victory Social Club, Kechill Gardens, Hayes, Kent. 7.30pm. 3rd Tuesdays. Club net 145.350MHz FM 11am Sundays.

Burnham Beeches RC. Contact: G6EIL Tel. 0628 25720. **July 23 6th McMichael Rally with Maidenhead DARC at Haymill Centre, Burnham (Slough).** CAMRA bar, food, parking, radio controlled cards, ATV group, packet and HF stations, £1, car boot area £5, from 10.30 (10.15 disabled). Contact Bob Hearn GOBTY Tel. 0494 29868.

Cambridge DARC. Contact: D. Wilcox Tel. 0954 50597.

- Chesham DARS.** Contact: L. Cabban Tel. 09278 3911. Meetings: The Stable Loft, Bury Farm, Pednor Rd., Chesham. 8pm. Wednesdays.
- Cheshunt DARC.** Contact: Roger Frisby G4OAA Tel. 0992 464795. Meetings: Thursdays 8pm Church Room, Church Lane, Wormley, Herts.
- Chichester DARC.** Contact: C. Bryan G4ZTD, Tel. Chichester 789587. Meetings: St. Pancras Hall, St. Pancras, Chichester. 7.30. Club net G8WSX on S11 Mondays 7.15pm. 1 and 3 Tuesdays. **Jul 16 Sussex Amateur Radio and Computer Fair, Brighton Racecourse.**
- Clifton ARS.** Contact: Martin Brown G0DGC Tel. 01 691 2341.
- Coulsdon ATS.** Contact: Alan Tel. 01 684 0610.
- Crawley ARC.** Contact: Jack Tel. 0294 28612.
- Dover: South East Kent YMCA ARC.** Contact: Des Edwards Tel 0304 203073. Meetings: Dover YMCA, Godwynehurst, Leyburne Rd., Dover, Kent CT16 1SN. Wednesdays. Jun 24-25 Waldershare Vintage Weekend special event station GB2 WYV; Jul 19 Morse tests; Nov 15 Morse tests.
- Dunstable Downs RC.** Contact: Tony Kelsey-Stead Tel. 0582 508259. Meetings: Room 3, Chews House, 77 High St. South, Dunstable, Beds. Fridays. May 12 Interference on radio sites by Nick Fenner G1NMP; Jun 4 Description by Phil Seaford G8XTW; Jun 18 DF/Treasure hunt; Aug 20 DF/Treasure hunt. **Sep 10 6th National Amateur Radio Car Boot Sale at The Shuttleworth Collection, Old Warden Aerodrome, Nr. Biggleswade, Beds. 10am. Fly in is available — permission from Northhill 288.**
- Eastbourne EARC.** Contact: G1BRC Tel. 0323 29913.
- East Kent ARS.** Contact: Stuart Tel. 0227 68913. **13th Annual East Suffolk Wireless Revival 1989.** Contact: Jack Tootill G4IFF Tel. 0473 464047. Stand space from Colin Ranson G8LBS Tel. 0473 688204. Sunday 28 May at the Civil Service Sportsground, Straight Rd., Bucklesham, Ipswich, Suffolk. Traders, bring and buy, RSGB book stall, car boot sale, aerial testing range, transceiver clinic, packet radio demo, cw pile-up, vintage radio display, other stalls, play area, model flying display, refreshments. £1 including car parking. Talk-in on S22, BG3PO and GB3IH.
- Edgware DRS.** Contact: Ian Cope G4IUZ, Tel. Hatfield 65707. Meetings: Watling Community Centre, 145 Orange Hill Rd., Burnt Oak, Edgware. 2 and 4 Thursdays.
- Felixstowe DARS.** Contact: G4YQC Tel. 0473 642595.
- Grafton RS.** Contact: Rod Harrigan G0JUZ Tel. 01 368 8154. Meetings: Holy Trinity Church Hall, Stapleton Hall Rd., London N4. 2 and 4 Fridays.
- Hastings ERC.** Contact: Dave Shirley Tel. 0424 420608.
- Haverhill DARS.** Contact: Rob Proctor Tel. 0787 281359.
- Hilderstone RS Mobile Rally and Convention, Hilderstone College, St. Peters Road, Broadstairs, Kent July 30. Traded, bring and buy, lectures, raffle, 10am on. Contact: Alan 0843 593072 or Ron 0304 812723.**
- Horsham ARC.** Contact: P. Godbold Tel. Steyning 814516. Meetings: Guide Hall, Denne Rd., Horsham, Sussex. 8pm. First Thursdays.
- Huntingdonshire ARC.** Contact: G8lrs Tel. 0480 56772. Packet GB7HXA. Meetings: 1 and 3 Thursdays, The Medway Centre, Coneygeare Road, Huntingdon, Cambs 7.30am. **Aug 28 "Junk 88" sale and auction 10.30-5.00. Talk-in and refreshment.**
- Itchen Valley RC.** Contact: G1IPQ Tel. Southampton 736784.
- Loughton DARS.** Contact: J D Ray G8DZH Tel. 01 508 3434 (ev); 015083434 Micronet 800 mailbox, TeleGold 74:MIK1824; packet G8ZDH at GB7ESX. Meetings: Loughton Hall, Rectory Lane, Room 20, 7.45pm. Fridays. May 19 Planning night for Aylmers Farm; May 26-28 Aylmers Farm weekend GB2LRS; June 2 Birth of the multi-band receiver by Jack Atkinson G3OPA.
- Maidstone YMCA ARS.** Contact: G0BUW Tel. 0622 30544. Meetings: YMCA Sports Centre, Melrose Close, Maidstone, Kent. Fridays 8pm. May 19 Rally planning meeting. **May 28 Radio Rally A229 Loose Village (indoors) ATV demo, beer tent, children's playroom, GB2YSC on air. 0622 50709 details, 0622 890167 trade bookings.**
- Mid Sussex ARS.** Contact: G0GMC Tel. 07918 2937.
- Milton Keynes DARS.** Contact: Mike G0ERE Tel. 0234 750629.
- Norfolk ARC.** Contact: Craig Joly G0BGD 0303 485784 QTHR. Meetings: The Norfolk Dumping, the Livestock Market, Hall Road, Harford, Norwich. 7.30. May 10 Polar ski-trek expedition by Mike Mearman G0/PA3BHF; May 17, 31 NFD briefings; May 24 GB3NB repeater AGM; Jun 3/4 HF NFD; Jun 7 Inter-club quiz with Leiston ARC; June 14 Informal and committee; Jun 21 Domestic satellite television by Gordon Higgins G3PXT; Jun 28 Practical antennas by Ron Huntsman G3KBR.
- Reading DARC.** Contact: M G Anthony G4THN, 9 Paice Green, Wokingham. Berks RG11 1YN.
- Peterborough RES.** Contact: Peter G4PNW QTHR.
- Petersfield — Royal Naval ARS. 29th Annual Mobile Rally, June 11 HMS Mercury, Petersfield, Hants. Trade stands etc., amusements for children, non-radio stalls including toys, jewellery, plants, garden gnomes (eek), DIY archery, handicrafts, vintage engines, radio controlled models, marching bands, etc. Flypast by Faery Swordfish. Parking, refreshments, talk-in on 2m and 70cm. Adults £1, children free, 10am-5pm. Contact: Cliff Harper G4UJR QTHR. Tel. 0703 557469.**
- Reading ARC.** Contact: Mike G4THN Tel. 7434 774042. 2 and 4 Thursdays, Caversham Conservative Club, Caversham, Reading, Berks.
- St. Albans: Verulam ARC.** Contact: George Christofi G0JKZ Tel. 01 427 4800. Meetings: RAF Association HQ, New Kent Rd., off Marlborough Rd., St. Albans. 7.30pm. 2 and 4 Tuesdays. May 23 6m Equipment by Roger Ray G8CUB.
- Sevenoaks DARS.** Contact: Barry Leggett Tel. 0732 741222 ext. 245 office hours. Meetings: Emergency Control Centre, Sevenoaks District Council Offices, Sevenoaks, Kent. 8pm 3 Mondays.
- Shefford DARS.** Contact: Tim Stellar G6RCT Tel. 0707 372211. Meetings: Church Hall, Ampthill Rd., Shefford, Beds. 8pm.
- Southend DRS.** Contact: S. Blinkhorn G1XGP, 102 Lord Roberts Ave., Leigh-on-Sea, Essex SS9 1NE. **May 7 Southend DARS rally and boot sale, Roachway Youth Centre, Roachway, Rochford, Essex. 10am. Contact: Ted G4TUO Tel. 0702 202129.**
- Southgate ARC.** Contact: Brian Shelton Tel. 01 360 2453. Meetings: Holy Trinity Church Hall, Winchmore Hill, London N21. 7.45pm. 2 and 4 Thursdays. May 11 Marconi and Microwaves by Stan Woods; May 25 "Dr QSO" CW computer program demonstrated by G0ASA.
- South Kent (YMCA) ARC.** Contact: Des Edwards Tel. 0304 203073. Meetings: Dover YMCA, Godwynehurst, Leyburne Rd., Dover. Tuesdays. Jun 24-24 Waldershare Vintage Weekend GB2WVW; Jul 19 Morse tests; Nov 15 Morse tests.
- Stevenage DARS.** Contact: G6EDA Tel. 0438 724991. Meetings: 1, 3 Tuesdays Sitec Ltd., Ridgemonk Park, Telford Ave., Stevenage 8pm (7.30 for tuition).
- Welwyn Hatfield ARC.** Contact: Roger Curtis G0CYC Tel. 0707 324958. Meetings: Lemsford Village Hall, Brocket Rd., Welwyn Garden City, 1 Mondays, 8pm. 9th WGC Scout HQ, Knightsfield, WGC 3 Mondays. Regular nets. May 15 HF field day prep; Jun 3.4 HF field day, Hill Farm, Ayot St. Lawrence; Jun 5 Summer Social Barbeque and model aircraft display; Jun 19 VHF FD prep; Jul 1.2 VHF field day, Hill Farm.
- West Kent ARS.** Contact: B. Guinnessy Tel. 0892 32877.
- West Sussex ARS.** Contact: M. Mundy, 142 Junction Road, Burgess Hill.
- Wimbledon DARS.** Contact: Nick Lawlor G6AJY Tel. 01 330 2703. Meetings: 2 and 4 Fridays. St. Andrews Church Hall, Herbert Rd., Wimbledon, London SW19. 7.30pm. May 26 Quiz with Coulsden Soc; Jun 9 Cellular Radio by Ian Lamb G8KKQW; Jun 30 HF antennas and feeder systems by Louis Varney G5RV. Hope the scanner appeal went well. Too late to publicise, sorry.

IRELAND

Armagh and Dungannon DARC. Contact: J. Murphy Tel. 0861 522153.

Donegal ARC. Contact: EI3BOB Tel. 074 57155.

Mid Ulster ARC. Contact: Jim Lappin Tel. 0762 851179.

Meetings: 2 Sundays (not July and Aug) 3pm Guide Hall, Gilford, Co. Down. **May 21 Parkanaur Radio Rally, Silverwood Hotel, Lurgan, Co. Armagh from 12 noon. Trade stands, bring and buy, books, QSL bureau etc. Talk-in S22. £1. Proceeds to Stanley Eakins Memorial Fund.**

Free Readers Ads!

FOR SALE

MICROWAVE modules, 100W linear 2 metres 3W input, £115; Spectrum 48k, cassette recorder, printer and joystick, £75; Akai colour camera for ATV, £125. **GODVZ QTHR.** Tel 051-625 2271. **SWAP,** sell. Black Jaguar portable scanner, gwo, £130 or swap for BRL 500 amplifiers for conversion or will buy. Must be gwo, also swap TX-3 for RX-4, program C/64 disk only, also w/fax programs wanted, C/64. Paul, 130 Spashett Road, Lowestoft, Suffolk.

FT290R, 2M, all mode transceiver with rubber duck and carry strap, good condition, £220 ono; microwave modules, 144MHz, 100W linear amplifier, 144/100LS, £115 ono. Phone 091 5109385 (after 6 pm).

FOR SALE. Plessey PR 1553 HF communications receiver, solid state, digital, vgc, £350. Phone 0684 73366 (after 2 pm).

FT102, HF transceiver, excellent condition, new relays fitted, handbook and original packing, £500; matching SP102 speaker with audio filters, £50. **GM3DPK QTHR.** Tel 02612 5373.

HEATHKIT R-C Bridge, G-3V, handbook, £25, plus carriage; Maplin keyboard, plus metal case, £20, carriage extra; Philips push button car radio, £10, carriage extra; aerial, boot mounts, £5, plus carriage; manuals, servicing, TR2400, TR5500, TR9000, TR2500, TR3500, TR3200, £8 each plus postage. — 0359-26-5059.

FOR SALE. Sony ICF 2001 plus mains PSU, little used, £110. Tel 0594 23717 (evenings).

TRIO TS930S HF transceiver and extension speaker, £1195; **Trio TS711E** 2 metre transceiver, £625; Capco ATU, £120; Bnos 100 watt 2 metre amplifier, £110; Alinco 25amps 13.8DC power supply, £110. All in mint condition and boxed, ono, Surrey. Phone 01-640 0281.

TRIO TR3200, 70cms, FM, portable, trans, nicads, boxed, mint, £120; Yaesu CPU 2500R, 2M, FM, mobile trans, keyboard, mic, £125, vgc. Tel Weymouth 0305 773240.

EX Govt equipment for disposal. Xtal calibrated wavemeter TE149, B38/R208, RX 10-60MHz, R1481, RX 66-86MHz. Condition of above not known. Xtal calibrator No. 10, modified to use FETs, offers. Redruth 0209 218926 (evenings).

FOR SALE YAESU 7700 with ATU and 2metre converter. £350 also

YAESU FRG7 £120. both units in very good condition. Tel: 0484 661101.

SONY ICF-6700W world short wave receiver all bands. Excellent. £160. Tel: 0245 (322082) evenings. Chelmsford, Essex.

REDIFON GR439 AM, SSB, CW, 100W synthesized military transmitter receiver 1-12MHz complete and in excellent condition with manuals. £240 ono. Vic Tuff, 49 Solingen Estate, Blyth, Northumberland, NE24 3ER. Phone: 0670 355170.

SOMMERKAMP FR-100B Amateur bands Receiver: 12 valves, XTAL & Mechanical filters, SSB, CW, AM. Covers 80,40,30, 20,15, 10m VGC complete with circuit, handbook and spare valves. Has internal XTAL calibrator, S.Meter. Etc. £75. Tel: 061 736 3187 Tony G4DFP (Manchester).

SWAP FOR Solid State QRP Transceiver or FT1012D my Trio TS700G all mode two metre rig and A drake TRL, CW, HF Rig the TRL, CW Needs an overhaul otherwise OK. In daily use on Eighty metres.

SCANNERS Pro-32 hand held 200 memories (Includes Airband). Pro-2004 Base or mobile, 300 memories, both in mint condition. Offers please. May consider FRV8800 VHF converter in part exchange for either unit. Tel: 0272 861589 (Bristol).

SONY ICF2001D as new boxed with instructions. £149. Sony ICF7600D excellent condition boxed with instructions. £79. Ex-Admiralty B40 receiver good condition. £40. Also, loads of old test equipment for sale. Contact Dave Taylor, London 01-286 0111.

'PALM IV' 70cm hand held. £75 **TS5** 10HF transceiver, PS510 PSU and speaker. £190. TR2300 2 metre portable transceiver. New NiCads. £90. FT708R 70cms hand held NC-8 base charger — PSU, speaker/microphone spare NiCad pack. £175. G8BEQ, 2 Bexley Close, Glossop, Derbyshire. SK13 9BG.

FOR SALE Icom IC505 Six Meter transceiver with IC-EX 248 FM unit fitted 10W output as new boxed with op-manual. £450 ovno. FT290R plus 16 ele Jay-Beam as new. £250 ovno. G10QG QTHR. Tel: Dave, Guildford 0483-504761.

YASEAU FRG 7700m. £310. Trio R1000. £225. Drake R-4B with all crystal. £225. Global ATU 1000. £30. All equipment as new 01-590 9366 evening.

FOR SALE little used Intellivision

Matel unit with full set of games from space to sports, including golf, football, etc. Some unopened. £80 ono. Phone: 0283 713727.

FOR SALE Kenwood TS711E. £625. Pracal 9084 signal Generator. £500. Farnell SSG520 signal generator. £600. Wanted Bird thurline elements Icom IC-551 G4AJE 0354 741 168 (CAMBS).

ICOM 1200E 23cms mobile/base 23cms TXCVR latest model (mint). £385. YAESU SP767 extension speaker (new). £50. SSB (German) PA2310. 500MW in 10w out 23cms linear. £85. Cue Dee 17432 70cms antenna (mint). £31. Phone: Paul G4XHF (0293) 515201 QTHR.

YAESU FT102 AM/FM fitted repeater T/burst FV707DM digital VFO UD scan 12 memories FTV107R T/verter C/W 2m mod. SP102 speaker, Kenwood MC35S fist mic, all manuals, will not split. £895. Nentone 12A. PSU VHF supp. £60 ono. Brian G1UWV QTHR. 0425 615860.

BRONICA S2 camera with case and spare back, etc. Would exchange for suitable 6m/4m/2m £70cm transceiver camera is in A1 condition tel Maurice, Chester 371606 evenings, weekends.

TRIO 2000 CWO with separate ATU price: £400. Phone 0225 337143.

EPSON PX8 lap-top computer with charger and manuals, ROMS for CPM basic wordstar calc, cardbox with oval automation UD80A and DS8. £150. Phone: 0272 583603 eve. Phone: 0272 363204 Day, or QTHR G1PNF.

H.R.O. 5T RX Octal valves. Reconditions as new. Two PSU's twelve coils, some B/S. Collectors RX. Exchange for B40 or B40 spares + cash buyer collects.

FOR SALE Alinco dual bander only used 4 times. Boxed as new. quick release mobile mount, see Water & Stanton ads! My price only £325, including mobile dual band ariel with mag mount. Phone: Tony 01-635 8577 between 9am-5pm. **FT 690R** MkII 6m transceiver, still under guarantee, mint condition, boxed, also 15W 6m linear amplifier. Family reasons force sale. £350. Or would exchange for a receiver (with cash adjustment). Tel: Bedenham (Hereford) 843 or write QTHR G1JWD.

FOR SALE power supply 13.5volts 5-7amp. 240V input. £17. Power speech clarifier. £25. TV Perido portable old frequency. £20. 0283 221870. Wanted: good CB to convert to 10MHz. 0283 221870.

TEN-TEC Paragon transceiver absolute mint. Used only by SWL

all filters fitted. 6.0, 2.4, 1.8, .50, .25. Offers over £1300. Also AFR 2010 decoder, fully expanded. Also new video board. £700. Ring (0772) 704009. Evenings or week-ends.

FOR SALE TS120V SP120 VFO120 PS20 QRP equipment unmarked as new. £550. No offers. Ring. G400K, Middlesborough 211685 QTHR.

FOR SALE IC 202S transceiver YAESU all mode transceiver. YAESU handie FT703R transceiver. Offers. Tel: Trowbridge 768856.

AR 2002 Scanner, mint condition, genuine reason for sale. £310 ono. Also IC O2E hand held 5W as new. £175 ono. Phone Brian Sheffield 0742 887052 anytime.

934MHz Nevada Delta 1 boxed. Corona 23db pre-amp, SSE Meter, Nevada HPS 900 SWR/power meter, Nevada P7RE G/mount antenna. Crestbyte base. Colinear + H100 cable. Patch leads. Extension speaker. All as new. £450. Dave, G6PJE Tel: 0945 880893 Anytime.

FOR SALE Workshop manual for FT221; £5. Easyscript and Future Finance for Commodore 64; £5 each. Commodore 1520 printer; £20. Books and other bits for C64. SAE please. Crystals for converters, HC18U, 20, 74 and 116Mhz; £2 each. Ring John on Colchester 860238, 6-9pm only please.

LINEAR two SSB Rig. Output OK. £50. G1WOO Rex 34, Bishop Dale, Brookside, Telford TF3 1SB.

JAPAN Radio Co., (JRC), JST125 Transceiver, NBD500 power supply unit, tested only. Brand new, boxed. Superior quality equipment at £975 ono. Tel: 0602 609345.

CREED teleprinter with case. £25. AVO Test Bridge. £15. Tel: 01-647 3758 (Wallington).

SONY ICF PRO/80 SW/VHF receiver for sale. Boxed and in very good condition. £185 ono. (£350 new). Tel: 02357 69347. Delivery free.

FT1012D MkII immaculate, FM, fan, narrow CW filter, WARC, plus YAESU YD148 base mic. Delivery may be possible. £530. phone Mike GODM1 (not QTHR) 0737 765550 (Redhill).

YAESU FT727R 70cm/2m H/H 5W o/P FNB4A charger. £310 ono. G1BJN Dorchester 0305 65096 after six.

EX-WD R210 receiver 2-16MHz in 7SW bands. Film scale effective length 52in, Crystal calibrator, CW filter. 240V AC power supply. Speaker. £75 ono. Phone 051 625

9006 buyer collects. Hand book, inc.

FT77 80-10M 100W VGC £400. Realistic DX302 RX digital read-out, VGC. £120. PSU 25amp. £100. AT250 auto ATU 160-10M, new. £300. AMECO RX R5A AM/CU VGC. £50. Buyer pays postage or collect. Bob GOGVZ 0223 243581 after 6pm.

FOR SALE TRIO 811E good condition. £750 ono. Wanted: 934MHz radio. Tel: 0226 285450 or 0836 672 385 after 6pm.

SUPER STAR 2000, AM/FM SSB/CW 28-30 with crystals. For 27MHz. £130 DNT 10mts. FM £25. Wanted: TS 700S. Good condition. No Mods. Northwich, Cheshire 0606 44670.

LOW BAND FM Westminster on 70.260 70.425 70.450 70.475 £85.00. Single channel AM Westminster on 70.260 £40.00. Both post paid by me. FDK 750XX, frequency display not working. Complete with 70cms transceiver, exchange for YAESU 107 or WHY; Cash adjust 0534 25983

2 GEC Courier H.H. L.B. MA with spare batteries and charger. OK for 4 meter? Exchange for Belcom scanner or PYE Westminster L.B. AM or WHY? Attention camera collectors! Virtually new Sanyo 8mm micro zoom double 8 movie camera in case. Early 1960s? Best offer or WHY? Exchange 0534 25983.

COMPLETE HF base stations comprising YAESU FT101E CW/SSB/AM in excellent condition including key, table microphone and LP filter £210. Butternut HF 6 virtually new £125. Complete station for £320 including coax plugs, etc. Contact G3HNP Winteron-on-sea. 560.

FOR SALE 2 Pye Westminster W15 AM transceivers £50.00 each or will swop for any Ham Radio or scanner. Please contact Mr David Brookes 21a Woodlane, Urmston M314HY. These Rigs can be converted to 10m, 70m. Radio Ham

CUSHCRAFT A3 tribander antenna, brand new. Planning permission refused. Offers around £230, please. Richard G4XLV Plymouth 0752 363416.

FOR SALE Sangean ATS 803A. Highly praised (BBC wave guide) world receiver A,150-29999 SSB/CW and FM including 9 vlt regulated PSU., comprehensive instruction book, world wide wave guide manual, also detailed service instructions, accessories, original packing. All unmarked. As new, £78. incl. Phone 0805 23311 anytime.

FOR SALE Sony ICF7600D. A very nice little portable receiver 150Khz to 30MHz, SSB and 76Mhz to 108MHz FM in box as new with batteries and earphone. 6 volt mains adaptor missing, so only

£85.00 or ONO aldershot 0252 332035.

YAESU FT1012D MK3 little used mic manual 120W out, £430.00. Drake MN7 ATU with manual BA/UM fitted, £150.00. Atari 520 SFTM, SM125 monitor, STAR LC10 printer. Phone for price. Phone before 3.00pm or I won't be in. George G143JQ QTHR. Phone (0762) 334648.

2 CTE/600 hand portables, same as IC2E, good condition. TX/RX 140-150 MHz, repeater shift, etc. Complete with 2 base fast chargers. Also spare battery pack £250 ono, the lot. 01-501 2807 Ilford after 8.30pm.

PYE low band F27 AM base station, £10. Buyer collects WG16 waveguide high power load, £5. Variable attenuator WG16 square flanges 0-30db £5. Three short flexible WG16, £5. Phone Chris GOFJY Worthing (0903) 40072 Evenings.

ICOM IC201 2 metre multi mode for sale or to swap WHY. Phone 0753 824847. Have Cobra 148GTL late model as new. AM,FM,SSB and CW. £100 phone 0753 824847.

HAM CONCORDE II (Boxed G/C) freq 26.065 to 28.305, Sadelta Echo Master Plus G/C, PSU and ½ wave Hy-Gain Rod, £140 ono. Also Uniden President Lincoln modified to 26.000 to 29.999 boxed excellent con. £230. nvno. Plus Bremi BRL 210 mains linear £60. Phone David (0290) 24859.

FOR SALE NRD525 Comms Rec comes with NRD NVA 88 ext speaker £700. POCOM all mode RTTY. CW converter £500 ICS PK 232 RTTY converter comes with IBM disc not used £200. Dressler ARA 30 active antenna £60 ERA BP 34 AV SSB Audio filter £60 0306 712878.

BURNDEPT BE470 3chan UHF hand held converted to 70cm Xtalld on 433.200 Simplex. Complete with NiCads, built-in mic and ant. £55 inc postage. Details available for Xtal freq's for other chans. Tel Andy 0904 414 988 after 7pm please.

FOR SALE new antenna rotator still boxed £30. Tel 0246-236496.

YAESU FT767GX good condition £1200 ono. also Uniden 2830 26-30MHz good condition, £240 ono. Phone Darren (04191) 38462. Oxfordshire.

REALISTIC PRO 2004. aluminium pole 16' + Discone. Mint boxed. £250: Uniden 2830 All mode rig 26-30MHz mint £220: Cobra 148GTL DX 5 bands £150 excellent condition: Pro 2004+Uniden. £450: PRO 2004 + Cobra £380. You won't be disappointed when you see the condition: Tel Grimsby 827717.

MARCONI TF995A 13/S Signal generator. As new with all accessories. In case with full

manual. 1.5 FM with internal meter to monitor RF/MOD/DEV. and XTAL calibrator £55.00. (0742) 746550 (sheffield).

FOR SALE YAESU FRG7 bxd with active antenna. Also spectrum 48k computer, cassette player, printer, RTTY program. Some game software. All leads and manuals including sortwave frequency book. Excellent working order £150, the lot, ono. Telephone 061-724 0269.

MARCONI 'Atalanta' receiver with manual/spare valves 15KHz-28MHz. 10 bands CW/AM, built in 230V AC. PSU. Buyer must collect. Weight 78Lbs. 20" x 20" 12.5" high. QTHR tele. 01-644 3454 Peter G3ORE after 7pm please. £100 ono.

TANDY TRS-80 computer interface Cat.No. 26-3029 for sale. Offers ring Derek G4WLA 0626 863217.

FOR SALE realistic PRO-2021 6 months old, complete with box, manual, bracket and discone. £150 ono, or will swap for 2 metre hand held or what have you. Phone evenings 0604 415 650. Andy. **FOR SALE** FT2 90R Mk.1 Sandpiper ¾ x 3 Colinear, 10m. Pope 100 Coax, NiCads, £275 or PX 2M multimode capable of voice readout. GW1 XUK. Tel Penmaenmawr 623672.

RECEIVER realistic DX400 scanner 150kHz To. 28,999 kHz 87.4MHz to 108MHz. As new, £100. also Sommerkamp TS-788 DX transceiver £200. Tel 0226 299514 after 6.00pm.

FOR SALE Debeg maritime unit: Main and Reserve MF transmitters 410-512kHz A1/A2, auto-alarm Rx'er, 2 Telefunken HT PSU, 19" rack mounting cabinet. Also Redifon 'OMEGA' Navigator Rx'er. Reasonable offers, buyer collects. G1SWT 0827-54846.

AMSTRAD CPC 464 computer with colour monitor, over 20 magazines. More than £160 worth of original games. Full working order. Only £150. Ring after 6.00pm on 0959-74275.

ZETAGI B300P 400W 3-30MHz amplifier: ICOM 1050B 10M.FM ±100Hz shift. Crystal filter: 3 x 29MHz amplifiers 100/50/30W: Antenna switch 2way Kenwood TS430 FM module: Taylor model 65B signal generator: Marconi oscillator CO 546 1-500KHz: Hy-Gain V multimode for 10m conversion: Workshop manual YAESU FT107M: G4OHJ QTHR. Warks. 0789 773286.

FT290R CW full mobile kit 10XY Jaybeam aerial power source NiCads and soft case and linear amplifier £335-00 Chippenham Wilts. Telephone 0249 782829 evenings.

SCANNER Jill SX 200N 26-88MHz 108-180MHz

380-514MHz, AM+FM, 16 memories 12V-DC 240AC. £199 ono. Tel: 0698 833903 (Holy Town) Motherwell. Ask for Davy.

FT290R power supply, beam antenna, rotator, all VGC. Phone Steve after 7pm (0536) 745970 (Northants). Ideal way to start. AR £350 ovno. Buyer collects.

FOR SALE Commodore 128 computer £120, ICS TNC unit Amtor, RTTY, CW. Can be used with C64 & 128 BBC computers. £180 ono. Ring Peter 223 9171 after 7pm.

AOR 2001 scanner, 25-550MHz, perfect condition with all accessories and original box. £240. Tel: Peter 01-643 5063.

RACAL RA 17L communications receiver plus SSB adaptor £250 Racal RA17W receiver £200 all excellent condition prefer buyer collects or carriage extra. Please telephone G. Millington, W.ton 0902 333971.

FT290 Mk1 with Mutek pre-amp, NiCads, charger, soft carrying case, ¾ths. Mobile whip, gutter mount and cable. All in good condition and in original packing. £240. Carriage paid if necessary. Telephone Paul on 0246 475551 after 6pm.

PRO-2004 programmable scanner, general coverage AM/FM monitor receiver. 300 memory channels, (see Tandy catalogue). 1 year old, only £210. Boxed with instructions. Phone Sheffield 0742 326309 after 6pm.

VC10 VHF converter for Trio R2000 118 to 174 MHz recent check by Lowe, with manual circuit Dia and whip ant. £110. Want FRG 9600 100KHz to 950 or 60 to 950 cash waiting all letters answered; sorry no phone. S.P. Martin 24 Collingwood Close, Worle. W-S-Mare, Avon BS22 9PQ.

YAESU MD-1B8 base station scanning microphone (absolutely new) £52. Also MH-1B8 hand microphone (new) £16. Daiwa CN650 SWR/PWR meter 1.2-2.4GHz & timestep weather satellite frame store/ decoder mono/colour output perfect £360 KR600 rotator excellent £145. G4XHF (QTHR) (0293) 515201.

KENWOOD communications receiver model R1000 200KHz-300MHz in mint condition £225 ono. Allen Southampton 0703 869346.

KW 2000E SSB transceiver including: instruction manual, circuit diagram, box of spare valves, low pass filter. £190 ono. Ring Vic (061) 477 0970 PSU and microphone included.

BBC computer bits. Hard disc unit £160. Acorn IEEE interface, £50. NEC matrix printer serial interface £40. Rom board £15. Monitor £30. DS80 disc drive £50. Rodime 3½", 10 meg drive £50. Adaptor

AC B4000 £65. 0423 872045 (Harrogate) after 6pm.

FOR SALE Uniden bearcat 100 XL hand held scanner, complete with AC power supply/charger, carrying case, Ang, Etc, Boxed VGC. £150. Ring Ely (0353) 661323.

POCOM RT-100 RTTY/data modem for decoding press and financial news in german language only on 110mgz and 140mgz bands. Fully self contained needs no computer assistance, but needs multi standard television £150. ono. Phone G1 TBO 0424 224549.

DATONG D70 morse tutor (unwanted gift) £40. Hi-mound HK 706 key £10. Tandy realistic PRO-38 VHF/UHF scanner (boxed) £65. All ono. Delivery free, 30 miles Radius. Leeds. Peter 0532 812573.

W15FM £20 W10F RX 3CH 16,0,67 £15 (this must be collected, heavy). .22 air rifle HW35 with case £100, Jacket shooting medium £20 prone mat (6'7") £15. Oric 48K micro software lots books (4) £25. contact Patrick. Tel: 0286 5468 (GW15XN).

REALISTIC PRO 2021 base/mobile scanner AM/FM. 68-88, 108-136, 138-174 380-512MHz complete with oscar discone antenna £120. Matsui MR4099 World Band receiver 150kHz-30MHz 87.5-108MHz 12.5W bands, etc. £55. Both boxed as new in mint condition. Tel Gosport (0705) 521756.

FT290R YAESU multi mode case charger £230 30 watt linear £50 headset adaptor £10. Lot £270 JVC turntable new auto/man £50 consider swap for VHF tuner or cassette deck. Phone anytime 01-302 8858 (South London).

FANS cooling 5" square by (X) 1½" 240V AC new cond. £5.00 each. Phone G3GLN QTHR 061 643 9014.

STANDARD 7900 70cm transceiver 10MHz coverage 10 watts original packing £125. Amstrad 464 computer green screen joystick games. As new. £120. 40ft tower, two sections, wall mount. £60. 20ft tower, one section £30. Tel: Bill 0724 846441.

FOR SALE Zetagi B550 mobile linear 500W+output. £165 or exchange W.H.Y. Also Vic 20 Datasette joystick 32K switchable ram, games, etc. £60 or exchange W.H.Y. 11 metre transceiver in example. Phone John, please. 0734 411501 weekends. Thanks. J.I.L. SX200N scanner one of the best. 26-514 MHz. Current price £325, excellent condition, £145. Ring Chris 0634 49112 (Kent).

FOR SALE old radio and electronics books S.A.E. list. Wanted, AC power units Codar type 250/5 AS used with AT5 TX. Prince and condition to Marris, 35 Kingswood

House, Farnham Road, Slough, Berks SL2 1DA.

PHILIPS D2999 computer controlled synthesiser world receiver as new. £215. Grundig 3000 satellite digitale, works OK. But, BFO needs attention. £65. Realistic 100XL BFO small, good condition. £25. Philips very old radio 12 band double conversion, powerful. £15. 01-571 5759.

TEKTRONIX 547B 50MHz dual trace oscilloscope. £150. Tektronix spectrum analyzer 1L5 plug-in unit. £100. Tektronix type M four trace pre-amp plug-in unit. £35.

MMT 28/144 transceiver, 2M in, 10M out, with 7dB attenuator. Ideal for FT290. New unused, in box. £75. Circuit 2M pre-amp £3. Tel: 0926 498388.

CHINON CP 7M SLR camera 25mm with 35-70mm zoom lens complete with carrying strap and holdall. Worth £300 sell £200 or swap for HF transceiver. 46 Greta Ave, Carlisle, Cumbria CA2 5RH. All letters will be answered.

GREEN screen monitor. 9 inch screen. Requires 15 VDC and composite video to get it working. Good condition. £10+postage, etc. Telephone 0782 516213 after 7pm.

NUMEROUS items of amateur equipment and electronic test gear for sale individually, or swap for good condition, running Vauxhall Chevette, Ford Fiesta, or Escort. Send SAE for equipment list to Mr. CT Bamber, Rozel, Maespica Road, Louier, Cwmtwrch, Swansea SA9 2PP.

SALE FAX-1 Fax weather system. Power pack, CP80 printer. BGC. Manuals, paper, etc. £250. Brother HR5 printer never used. Uses ordinary paper. Mains unit, also batteries, paper, etc. Also interface for spectrum computer. £65. Ring Richard on 0244 816435 Clwyd.

WANTED

WANTED Circuit for NationalRX 100A. Loan or photostat. All expenses paid.

HELP! Storno CQM-713-P3 service manual? Circuit diagram? any help appreciated. Costs refunded. Please phone Mark G7ARM. 01-554 8312 QTHR.

WANTED Taxi radio mobilis. Please phone 051-260-5665.

WANTED any info please for fitting a YAESU power reducer to a FT DX401 properly. Not via mike gain carrier, also any other mods on this fine rig. All costs will be repaid.

WANTED details Ex-army tank TX-RX model with YL1130 and QV06-40A. Output and PNP transistorised receiver for sale. ICOM 1050 10mtr. Also Sirtel 25 watt linear. Offers or WHY. Six

metres. Critchley G6NUK QTHR. 16 Finch Mill Avenue, Appley Bridge, Wigan WN6 9DF.

WANTED two metre element for Bird Wattmeter, 50 or 100 watt rating. Please contact Tom Valentine, 38 Grampian View, Montrose, Angus DD10 95X. Tel: 0674-76503.

WANTED VHF UHF Burndept hand holds. Phone 0785 812344.

WANTED B40/41 service data miniature valve type. 2-CX150B's. offers. Valves reasonably priced Ex Equipment. QV03/10's. 6BH6's, etc. 6 volt and 12 volt HTR. Metal valves. KT88's, EL34's, EL27's, EF86's, ECC83's, E83CC's. Plenty of others. G8BSK 290 priority RD St. Denys, Southampton SO2 1LS. **WANTED** YAESU FT2 transceiver, working order. Cheap. G2DHV. QTHR. Tel: 01-300 1649.

WANTED multi-mode RX/TX TriStar 77/747 or similar LSB/(USB)/FM/SSB must be in good condition. Tel: 0723-363825.

WANTED 934MHz Delta One transceiver. Tel: 0702 512814.

WANTED Trio R600 must be in GWO cash waiting urgent. Tel: 091 2585289.

WANTED by pensioner, Trio R600 or R1000 GWO with manual. Lowest possible price. Cardiff 0222 709456.

WANTED ATU YAESU 902, Drake MN2700, or CAPCO SPC300; also HF band SWR. Must be in good condition. George G3VGC. Tel: 01-659 0845.

WANTED 2 eight-pin Jones plugs and 2 eight-pin Jones sockets. Tel: 0652/635310. QTHR.

WANTED March 1969 issue of Practical Wireless, or copy of one. Sixty Superverter project, ie Top Band Converter for use with car radio please. I will gladly refund costs. Roy G0-BZT, 2 Elmdale Road, Sedgley, Bilston, West Midlands (09073) 78792.

WANTED Hallicrafters SX24 receiver, or similar. Also wanted, AVO 8 and AVO valve tester. Would exchange Marconi CR 150 RX for any of above. Also required, workshop manual for Taylor valve tester. Type 45A. Tel: (0526) 20520 anytime.

WANTED AF unit for FT707 or Sommerkamp FT767 DX. No naughty crystals thank you. Or, have you an old tired 707 collecting dust that you would like to sell for spares or repair. If so, phone Cliff G7CHL on 0296 658115 Aylesbury, anytime.

WANTED Kenwood AT230 ATU or AT250 automatic ATU. Tel: Dave 021-558-3522. B'Ham.

WANTED Sony ICF 6.800W. Tel: 0754. 74341.

MOTOROLA Walkie talkies. Wanted for cash working or not. Also wanted Baird mechanical television or autographs. Call 01-747 0069.

WANTED complete novice seeks information on all aspects of radio. The RAE, How to Build Simple Receiver, etc. Absolutely anything. Please pass on your knowledge. R. Dillon 70 Highfern Gardens, Belfast BT,133RE.

WANTED none working PCs, ATs, XTs and Sirius computers and boards for sale. 16-bit computer with CCPM 20meg hardisk. Virtual disk 720K, floppy 1meg sotre. Colour screen, software. Six ports, single or multi user. £375 or swap allband RX. Tel: 0767 80253.

WANTED QSL cards pre 1940 (postally used), also any post cards related to radio wireless's or nipper HMV. (No comics) please contact with details and prices to Tom Valentine, 38 Grampian View, Montrose, Angus. DD10 95X. Tel: 0674-76503.

WANTED Microphone for my Trio 2300FM radio. I have tried in vain to obtain one, but they are no longer available. Tel: Mike G5 MNX, York 0904 422773 anytime with price and details.

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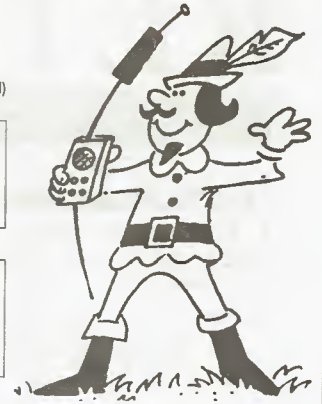
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Frequency selection is with the main tuning knob, direct keypad entry or up/down buttons that will shift in one kHz or one MHz increments or to the next ham band. DISPlay button selects 24 hour clock or date or tag. VOICE button causes a voice frequency announcement with optional synthesized voice board installed.

Rear panel controls are provided to adjust the VOX, CW monitor level and tone, and SSB sidetone monitor level. Switching is provided to control conventional linear amplifiers and of course, high speed switching for μ SK linears, such as the Titan. Other rear panel inputs and outputs for transverters, FSK (170 Hz shift), fixed level audio out, audio in, external speaker, aux dc jack and provision for the optional RS-232 control interface. An absolute delight for the all mode operator.

The Paragon is the result of a three year engineering effort. We are proud of the Paragon and we think it has set new standards of excellence in synthesized rigs. Check it out yourself. We think that you will share our pride in the Paragon.

Paragon Options

Model 256, FM Board.

This easily installed module adds FM transmit and receive capability. System bandwidth is 5 kHz.

Model 257, Voice Synthesizer Board.

This plug-in board announces the frequency displayed when the VOICE button is pressed.

Model 258, RS-232 Interface Board.

Provides remote computer control of frequency, mode, filter selection, VFO selection, all memory and scan features including memory programming and the other functions controlled from the push-button panel on the face of the Paragon. Supplied with command data for writing the program. Program discs are available from Ten-Tec for some of the more popular computers.

Model 259, Universal ALC Annunciator.

This is great for the vision impaired operators and can be installed in any transceiver with ALC. When the mic gain is advanced to the proper level, a beep sounds.

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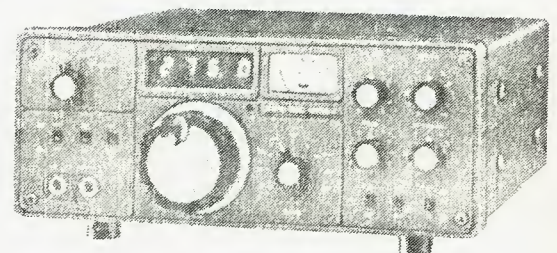
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