HAM RADIO TODAY
AN ARGUS SPECIALIST PUBLICATION
April 1987 £1.20

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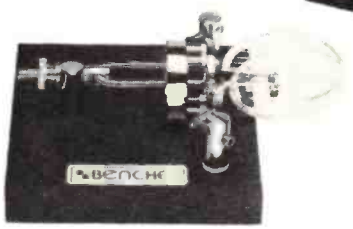

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HAM RADIO TODAY

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Assistant Editor
Dave Bobbett, G4IRQ
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Advertisement Manager
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Classified Sales Executive
Sue Curtis

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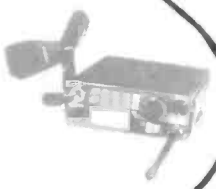

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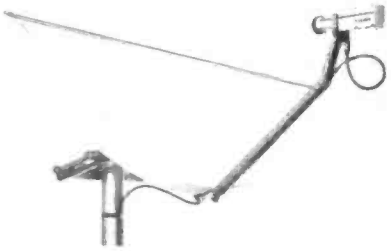

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DRAE	3W COAX SW	3 way coax switch to VHF S0239	15.40
DRAE	3W COAX SW	3 way coax switch UHF 'n' connectors	19.90
DRAE	WAVEMETER	V-UHF wavemr c/w in'tions	27.50
FDK	BJ200	VHF-UHF scanning receiver c/w nicads	269.00
FDK	FDK 725X	2mtr 25W FM Mobile t'ceiver	325.00
FDK	FDK 750XX	2mtr 20W multimode t'ceiver	469.00
GAMMA	2MTR S-JIM	Gamma twin Slim Jim type ant.	12.50
GREENPAR	'N'PLUG RG58	N plug for RG58 cable	2.75
GREENPAR	'N'PLUG RG8	N plug for RG8U cable	2.99
GREENPAR	BNC PLUG	BNC plug assy for RG58 cable	1.75
HI-MOUND	HK702	Delux marble base straight key	42.50
HI-MOUND	HK704	Squeeze key assy	28.50
HI-MOUND	HK708	Straight key	21.50
HI-MOUND	MK703	Squeeze key c/w base	37.15
HI-MOUND	MK705	Squeeze key	32.20

Tel: 021 421 8201 (24hr answerphone)
Telex: 334303 G TXAGWM

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RWC PRESENT A WORLD FIRST!

THE YAESU FRG FRG 9600 MK3, 100MHz-950MHz

We now offer the NEW FRG 9600's in two versions:

Option (1): FRG9600 Mk2 series 2 60-950MHz 'N' Connector. @ £519.00 Plus £5.00 carriage, or we will modify a standard unit for £40.00 inc. VAT (Inc £5.00) return insured carriage.

Option (2): FRG9600 Mk3 100MHz-950MHz HF switchable, actual frequency readout, (no external units) 'N' connector for V-UHF and SO239 fitted for HF @ £625.00 Plus £5.00 carriage, or we will modify an existing unit for £129.50 inc return carriage, which will have the 950MHz extended coverage fitted at the same time. ★(existing MK2 owners can have the New HF mod fitted for £99.00 inc return carriage) All modifications are Fully Guaranteed for twelve months from date of purchase/modification providing our modifications seals are unbroken.

★ *OPTIONS* We are able to supply RWC modified Video units (PAL, 6MHz I.F.) @ £27.50 (fitted free during modification) and PA4 AC-DC Power units plus CAT interface units, etc.

NOW WITH HF COVERAGE

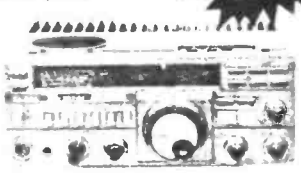
HI-Q	HI-Q COIL	2X coil/formers/insulators (pat-pend)	5.50
HOXIN	70N2DX	Dual band 6/8 + 3X 5/8 mobile	37.75
HOXIN	70N2M	144/432 dual band 1/2W+2X 5/8 mobile	24.95
HOXIN	70N2V	Dual band base ant 3'6" long	47.00
HOXIN	HS-358	430MHz tripple 5/8 6-3dB	33.73
HOXIN	HS-770	144/432 duplexer 50W 30dB isolation	24.95
HOXIN	HS-78F	2mtr 7/8 fold over 4.5dB	21.15
HOXIN	HS-88f	2mtr 8/8 fold over 5.2dB	24.10
HOXIN	SMC15SE	15mtr 130W PEP mobile ant 1.72m long	16.85
JAYBEAM	8XY-2M	2mtr 8E crossed antenna	43.00
JAYBEAM	LR1-2M	2mtr omni-d'tional colinear	35.70
JAYBEAM	LW10-2M	2mtr 10 element Yagi	28.23
JAYBEAM	MBM48	70cm 48E multibeam ant.	42.45
JAYBEAM	PBM14-2m	14 element parabeam 2mtr	68.50
JAYBEAM	Q4-2M	2mtr 4 element quad	35.50
JAYBEAM	TB1MK3	Triband rotary dipole s/steel	99.00
JAYBEAM	TB2MK3	2E tribander HF beam s/steel	199.00
JAYBEAM	TB3MK3	HF 3 element tribander beam	299.00
JAYBEAM	VR3MK3	3 band vertical HF ant.	69.96
KENPRO	KCS200	Mains charger for KTBP(H)	16.50
KENPRO	KR2000RC	Ant. rotator h/d braked	445.00
KENPRO	KR250	Ant. rotator	78.00
KENPRO	KR400RC	Ant. rotator medium duty	169.00
KENPRO	KR5400A	Elevation rotator d/c'trol	339.00
KENPRO	KR600RC	Ant. rotator m/duty braked	219.00
KENPRO	KT-BC	Standard mains wall charger	11.00
KENPRO	KT-BP(H)	3W h/duty nicad pack	49.95
KENPRO	KT-LC1	Leatherette case (KTBP)	9.95
KENPRO	KT-SM1	Speaker mic for KT200/220E	19.95
KENPRO	KT200EE	2mtr 2W t'ceiver c/w nicad+ charger	199.00
KENPRO	KT200EE	2mtr 2W TXR c/w empty batt. case	169.00
KENPRO	KT220EE	2mtr 5W LCD K-pad TXR c/w nicad charger	279.00
KENPRO	KT220EE	2mtr 5W TXR c/w empty batt. case	249.00
KENPRO	KT400EE	70cm 2W TXR c/w empty batt. case	229.00
KENPRO	KT400EE	70cm 2W t'ceiver c/w nicad+ charger	249.00
KENPRO	KTBP-1	Standard nicad pack	25.00
KING	ROTATOR2	40kg rotator offset mounting	47.50
KOPEK	AR1002	50kg loading 3-core auto-rotator	49.95
		80kg loading 3-core auto-rotator	59.95
M-MODULES	MMG114V	2mtr RF switched GaAsFET preamp	
M-MODULES	MML144/100HS	2mtr 100W linear 25W input	159.85
M-MODULES	MML144/100LS	2mtr 100W linear 1 or 3W input	169.95
M-MODULES	MML144/100S	2mtr 100W linear 10W input	149.95
M-MDDULES	MML144/200S	2mtr 200W linear 3-10-25W input	334.65
M-MODULES	MML144/30LS	2mtr 30W linear 1or3W input	94.30
M-MODULES	MML432/100	70cm 100W linear 10W input	334.65
M-MODULES	MML432/30L	70cm 30W l'ear 1 or 3W input	169.00
M-MODULES	MML432/50	70cm 50W linear 10W input	149.50
MuTek	BBBA500u	20-500MHz l/noise w'band preamp	37.50
RCA	6146B	PA valve	12.85
REGENCY	HX2000E	VHF-UHF H/H scanning receiver	279.00
REGENCY	HX850E	Micro H/H scanning receiver c/w	259.00
REGENCY	MX5000	25-550MHz scanner am/fm (AOR2001)	329.00
REGENCY	MX7000	25-550 & 800-1300MHz scanner am/fm	399.00
REGENCY	MX8000/AOR2002	25-550 & 800-1300MHz scanner AM-FM (W-	485.00
REVCO	2045/6	Nest of dipoles w/band ant 26-500MHz	69.00
REVCO	REVCONE	W/band discone ant. 30-500MHz	29.95
SAGANT	S-ROD 2	2mtr 5/5 BNC portable ant	11.95
SAGANT	S-ROD 7	70cm 5/8 BNC portable ant	11.96
SAGANT	SLIM 2	Shortened helical for 2mtrs	8.95
SAGANT	SLIM 7	Shortened helical for 70cm	8.95
SUN	PL259/6	PL259 plug assy RG58 cable	0.75
SUN	PL259/9	PL259 plug assy for RG8U cable	0.75
SUN-ANT	KG208SE10	10mtr loaded 1/4W tilt-over	14.50
SUN-ANT	KG208SE2	7/8 2mtr ant tilt-over	16.50
SUN-ANT	KG209SE2	7/8 2mtr with capacity hat	15.95
SUN-ANT	KG309SE2	5/8 2mtr tilt-over antenna	15.50
SUN-ANT	SGM/239	SO239 type gutter-mount c/w cable/259	9.75
SUN-ANT	SO239/CGM	Cast/Chrome SO239/Gutter mount assy	4.75
TONNA	20089M	144MHz 9 e'ment port. ant 'n'	33.50
TONNA	20199	144/435 9+19 element oscar ant.	40.25
TONNA	20624	1296 23 element ant 'n'	30.25
TONNA	20809N	144MHz 9 e'ment fixed ant 'n'	30.86
TONNA	20813N	144MHz 13 element portable antenna 'n'	46.00
TONNA	20817N	144MHz 17 element fixed antenna 'n'	61.53
TONNA	20818N	144MHz 9 element crossed antenna 'n'	57.85
TONNA	20921	432MHz 21 element Yagi antenna 'n'	45.62
TONNA	20922	435MHz 21 element ATV 'n' conn.	44.57
TONO	2M-40G	2mtr 1-3W in 35W Op GaAsFet pre amp	69.00
TONO	2M-90G	2mtr 10W in 80W OP GaAsFet pre amp	139.00
TOSHIBA	12BY7A	Driver valve	5.85
TOSHIBA	6KD6	PA Valve	8.50
TOSHIBA	6SJ6C	PA Valve	7.90
TOYO	SWR171	26-30 MHz economy VSWR meter 1-10W	14.50
WELZ	AC38M	3.5-30 MHz ant. tuner unit	85.00
WELZ	SP10X	1.8-160 MHz VSWR meter (portable)	42.95
WELZ	SP122	1.8-60MHz 20-200-2KW VSWR meter	98.00
WELZ	SP220	1.8-200MHz VSWR meter	89.96
WELZ	SP825	1.8-1.2GHz SWR/Power meter	189.00
WESTERN	HF-COAX-SW	4 way 1.8-150MHz 4 way+ ground coax SW	19.50
////////	PLEASE ADD	Post & Packing £2.50 min. or at cost	

New Storno CQM713/P3 2mtr Modification Kit NEW

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

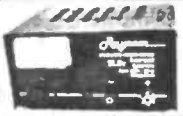
Again we improve a fine HF transceiver by fitting our FAST TUNE FACILITY. The mod is "free of charge" at normal retail price, or send your rig, carriage paid and payment of £34.50 and we'll fit it for you. Can be fitted by experienced constructors. Built and tested kit at £20 Inc p&p.

INSIST THAT YOUR NEW 757 HAS OUR "FAST TUNE" MOD.....



FT-757 GX-RWC £925.00 with MOD fitted carriage inc.

NEW



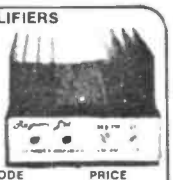
Model shown is 1300M 13.8V 6a metered.

NEW RAYCOM 13.8 VDC POWER UNITS (All AC 240 V)

	13.8V 12 A. MAX	£59.00	post £5.00
	13.8V Amp Max	£45.0	post £5.0
1305M	13.8V 5 Amp Max	£28.50	post £3.00
1303M	13.8V 3 Amp Max	£19.25	post £2.50

RAYCOM RF AMPLIFIERS

All 1-3 Watts input SSB & FM options (FM only can be used for CW)



VHF UNITS (144-175MHz)

Special models & bands available to order

	ORDER CODE	PRICE
45 FM/CW	V45F	£62.30
35 FM/CW/SSB/AM	V35L	£59.50
25 FM/CW	V25F	£48.50
15 FM/CW/SSB/AM	V15L	£49.50
15 FM/CW	V15F	£39.50

All units use Mitsubishi or Toshiba power modules

Post & packing £2.50

UK Mainland POST/CARRIAGE Transceivers/Receivers/mobiles £7.50. Handhelds £5.00.Acessories £2.50-£5.00. DATAPOST £10.00. Next Day Carrier £12.50 Or at Cost. Send £1.00 for Raycom Product catalogue (£2.00 refundable over £100.00 Cat. Orders) Leaflets/Specifications available on all Main lines, Also Free Bi-Weekly Used list.

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SCANNING RECEIVERS £26

C.T.E. DISCONE WIDEBAND ANTENNA

RECEIVE	70-700 MHz
TRANSMIT	70-500MHz
MAX POWER	500W
GAIN	3.5dB

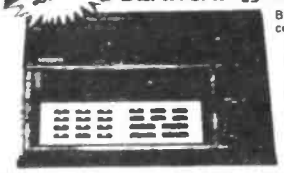
WIDEBAND DISCONE RECEIVING ANTENNA

(3 Element) 70-500MHz £24.95

NEW BEARCAT H/HELD SCANNING RX. MODEL 100XL £229

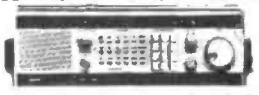
Receives 8 bands plus aircraft band. 16 Channels, priority keyboard lock and lighted display. 66-88 MHz 118-174 MHz 406-512 MHz

£209 **BEARCAT 175XL**



Base receiver covers:- 66-88MHz 118-174MHz 406-512MHz with 16 channel memory/scan

BEARCAT DX1000 COMMUNICATIONS RECEIVER £379



Direct access communications 10KHz-30MHz with 10 channel micro-processor controlled memory.

10 Mtr MOD BOARD - Remember who did it first!

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

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

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

* Only suitable for experienced constructors.

KIT OF PARTS AVAILABLE £17.50 + £1 p&p.

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

Better and "extended Range mods" (RX only for UK market) avaliable for the following Models, ONLY available at RWC.

YAESU FT23	ICOM MICRO 2E	Most of these latest models can be modified for up to 20MHz. extended coverage — call now for details some we modify free.
YAESU FT73	ALINCO ALM203E	
ICOM IC28E/H	KENPRO KT220EE	
ICOM IC48E	REVCO RS2000E	

Remember who did it First!

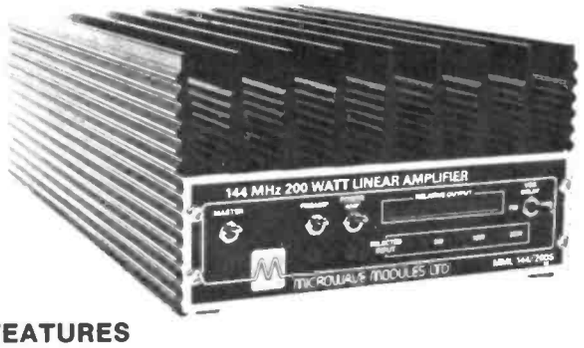
If you are a Bona-Fide Radio/Electronics Dealer contact Martin, Andy or Ray NOW!

MICROWAVE MODULES LTD

SPECIAL OFFER

3 DAY BONUS BREAK HOLIDAY?

YES! A FREE 3 DAY BONUS BREAK HOLIDAY WITH EVERY MML 144/200S LINEAR PURCHASED DIRECTLY FROM THE FACTORY OR FROM OUR STAND AT THE N.E.C. ON MARCH 27/28th



FEATURES

- 200 WATTS OUTPUT POWER..
- SUITABLE FOR 3, 10 and 25 WATT TRANSCEIVERS.
- LINEAR ALL MODE OPERATION.
- STRAIGHT THROUGH MODE.
- ULTRA-LOW NOISE GaASFET RECEIVE PREAMPLIFIER — FRONT PANEL SELECTABLE.
- RELATIVE OUTPUT LED BAR DISPLAY.
- EQUIPPED WITH RF VOX AND MANUAL OVERRIDE.
- LED STATUS LIGHTS FOR POWER, TRANSMIT AND PREAMP ON AND INPUT LEVEL.

SPECIFICATION

Linear Amplifier

Power output	: 200 watts ± 1dB
Power input	: 3,10,25 watts manually selectable
Frequency Bandwidth	: 144-146 MHz at -1 dB
Power requirements	: 13.8V DC at 30 Amps
Quiescent current	: 3.5 Amps

Receive Preamp

Overall gain	: 12 dB typical
Overall noise figure	: Better than 1.5 dB
Frequency bandwidth	: 144-146 MHz at -1 dB
Receive current	: 100mA

DESCRIPTION

This unique new product MML 144/200-S has been introduced to cater for the growth requirement for a high power 144 MHz solid state linear amplifier. The amplifier provides an output power of 200 watts and is fully compatible with transceivers having output power of 3,10 and 25 watts. The input power level is manually selected to suit the transceiver in use and in this way this single product is ideally suited for use with mobile, portable or base station equipment.

Several front panel mounted switches controlling the internal switching circuitry allows the unit to be left in circuit at all times. Thus the linear power amplifier and the GaAsFET receive preamplifier can both be independently switched in and out of circuit. In this way, all four operational combinations are possible.

The power amplifier utilises two rugged 100 watt amplifier stages fed into a Wilkinson power combiner which results in an output power of 200 watts. When used with 25 watt transceivers the transmitter output is fed directly to these stages. However, when used with 3 or 10 watt transceivers, the transmitter output is first amplified by a driver stage before final amplification to the 200 watt level.
The PA transistors are thermally tracked against temperature variation and operational temperature rise. This technique, together with a well regulated bias supply, ensures highly reliable and ultra linear performance, thus making the unit ideal for all modes of communication. (SSB, FM, AM & CW). A visual indication of relative power output is provided by a front panel mounted LED bar display.

				TOTAL inc. VAT	POST RATE
MMT432/28-S	70cm Linear Transverter	195.50	B		
MMT1296/144-G	23cm Linear Transverter	258.75	D		
MMX1268/144	1268MHz Transmit Up-Converter	195.50	D		
MMC50/28	6m down to 10m Converter	37.95	A		
MMC144/28	2m down to 10m Converter	37.95	A		
MMC144/28-HP	2m High Performance Converter	47.84	A		
MMC432/28-S	70cm down to 10m Converter	44.85	A		
MMC432/144-S	70cm down to 2m Converter	39.90	A		
MMK1296/144	23cm down to 2m Converter	129.95	B		
MMK1691/137.5	1690MHz WX Satellite Converter	144.90	B		
MMG144V	2m RF Switched GaAsFET Preamp	37.95	A		
MMG1296	23cm GaAsFET Preamplifier	74.98	A		
MMG1691	1690MHz GaAsFET Preamp	129.95	B		
MMD1500P	1500MHz Divide by Ten Prescaler	119.60	A		
MMR3/25	3dB 25 Watt Attenuator	19.78	A		
MMR7/3	7 dB 3 Watt Attenuator	19.78	A		
MMR15/10	15 dB 10 Watt Attenuator	19.78	A		
MML28/100-S	10m 100W Linear, 10W input			129.95	C
MML144/30-LS	2m 30W Linear, 1 or 3W input			98.90	B
MML144/50-S	2m 50W Linear, 10W input			106.95	B
MML144/100-S	2m 100W Linear, 10W input			149.95	C
MML144/100-HS	2m 100W Linear, 25W input			159.85	C
MML144/100-LS	2m 100W Linear, 1 or 3W input			169.97	C
MML144/200-S	2m 200W Linear, 3, 10, 25W input			369.95	D
MML432/30-L	70cm 30W Linear, 1 or 3W input			169.05	C
MML432/50	70cm 50W Linear, 10W input			149.50	C
MML432/100	70cm 100W Linear, 10W input			334.65	D
MMC435/600	70cm ATV Converter, UHF output			35.65	A
MTV435	70cm ATV 20W Transmitter			197.80	B
MM2001	RTTY to TV Converter			188.83	B
MM4001-KB	RTTY Transceiver with keyboard			299.00	D
MMS1	The Morsetalker			129.95	B
MMS2	Advanced Morse Trainer			168.82	B
MMT144/28	2m Linear Transverter, 10W o/p			139.84	B
MMT144/28-R	2m Linear Transverter, 25W o/p			289.80	B
MMT 50/144	6m Linear Transverter 20W o/p			289.80	B
MM50/28	6m Linear Transverter 20W o/p			289.80	

FULL DETAILS OF BONUS BREAK HOLIDAYS AVAILABLE ON REQUEST.

Postage Packing charges A = £2.35 B = £4.91 C = £5.60 D = £6.98

Club Secretaries: Our man on the road Mick, G4EFO, is available for club lectures during 1987. Please ring 0403 730 767

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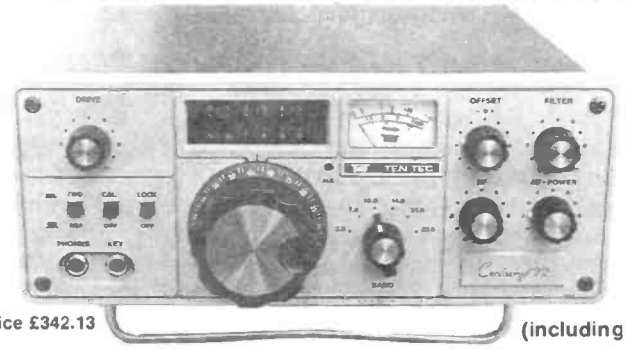
NO FRILLS, "GIMMICKS", OR UNUSED FACILITIES - FOR THE SERIOUS PHONE/CW OPERATOR WHO WANTS THE LOWEST NOISE, CLEANEST AND MOST SELECTIVE AMATEUR hf TRANSCEIVER ON THE WORLD MARKET

KW TEN TEC "CORSAIR II" 200 WATTS SSB/CW TRANSCEIVER

Price £1147.24 (including VAT and delivery) MADE IN U.S.A.

KW TEN TEC "CENTURY 22" CW ONLY TRANSCEIVER



Price £342.13 (including VAT and delivery)

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The KW-TEN TEC ARGOSY II 100 watts HF ssb/cw Transceiver for mobile portable or home station **£589.00**
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KW TRAPS (original and best) for KW Trap Dipole.
KW TRAP DIPOLE (now in 27th year of manufacture)
KW BALUN, KW ANTENNA SWITCH. etc.
ALL BACKED BY THE KW SERVICE (trusted by Radio Amateurs and Government Services for more than 30 years).
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IF YOU BUY a kit or module from us the chances are it will be from the top best sellers listed below. We are pleased to say that they just sell and sell and sell...

Shouldn't you have at least one in your shack?

70cms Modules

		Assembled	Kit
70FM05T4	500mW NBFM Transmitter	63.40	39.85
70FM05R5	NBFM Receiver	75.40	59.95
70FM10	10W Power Amplifier	56.45	45.50
70LIN3/LT	500mW Linear Amplifier	39.90	30.55
70PA2/S	RF Switched Pre-Amplifier	30.56	19.10
70PA5	GaAS FET Pre-Amplifier	23.60	14.75
TVUP2	70cms TV Converter	38.40	28.75
TVM1	70cms TV Modulator	11.60	7.25

2M Modules

144PA4	2M MOSFET Pre-Amplifier	17.20	10.75
144PA4/S	RF Switch Pre-Amplifier	31.20	19.50
144LIN25B	RF Switched 25W Linear	49.20	35.75

24cms Modules

		Assembled	Kit
1250DC50	TV Down Converter	79.95	—
1250PA2	TV Pre-Amplifier	49.95	—
1240 TVT	Frequency Locked T'mitter	145.00	—
UFM01	420 MHz FMTV Exciter	41.25	28.25
VIDIF	IF Processor/Demodulator	63.75	—
SCT-2	Transmit Sound Modulator	16.50	—
SCR-2	Receive Sound De-M'lator	24.95	—
VP/D1	Pre-Emp/De-Emp Module	10.50	—

General Accessories

TB2	Toneburst	7.50	4.70
PT3	Piptone	8.45	5.10
MPA2	Microphone Pre-Amplifier	6.25	4.60

All prices include VAT but please add £1.00 for postage and handling. Delivery is usually from stock or within 28 days.

A copy of our full list of modules and kits for practising amateurs is available for the cost of an A4 size SAE

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Youngs Industrial Estate
Aldermaston, Reading
Berkshire RG7 4PQ
Telephone: (07356) 71444 Telex: 846630

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TX-3 RTTY/CW/ASCII TRANSCEIVE

All the features you've ever wanted in this really top class program. Some of the facilities are:

Split-screen, type-ahead, receive screen unwrap, 24 large memories, clock, review store, callsign capture, RTTY auto CR/LF. CW software filtering and much more. Uses interface or T.U. for **BBC-B** and **CBM64**. Tape £20, disc £22. For **VIC20** we have our RTTY/CW transceive program. Tape £20.

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This is still a best-selling program and it's easy to see why. Superb performance on 4 modes, switch modes at a keypress to catch all the action. Text and picture store with dump to screen, printer or tape/disc. An essential piece of software for trawling the bands. **SPECTRUM** needs no hardware, **BBC-B, CBM64** and **VIC20** need interface. Tape £25, BBC or CBM64 disc £27.

TIFI Interface has 2-stage RTTY and CW filters for improved reception and transmit outputs for MIC, PTT and KEY. Kit £15 (assembled PCB + cables and connectors) or ready-made £25 in a box with all connections. Extra MIC leads for extra rigs £3 each.

BBC World map and locator shows daylight and darkness zones and realtime clock updated as program runs. Accepts input of lat/long, QTH or maidenhead locator, NGR or one of 245 placenames. Prints distance, bearing, VHF contest score and long path details. Plots distant station and great circle path on map. Runs on **ELECTRON** also. Tape £7, disc £9.
For **CBM64, VIC20, SPECTRUM** we have our original locator program (no map, NGR or placenames) tape £7.

Morse tutor is now fully revised with every feature to learn morse the quick and easy way. Graded learning for beginners and 40 plain language texts for test preparation. Tape £6 for **BBC-B, ELECTRON, CBM64, VIC20, SPECTRUM**. The original **ZX81-16k** program is still available at £6.

Logbook date, band, mode, call and remarks for all your contacts. Easy to use, printout to screen or printer, callsearch. For all the above computers, tape £8.

RAE Maths All the practice and testing you need for the exam. For all the above computers inc. **ZX81-16k**, tape £9.

All BBC and CBM64 programs are available on **disc** at £2 extra. All VIC20 programs (except locator) need expansion.

Prices include VAT and p&p, 1st class inland, airmail overseas, normally by return. Eire, C.I., BFPO deduct 13%.

technical software (HRT)

Fron, Upper Llandwrog, Caernarfon LL54 7RF.
Tel: 0286 881886


23cm Receiver

NEW!

With interest in the 23cm band on the increase, we are pleased to introduce this new 23cm receiver. This high spec FM receiver will provide a low cost, effective way of monitoring the band without the need to tie up rigs plugged into converters.
An IF of 145MHz enables the receiver to double as a 2m FM receiver.
A companion transmitter is planned for the near future.

Specification

* Freq Range	1296 to 1298MHz
* IF Freq	144-146MHz
* 3 Channel	Xtal Controlled
* RF Sensitivity	<0.25μV for 12dB SINAD
* Adjacent Channel	>60dB
* AFC Range	±5kHz
* Audio Output	600mW into 8 ohms
* Power required	12-15 volts DC
* Size	185-135mm

Kit includes: Double-sided glass fibre PCB, all components, helical filter, surface mount components and potentiometer (Ch. Xtal not included).
Minimum of test equipment required - multimeter and diode probe.
Please allow 21 days for delivery.

Cirkit

Cirkit Distribution Limited. Park Lane, Broxbourne, Herts EN10 7NQ
Telephone: (0992) 444111 Telex: 22478

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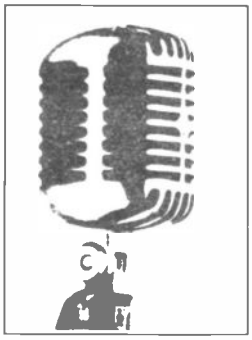

MARCH 27-28

1987

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LETTERS

Don't Be Put Off!

Dear HRT, May I be allowed to comment on the recent correspondence by 'Disilluisoned G1? The treatment he received has also been meted out to us older radio amateurs. It has happened to me on the air and also once at Ally Pally. I obtained my first licence, in Canada, in 1959.

Whilst assisting on a stand in Ally Pally the year before the fire, an amateur with the call sign G3P?? came up and started chatting. After a few minutes he made the comment "Of course, you're quite new at this game". Knowing the approximate year he was licenced, I replied "I had my first licence in Canada in 1959". Whereupon, he turned on his heel and left without another word.

It is not possible to take that action on the air but don't be disillusioned, you young fellows, there are still more gentlemen on the air than cynics. Enjoy the hobby, especially try to obtain your full licence, I'm sure there are very few old-timers on 80 metres who will shun you, the reverse is the case.
Robert M Dotchin, G3WEP (ex VE3CXG)
We trust that the equivalent comments apply to the few but steadily increasing number of women amateurs too!

CB Retransmission

Dear HRT, In reply to OP (Ayrshire) concerning his report of another amateur taping his CB conversation and playing it on the 2m band to friends. I agree with OP's comments in their entirety as it happened to me on one of our local repeaters when I was first licenced. It would seem there are some amateurs who take great pleasure in doing this and have nothing better to do with themselves. My re-transmission by this amateur was solely done to pick me up on a word or words used by myself because I had been on 27MHz myself prior to RAE and licencing, which to me is childish and does not give Amateur Radio a good name; far from it. I would recommend that as the Editor said if OP knows or can find out who it was then contact the RIS. I wish him luck on the bands and in his morse if he is so minded.

R W Sharman, G1NGR

Conventional Deliberation

Dear HRT, After reading the first copy of HRT purchased by me, I was compelled to write to you and congratulate you on two points, firstly on the production of an excellent magazine, and secondly express my admiration of your courage to stick to the old, tested and trusted method of depicting a resistor (or resistive) on the circuit diagrams, instead of following like a flock of sheep the designation of a resistor that bears more resemblance to a coffin that a resistor.

I view this change of presentation as ridiculous as the change of frequency designation from megacycles to megahertz and I for one refuse over the air to speak of hertz, kilohertz or megahertz.

I do not oppose change, except where the change is too ridiculous for words.
Bill Wright, G3FRW
We believe that the most important criterion for adopting any sort of system of units or any covention for depicting circuit elements is simply a matter of making yourself as clear as possible. Rightly, wrongly or even ludicrously, the vast majority of people now use hertz as the unit of frequency, and you risk not being understood if you don't. When it comes to resistors, the world is pretty evenly split between those who throw a wobbly at drawing neat squiggly lines and those, like us, who find rectangular boxes meaningless and too easily mis-read as something else, so one can choose which system one prefers.

Dear HRT, With reference to the recent article in Feb. 87 of Ham Radio Today by G6MKC, on a Mod for your FT290.

I had the same problem of how to 'hardwire' by BNOS linear to my FT290. One solution is a lot simpler (and cheaper) than that suggested by G6MKC, it is to insert a diode series with the PTT wire, as long as the diode is wired with the cathode to the rig side.

The reason for having to do this is because the FT290 PTT output has about 4 volts on it as this is how they do their own stitching, but it does upset other linears.

I used a diode in the IN4 series and wired it inside one of the 3.5mm jacks. mark the jack and either the rig or linear so that if the lead is removed it always goes back the same way round.

On one type of linear I had to use a 5.6v Zener diode to overcome the problem. This was due to the way the switching was done on this linear.

I hope this tip can be of use to some of your readers. I can supply any further details if you want.
Ritchie Craib GM1LKD.

Dear HRT, I would like to say that I have also had a similar experience as Mr. Lund, but with the company Racal.

I have a RA17, but because I cannot get out, I was in some difficulty when it developed a fault. With the help of their Mr. Theedam I was able to get it back in working order. Like Mr. Lund's radio, mine is also some 20 years old. I'm sure Racal could have 'excused' themselves but they were really great. You see, to people like, the radio is more than a 'radio' — it is our contact with the world at large. Be it Mexico or Manchester, it is also the difference between a lonely hard day.

I hope Racal will always allow their staff to be so considerate, without 'technical care' some of us are really out on a limb. Regards to G4TOZ, G4WNM and company, I always listen to their Top Band net in East London.
Tom Bender, Hackney.

Please address correspondence to:
Letters, Ham Radio Today,
1, Golden Square,
LONDON W1R 3AB.

RADIO TODAY

FRG9600 now covers HF

R. Withers Comms Ltd have announced their latest HF modification for the Yaesu FRG9600 super-scanner, which is able to cover 100kHz through to 950MHz without gaps. The new 'MkIII' version has an improved 'S' meter and a typical sensitivity of better than 2uV on HF and better than 1uV over the 60-950MHz range.

The new HF section is fitted internally with switching circuits and a small toggle switch on the rear apron to enable band change, whereby the display changes to read actual frequency (100kHz-60MHz). The standard SO239 antenna connector has now been changed for a 'N' connector for coverage from 60-950MHz and a SO239 connector fitted for HF coverage 100kHz-60MHz.

As an 'N' connector is now fitted for VHF-UHF coverage it is possible to use a wide-band discone antenna such as the ICOM AH7000 which is supplied with low-loss coaxial cable and 'N' connectors. A dipole or long-wire antenna can be used for HF coverage with very good results. This facilitates use of two antennas for all bands.

The new FRG9600's are available in two versions: The FRG9600 Mk2 series 2; 60-950MHz, 'N' Connector. £519.00 plus £5.00 carriage, or RWC can modify a standard unit for £40.00 inc VAT.

The FRG9600 Mk3; 100kHz-950MHz HF switchable, actual frequency readout (no external units), 'N' connector for VHF and UHF and SO239 fitted for HF at £599.50 plus £5.00 carriage, or modification of an existing unit for £129.50 inc return carriage, which will have the 950MHz extended coverage fitted at the same time. Existing MK2 owners can have the new HF mod fitted for £99.00 inc return carriage.

All modifications are fully guaranteed for twelve months from date of purchase/modification providing RWC's modification seals are unbroken. Modified PAL video boards are also available for £27.50, which have the necessary 6MHz intercarrier spacing fitted. Further details on these units can be obtained from: RWC Ltd, 584 Hagley Road West, Oldbury, Warley, Birmingham B68 0BS. Tel: 021 421 8201/2/3.

Bristol FM TV Group

The Bristol FM TV Group has produced a new broad banded 23/24cm ATV aerial. By utilising conventional band IV/V technology, a compact and inexpensive starter or portable aerial has been made available to ATVers.

Type: 18 element yagi, end mounting.
Gain: 10dB approx
SWR: Approx 1.5 across the band.
Length: 0.92m
Weight: 0.3kg
Supplied with mast clamp suitable for masts up to 55mm outsider diameter, and waterproof terminal box.

The aerial is specially manufactured by a professional manufacturer and is exclusive to the Group. All proceeds after deduction of manufacturing costs will go to Group funds, and the construction of GB3ZZ, Bristol's proposed 23cm FM TV Repeater. The aerial is supplied ready assembled, needing only one screw to fit the rear reflector element. Cost: £12.50 collected, £14.75 posted to any UK address. (20% discount to group members). Orders, cheques payable to: Bristol FM TV Group, 15 Witney Close, Saltford, Bristol BS18 3DX. Please allow 28 days for delivery.

ISWL back in business again

Following the closure of the International Short Wave League in June 1986 due to lack of funds, we have been advised that ISWL has been re-launched with the re-flotation costs and working capital being donated by Council members. The officers are President Frank A. Baldwin, Hon. Secretary Jim May G1GWG, Asst. Hon. Secretary Mrs Evelyn May G1OFC, Treasurer Mike Gater G4ICC, Council members Dick Rugg G2BRR, SWL's Bernard Hughes and Ivor Davies.

The QSL Bureau has also been reactivated and services resumed, the League journal *'Monitor'* being planned to appear early in 1987 together with commencement of memberships. If you are interested in ISWL there is also a regular Saturday morning net at 10:30 (clock time) on 3685kHz, the net controller being G2BRR and all ISWL members are welcome. Further details concerning ISWL and applications for membership should be sent to: ISWL HQ, 10 Clyde Crescent, Wharton, Winsford, Cheshire CW7 3LA.

Hands off the mic!

Few can doubt that driving along with one hand to control the car and another to control the rig and hold a microphone is little short of suicidal in many situations. So it's hardly surprising that the 'boys in blue' have recently been taking an interest in this sort of behaviour.

Waters and Stanton now say they have a solution to the problem, in the Adonis FX-8 microphone, which has the unique feature of giving good results when mounted several feet away from the operator in a noisy environment such as a car. This has two back-to-back electret microphone capsules, with the individual amplifiers and the difference signal from the amplifiers is what is output. W&S claim that having separate pre-amplifiers makes it so superior to the conventional noise-cancelling microphones that the ambient noise level is virtually eliminated.

The set-up is completed with a control box with up and down buttons which is designed to fit on the car's gear stick *(Your driving instructor would have something to say about driving along with your hand on the gear lever — Ed)*. This is all for £69.95, inc VAT, from Waters and Stanton Electronics, 18-20 Main Road, Hockley, Essex SS5 4QS (Tel 0702 206835 or 204965) or 12 North Street, Hornchurch, Essex RM11 1QX (Tel 04024 44765).

Adding to their existing range of satellite TV related books, J. Vincent Technical Books has announced the addition to 'The Ku-Band Satellite TV, Theory Installation and Repair'. The book deals with the choice, installation and adjustment of home-based satellite dishes and also covers site surveying, cable TV, transmission descrambling and satellite tracking. The current price is £23 including p&p and is available from J. Vincent Technical Books, 24 River Gardens, Purley, Reading RG8 8HX. Tel: 0734 414468 or from 'The Modern Bookshop', London.

Old Callsigns Received?

The department of Trade and Industry has announced a change in policy regarding the re-issuing of lapsed Amateur Radio Licences with the original call signs.

The Department has now decided, after considering several individual cases, and representations from the Radio Society of Great Britain, to permit any previously held licences to be re-issued to the legitimate holders — even where the original qualifications were not based on the current City and Guilds Radio Amateur Examination syllabus. The one exception concerns licences which had call signs in the G5+ three letters series; that series has already been withdrawn for re-use, so will not be available.

Previously the Department's policy has been to permit only the re-issue of licences which were obtained on the basis of a pass in the Radio Amateur Examination, conducted by the City and Guilds of London Institute and awarded after 1958.

In order to reduce the administrative burden on the Department the onus will be firmly on the applicant to provide evidence that he/she did in fact hold that licence and to satisfactorily provide confirmation of their identity. The applicant would be required to provide: (1) incontrovertible evidence of having previously held the licence with that call sign (for example a copy of the original licence document); (2) Full details of the lapsed licence — including full call sign, address to which it was issued, all subsequent changes of address notified to the Department and its predecessors while the licence was valid, of issue of the licence and any further information (such as correspondence with the Department); (3) Proof of the applicant's identity (a birth certificate or passport).

There will be no change to the requirement that all new first-time licencees hold a pass in the Radio Amateur Examination.

Applications for the reissue of lapsed licences should be made, in writing, fully supported by the necessary documentary evidence, to: Department of Trade and Industry, Radiocommunications Division, Amateur Radio Section, Room 613, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

Spectrum SSTV Program

This program from JEP Electronics provides slow scan TV facilities from your Spectrum computer, allowing both transmission and reception of SSTV programmes on the HF and VHF bands.

The program package consists of two cassettes, the main transceive program, and a design program which enables you to design personal screens for transmission. In addition, if you have a camera and digitiser, these may be used with the program to enable transmission of your personal or shack pictures.

The menu of the transceive program allows for receive and transmit modes, as well as loading and saving pictures to and from either cassette or micro-drive. Up to eight pictures can be stored in the programs memory bank on a 48K machine, while many more may be stored in the 128K. These stored pictures can be pictures for transmission or 'captured' pictures; or a mixture of both, and a tuning aid is incorporated in the program to assist in netting.

In transmit mode, text or picture screens may be input for transmission, either singly or in a desired sequence. The size of the letters in 'text' mode can be varied from one per screen up to 24 (4 lines of 6). This variation is particularly useful when conditions are bad, as large letters can then be used. It is also possible to transmit a normal or inverse screen, which again can be useful in adverse conditions.

The receive mode allows variation of contrast on the received picture, as well as giving the facility to invert the received picture if desired. Additionally, the picture attributes may be set to bright or normal.

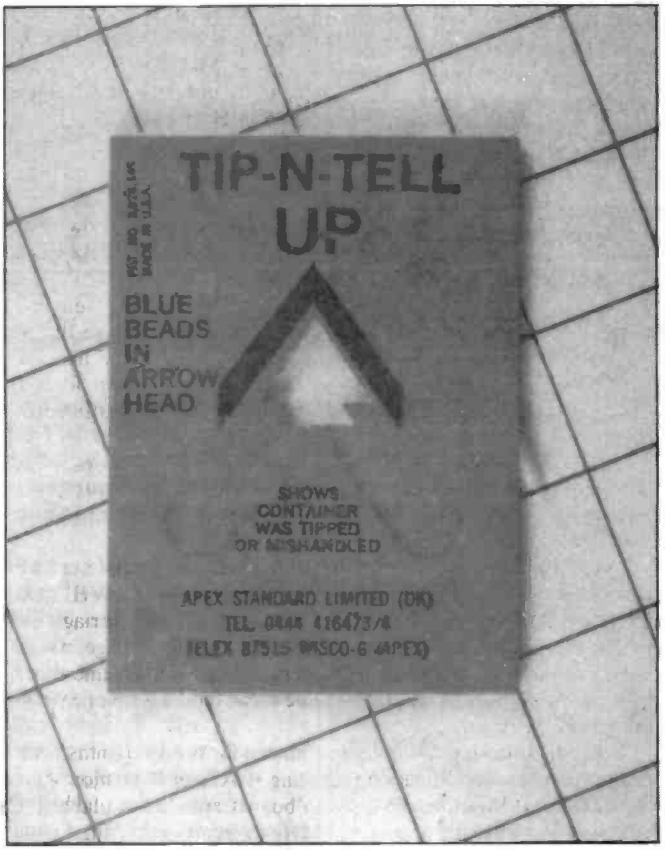
Prices are as follows (all include VAT and P&P): twin cassette pack with comprehensive instruction book £25.00; ready built interface and tone generator £42.75; as above with automatic PTT control £47.50; interface and tone generator kit £32.75; as above but kit includes automatic PTT £37.50. All from J.E.P. Electronics, New Road Complex, Kidderminster, Worcestershire DY10 1AL.

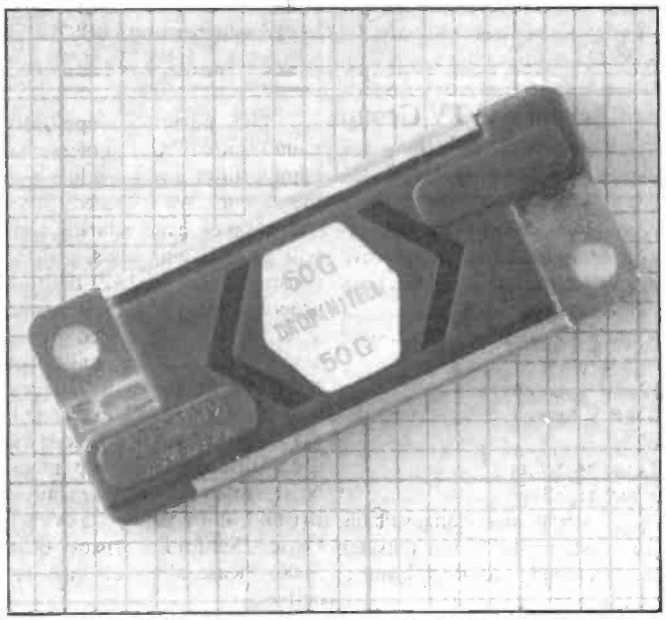
A spy in the case?

Two new gadgets might put an end to disputes with the Post Office and other carriers as to whether or not delicate electronic items were adequately packaged in the first place or whether somebody somewhere threw them against a brick wall.

The two devices are the Drop-N-Tell and the Tipp-N-Tell, from Apex Standards Limited, 17 Boltro Road, Haywards Heath, W Sussex, Tel 0444 416473, and cost around £1.80 and 75p each respectively, ex VAT.

Obviously, the Drop-N-Tell is much more applicable to the amateur market, and we here at HRT don't think it will be too long before these devices start turning up with more expensive transceivers, etc, that are sent out by the post or carrier. Whether they will be acceptable evidence for compensation remains to be tested.





'Trying to connect you'

The last time we tried to contact South Midlands Communications we were greeted by a speech synthesiser of such sophistication that we had to let it go round twice before we got the hang of it! From the 1st of March their new number for the telephone is (0703) 255111 — if you are one of these flash types who send telex messages it is now 477351 SMCOMM G, and for the ultimate posers SMC's FAX number is (0703) 263507.

In this ever changing world we are glad to report that at least one thing is to stay the same and that is their address, which is: South Midlands Communications Ltd, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants SO5 3BY.

Surface mounted home-brew?

We can't help wondering how long it will be before we get sent a project which uses surface mounted components now that Cirkit Ltd have started marketing resistors, capacitors, inductors, coils, filters and delay lines in that form. Don't rush over to the drawing board just yet though because the devices can only be supplied in bulk at present, but we are told that the company is considering ways of making the components available to home constructors too. Apparently one of the problems is that the things are so small that they are difficult to handle at the packing stage. Cirkit can be contacted at Cirkit Distributions, Park Lane, Broxbourne, Herts EN10 7NQ or on (0992) 444111.

Oswestry DARC Border Award

Following the success of the award for operators and SWL's which began on 1st January 1986, based on the county of Shropshire and its border counties using 144MHz and above; the Oswestry DARC have introduced another award for the 10m-160m bands. Bands and modes may be mixed but all stations worked or heard must be after 1st January, 1987.

This time the border used is that between England and Wales. The numbered certificates will be of the same high quality and layout as the first award. For this award claims are based on the counties of: GW — Clwyd, Powys, Gwent and G — Cheshire, Shropshire, Hereford/Worcester and Gloucestershire.

Requirements: Work or hear either a club member, the club call sign (G4TTO) or any special event station organised by the club.

Plus: QTH UK and Eire — 10 stations in each county; other regions — five in each county; total required: UK — 71 stations, other regions — 36 stations.

Claims: List of log entries, certified correct by two other operators or SWLs giving date, call sign, frequency, mode, county for each station worked or heard, together with £1.75 or 10 IRCs to: Tony, Awards Manager, PO Box 6, Oswestry, Shropshire, SY11 1ZZ.

Further details of both awards are available by sending SAE to the above address.

New mini quartz resonators

A miniature ceramic packaged 8-20MHz AT-cut quartz crystal, the ETA CX-AT, has been announced by Stanler Components Ltd., for both surface mounting and through-the-board applications.

The CX-AT is designed for use in simple Pierce oscillators and is manufactured by a photolithographic process using state-of-the-art equipment which results in miniature ceramic packages one quarter the size of an eight-pin mini-DIP.

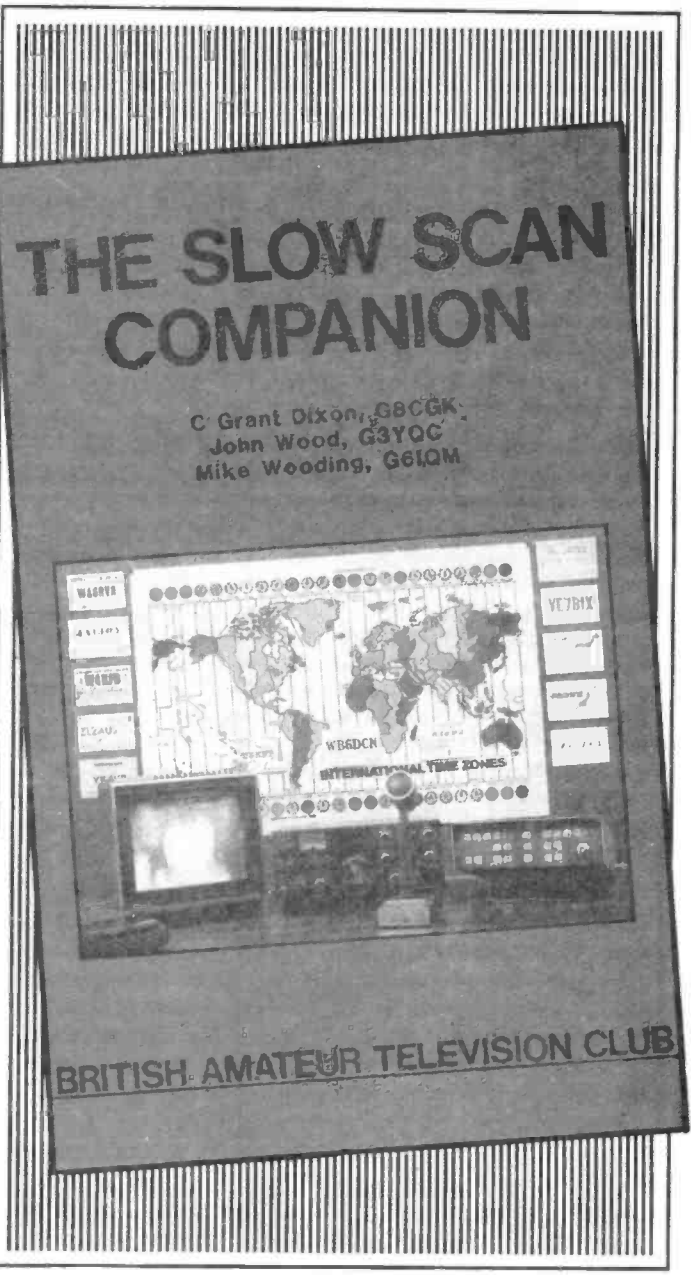
The crystals have low ageing, high stability and low power consumption and can be supplied with standard frequency tolerances down to +/−50ppm with tighter tolerances available on request, further details from: Stanler Components Ltd., 12 Benfield Way, Lakes Road, Braintree, Essex. CM7 6YS. Tel: Braintree (0376) 40902.

New N. Wales rally

Adding to the burgeoning list of new rallies this year is the North Wales radio rally, to be held on 7th and 8th of November at Aberconwy Conference Centre, Llandudno.

The organisers have certainly made the prices competitive, and the facilities available look very attractive, but we can't help but wonder how many will make the trip so close to the Telford rally. However, we wish the organisers luck and hope that all goes well.

Anyone who might be interested in exhibiting should contact the secretary of the organising committee: Mr E. Shipton, GW0DSJ, at 34, Argoed, Chester Avenue, Kinmel Bay, Rhyl, Clwyd, North Wales.



New SSTV book from BATC

If you revel in receiving retarded rasters then the latest publication from the British Amateur Television Club may be just what you're looking for. This A5, 100 page book starts off with the fundamentals of SSTV and then moves on to cover reception and transmission followed by techniques used for colour, commercial equipment, using home micro's, digital systems and scan conversion methods.

The book is liberally sprinkled with photos, diagrams, and circuitry — in fact virtually everything which could be needed to get you going with this rather fascinating mode. Just try getting the Fast Scan TV mob to fit inside a 2.5kHz bandwidth!

The book, co-written by Grant Dixon, John Wood and Mike Wooding is available from: BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN for £3.50 including postage and packing.

HB9CV
Theory meets Practice

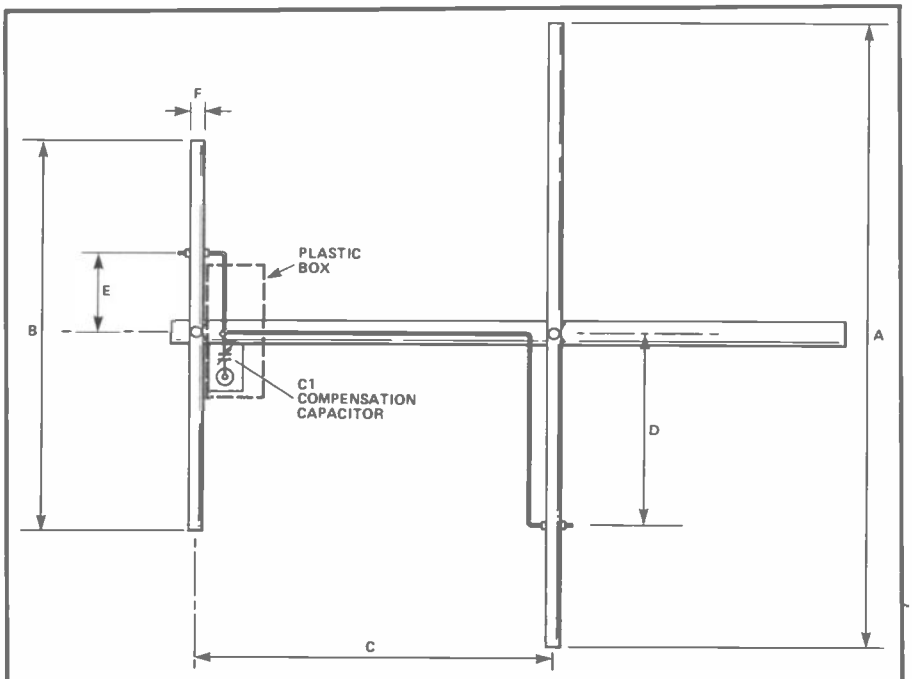


Fig. 1 Construction of the HB9CV, letters refer to dimensions given in Table 1.

The popularity of the HB9CV aerial just goes to prove that it's a worthwhile project — here Mick Senior explains the theory and practice of construction for Two, Seventy and 23cms.

The theory for the HB9CV has been around for a considerable time now, in fact it's been around since the early sixties, when the original HF versions were made. The two metre version, which is a much later development, is a very useful portable version for club fox-hunts or summer time portable expeditions.

Origins of the '9CV

The HB9CV antenna is a two element array originally designed by the Swiss amateur, R. Baumgartner HB9CV, for use on the HF bands. The design for the two metre version has since been published in many amateur journals — some of which have got the idea completely wrong!

A few years ago I was involved in the design of a commercial HB9CV and following a few experiments we came up with a number of ideas for an easily reproducable version for two metres. As the antenna is no longer produced commercially I have retrieved some of the ideas from the archives, together with dimensions for 70cms and 23cms versions for this article.

Both elements of the HB9CV antenna are gamma fed from the same point; the second element however, is driven out of phase to the first. The spacing between the elements and the phase shift or 'delay lag' between them, determines the polar response of the antenna and in this respect it also affects the gain of the array which is about 4.5dB over a dipole if constructed correctly — when a very good cardioid or heart-shaped radiation pattern can be achieved. This can be very useful because the effective 'null' off the back of the antenna is quite sharp and deep so good use can be made of this when operating portable. It can be used to reduce the signal strength from strong stations when trying to work a bit of DX, but the null really comes into its own on fox-hunts. When used with a simple diode probe, tuned circuit and meter arrangement, DF'ers can almost walk straight up to the fox.

Operating theory

Concerning the theory behind the antenna, it is interesting to look at the feed system and the phase relationships between the two elements. For optimum gain (4.9dBD) the spacing between the two elements is 0.2 λ and the phase difference is 153.5 degrees. On the HB9CV antenna, the feed between the two elements is made of aluminium or brass rod. This is placed in close proximity to the elements and boom and is in fact a piece of fabricated transmission line. We could actually do away with the inverse gamma feed system and use conventional coaxial cable to connect the two elements, which is the feed arrangement used on ZL special antennas. For the technically minded, or for those who would like to experiment with the antenna, we can go a little further into the phase relationship theory. It is important to remember that one wavelength is 360 degrees and that standing waves on antennas and feed lines occur alternately at maxima and minima every 180 degrees. Next we need to know the velocity factor of the feeder in use (in most coaxial cables it's about .66) and finally the phase lag in degrees of the second driven element.

Now if we take all of these facts into account, using our previous example of the optimum gain for the HB9CV (0.2 λ spacing and 153.5 degree phase difference), we can use the following formulae to determine the various lengths of coaxial cable.

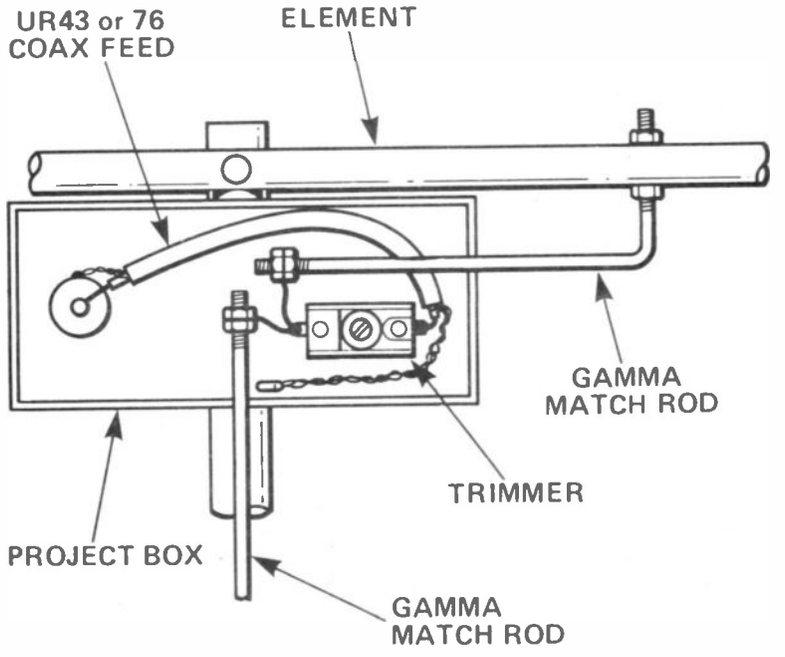


Fig. 2 Wiring details for the gamma match enclosure.

$$\text{Wavelength} = \frac{\text{Speed of electro-magnetic waves}}{\text{frequency}}$$

Therefore at 145.000MHz the following applies:

$$= \frac{3 \times 10^8}{145 \times 10^6} = 2.069 \text{ metres} = 206.9\text{cms}$$

this is one wavelength or 360 degrees: therefore at 153.5 degrees we have the following:

$$\frac{153.5}{360} \times 206.9 = 88.2\text{cms}$$

Taking into account the velocity factor of the cable being used (0.66 for typical coax) we are left with the formula:

$$\text{cable length} = 88.2\text{cms} \times 0.66 = 58.2\text{cms}$$

Therefore if we wanted to drive two elements spaced at 0.2 λ to achieve optimum gain a piece of coaxial cable 58.2cms long would give the required 153.5 degree phase change. Well that's the hard bit, now back to the real world and sanity!

As we have already seen, the phasing relationship between the two elements directly affects the polar pattern of the antenna, and the length of the feed between the two elements directly affects the phase delay of the second element. Remembering that the gamma matching arrangement between the two elements is in effect transmission line, we can now see why spacing and tapping points of the feed system can be quite critical.

Getting physical

Figure 1 shows the physical layout of the antenna arrangement. On both the two metre and 70cms versions conventional materials and layout practices can be applied, but on 23cms we will need to use a little ingenuity, care will be needed in selecting the tuning capacitor for example because of the losses exhibited at 23cms. The value of the capacitor will be very small and typically is around 1-2pFs. So don't be surprised if the trimmer that you have used is at minimum capacitance. Physical construction will also be very delicate and in this respect no specific constructional details for 23cms are given, although all the element lengths and spacing dimensions are given in **Table 1**.

Note that the feed point from input to phasing element is via a *series* capacitor and not, as a lot of publications have indicated, a trimmer across the feedpoint. If, however, any difficulty is found in matching the feed to the antenna a second variable capacitor should be fitted. The value is 3-30pF and it is soldered between the coax centre and ground (see **Fig. 3**) inside the projects box. This alters the feed from a gamma to an omega match. This is very useful in tuning out the reactance of the antenna and helps to give a perfect match.

To construct a two metre version of this antenna cut the elements to the lengths indicated in **Table 1** and when cutting the boom allow an extra 200mm beyond the second element for handling or mast mounting purposes. Take the piece of tube used for element A and drill a 5mm hole through the tube half way along for a bolt to secure the element to the boom. Next measure 190mm along the element from the hole which you've just drilled and drill a 4mm hole at a 90 degree angle to the first. Now take element B and follow the same procedure, except this time only measure 180mm from the centre before drilling the second hole.

Taking the material that you have selected for the boom, drill a 5mm hole 20mm from one end. Measure a further 250mm along the boom and drill a second hole then using two 40mm x 4mm bolts, mount the two elements to the boom.

Remember that the shorter of the two elements is mounted at the hole 20mm from the end and the second element must be mounted with the 4mm hole in the element *on the opposite side of the boom* to the first element's 4mm hole. If you are lucky enough to have two element support brackets, which can be salvaged from old aerials or bought from one of the mobile rallies, they will make your antenna rigid and strong.

There are a number of methods of connecting the coax to the antenna — some people prefer a 'flying lead' approach and others would rather have a connector mounted directly on the plastic box covering the gamma match. **Fig. 1** and **Fig. 2** show the latter method, which is self explanatory except to say that the piece of coax which links the box-mounted BNC socket to the antenna should be routed away from the gamma match rods so as to avoid de-tuning due effects. If a 'flying lead' is required then simply proceed as follows:

Taking the antenna, drill a 7mm hole through the support boom 35mm from the shortest element. This is to allow the coaxial feed to enter the box that houses the trimming capacitor for the gamma feed. Next, take a small plastic projects box (50x75x25mm) and mount it between the elements, tighten up against element B.

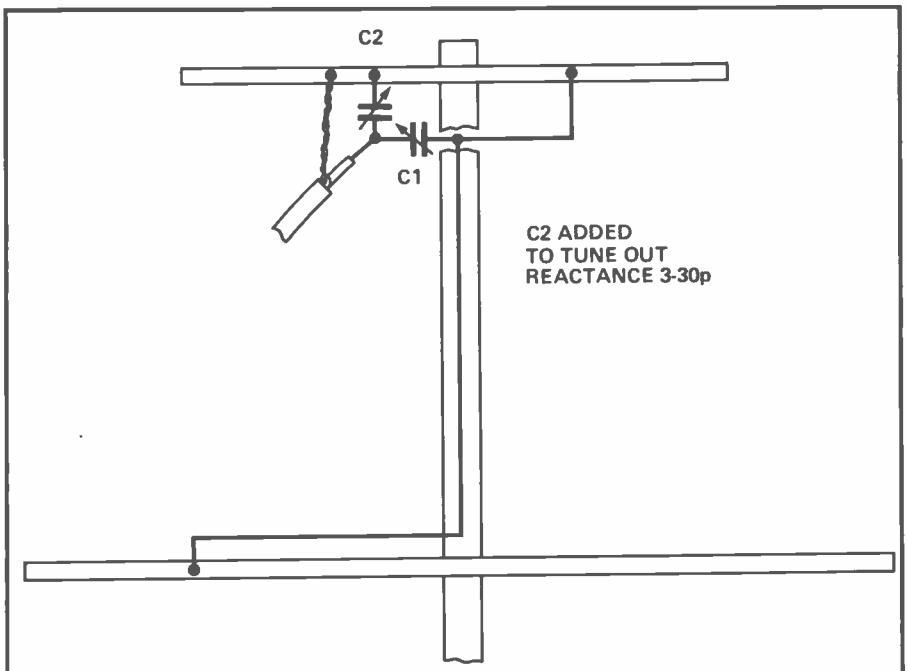


Fig. 3 If tuning is a problem, a second capacitor can be added as shown to form an omega match.

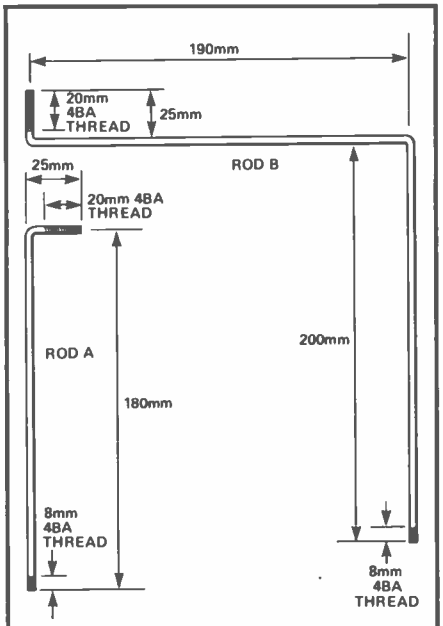


Fig. 4 Bending and tapping detail of the matching rods for the 2m version.

The box can be fixed to the boom with a small self-tapping screw to which a solder tag should also be attached (1mm pilot hole should be made through the box and into the boom for this purpose); to enable the screen of the coaxial cable to be grounded at the feed point. Take about four metres of URM76 cable and at one end separate the centre conductor from the screen and make two tails (see **Fig.2**), leaving about 20mm of dielectric between the screen and inner conductor. Trim the screen back to about 10mm and the inner to 5mm and turn the aerial over so that the 7mm hole leading to the back of the projects box can be seen. Now continue this hole into the box, taking care when using an electric drill as the boxes appear to be very brittle. If you decide to melt your way through with a soldering iron do remember that the smoke given off contain phosgene and hydrogen cyanide and if I tell you that the latter was used in chemical warfare you will realise just how toxic it is — work in a well ventilated area.

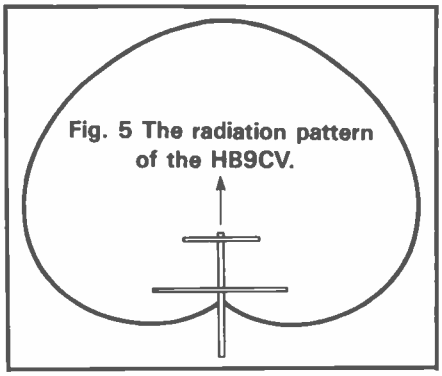
Feed the coax through the hole in the box so that just the two tails are left showing. Solder the screen to the solder tag and secure part of the remaining tail of coax to the underside of the boom with a couple of cable ties. You will be left with a useful fly lead to plug into your portable transceiver.

A BNC socket can then be mounted directly onto the boom and the variable capacitor soldered between the end of the socket and the phasing line. The only problems that arise with this method is waterproofing, the antenna in this form can only be used in fair weather or perhaps indoors but there is no reason why several antennas should not be fed in stacked arrays — and on 23cms the whole lot could be mounted in a fairly small plastic box if preferred.

Table 1. Dimensions and materials table for the HB9CV.

Band	Dimensions in mm						Variable	Materials used	
	A	B	C	D	E	F	Capacitor	Antenna elements	Matching rods
144MHz	1030	950	250	190	180	5	3-30 pf	10mm tube	3mm rod
70cms	338	308	83	57	53	4	2-10 pf	5mm brass	2mm rod
23cms	113	103	27	19	17.5	2.5	0.6-6 pf	3mm brass	1mm wire

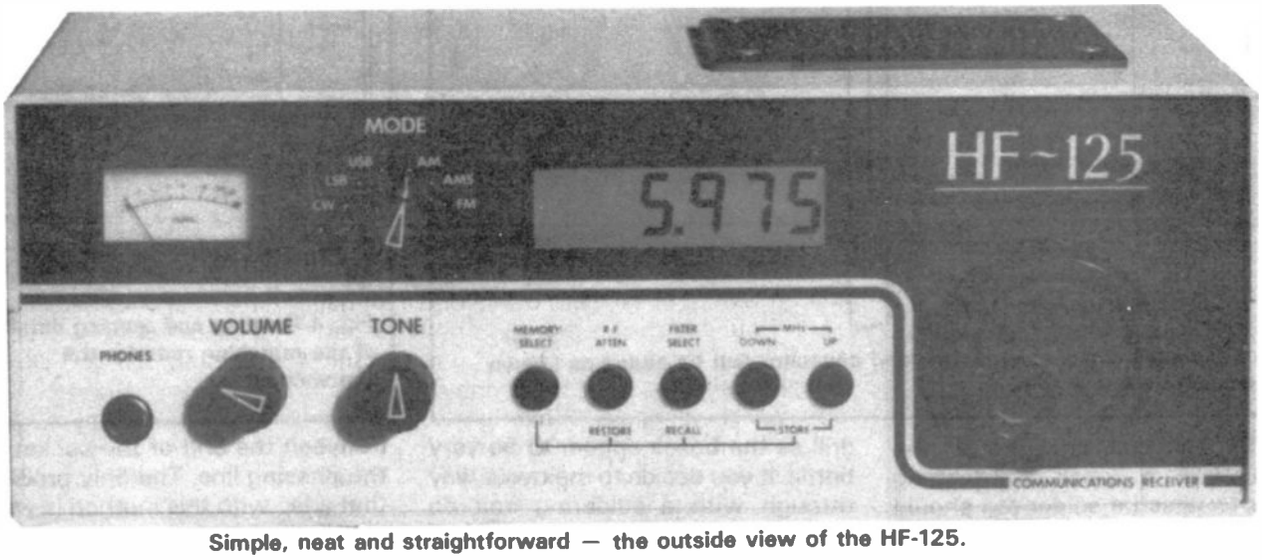
Note: The size of the boom is not too important, on the authors 2 & 70cms antennas 15mm square alloy was used.
The elements for the two metre antenna are aluminium and the 70/23cms versions are brass tubing
The materials used for the gamma matching are: Aluminium rod for 2 mtrs, brass rod for 70 cms and silverplated copper wire for 23 cms



As stated earlier, the radiation pattern from a correctly constructed HB9CV is cardioid with about 4.5dB forward gain over a dipole and a beamwidth of +/– 110 degrees, the power on the test antenna falling off by around 35/36dB at these points. Whilst there are many more sophisticated antennas with superior (and occasionally inferior!) performance on the market, the popularity and longevity of the HB9CV design for portable and temporary use proves its worth. Why not build one and see!

REVIEW

Lowe HF 125 receiver



Simple, neat and straightforward — the outside view of the HF-125.

No it's not just a 'tour around the service manual' — Chris Lorek has done it again with the first full review of the new Lowe HF receiver. What's the verdict? Read on!

Some time ago, somebody came up with the idea of a well designed, no nonsense general coverage receiver that would cope with the barrage of strong signals found on the short wave bands in Europe without needing a degree in electronics coupled with constant adjustment to use. The people in the Far East didn't seem interested in making one, so a British company decided to have a go, and came up with the HF-125.

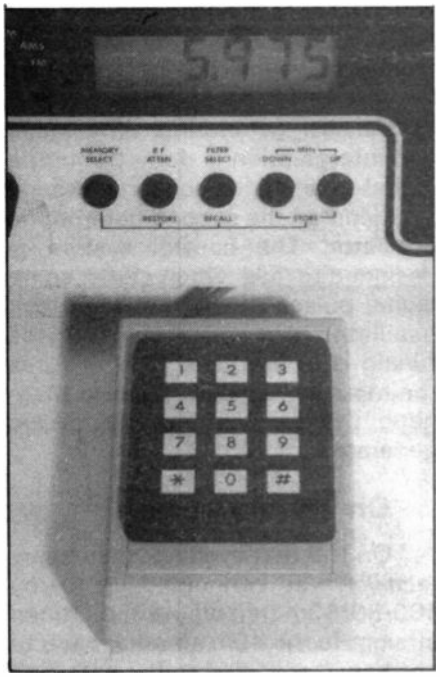
Vive la Difference

No shiny knobs to be found, but instead a hardwearing cream and black front panel and a small lightweight cabinet. However, the bells and whistles are still there, if a little disguised, such as 30 programmable memories, alpha-numeric readout of filter bandwidth, attenuator and squelch state, as well as the usual frequency readout on the large backlit LCD (Liquid Crystal Display). Behind the scenes are microprocessor control of nearly everything, digital encoded variable-speed tuning control, automatic selection of the most appropriate filter for the mode in use with manual override and even an optional synchronous AM demodulator so rarely offered in lower cost equipment.

Operational Features

The receiver covers 30kHz to 30MHz continuously, with CW, LSB, USB, and AM, with Synchronous AM and narrow band FM provided by the optional D-125 detector module. Tuning is accomplished by the main knob in conjunction with panel-mounted 1MHz Up/Down buttons, or by the optional K-125 keypad for direct frequency entry. Selectable filter bandwidths are 2.5kHz (normally used for SSB/CW), 4kHz, 7kHz (normally used for AM), and 10kHz, FM uses a fixed bandwidth of 12kHz. A 400Hz audio filter, centered on 800Hz, may be switched in to aid CW reception, and an internal speaker is fitted to the top panel. The tuning step rate is 15.6Hz on SSB, CW, and snychronous AM, 62Hz on AM, and 125Hz on FM, this gives 3.125kHz, 12.5kHz and 25kHz respectively for each revolution of the main tuning knob. To get from one end of the band to another quickly, the speed of rotation of the tuning knob is monitored, this goes into a rapid mode of 50kHz/rev (CW/SSB) or 100kHz/rev (AM/FM) when needed. Pressing the 'Memory Select' and 'MHz Down' buttons locks the tuning control to guard against accidental frequency shifts, this may be defeated by changing mode or by pressing the 'Memory Select' and 'MHz' Up' buttons.

Two banks of 15 memories are provided for frequency storage, accessed by the 'Memory Select' button. The memory numbers cycle through on the display, followed by the stored frequency and when the required memory is located, selection is accomplished by a press of the 'Recall' button, if required a press of the two 'Store' buttons instead will transfer the manually tuned frequency into memory. A 20dB RF attenuator may be switched in on any mode and a press of the 'RF



The optional keypad allows direct frequency input.

Atten' button displays the current attenuation state on the display, either 'OFF' or 'ATTN' — a further press toggles between the two.

The IF (Intermediate Frequency) bandwidth filters are automatically selected when you change mode, however these may be changed manually by a press of the 'Filter Select' button. The current bandwidth is displayed and this cycles through 2.5kHz, 4kHz, 7kHz and 10kHz by repeated presses. On FM however, the filter select control gives squelch override with the display in this case indicating either 'SQL' or 'OFF', the threshold point being adjustable through a rear-panel screwdriver hole.

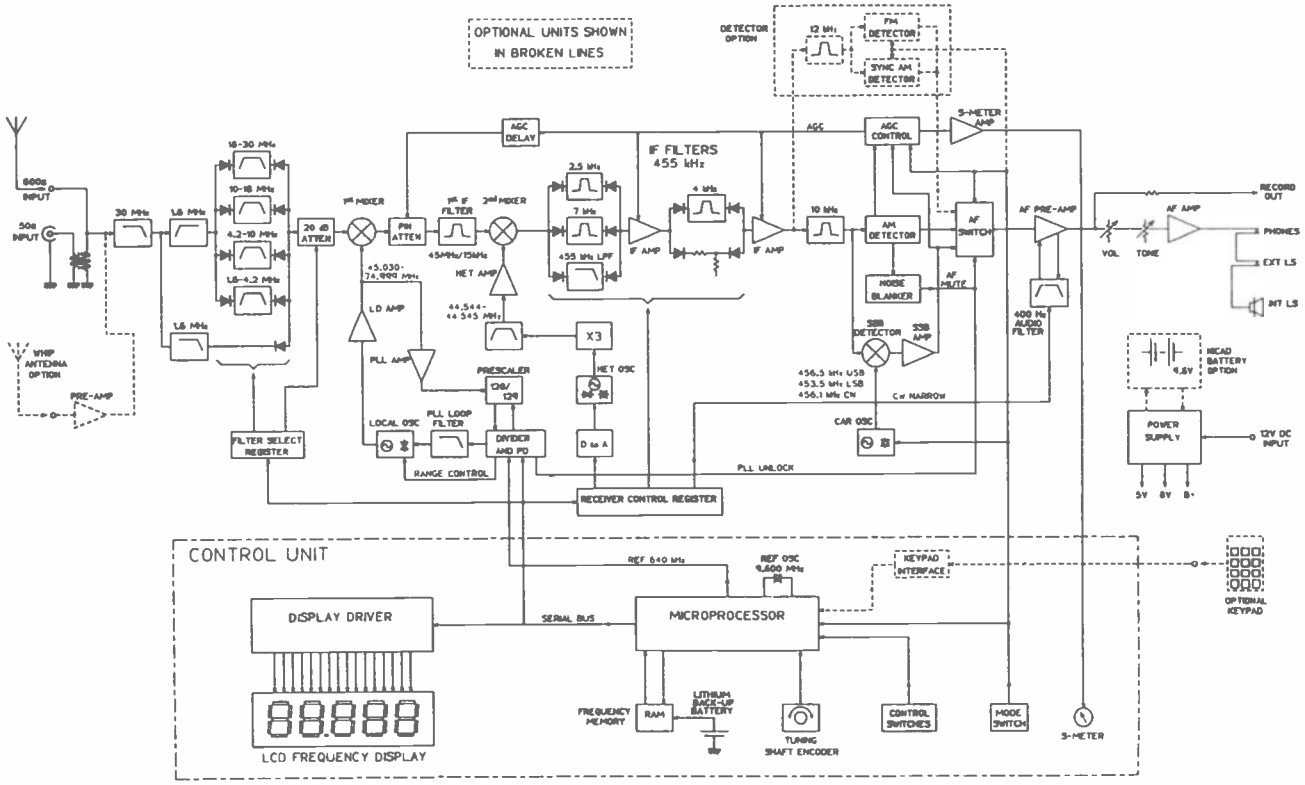
The set is powered from an external 12v nominal supply, either from the small plug-in PSU supplied with the set, or from external batteries. A further optional extra, the P-125, allows for portable use of the receiver by providing an internal rechargeable ni-cad battery pack and an active aerial preamplifier, together with a telescopic whip aerial. The nicads are normally charged from the power supply and are claimed to give around eight hours operation following a full charge. On the rear panel are sockets for 12v DC power, external loudspeaker, fixed level record output, ground, 600 ohm and 50 ohm aerials, and the external keypad.

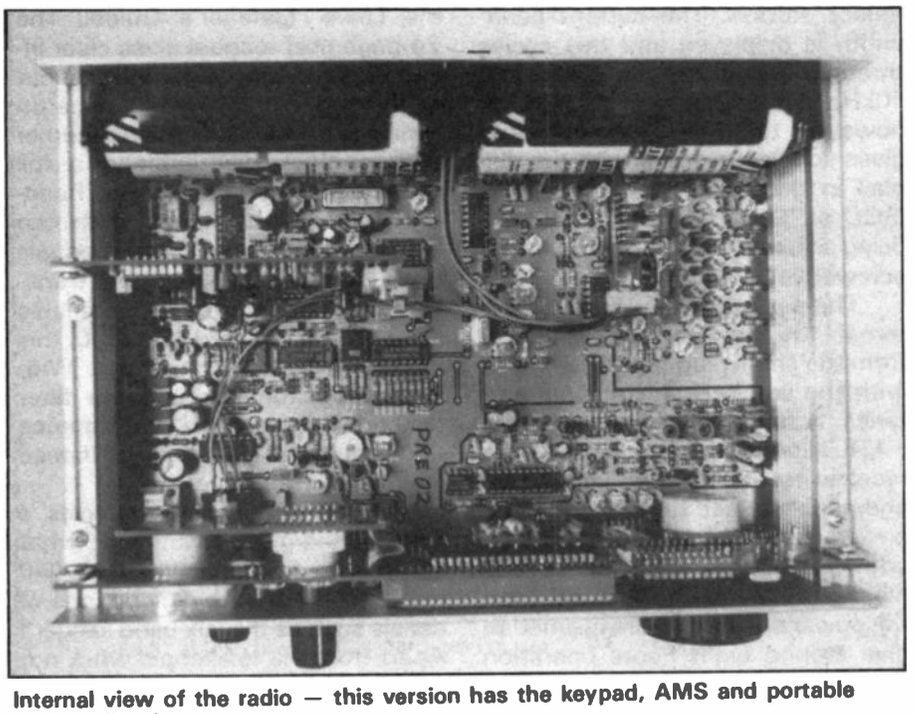
Paperwork

The receiver comes with a well written user manual and a copy of the Lowe 'Listener's Guide'. The 24-page user manual gives clear instructions on how to get the best out of the set, and includes advice on aerials, a circuit description together with a block diagram and a full circuit diagram of the receiver. Reading it makes a change from the 'matter of fact' instruction manuals often found with imported transceivers. The manual is available separately if required for £2.50, this being refunded on purchase. With the notable omission of the filter rejection figures, all performance figures are well specified and indeed look very impressive.

The 'Listener's Guide' gives a lighthearted guide to knowing what stations to find and where to find them, together with descriptions of aerials such as the 'six band sagger'! Apart from the telescopic whip, not a mention of *antennas* anywhere in the two books, you can tell they're British (an antenna over here, for the uninitiated, is something on the end of an insect!). An optional purchase is the technical manual available at £15, this gives full details of all the internal functions of the set, together with board layouts, binary tables of IC functions, and a complete parts list.

Fig. 1 Block diagram of the new receiver — options are shown in broken lines.





Internal view of the radio — this version has the keypad, AMS and portable options fitted.

Circuitry

Opening the receiver case shows a neat construction technique has been used, components are leaded discrete and board access is very easy, making servicing relatively straightforward. Of note is the lack of screening of various sections such as the sensitive VCO (Voltage Controlled Oscillator) which is in proximity to the digital control circuitry, showing that careful attention must have been paid in the design stages.

Reference to the block diagram shows that a dual conversion superheterodyne is used with IFs of 45MHz and 455kHz, the first to ensure a good image rejection and the second providing the main amplification and narrow signal filtering. The aerial input is fed through a 30MHz low pass filter to reject VHF Band II images, into a network of bandpass filters via a 1.6MHz highpass filter, for the HF bands, or a 1.6MHz lowpass filter for the remainder. Signal routing continues through the switchable 20dB attenuator into a Plessey SL6440C mixer, (good British stuff, this) then via an AGC controlled attenuator and a pair of monolithic dual crystal filters at 45MHz to the second mixer, again an SL6440C to give the 455kHz second IF, where the narrow-band filtering takes place with four ceramic filters and an LC network. To give the best possible stop band attenuation, filters are cascaded where possible for each selected bandwidth, ie. 2.5kHz bandwidth; 2.5kHz, 4kHz, and 10kHz filters — 4kHz bandwidth; 4kHz, 7kHz, and 10kHz filters — 7kHz bandwidth; 7kHz and 10kHz filters — and 10kHz bandwidth; 10kHz filter.

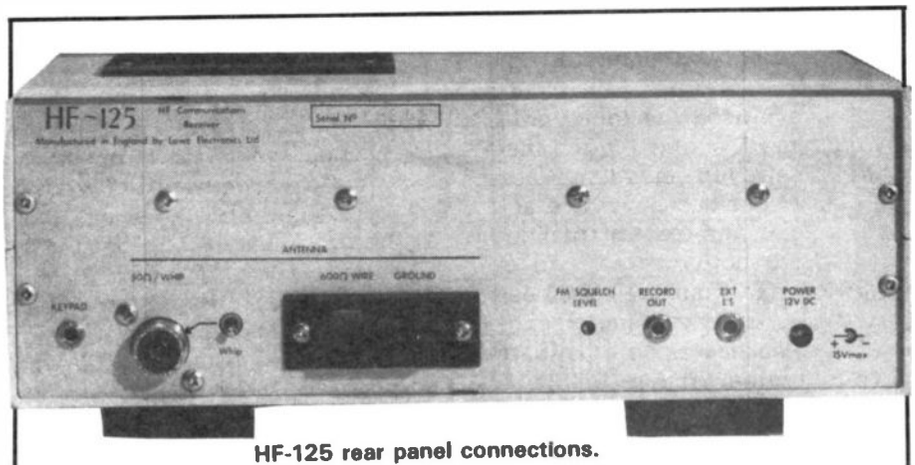
An SL6700C serves as a 455kHz amplifier, AM detector and noise blanker. This also acts as a product detector for SSB/CW use with the heterodyne frequencies being generated by a ceramic resonator oscillator with transistor switched capacitors to give the required frequency offset. CW audio filtering is provided by a high 'Q' peaked response filter centered on 800Hz, and a CMOS 4066 analogue switch which selects the desired audio output.

Tuning is achieved by serial microprocessor control of an MC145156P synthesiser generating 1kHz steps and interpolation is done through a digital-to-analogue converter driving a varicap on the second heterodyne oscillator. The control system is designed to 'idle' when static, so no digital pulses apart from the clock oscillator are generated unless tuning is in progress. This ensures the minimum of EMC (Electro-Magnetic Compatibility) problems are generated.

On The Air

On the first evening, the review receiver was connected up to my 160/80/40m trap dipole and I tuned straight to the 40m amateur band to see how it stood up to the battering from high powered propaganda broadcasters when attempting to resolve relatively weak amateurs striving to get contacts. The simple answer was, *no problem!* Even the modulation sidebands of Radio Tirana were heard 'splitching' around 6kHz away underneath the odd East European station. Normally these would have been completely covered by receiver blocking problems.

The band noise seemed rather quieter than expected and although this could have been psychological due to the S-meter not deflecting enormously, I would tend to believe that it was due to the absence of intermodulation effects that often happily burble away in most other receivers. Placing the attenuator in circuit did not improve readability, showing the set was not suffering from overloading. Tuning to the 49m broadcast band, where broadcasters



HF-125 rear panel connections.

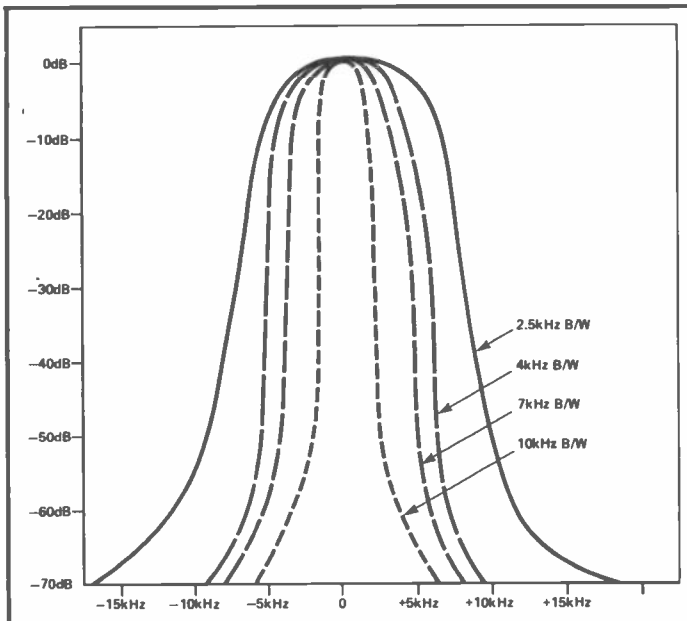


Fig. 2 RF bandwidth plots for all four filters.

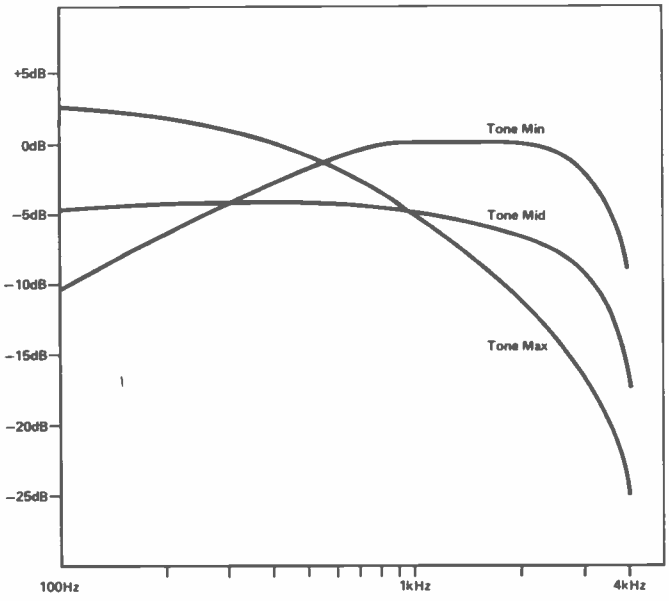


Fig. 3 AM audio response curves with 7kHz filter.

are often running the half-megawatt mark in terms of output power, showed no discernible problems in readability, again no need for the attenuator — very good indeed!

Testing the synchronous AM mode, where an internally generated carrier is inserted in phase with that being received, proved its worth in coping with the distortion sometimes produced when a signal fades — tuning was a little tricky but the result was greater entertainment quality from the tuned station. I monitored Swiss Radio International on 6.125MHz and Deutsche Welle on 7.265MHz for long periods on the loudspeaker using this mode, and it drastically improved upon the usual faded, distorted audio which we have all come to know and love. Testing for readability improvement on the several jammed stations, showed greater degredation unfortunately, readability was improved in these cases only by careful tuning in SSB mode.

I always used the tone control towards its HF end as I found there was excessive top cut when I placed the control position anywhere anticlockwise of its central position, when using both internal and external speakers as well as headphones. The output volume from the internal speaker was only just sufficient for normal listening before the onset of distortion, similarly using 8ohm headphones produced the same results due to the internal series 220ohm resistors fitted.

I found the frequency entry keypad very useful in quickly accessing a known broadcast channel, such as when exploring the wavebands with a copy of the World Radio and TV Handbook by your side. The manual mentions the possibility of a slight 'glitch' every 1kHz on AM when tuning, due to the synthesiser steps but I found no audible effect at all which is quite good, it was just detectable on SSB however, when tuning through a steady carrier.

I did notice that in some circumstances, a strange 'warble' accompanied SSB signals and degraded Synchronous AM reception. Following investigation, I found this to be the result of weak magnetic fields from the mains transformers of other sets in the vicinity. The VCO area of the HF-125 appeared to be the most sensitive, holding the supplied AC mains PSU within 200mm caused the warbling effect and placing it immediately below the set gave complete rubbish from the speaker. The manual does warn of stray fields, but this amount of degradation precluded the HF-125 being used say, on top of or next to the main station rig. Two HF-125's were tested and both were found to exhibit this effect to varying degrees. However I must say that both were preproduction models and in contacting the supplier it appears that this matter is already in hand, production models will have a modification incorporated in the earth paths of the circuit board to help this.

Otherwise, the SSB performance was quite reasonable, I felt the bandwidth was a little too wide as I could occasionally hear SSB signals 3 or 4kHz away coming through, but one can't expect too much from ceramic filters and the use of high frequency crystal filters for each mode would certainly put the price up. The FM facility was still in the final stages of development and was not operational, hence I could not test this. The CW mode uses the 2.5kHz filter and for general tuning around this is quite acceptable, but under interference conditions the 400Hz audio filter made a world of difference. Weak signals that were drowned by an adjacent strong station could be restored to perfect readability by switching this in. The AGC was still affected so varying the audio output level, but this was nevertheless far better than losing the signal completely and is a very useful feature for CW addicts.

Laboratory Tests

The sensitivity checks showed the receiver to be quite reasonable on the LF bands but possibly a little lacking for sunspot minimum activity on 10m and the like, due to the absence of an RF amp. However this is offset by the extremely good strong signal handling performance

Laboratory Results

Sensitivity: Input level in uV pd at 50 ohm SO239 connection giving 12dB SINAD

Freq (MHz)	SSB/CW 2.5kHz b/w	AM (30% mod) 7kHz b/w
0.150	3.98	25.4
0.500	0.403	2.18
1.0	0.420	1.90
2.0	0.318	1.39
4.0	0.406	1.71
6.0	0.387	1.60
8.0	0.409	1.64
10.0	0.477	1.45
12.0	0.335	1.52
14.0	0.438	1.69
16.0	0.376	1.92
18.0	0.533	1.72
20.0	0.380	1.58
22.0	0.420	2.02
24.0	0.429	1.72
26.0	0.466	1.87
28.0	0.478	1.86
30.0	0.448	2.02

Intermodulation Rejection: Level of two signals, separated by +100kHz and +200kHz, required to cause 12dB SINAD on-channel signal, measured using AM and 7kHz RX bandwidth

RX Freq (MHz)	Interfering Signal Level	
2.0	7.38mV pd	74.5dB
7.0	22.5mV	82.5dB
15.0	11.4mV	74.6dB
28.0	11.7mV	76.0dB

Image Rejection: Level of signal separated by (2 x 45.0MHz) to cause 12dB SINAD on-channel signal, measured using AM and 7kHz RX bandwidth

RX Freq (MHz)	Interfering Signal Level	
2.0	12.7mV pd	79.2dB
7.0	75.8mV	93.0dB
15.0	2.12V	120dB
28.0	1.86V	120dB

Attenuator Accuracy: Measured at 14.25MHz; 20dB Setting — 20.2dB

Blocking Rejection: Level of unmodulated interfering carrier required to cause degradation of 12dB SINAD on-channel signal to 6dB SINAD, measured using AM and 7kHz RX bandwidth

RX Freq (MHz)	Interfering signal separation		
	+100kHz	+1MHz	+10MHz
2.0	13.1mV pd 79.5dB	73.8mV pd 94.5dB	139mV pd 100dB
7.0	19.0mV 81.0dB	84.7mV 94.0dB	169mV 100dB
15.0	21.2mV 80.0dB	106mV 94.0dB	212mV 100dB
28.0	14.8mV 78.0dB	78.4mV 92.5dB	186mV 100dB

S-Meter Linearity: Measured at 14.25MHz

Level	SSB/CW (2.5kHz b/w)		AM (7kHz b/w)	
S2	0.945uV pd	−39.0dB	1.04uV pd	−36.4dB
S3	1.84uV	−33.2dB	1.81uV	−31.6dB
S4	3.23uV	−28.3dB	2.74uV	−28.0dB
S5	5.36uV	−23.9dB	4.70uV	−23.3dB
S6	11.0uV	−17.7dB	9.48uV	−17.2dB
S7	24.5uV	−10.7dB	20.3uV	−10.6dB
S8	46.2uV	−5.2dB	43.4uV	−4.0dB
S9	84.1uV	0dB ref	68.7uV	0dB ref
S9+10dB	302uV	+11.1dB	249uV	+11.2dB
S9+30dB	6.89mV	+38.3dB	6.47mV	+39.5dB
S9+50dB	39.4mV	+52.4dB	28.3mV	+52.3dB

Overall Bandwidth: Measured at 10.7MHz (see accompanying graphs for full plots)

Filter b/w (kHz)	−3dB	−6dB	−60dB
2.5kHz	2.34kHz	2.88kHz	7.10kHz
4kHz	4.32kHz	5.47kHz	10.80kHz
7kHz	5.38kHz	7.43kHz	13.00kHz
10kHz	5.69kHz	10.74kHz	23.25kHz

Audio Distortion: Measured with 2.50mW output of 1kHz audio into 8 ohm load and 1mV Rx signal

Mode	Filter and Modulation	Distortion
SSB	2.5kHz b/w	1.93%
AM	7kHz b/w, 60% mod	2.08%
AMS	4kHz b/w, 60% mod	0.89%

and in many respects this was one of the few receivers I have come across where I was able to measure the close-in selectivity performance due to the absence of blocking effects even within the passband of the first roofing crystal filters, where many sets fail miserably. The image signal, falling in broadcast Band II, was well suppressed and should not cause problems. The intermodulation rejection, particularly around 7MHz was very good, and the S-meter was accurate and linear, allowing sensible reports to be given.

The close-in selectivity on SSB is limited by reciprocal mixing of the synthesiser noise, most likely produced by the phase comparator. Several checks were made of the phase noise of the HP8640B signal generators used for testing this, to ensure I was not measuring the performance of those rather than the receiver!

The audio distortion was very low, giving potentially good quality reception when used with a decent external speaker. The audio output was measured as 1.21W rms maximum into an external 3ohm load on SSB but only 578mW rms with 70% mod on AM, showing that there was gain at hand, I was informed that production models will have a resistor modification on AM to give a similar output power for both modes.

Conclusions

The strong signal handling performance of the set is excellent, only the reciprocal mixing limits this, but even so no problems were found in this respect under the most trying on-air tests. Only one or two slight 'niggles' were found, these being easily solved by minor circuit modifications and, I am told, are in fact planned for incorporation into full production sets. The overall electrical performance of this receiver is excellent, and the designer should be proud of his work. The projected price of £375 does not include frills and gadgets as found in many other receivers, for those who are instead looking for a high level of performance in their station this receiver should fit the bill nicely.

My thanks go to Lowe Electronics for the loan of the review receiver.

RADIO Tomorrow

1 Mar YL-OM Contest.

2 Mar Welwyn/Hatfield ARC: Video evening.
Todmorden DARS: RNLI talk.
YL-OM Contest.
Braintree DARS: Talk 'Antenna construction' by Mike Wheeton G4ZPE.
Burnham Beeches RC: AGM.
Rhyl DARC: Activity night and film show.

Mar Harpenden ARC: 'Satellites and Amateurs' by John G4JOV.
Fylde ARS: 'Aurora, what causes it — Part 1' slide show by G2FKZ.
Wakefield DRS: Great egg race.
Bury RS: Talk 'Clandestine radio' by Gordon G3LEQ.
Dartford Heath DFC: Pre-hunt meeting, Horse and Groom, Leyton Cross Road.

Mar Three Counties ARC: EMC by John Greenwell
Rolls Royce ARC: Construction contest.
Trowbridge DARC: Natter night.
Fareham DARC: Natter night.
Cheshunt DARC: Natter night.

5 Mar Bredhurst RTS: Demonstration of compact disc players by Colin G3VTT.
Spen Valley ARS: Talk: 'Public service communications' by Bob Lomas G4YTE.
Pontefract DARS: Components Fair planning.
Horsham: ARC: Spring junk sale.
Salop ARS: Visit to Shropshire Star printshop.
Vale of Evesham RAC: Tour of BBC Woodnorton with G3DEF.

6 Mar Coventry ARS: Computer evening (bring your own if possible).
Axe Vale ARC: Torbay Club's NFD video.
Maidstone YMCA ARS: Junk sale.
AMRAC: Meeting.
Aberdeen ARS: Junk sale.
YL activity day.

7 Mar **Blue Star Rally, Newcastle. Venue is High Gosforth Park Racecourse (5mls N of Newcastle upon Tyne). Trade stands, morse tests, bring and buy, refreshments. Talk-in and special event stations GB0BSR and GB0NBL.**

8 Mar **Second Annual Wythall Radio Club Rally, Wythall Park, Siver Street, Wythall, S Birmingham. Opens 12 noon, trade and club stands, talk-in on S22, morse tests. Admission 50p.**
Dartford Heath DFC: Club hunt, 2.30 pm Dartford Heath.

9 Mar Felixstowe DARS: Visit Sainsbury Superstore, Warren Heath.
Milton Keynes DARS: Talk 'American Scientists' by USAF Chicksands.
Sutton Coldfield RS: Projects think tank.
Atherstone ARC: Talk 'Nicads — uses and abuses' by G6YQU and G4IWA.

10 Mar Worksop ARS: Mag sale.
Macclesfield DRS: Talk 'History of morse' by G0AMU.
Wakefield DRS: Coaxial cable realities.
Keighley ARS: Informal meeting.
Verulam: ARC: Activity evening.

11 Mar Fareham DARC: Junk sale.
Armagh & Dungannon DARC: AGM.
Fareham DARC: Junk sale.
Cheshunt DARC: Junk sale.

12 Mar Pontefract DARS: Talk 'Memories of radio in WW2'.
Edgware DRS: Talk 'SW Herts UHF group new 23cms repeater'.
Southgate ARC: Talk 'Building the PW Halford HF transceiver' by Gunther Engel G4MVF.

13 Mar Coventry ARS: Night on the air.
Loughton DARS: Talk 'Basic AC theory' by G8DZH.
Aberdeen ARS: 'Portable meteor scatter DXpedition by Stewart Cooper GM4AFF.
N Bristol ARC: Bring and buy sale.
Wimbledon DARS: Talk 'Aircraft radio aids' by Mike McCarthy G0AWQ.
Maidstone YMCA ARC: Natter night, RAE & CW.
Itchen Valley RC: AGM.
Wigston ARC: AGM.

15 Mar Derby DARS: Derby DARS National 144-145MHz Contest.
Crawley ARC: Visit to Dungeness 'A' power station.

16 Mar Todmorden DARS: Chat night.
Braintree DARS: Talk 'QRP construction and operation' by Bill Taylor, G3GRT.
Burnham Beeches RC: Talk 'Forth language' by Duncan Loutill.
Rhyl DARC: Talk 'Transverters' by John Roberts, GW3RBM.

17 Mar Halifax DARS: RSGB Retion 2 rep — G4EJP.
Harpenden ARC: RSGB film.
Fylde ARS: Demonstration 'Modifying a receiver for top band DF'.
Wakefield DRS: Members homebrew beer/wine evening.

18 Mar Three Counties ARC: 'Introduction to packet radio' by Jeff Ward, K8KA.
SE Kent: Natter night and committee meeting.
Trowbridge DARC: Activity night and committee meeting.
Hastings ERC: AGM.
Fareham DARC: Natter night.
Lough Erne ARC: Talk 'RTTY, AMTOR, packet radio and your home computer' by Victor, GI4LKJ.
Cheshunt DARC: Natter night.

19 Mar Bredhurst RTS: AGM.

19 Mar
Spen Valley ARS: Preliminary AGM.
Salop ARS: Fox hunt.
Pontefract DARS: Committee meeting.

20 Mar
Coventry ARS: An 'ouutside' speaker.
Aberdeen ARS: Amateur TV demonstration by Tony Thomasson, GM0GAT.
N Bristol ARC: Packet radio demo.
Maidstone YMCA ARS: Soldering techniques.

22 Mar
Tiverton SWRC: Mid Devon Rally, The Pannier Market, Tiverton. Opens 10 am, talk in on S22, easy access, excellent parking. Contact G4TSW, PO Box 3, Tiverton, Devon, EX16 6RS.

23 Mar
Felixstowe DARS: AGM.
Sutton Coldfield ARS: Annual junk sale.
Atherstone ARS: Informal at The Bull, Witherley, 8 pm.

24 Mar
Worksop ARS: Video night.
Bristol FM TV Group: AGM.
Wakefield DRS: Talking Turkey by G1FOC.
Verulam ARC: Talk 'Antennas for small gardens' by D. Field, G3XTT.

25 Mar
Fareham DARC: Talk 'Equipment reliability' by Keith, G1NWN.
Stockport RS: Talk 'KISS' by Dave, G8UQC.
SE Kent YMCA ARC: Construction evening.
Fareham DARC: Talk 'Equipment reliability' by Keith, G0GFD.
Cheshunt DARC: Talk 'UHF TV relay systems' by Fred Lyons.

26 Mar
Edgware DRS: Talk 'Propagation' by John, G3SJE.
Pontefract DARS: Informal.
Southgate ARC: Informal evening.

27 Mar
RSGB Convention: NEC, Birmingham.
Coventry ARS: Night on the air.
Loughton DARS: Night on the air.
Aberdeen ARS: Talk 'Propagation for beginners' by Findley Baxter, GM3VEY.
N Bristol ARC: CW activity night.
Wimbledon DARS: Talk 'INMARSAT maritime communications' by Chris Whitmarsh, G0FDZ.
Maidstone YMCA ARS: Natter night, RAE & CW.
Itchen Valley RC: Talk 'Packet radio' by Phil, G6DLJ.
Harrow RS: AGM.

28 Mar
RSGB Convention: NEC, Birmingham.

31 Mar
Wakefield DRS: Club project evening.
Keighly ARS: Talk 'Jordan' by JY9WR.

1 Apr
Three Counties ARC: Talk 'The real hobby' by Dick Ganderton.
SE Kent YMCA ARC: AGM.
Trowbridge DARC: Natter night — all fools welcome!
Cheshunt DARC: Watch this space! — G3TIK.

2 Apr
Spen Valley ARS: AGM.
Salop ARS: Construction contest.
Pontefract DARS: Arrangements for Components Fair.
Bredhurst RTS: Talk 'DXpedition to Andorra' by Burt Mengerink, G1LAC.

3 Apr
Axe Valley ARC: 2 metre fox hunt.
AMRAC: Meeting.
Aberdeen ARS: Junk sale.
Maidstone YMCA ARS: HF NFD arrangements.

5 Apr
Cambridgeshire Repeater Group: 'Junk Sale Rally Extravaganza' Pye Telecom Canteen, St Andrews Road, Chesterton, Cambridge. Opens 10.30 am, trade stands, junk sale, bring & buy, talk-in on S22 and RB14 by G5PI.
Pontefract DARS: Components Fair, Carleton Community Centre, Pontefract. Admission free, open 11 am to 4.30 pm, talk-in on S22, trade stand, bring & buy, bookstall, refreshments and bar.

6 Apr
Felixstowe DARS: Talk 'BBC transmitter engineering' by Chris Driver, G6CMD.
Braintree DARS: Construction contest.
Welwyn/Hatfield ARC: Basic power supplies.
Burnham Beeches RC: Talk 'Cable TV' by Joe Delahunty of Windsor TV.
Rhyl DARC: Talk 'Fire prevention'.
Todmorden DARS: Talk by CEGB.

7 Apr
Worksop ARS: Junk sale.
Harpenden ARC: Junk sale.
Fylde ARS: Talk 'Aurora, what causes it' part 2, with tape and slide show.
Wakefield DRS: Computer evening.

8 Apr
Cheshunt DARC: Quiz with Harlow RS.

9 Apr
Edgware DRS: Talk 'The origins of morse' by Tony Smith, G4FAI.

10 Apr
Loughton DARS: AGM.
N Bristol ARC: Lecture 'QRP' by Bill Beacham.
Wimbledon DARS: Surplus equipment sale.
Maidstone YMCA ARS: Natter nigth, RAE & CW.
Itchen Valley RC: Talk 'The electron microscope' by Mike, G4NMP.

11 Apr
Wakefield DRS: Science Museum visit.

13 Apr
Milton Keynes DARS: Bring and buy.
Atherstone ARC: Talk by officers of the DTI RIS.

14 Apr
Wakefield DRS: AGM.
Keighly ARS: Junk sale.
Bury RS: Social evening.
Dartford Heath DFC: Pre-hunt meeting, Horse & Groom, Leyton Cross Road, Dartford.

15 Apr
Three Counties ARC: Talk 'Radio Society of Great Britain' by John Nelson, G4FRX.
Trowbridge DARC: Activity night — details from sec.
Hastings ERC: Junk auction.
Cheshunt DARC: Natter night.

16 Apr
Spen Valley ARS: Film night.
Bredhurst RTS: Talk 'Crime prevention in the home'.

17 Apr
Maidstone YMCA ARS: Good Friday (shack only).

19 Apr
Dartford Heath DFC: Club hunt, 2.30 pm, Dartford Heath.

20 Apr
Burnham Beeches RC: No meeting — foxhunt at 5 pm.
Rhyl DARC: Talk 'Satellites'.
Todmorden DARS: Chat night.

21 Apr
Worksop ARS: Visit to local police station (voluntary we hope! — Ed).
Harpenden ARC: Talk 'Antennas' by Don, G3JVN.
Fylde ARS: Informan meeting and morse.
Wakefield DRS: On the air & club project problems.

22 Apr
Cheshunt DARC: Discussion on TVI, BCI, AFI.

23 Apr
Edgware DRS: Informal meeting.

24 Apr
Halifax DARS: Club dinner.
N Bristol ARC: Homebrew competition.
Wimbledon DARS: Talk 'HF maritime radio' by Mike Blunden, G3PFH.
Maidstone YMCA ARS: Natter night, RAE & CW.
Itchen Valley RC: Talk 'Metal detecting'.

25 Apr
Loughton DARS: Special event weekend.

26 Apr
Lough Erne ARC: Annual mobile rally at Killyhevlin Hotel, Enneskilen. Opens at noon with trade stands and speakers.

27 Apr
Atherstone ARC: Club night & night on the air.

28 Apr
Wakefield DRS: Talk on Egypt by G4AAU.
Keighley ARS: Visit to HMS Forest Moor, Harrogate.

29 Apr Three Counties ARC: AGM.
SE Kent YMCA ARC: Talk 'Top Band' by John Heys.
Trowbridge DARC: Natter night.

30 Apr Edgeware DRS: Straight key evening.
Bredhurst RTS: Talk 'QSL bureau' by Martin, G4RVV.

Will club secretaries please note that the deadline for the June 1987 segment of Radio Tomorrow (covering radio activities from 1st May to 1st July 1987) is 17th March.

Contacts

Aberdeen ARS	Don	04676251
Abergavenny & NH ARC	GW4XQH	0873 4655
Aberporth ARC	GW0DPR	023987 274
Alyn and Deeside ARS	GW4RKX	0244 660066
Amateur Radio & CC	Trevor	04895 81032
AMRAC	Phil, G6DLJ	0703 847754
Armagh & Dungannon DARC	J. A. Murphy	0861 522153
Atherstone ARC	Roy	0203 393518
Axe Vale ARC	Bob	029 74 5282
Ayr ARG	GM3THI	Ayr 42313
Barking RES	R. Woodberry	01 594 4009
Barry College RS	John	065679 710
Basingstoke ARC	Dave	07356 5185
Bath DARC	G4UMN	Frome 63939
Biggin Hill ARC	G0AMP	0689 57848
Borehamwood Elstree ARS	Tony	01 207 3809
Braintree ARS	Pub Sec	0376 28714
Bredhurst RTS	Kelvin G0AMZ	0634 376991
Brighton DARS	Peter	0273 607737
Bristol ARC	G4YOC	Bitton 4116
Bristol (Shirehampton) ARC	Ron Ford	0272 770504
Burnham Beeches RC	G6EIL	0628 25720
BT (Reading) ARC	G4MUT	0734 693766
Bury RS	Allan	0204 706191
Cambridge DARC	D. Wilcox	0954 50597
Chesham DARS	Liz	09278 3911
Cheshunt DARC	G4VMR/G4VSL	092084 250
Chester DRS	Dave	0244 336639
Chichester DARC	C. Bryan	0243 789587
Clacton ARS	Reg	0255 430466
Chiltern ARC	Ron, G3NCL	0494 712020
Clifton ARS	RA Hinton	01 301 1864
Conwy Valley ARC	GW4KGI	0745 823674
Coulsdon ATS	Alan	01 684 0610
Coventry ARS	Bill, G3UOL	0203 414684
Crawley ARC	Jack	0293 28612
Darenth Valley RC	Sec	0322 63368
Dartford Heath DFC	Pete	0322 844467
Denby Dale DARC	G3SDY	0484 602905
Derwentside ARC	G1AAJ	0207 520477
Donegal ARC	EI3BOB	074 57155
Dorking DRS	John	0306 77236
Droitwich DARC	G4HFP	0299 33818
Dudley ARC	John	0384 278300
Dunfermline RS	GM0DYD	0383 413440
Dunstable Downs RC	Phill Morris	0582 607623
Eastbourne EARC	G1BRC	0323 29913
East Kent ARS	Stuart	0227 68913
East Lancashire ARC	Stuart	0254 887385
Edgware DRS	G4IUZ	0707 65707
Exeter ARS	Roger Tipper	0392 68065
Fareham DARC	Alan, G3CCB	0329 288139
Farnborough DRS	Mr Taylor	0252 837581
Felixstowe DARS	G4YQC	0473 642595
Fishguard DARS	Bernard	0348 872671
Fylde ARS	F. Whitehead	0253 737680
Galashiels DARS	GM3DAR	0896 56027
Glossop DARG	G4GNQ	QTHR
Gt. Lumley ARES	G4MSF	091 4693955
G. Peterborough ARC	Frank	0733 231848
Halifax DARS	D. Moss	0422 202306
Harpenden ARC	G1BJC	05827 2455
Harrow RS	Tony	01 861 0419
Hastings ERC	Dave Shirley	0424 420608
Haverhill DARS	Rob Proctor	0787 281359
Havering DARC	G0BOI	04024 41532
Hillingdon ARC	Howard, G6SII	01 561 2917
Hornsea ARC	Richard	0401 62498
Horsham ARC	Paul, G4YFY	0403 87 404
Inverness ARC	Brian	0463 242463
Itchen Valley RC	G1IPQ	S'oton 736784
Keighley ARS	G1IGH	0274 496222
Kidderminster DARS	Tony	0562 751584
Kingston DARS	G3ODH	Epsom 26005
Lagan Valley ARS	Jim, GI4TCS	0846 682474
Leeds DARS	G1EBS	0274 665355
Leighton Linslade RC	Pete Brazier	052 523 270
Lincoln SWC	Pam, G4STO	0427 788356
Lothians RS	Robin	0506 890177
Louth DARC	G1IZB	047286 595
Loughborough ARC	Philip	0509 412043
Lough Erne ARC	Bill	0365 24905
Loughton DARC	G4FKI	0525 714591
Macclesfield DRS	G1NUS	0625 24534
Maidenhead DARC	John	0628 28463
Maidstone YMCA ARS	G0BUW	0622 30544
Maltby ARS	Keith, G1PQW	0709 814135
Medway ARTS	Tony	0634 578647
Midland ARS	G8BHE	021 422 9787
Mid Sussex ARS	G1FRF	0791 82937
Mid Ulster ARC	Sam	0762 22855
Mid Warwickshire ARS	G4TIL	Southam 4765
Milton Keynes DARS	Mike, G0ERE	0234 750629
Morecambe Bay ARS	G3PER	Heysham 52659
N. Bristol ARC	Alan Booth	0272 690404
N. Cornwall RS	J. West	0288 4916
N. Staffs ARS	G6MLI	0782 332657
N. Wakefield RC	Steve	0532 536633
Newbury DARS	G3VOW	0635 43048
Newport ARS	GW6ZUQ	02912 6867
Norfolk ARC	Andy	Norwich 610874
Oswestry DARC	Brian	0691 831023
Peterborough RES	Peter	G4PNW QTHR
Plymouth ARC	G4SCA	0752 337980
Pontefract DARS	Colin, G0AAO	0977 43101
Poole ARS	G0EQV	0202 674802
Preston ARS	George	0772 718175
Reading DARC	Steve, G4YFB	Reading 867820
Rhyl DARC	GW1PLI	097 888 621
Salisbury RES	Neil	0980 22809
Salop ARS	Simon	0743 67799
Sheffield ARC	John	Sheffield 581766
Shefford DARS	Alan, G4PSO	Hitchin 57946
S. Bristol ARS	Len Baker	0272 834282
S. Cheshire	Chris	07816 73185
S. Lakeland ARS	G4VKE	0229 65359
S. Manchester RC	Dave Holland	061 973 1837
S. Tyneside ARS	G4XWR	S. Shields 543955
S. E. Kent (YMCA) ARC	John	0304 211638
Southdown ARS	P. Henly	0323 763123
Southampton: See Waterside.		
Southgate ARC	Dave	0992 30051
Spen Valley ARS	G4MLW	0924 409739
Stevenage DARS	G6EDA	0438 724991
Stockton DARS	John Walker	0642 582578
Stockport RS	Mel	061 224 7880
Stourbridge DARS	G3ZOM	K/ford 288900
Stowmarket DARS	M. Goodrum	0449 676288
St Helens DARC	A. Riley	051 430 9227
Surrey RCC	John	01 657 0454
Swale ARC	B. Hancock	0795 873147
Telford DARS	Tom Crosbie	0952 597506
Three Counties ARC	Keith, G0BTU	0730 66489
Tiverton SWRC	Alan	0392 881569
Todmorden DARS	G1GZB	070 681 7572
Trowbridge DARC	Ian	0380 830383
V White Horse ARS	Ian White	Abingdon 31559
Verulam ARC	Gerry	St Albans 52003
WACRAL	G4NPM	0795 873147
Wakefield DRS	G4VRY	0532 820198
Warrington ARC	Paul, G0CBN	0925 814005
Waterside SWC	Bernie Lyford	0703 893937
Welland Valley ARS	J. Day	0858 32109
Welwyn Hatfield ARC	Kevin, G4WLG	0707 335162
West Kent ARS	B. Guinnessy	0892 32877
Westmorland RS	G. Chapman	0539 28491
White Rose ARS	G4ATZ	0937 842790
Wigston ARC	G6HAJ	Leicester 403105
Willenhall ARS	G4LWI	0902 782036
Wimbledon DARS	George	01 540 2180
Winchester ARC	Gordon	0703 772191
Wirral DARC	Peter	051 677 7376
Wolverhampton ARS	Keith	0902 24870
Worcester DARC	D. Batchelor	0905 641733
Worksop ARS	G4ZUN	0909 486614
Wythall RC	G1MEE	0546 824705
Yeovil ARC	Eric Godfrey	Yeovil 75533
308 ARC (Surbiton)	Bob	01 391 0788

Bearcat 100XL Scanner REVIEW

Looking for a reasonably priced handie-scanner with acceptable performance? We think we've found one. Chris Lorek, G4HCL, roams the airwaves.

Since the availability of handheld scanners, such as the Regency HX2000 reviewed in the Jan 87 issue, more amateurs have seen the advantages of small portable scanners, rather than table top models that tie you down to your shack or car. Visit any large airport observation gallery for instance and see what the keen aircraft spotter has tucked in his pocket, listening to both aircraft (AM) and the airport services on VHF/UHF FM. Strictly speaking illegal, yet I haven't seen anyone bundled away into a waiting police car for doing so, however some authorities take a very dim view to members of the public listening to certain radio goings-on. So if using a scanner such as this, ensure that you don't fall foul of the law by listening to things you're not supposed to!

Bearcat have been making scanners for as long as most amateurs can probably remember and have now come up with a small portable set aimed at the radio-aware public which could also find amateur uses. This is the 100XL, launched in this country in late 1986. Following a visit to the dealer, the HRT heavy mob came away with the first review sample.

Features

The set measures 74mm(W) x 178mm(H) x 35mm(D), almost the same size as the Regency, but weighing a little more at 545g with the nicads fitted — these being six AA size cells which are supplied with the set. Also supplied are a chunky protective carrying case, matching aerial, nicad charger, earphone and a user operating booklet. The latter gives simple operating instructions with examples, but no circuitry or similar technical information apart from typical performance specifications. The frequency coverage is 68-88MHz FM in 12.5kHz steps, 118-135.975MHz AM in 25kHz steps, 136-174MHz FM in 5kHz steps, and 406-512MHz FM in 12.5kHz steps. This gives coverage of the 4m, 2m, and 70cm amateur bands as well as many other frequency bands we're not supposed to listen to.

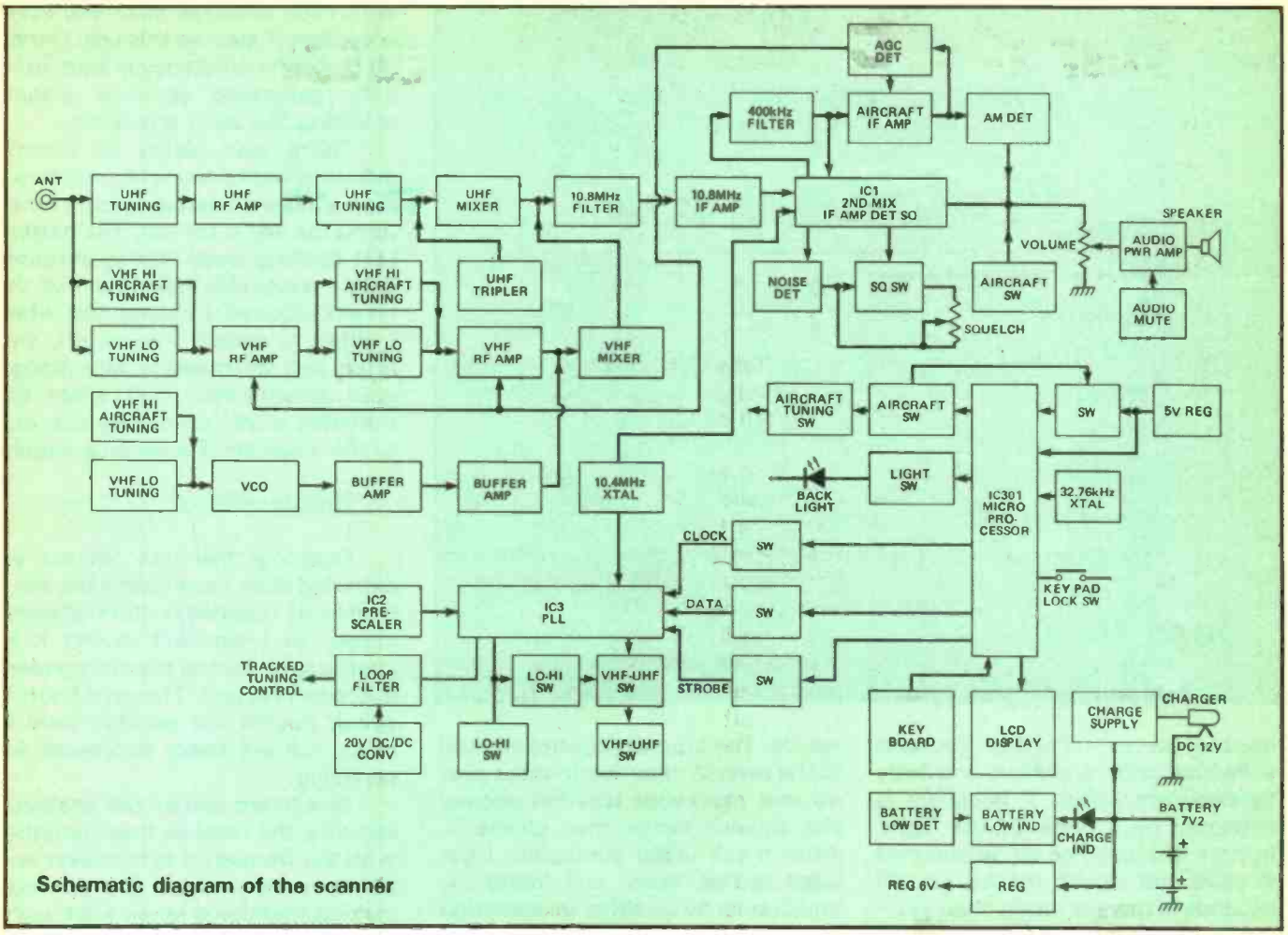
Frequencies may be scanned for activity between any two pre-programmed limits, and sixteen memory channels are available for storing frequencies which may also be individually scanned once programmed. A 'priority scan' facility allows you to automatically check memory channel 1 briefly every two seconds for activity, locking onto it for the duration of the signal if occupied. This may be used whether the set is otherwise searching between frequency limits, scanning memories, or just monitoring another channel.

The top panel houses rotary volume and squelch controls, together with a BNC aerial connector and a 2.5mm earphone socket which may also be used to drive an external speaker. Also mounted here are a keypad-lock slider switch which prevents accidental frequency shifts, and an LED battery condition indicator, this lighting constantly when the set is on charge, but flashing in use when the internal batteries start getting low.

The set front features a large LCD (Liquid Crystal Display) area accompanied by a 21-button keypad to control the remainder of the set's functions, including the timed LCD backlight.

Operation

When switched on, the set immediately commences scanning through the programmed memory channels. Selection of individual memories is done by the use of the 'manual' button, and repeated presses cycles through the channels. Selection of FM or AM modes is automatic, depending upon whether the programmed frequency is in the 118-135MHz (AM) aircraft band or not.

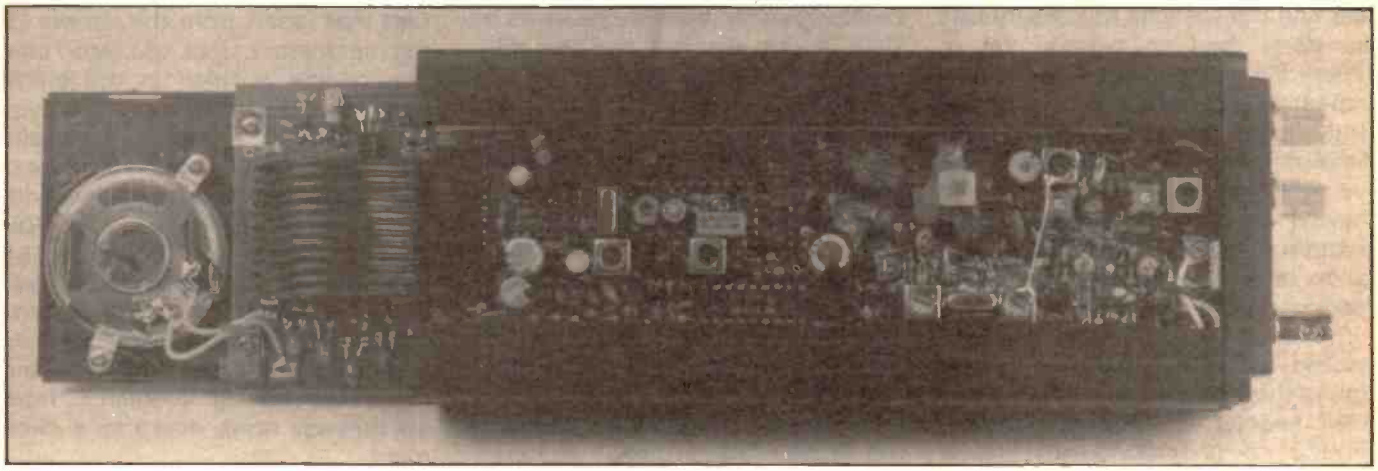


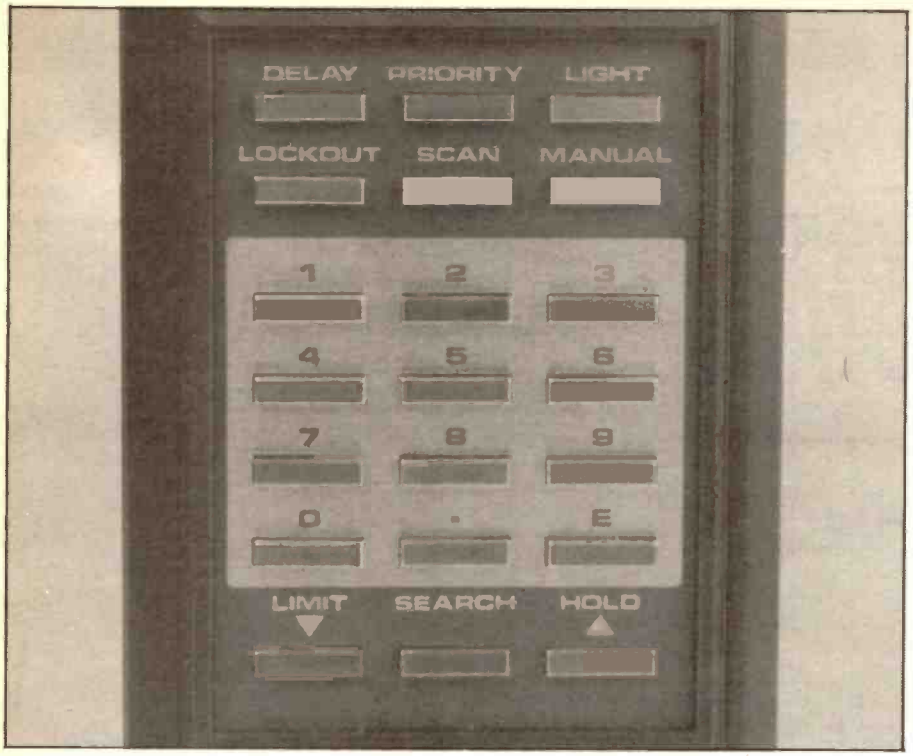
Schematic diagram of the scanner

The numeric keys 0-9 and the decimal point are used to program frequencies and search limits into the scanner, the 'E' button entering the programmed frequency into memory. The 'delay' facility adds a three second delay to the programmed channel to prevent missing replies on simplex and the 'lockout' facility allows you to skip any channels from the scan routine.

Searching of the bands for new frequencies is performed by the 'limit' and 'search' buttons, one simply taps in the lower frequency, presses 'limit', then the upper frequency followed by 'limit' again, then 'search'. The set commences searching in the appropriate frequency step for the band in use, but the display only shows every eighth frequency. When the squelch lifts, the search stops and the full frequency is displayed, the search continuing when the squelch closes or three seconds later if the 'delay' function has been enabled. A press of the 'hold' button inhibits the search recommencing in case you find something interesting. Because the search could stop before the correct signal frequency is reached, the 'limit' and 'hold' buttons have a dual purpose of incrementing the frequency up or down by one step at a time.

The LCD shows the reception frequency in large digits, accompanied by the number of the memory





channel in use. Further sections show that priority, lockout, and delay facilities are active. A backlight is activated by a press of the 'light' button, this stays on for 15 seconds in scan and search modes, for 45 seconds in manual mode, then automatically switches itself off. It may also be turned off before this time by a further press of the 'light' button.

In Use

Operating the set was very easy following a quick read of the operating booklet, I was listening to signals within seconds of tapping the first numbers in. The supplied rubber duck aerial seemed quite efficient on all frequencies and replacing it with a resonant helical for 2m and 70cm showed little difference. However, I did find the set was noticeably less sensitive than an average 2m or 70cm set, living in between several repeaters on both bands with no truly 'local' box showed this slight limitation up. This restricted its versatility a little, by sometimes having to rely on a better aerial system to resolve weak signals that were otherwise perfect copy on a dedicated portable transceiver.

Although the push buttons lacked a positive 'feel' to them, I found they were easy to operate and well spaced for possibly clumsy fingers or operation with gloved hands. The squelch control worked in the reverse direction to most gear so that clockwise rotation opened the squelch rather than closed it. After much initial confusion, I got used to this 'quirk' and found the squelch to be positive in operation with a reasonable amount of hysteresis to stop the annoying 'jittering' effect sometimes found on badly designed sets.

The 5kHz steps on VHF hi-band were generally a nuisance in that when searching, the set invariably stopped 5 or 10kHz before the correct frequency was reached, requiring further button-pushing operations to hear what was going on. The steps were ideal on the other bands though and whilst the use of 12.5kHz on UHF might surprise some amateurs, it's no secret that commercial radiotelephone users of UHF in this country are presently going in that direction.

When connected to my main amateur aerial system, the set gave a good account of itself in terms of strong signal handling, even the local military aircraft flying at dangerously low altitudes around my tower caused no audible cross-modulation effects from their AM transmissions, which I occasionally suffer from with some other receivers. Hearing local amateurs up around 160MHz was a little disconcerting though, showing the usual failing in image rejection with wide coverage scanners using a low first IF such as this one. I found no problems whatsoever with internally generated spurious signals affecting the scan operation.

There was plenty of volume available, especially when fed into a more efficient external speaker when using the set in the car. The battery LED flashing away merrily certainly gave a noticeable indication that the nicads required a charge, but when I forgot to switch the set off, as I often did, all memory information was unfortunately lost when the batteries went completely flat, due to the absence of a back-up supply.

Technicalities

Opening the box shows an extruded alloy case giving the set a degree of toughness from physical abuse, so I wouldn't expect it to shatter into several plastic splinters if it was dropped. The two internal circuit boards are securely held in place, but are easily accessible for servicing.

One board carries the analogue circuitry, the receiver itself together with the frequency synthesiser and all components here are discrete, making traditional repair work easy. The other board has a surface mounted 64 pin dedicated microprocessor controller, together with further surface mounted switching transistors and an NJM555 oscillator, these 'chip' components usually result in a more reliable product but often mean a board replacement for the service engineer lacking the required specialised microscopic tools.

The usual dual conversion superheterodyne circuit is used and the block diagram shows the operation in detail. Of particular interest is the fact that (apart from the remote LF microprocessor clock oscillator) only one crystal is used in the entire receiver and synthesiser. This gives rise to very few 'birdies' (internally generated signals) which stop a set scanning and generally interfere with operation on similar radios. A 20V supply, generated from the 555 oscillator on the digital board, provides the voltage for the synthesiser active loop filter, this allows a wide switching bandwidth whilst keeping reciprocal mixing problems from snythesiser noise down to a minimum.

Laboratory Results

The sensitivity measurements confirmed the slightly poor results noted on the air, surprising particularly on VHF considering the use of 3SK85 and 3SK88 dual gate MOSFETs in the front end. Attempted realignment of the coils (by the set owner!) gave no improvement, suggesting loss in the switching and bandpass filtering circuitry. However this is not untypical of wideband scanners, and the set still met its published specification.

The image rejection was the usual appalling figure, again not untypical for a set of this type, and not surprisingly the handbook makes no mention of any specification for parameter! I can't complain about the adjacent channel performance at 25kHz spacing though, this was quite good as was the blocking and intermod. rejection — in all the strong signal handling was quite good bearing in mind the intended use and price of the set.

The amount of available audio from the 2.5mm jack socket was amazing, this was measured using freshly charged internal batteries, you won't have problems in noisy surroundings or deafening yourself with headphones! The current consumption was a bit high, probably due to the ECL (Emitter Coupled Logic) prescaler in the synthesiser, which improves the RF performance but at the expense of power consumption. A quick calculation shows that around five hours of continuous use should be available before a battery recharge becomes necessary.

Conclusions

The set is sturdy and built to stand rough usage, so it should find a home with many enthusiasts who wish to keep in touch when out and about. The operation is very straightforward and the most-used facility, that of memory scan, is automatically enabled when switching the set on. The battery life does not easily lend itself to a full day of reception, and fitting a spare set when out in the field requires the use of a screwdriver as well as reprogramming all the memory channels, but then it is no worse than other sets.

The RF performance was up to expectations, although I would still have liked to see a better sensitivity on the VHF-Hi and UHF bands. Being a portable set, it does mean that you can use it where otherwise you might not be able to, that is, closer to the action. This certainly offsets that limitation, and renders the set potentially a useful and interesting companion for those of us who never want to miss a thing!

My thanks go to Ray Withers Communications, for the supply of the review sample.

Laboratory Results

Sensitivity: Measured as uV pd to give 12dB SINAD, FM 3kHz dev, AM 80% mod.

Frequency (MHz)	Sensitivity (uV)
66	0.287
70	0.241
80	0.211
88	0.213
118	0.851 (AM)
130	0.418 (AM)
135	0.387 (AM)
136	0.454
140	0.417
145	0.530
150	0.598
160	0.356
170	0.350
174	0.298
406	0.538
430	0.533
440	0.475
450	0.588
470	0.494
490	0.462
512	1.05

Adjacent Channel Selectivity: Rejection ratio of interfering signal, modulated 400Hz at 1.5kHz dev. causing 6dB degredation of 12dB SINAD on-channel signal.

Spacing	Rejection
+12.5 kHz	11dB
−12.5	10
+25	54
−25	52

Current consumption	
Scanning, no received signal	88mA
Receiving at mid volume	124mA
Receiving at max volume	205mA

Maximum Audio Output: Measured at onset of clipping, with 5kHz dev. FM, and 80% mod. AM.

Load	Output
3 ohm	2.28W RMS
8 ohm	1.79W RMS
15 ohm	0.92W RMS

Spurious Signal Rejection

Image Rejection: measured as dB increases in image frequency signal needed to give 12dB SINAD on tuned frequency.

Blocking Rejection: measured as Adj. Chan selectivity but with +/— 1MHz spaced signals.

Intermodulation Rejection: measured as increase in level of two interfering signals to give identical 12dB SINAD on-channel signal.

Freq (MHz)	Image Rej (dB)	Blocking Rej (dB)		IMD Rej (dB)	
				Spacing	
		+1MHz	−1MHz	25/50kHz	50/100kHz
78	40.6	58	69	52	60
125	18.2	81	80	55	61
145	8.1	88	87	64	69
161	10.9	88	88	62	66
435	1.4	82	79	61	71
460	1.9	82	80	61	70

HOKUSHIN aerials.

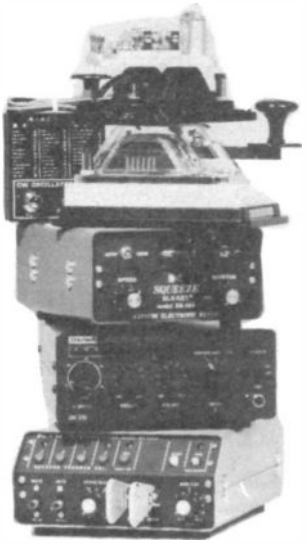
BASE STATION AERIALS

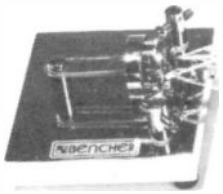
HF5...80 to 10 metre vertical, no radials required when ground mounted ..... £83.39 inc vat, carriage £7.00.
HF5R...Radial kit for use with HF5 when mounted on chimney or gable end..... £54.81 inc vat, carriage £7.00
GPV5...Two metre base station colinear, 6.5 dB gain, 3.1 metres high ..... £54.92 inc vat, carriage £7.00.
GPV25...as above but 3 section colinear, 7.8 dB gain, 4.45 metres high ..... £51.97 inc vat, carriage £7.00.
GPV7...Seventy centimetre triple 5/8 base station colinear, 6.8 dB gain ..... £45.59 inc vat, carriage £7.00.
GPV720...Dual band (144/430 MHz) base station aerial. £45.68 inc vat, carriage £7.00.

MOBILE AERIALS

2E...Two metres 5/8 whip, 3.4 dB gain, foldover base £14.56 inc vat, carriage £2.00.
2NE...Two metres 7/8 whip, 4.5 dB gain, foldover base£24.23 inc vat, carriage £2.00.
OSCAR430...Seventy centimetre triple 5/8 whip, 6.3 dB gain ..... £27.72 inc vat, carriage £2.00.
OSCAR720...Dual band (144/430 MHz) whip ... £24.59 inc vat, carriage £2.00.
HS770...144/430 MHz diplexer for use with OSCAR720 . £18.02 inc vat, carriage £1.50.
GSS...Gutter mount (requires RG4M cable assembly) . £6.26 inc vat, carriage £1.25.
RG4M...Cable assembly for GSS base, complete with SO239 and PL259 plug ..... £6.26 inc vat, carriage £1.00.
12B...Car wing mount with SO239 top and bottom£6.73 inc vat, carriage £1.00.
HSTMB...Car boot mount including cable and PL259 £15.42 inc vat, carriage £1.50.
MA200S...High quality mag mount with cable and strong protective cover to prevent paintwork damage.. £22.90 inc vat, carriage £2.00.

KEYS & keyers.





TK5 Morse practice oscillator £13.65 inc vat, carriage £1.50
HK708 Straight key £21.82 inc vat, carriage £2.50
HK702 Deluxe version on heavy base £43.30 inc vat, carriage £3.00
HK704 Squeeze paddle £20.26 inc VAT, carriage £1.50
BK150 Electronic keyer with built-in side tone, solid state or relay keying £133.75 inc vat, carriage £3.00.
BK1024 Electronic keyer with 1024 bit memory £241.98 inc vat, carriage £3.00.
DK210 Daiwa electronic keyer, requires paddle £73.96 inc vat, carriage £2.50.

BY1 black base £67.42 **BY2** chrome base £76.97 **BY3** gold plated base £141.75 Vat inc.

Bencher Single Paddle
BST1 black base £67.42 **BST2** chrome base £76.97 Vat inc.
Carriage on BENCHER keys £3.00.

data equipment

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

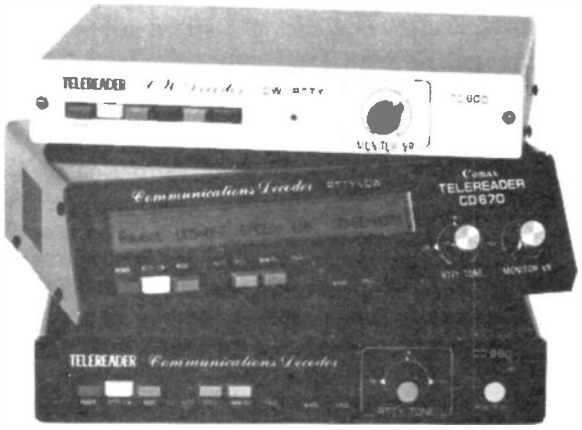
CD600 . . . £215.14 inc VAT, carriage £7.00.

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

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

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

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



DAIWA meters

CN410M . . . Frequency range 3.5 to 150 MHz, forward power switchable 15/150 Watts, reflected 5/50 Watts, SO239 connectors.

CN460M . . . Frequency range 140 to 450 MHz, forward power switchable 15/150 Watts, reflected 5/50 Watts, SO239 connectors.

NS440 with remote head . . . Frequency range 900 to 1300 MHz, forward power switchable 5/20 Watts, reflected 1.6/6.6 Watts, N type connectors.

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

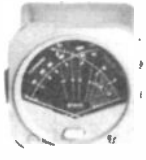
U66V . . . remote head, frequency range 140/525 MHz, max 300 Watts, N type connectors.

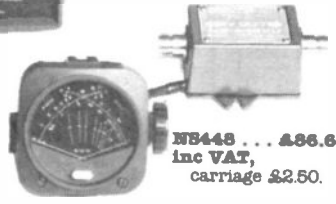
SC20 . . . extension cable for U66V, approx 20 metres long.

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

NS660P . . . £115.00 inc VAT, carriage £2.50.

CN460M . . . £65.40 inc VAT, carr £1.50.





NS440 . . . £86.60 inc VAT, carriage £2.50.

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telephone 01-429 3256.

In Bournemouth,
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the address, 27 Gillam Road, Northbourne, Bournemouth,
telephone 0202 577760.

Although not a shop, there is on the South Coast a source of good advice and equipment, John, G3JYG. His address is Abbotsley, 14 Grovelands Road, Hailsham, East Sussex. An evening or weekend call will you put in touch with him. His telephone number 0323 848077.

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

AR2002 receiver

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

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

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

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

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

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

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

TWO METRE MULTIMODE
from TRIO, the TR751E

There has been a TRIO two metre multi-mode mobile transceiver for the last six years. Beginning with the successful TR9000 and continuing with the TR9130, amateurs have always found the series to be reliable and above all easy to operate, especially whilst mobile. Advances in technology have enabled TRIO to further improve on the TR9130. Additional operating features have resulted in an even easier to use and smaller transceiver. However TRIO have not discarded the valuable experience gained over the last six years. The result is the TR751E, a new generation of multi-mode mobile transceiver.

The TR751E is the first multi-mode mobile transceiver that can be set to select the correct mode whilst scanning the band. By setting the rig to vfo and selecting AUTO mode before pressing the SCAN button, the TR751E will move up or down the band changing both mode and step rate according to the and plan (5kHz@SSB, 12.5kHz@FM or 1kHz@SSB, 5kHz@FM depending on the selected frequency step).

The transceiver has two VFO's and 10 memory channels. Memory information is easily transferred to either vfo. Each memory holds information on frequency, mode and also the step rate to be set when transferring the memory information to vfo. Memory channel one is also the ALERT frequency, memories 7 and 8 relate to DCL and memory 0 programs the user defined limits of frequency scan.

The TR751E can be set to scan between user programmed limits or around them depending on the frequency set when the scan is started. When AUTO mode is set the transceiver will select the correct mode as it scans. In addition to scanning each memory, the TR751E can be set to scan those memories programmed with the same mode. Pause on an occupied channel is time operated but can be changed to carrier hold by an internal modification.

Operating on 13.8 volts DC, power output from the transceiver is 25 watts (high) and approximately 5 watts (low). The low power setting applies to all modes. When compared with the TR9130, the TR751E is smaller and lighter. TR751E (TR9130) 160mm (175mm) wide, 60mm (68mm) high, 213mm (253mm) deep, 2.1 Kgs (2.4 Kgs).

The TR751E is perfect for base station use. When operating on SSB, signals can easily be found using the frequency step set to 5 kHz, fine tuning quickly achieved by switching to the 50 Hz rate. Operation is also ideal on FM, the rig stepping in either 12.5 or 5 kHz steps. Full repeater facilities are also available including reverse repeater. Receiver performance is excellent, our first sample amazed us, FM, 0.14uV for 12dB SINAD and SSB, 0.09uV for 10dB S+N/N.

As an option, the TR751E can be fitted with DCL. Compatible with the DCS system, DCL (Digital Channel Link) enables your rig to automatically QSY to an open channel. The DCL system searches for an open channel (checks the next eleven 25KHz spaced frequencies above the one stored in memory 7), remembers it, returns to the original frequency and transmits control information to the other DCL equipped station that switches BOTH rigs to the clear channel.

For the blind operator the TRIO TR751E is perfect. As each mode is selected a tone gives the appropriate morse letter (F for FM, U for USB, etc) and when fitted with the optional VS1 board, a digitally encoded girl's voice will announce on request the operating frequency.

In addition, the TR751E has an illuminated analogue S/RF meter, all mode squelch, MHz select keys, a noise blanker, semi break-in CW with side tone, RIT, memory channel up/down keys and a frequency lock. TRIO's attention to detail can be seen in the design of the included mobile mount, a clamp system with rubber pads protecting the rig as it is slid in and out and for security, the clamp can be easily locked in the closed position.

There is so much more to say about the TR751E, so why not ring us and let's talk about it.

TR751E ..... £649 inc VAT. carriage £7.00
MU1 (DCL modem)..... £32.63 inc VAT carriage £7.00

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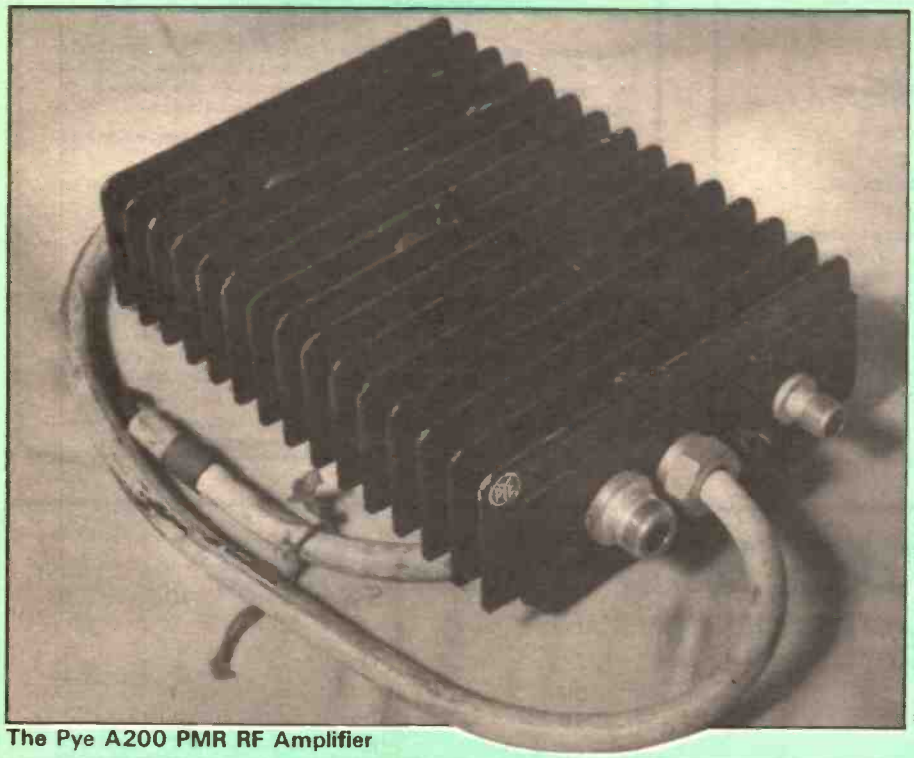
Pye A200 two metre CONVERSION



The Pye A200 PMR RF Amplifier

Eric Graham, G0CTM

Some Pye A200 RF amps are designed for bands other than Six and Two, but Chris Muriel, G3ZDM, shows us how to get these versions to go where they weren't intended with a few simple mods.

After reading Chris Lorek's article on modifying the Pye A200 RF amplifier for six metre use *(HRT, Sept '86)*, I decided to investigate the possibility of converting some of the other A200 variants for two metre use. To recap briefly, the metal plate fitted to the side of the case identifies the frequency range over which the unit is designed to operate — each range being represented by a two character code. As Chris mentioned in his article the codes are as follows:

EO=68-88MHz, M1=105-108MHz, BO=132-156MHz and AO=148-174MHz.

Obviously if you can get hold of the BO or AO versions then, apart from some retuning in the case of the AO, no further modifications should be necessary for two metre use. However, the chances are that these versions may be fetching higher prices now and they may also be more difficult to obtain as supplies dry up, so an alternative approach to getting a cheap two metre amplifier was tried out.

Universal circuit boards

The great advantage of the A200 series amplifiers is that they are all built on the same PCB, only component values are changed to accommodate the different ranges — so in theory at least any version can be converted to any other version if you know the correct component values. For the purposes of this article I will confine my comments to conversion of the M1 unit for amateur use on Two, ie. converting from 105-108MHz to 144-146MHz, which constitutes something in the region of a 38% frequency shift.

I managed to acquire the official Pye parts list which is common to all versions. This details the component differences and therefore the required component changes can be easily deduced — fortunately the coils used do not need changing.

The modifications

Undo the four cross-head screws securing the lid, taking care not to lose the screws and the rubber gasket. The heavy duty three core cable may look as if it is intended for mains use, but it's not. Brown and blue are 14.8 volts positive and negative respectively and green/yellow is a power switching lead — not normally required. Since 10 amps can be drawn on FM, any extensions to the power input leads must be of similar current-carrying capacity to avoid large voltage drops and an overheated power input cable; and of course you should ensure that you have a 13.8 volt power source capable of more than 10 amps. The first job is to remove the PCB by undoing nine small crosshead screws which secure the internal board, plus three larger ones which secure the main heatsink to the chassis. Take care not to lose the insulating nylon washers for these and beware the gooey white heat-sink compound.

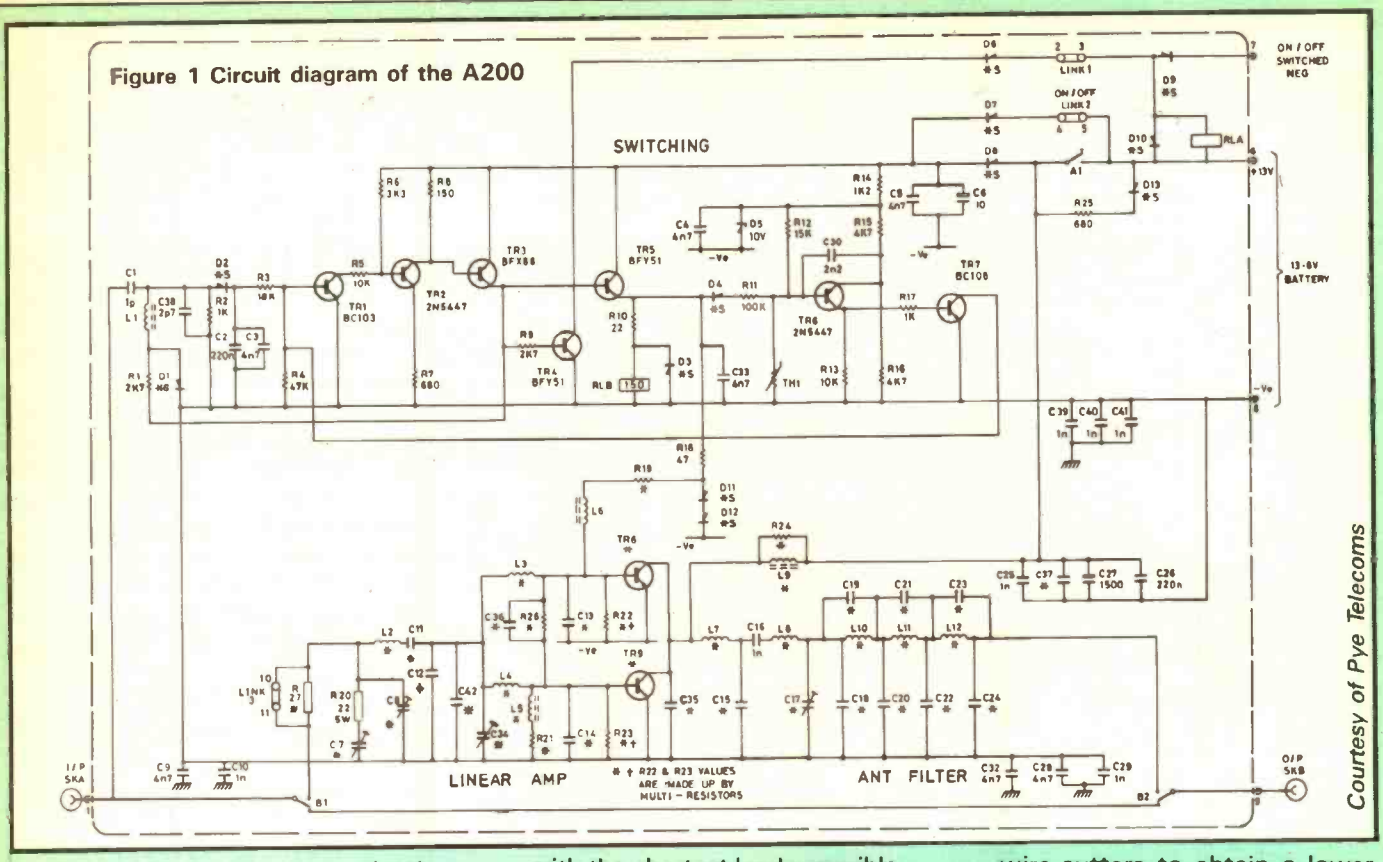


Figure 1 Circuit diagram of the A200

To remove the board completely the RF input and output leads must be unsoldered. At this stage the normal t.n.c. output socket can be replaced with a BNC bulkhead socket which will fit in the same hole — possibly needing a slight fettle with a round file. There are also three small 1nF capacitors on tags below the nylon washers which must be unsoldered before the board can be hinged out.

The mods themselves consist mainly of capacitor changes and either silver mica or ceramic plate types of close tolerance should be used. Proceed as follows:

1) Remove R23 and R22; these consist of three resistors each in the M1, yielding six components for the junk box.
2) Remove C12, C13 & C14 around the PA section. Substitute C12 (300pF) for C13 (originally 500pF in the M1 version), replace C12 with 200pF and C14 with 300pF; I used 200pF and 330pF chip capacitors here as good high Q capacitors are needed. Otherwise use the Semco mica-wrapped capacitors from Cirkit mentioned in Chris Lorek's six metre article or several capacitors in parallel to obtain the required capacitance with the shortest leads possible. With some A200's more output is achieved with C14 at around 220pF (150pF + 68pF in parallel). Chip capacitors are available from the RSGB Microwave Components Service.
3) C18, C19, C20, C21, C22, C23 and C24 must all be replaced as shown in the table. Use silver-mica or ceramic plate capacitors of the exact value needed.
4) You *may* find that the amplifier will tune onto two metres by adjustment of trimmers C7, C8 and C17. It is preferable, however to press on with the following changes; and of course it is essential if your unit won't tune at this stage.
5) Widen the thin strip of copper on the PCB joining L7 and L9 to about ¼-inch. I used adhesive copper tape here although the copper braid from television coaxial cable would do.
6) Replace C7 trimmer with a 2-22pF trimmer; a Mullard film dielectric (green) type fits easily here.
7) C8 and C17 may need replacement with lower values. As these are ceramic/mica compression types, I managed by trimming the brass plates with wire-cutters to obtain a lower capacitance. Otherwise substitute 10-80pF types for the original 30-140pF components.

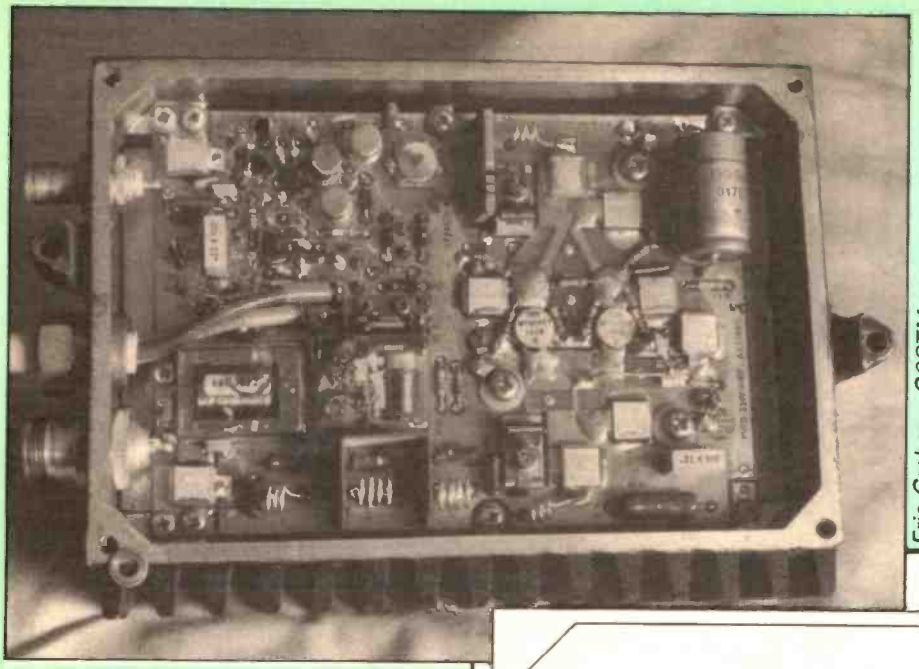
Switching modifications

The RF switching is designed to drop out immediately RF power is removed. For SSB use the hang-time needs to be increased from zero to about a second or so, depending on individual preferences. I used 2uF to give a one second delay, soldered between C2/C3 junction and the ground plane. Use an electrolytic, 10 volt working, negative to ground plane.

To increase RF sensitivity (remember I'm only driving this with an FT290) I decided to shunt C1, the input capacitor to the RF sensing circuitry, with a 4.7pF capacitor. A 1pF is used in the original so this

Table of capacitor changes

Capacitor	New value required
C18	12pF
C19	3.9pF
C20	22pF
C21	3.9pF
C22	22pF
C23	3.9pF
C24	12pF



Internal view of the A200

takes the input reactance from about 1100 to 200 ohms.

Tuning up

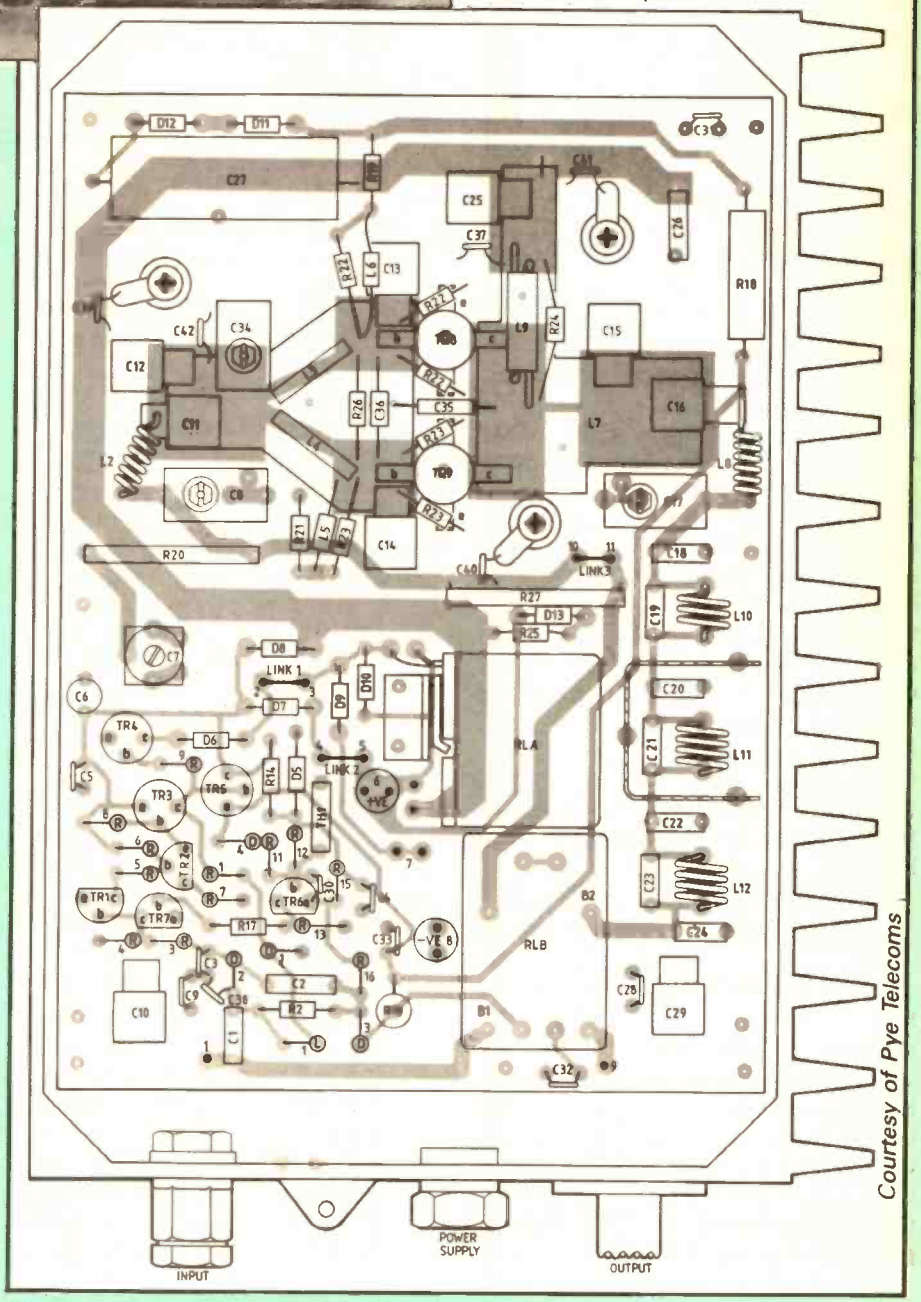
Replace the board and re-connect the input and output wires. Set C7 near mininum capacitance and apply 2 or 3 watts of FM (or CW with the key down) — preferably with the A200 connected to a dummy load via a power indicator. An SWR meter will suffice to show relative output level. Tune C8 and C17 for maximum output power. Then, if you have 5 to 10 watts of input power available from your rig, perform the following adjustment on C7 — set C7 to maximum, transmit 5 to 10 watts and adjust C7 so that the output power of the A200 reduces by 10%. You may now need to slightly re-tweak C8 for the best input match so the use of a second SWR meter (one in the input path, one on the output) is recommended here. This adjustment should prevent overdriving or clipping on the A200.

A further useful test is to use a hairdryer to test the thermal cutout. The sensor, TH1 (thermistor), is a black device with a white spot about 8mm long situated about 8mm to one side of the point where the brown + 13.8 volt power input lead connects to terminals on the board. Go to transmit and heat TH1, at about 80 to 100°C relay RLB should switch off, resulting in relay RLA dropping out and putting the A200 back to receive mode. After the temperature drops by about 5°C the A200 should switch back to normal transmit mode. Finally it is also a good idea to apply more heatsink compound just before replacing the PCB to ensure good heatsink contact.

The obvious use for one of these amps is, of course, in the car but do observe all the boring (but essential) rules such as wiring direct to the battery via a suitable fuse — wiring loom fires can be quite spectacular but rather pricey! Given the usual precautions the A200 should provide many years of cheap and reliable service.

Eric Graham, G0CTM

Figure 2 Component placement inside the amplifier



Courtesy of Pye Telecoms

REVIEW
ICOM IC275E

Whichever way you look at it, £1,000 rigs aren't cheap. But are they worth it and what do you get for your money — Chris Lorek checks out Icom's latest 2m super-rig.

Many years ago, the Trio TS700 was *the* ultimate for 2m do-everything operation, then came the Icom IC211E, the Yaesu FT726R, and a host of other transceivers all battling for supremacy in operating flexibility and performance, often with matching price tags! The battle of the big three continues, and Icom have now introduced what I consider to be the current champion in the field. The price of £1039 is within a few per cent of it's nearest rival, so it certainly looks interesting!

Small Set, Big Features

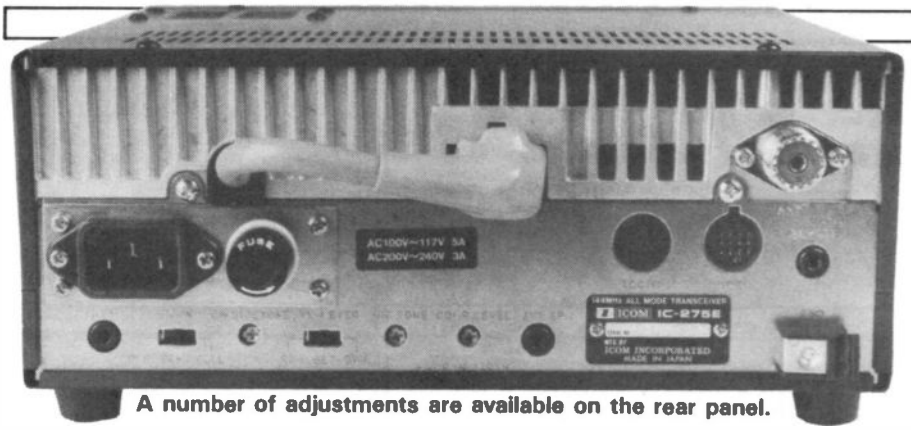
When opening the large packing box, I was ready to expect a similarly large set inside, but not so, at 241mm(W)×95mm(H)×239mm(D) it was reasonably compact, weighing 6.2kg in all. The set allows operation over 144—146MHz using USB, LSB, CW and FM modes, giving user controlled 2.5—25W output power and what is claimed to be a superb receive sensitivity from the use of a GaAsFET front end.

With 2m becoming more and more congested, especially in urban areas or when attempting operation from a hilltop portable site during a contest, many operators have realized the shortcomings of their receivers, replacement front ends were very popular. This could not have gone unnoticed in the land of the rising sun and Icom have used techniques normally only found on HF transceivers in the IC275, such as an IF notch filter and hopefully 'bombproof' mixers to try and capture an unfilled niche in the 2m market — as well as the odd luxury such as full CW break-in. Also with the boom in efficient modes of digital communication such as Packet and AMTOR, a 'Data' facility has been added where Icom claim a remarkable 3mS transmit/receive changeover (with 5mS normal lockup time), this requirement has often required rig modification in the past. A matching 70cm version, the IC475 is also planned, with an optional linkup facility between the two for satellite operation.

Knobs and Buttons Galore

The photograph shows the front panel of the set, which takes a while to get familiar with. The accompanying operating manual goes through 77 steps just to show you what everything does before you get to switch the set on and operate! It really is important to read it thoroughly several times, it took me just over three hours to get to grips with most of the features.

The set operates from either 240V mains using it's internal switched-mode power supply, or from an external 13.8V DC source. The four operating modes are selected by appropriate push buttons; the CW button toggles between normal operation using the standard SSB filter and narrow operation for use with an optional 500Hz crystal filter. The 'Data' button allows rapid Tx/Rx on AFSK by using the rear mounted accessory connector. The squelch control operates on all modes and the AGC button allows a fast or slow time-constant to be selected as appropriate — an adjacent switch operates the optional Icom masthead preamp. Further buttons con-



A number of adjustments are available on the rear panel.

trol an audio speech compressor for SSB use and the noise blanker. Small recessed rotary knobs are fitted (requiring an initial push to unlatch them) to control the transmitter RF output power, receiver gain (controlling AGC threshold on SSB/CW and acting as an RF attenuator on FM), CW keying Tx/Rx delay time, receive audio tone, and microphone gain. On the rear panel are controls for CW sidetone level and break-in (full/semi/off), microphone tone, speech compressor level, and a transmit meter switch.

Two digital VFO's are fitted, together with 99 selectable memories, each storing frequency, offset, and mode information. The main tuning speed is selectable by the 'TS' button, being 10Hz or 1kHz steps on SSB/CW, and 1kHz or 5kHz steps on FM. The VFO's may be used independently or split Tx/Rx between the two, with an equalizing switch being provided to quickly set both to the same frequency. The usual repeater shift is selected by a further push button, this is normally 600kHz but may be user programmed to any desired shift and a 'CHK' facility allows you to momentarily listen on the input. There is also a 1750Hz tone burst button for repeater access.

Memory channels are selected by a rotary knob and push buttons allow storing of VFO information in memory, clearing memory channel storage, transferring memory information to the VFO, and instant access to a pre-programmed calling channel. An optional sub-audible tone squelch module may be fitted and the tone frequency information can also be stored in the memory channels. A lock button prevents accidental frequency shifts and in case you get lost an optional speech systhesiser can announce the operating frequency and mode at the push of yet another button.

Further rotary knobs control the digital RIT (Receiver Incremental Tuning), Pass Band Tuning to vary the IF width on SSB and CW, and finally the IF notch position.

Scanning Facilities

In all four types of scanning are possible;

1) Memory Scan — where all programmed memories are sampled,
2) Programmed Scan — where a specified frequency range is scanned,
3) Selected Mode Memory Scan — offering scanning of all memories containing frequencies with the selected mode programmed, and
4) Skip Scan — giving selected memory sampling.

The scan halts as soon as the receiver squelch opens, resuming either 3 or 10 seconds later, the delay interval and scan speed being selectable by internal switches. An optional AQS (Amateur Quinmatic System) module may be fitted which gives further versatility to the set in auto-seeking of clear channels once called by similarly equipped stations, this has previously been described in 'HRT' but basically offers clear channel search, callsign squelch selective calling operation, digital code squelch operation, and a message transfer system of up to 14 characters.

A large, orange backlit LCD (Liquid Crystal Display) shows the operational frequency to 100Hz, the VFO in use, duplex, split, and scan operation, memory channel (and whether skipped), mode, data mode if selected, RIT offset, and tone squelch operation when fitted. Next to the LCD is a large meter indicating relative RF output on transmit and signal strength on receive, which may be switched to read ALC (Automatic Level Control) on transmit and act as a centre-zero meter on receive for FM use. The rear panel mounted Tx meter switch allows measurement of aerial SWR by metered indication of reverse power.

Sockets at the front are provided for the usual microphone and headphone plugs, whilst round the back are the connectors for AC and DC power, aerial, ground, external speaker, remote control for computer interface, AQS option, and an accessory socket with provision for Tx switching, Tx and Rx audio, squelch state, ALC input, and 13.8v output.

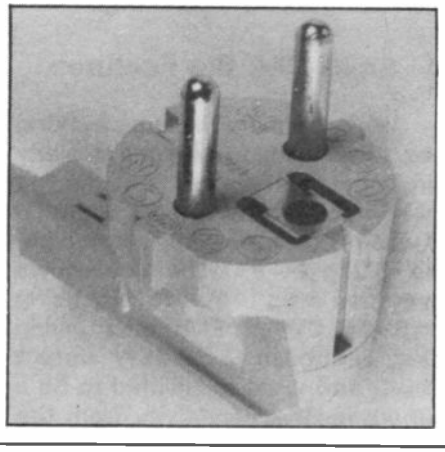
First Impressions

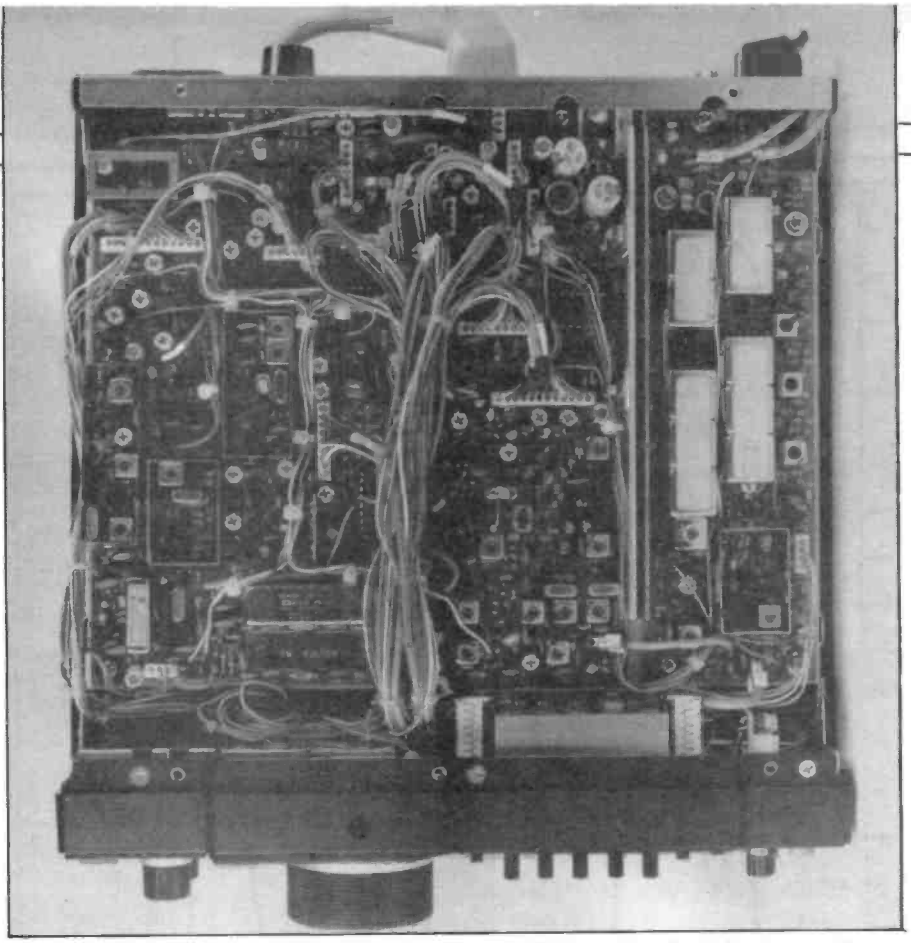
Very nice indeed, I wish I could afford one! On unpacking the set and getting ready to plug it in, the first thing that caught my attention was the continental plug fitted to the AC power lead. Here the two pins are connected to live and neutral, with the thin outer bands being connected to earth. A quick glance at the circuit diagram showed both live and neutral contacts inside the set to be linked via 0.001uF capacitors to the set case which was in turn connected to the earth lead — fairly common practice. Although the manual states an external earth should be used with the set, connected to the rear earth lug, it is very tempting to just plug the lead into a two-pin socket or to use a handy 'shaver' plug adapter to briefly test the set.

This is extremely dangerous and could be lethal. If your set has one of these plugs then cut it off.

The Icom UK importers were contacted regarding this matter and stated that this was the case with all imported Japanese transceivers, but

Beware the two pinned terror, a safe UK plug should be provided.





Topside interior view — discrete componentry but not for the faint hearted!

they would advise that a correct 13A UK plug be fitted by the user.

Having got that off my chest, there were few other things I could find to moan about. The optional CW filter availability is very nice, but what a pity it can't also be utilized in RTTY or AMTOR modes for FSK; however the IF passband tuning could be used to good effect here, possibly combined with the IF notch control to give an improvement if required. I would have preferred to see an FSK input to improve data performance rather than just AFSK, and two meters side by side to indicate Tx output/ALC and Rx signal strength/ centre zero, but now I'm becoming pedantic. In all, just short of superb at first glance.

On The Air

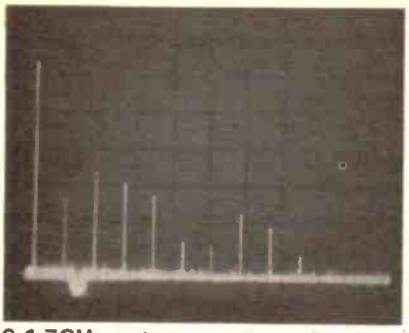
The set was connected up (using a different mains lead!) to my tower-mounted 2m beam and co-linear system, ready to give the set a good going over. Unfortunately the review period did not encompass any contests, but a nice tropospheric lift did occur a few days after installation which proved useful as well as exciting. The main tuning knob had a nice feel to it when tuning around the band and the brake tension was adjustable through a small screwdriver hole. I found the 10Hz tuning steps on SSB to be smooth in use, with a press of the adjacent step button allowing quick shifts in frequency. I could not say the same on FM though, using the main tuning knob was rather a pain — in particular the 5kHz steps were extremely awkward and as the minimum resolution was 1kHz, this precluded the use of accurate 12.5khz spacing. In the end, I loaded around 70 memories up with FM channels and used the memory mode for FM instead. After a period of experimentation, I found I could store 12.5kHz channels by tuning on SSB, then changing mode to FM and hitting the 'MW' button, hence overcoming this limitation.

The SSB selectivity was quite good and I found that I could tune away from a strong signal slightly and completely lose it, assuming of course that the operator was not splattering! Using a combination of IF passband tuning to knock one side of the passband out, and the notch filter at the edge of the other side, signals that were previously drowned with QRM were made readable. This was only previously possible when transverting from an upmarket HF transceiver, the transverter itself usually giving other strong-signal handling problems. I found no blocking or intermodulation effects whatsoever, but often this requires a severe test such as mountaintop contest operation, so I had to resign myself to the use of signal generators to examine this at a later stage.

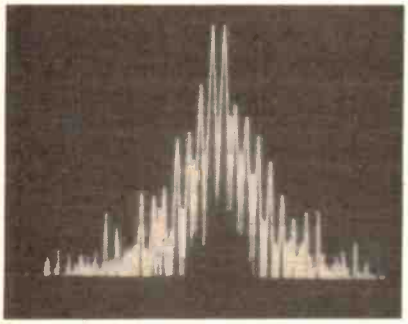
The rejection of adjacent channel signals on FM was similarly good with 25kHz spacing, 12.5kHz was reasonable but did suffer a little. The audio quality from the internal speaker was very clear and readable on all modes and I found I never needed to shift the tone control from it's centre position. The receive sensitivity in general matched the output power nicely, although plugging in an external GaAsFET preamp did bring the sensitivity up a little, but of course this would tend to compromise the strong signal handling. An ideal case in my opinion could be the matching optional IC25 masthead switched preamp at £82, which is controlled from the IC275 front panel.

On transmit, the audio was reported as excessively 'toppy' on all modes, right from the very first QSO. A fiddle round the back with a screwdriver in the TX tone control did the trick, shifting it from a central position to almost fully anticlockwise was required to restore normality. Following this, received audio reports were very pleasing and were enhanced further when I used my Icom SM10 desk mic in place of the hand microphone supplied. The compressor on SSB appeared to add HF to the audio, but increased the transmitted 'punch' by around a reported 6dB. No degradation in the width of my transmitted signal was reported with the compressor in, even when I hollered down the mic with the mic gain flat out!

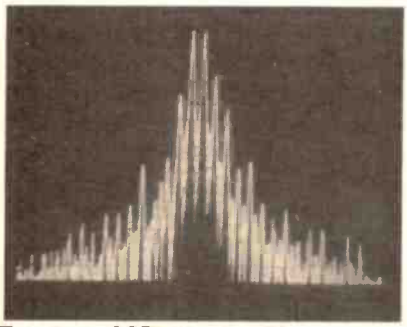
Although not stated in the manual, it is possible to QSY from a selected memory by turning the main tuning knob, this was often useful but sometimes awkward as I often tended to catch the knob slightly and inadvertently shift 5kHz on FM. I found the memory scan very useful, but the squelch threshold sensitivity varied slightly between FM and SSB, setting the squelch to just close on FM and switching to SSB required what I would deem to be an S7-8 signal to open it again. Setting the squelch to just close on SSB also required a reasonably strong, around S5-6 signal, to open it again. The S-meter seemed a little slow to get off the



0-1.7GHz output spectrum. Vertical scale 10dB/div.



Two-tone SSB output spectrum. 10dB/div vertical, 2kHz/div horizontal.



Two-tone SSB output with compressor switched in.

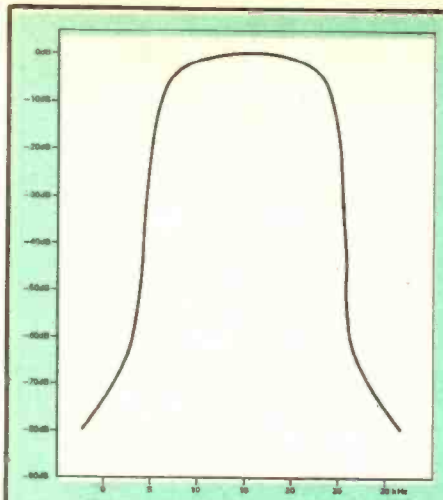


Fig. 1 FM selectivity — single signal.

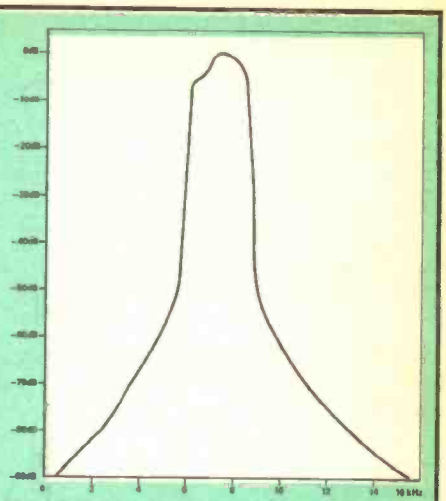


Fig. 2 SSB selectivity — single signal.

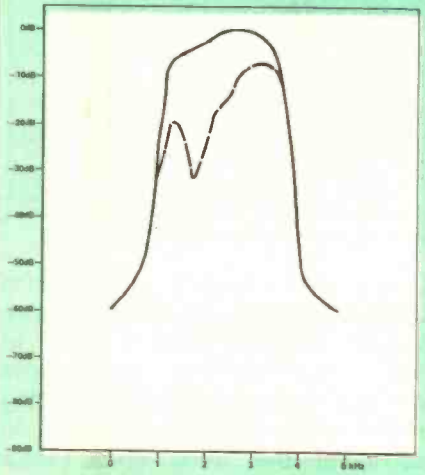


Fig. 3 IF notch filter action — SSB/CW mode.

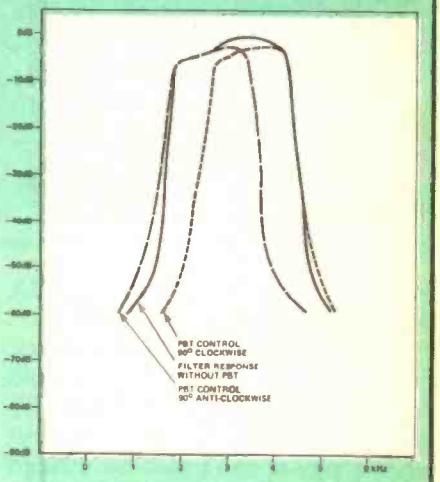


Fig. 4 Pass band tuning effect.

mark, fully readable signals on all modes sometimes causing no movement, but on FM it was quicker to reach the end stop although it was more linear on SSB/CW. The end result was that I could not use the S-meter to give meaningful reports.

Operation on AFSK was quite satisfactory, an input on the rear AQS socket allowed the mic audio to be muted on transmit, and internal switches allowed variation of input and output audio levels to interface to the accessory socket. Together with the Tx keying lines this allowed simple operation with my MM4001 RTTY/DATA transceiver even though no VOX facility was present on the transceiver. Using the notch facility did seem to knock rather a 'hole' in the passband, leading to unequal tone output levels. In fact when switching on one day, I was surprised to find very little band noise present on SSB, at first I thought I had a problem until I realized the IF notch was switched in. An indicator LED would have been useful here as it is very difficult to see the position of the button without close inspection.

Circuitry

The manual supplied gives full circuit information together with internal views of the equipment, showing main adjustment points and where the lithium backup battery is fitted. The photographs show that traditional discrete components are use in the main, constructed on large printed circuit boards with several interconnecting wiring looms. This offers a good chance for cost-effective repair when the set eventually develops a fault, but needless to say with a set of this complexity only the very brave or those with much experience would attempt to service it themselves.

The block diagram showed the operation of the main set functions, of particular note was the use of Icom's new 'DDS' (Direct Digital Synthesiser) unit in a dual phase-lock loop system for frequency generation, giving the very fast 5mS lockup time. This appears very similar to the technique used in the Icom u2E handheld (reviewed and described in a UK 'first' in the Feb 87 issue of HRT) where we revealed the total absence of any frequency systhesiser! We have been told that this is a different device but no details of this appear in the circuit, and a further mystery is a 'DAS' block which generates other fixed frequencies — it looks as if they are keeping it a close secret!

A 1200 baud serial data port interfaces with the outside world to enable control of frequency and Tx/Rx switching from a personal computer, a user-fitted MAX232 IC voltage level converter is however required for true RS-232C operation.

Laboratory Tests

The receiver sensitivity measured quite reasonably, the strong signal rejection was very good indeed, showing the designers had done their homework well. Receiver skirt selectivity plots were taken and these show the bandwidth broadening out, due to reciprocal mixing at around the −50dB mark. This is a little disappointing, but is to be expected with a fast switching speed synthesiser, as one often has to trade one advantage off against the other. As usual, extensive phase noise checks were made of the laboratory equipment used, the end result showing I was able to make useful measurements down to at least −80dB in a 2.5kHz equipment bandwidth.

The IF notch gave a useful rejection level, but as can be seen from the accompanying plot it also caused rather a large amount of attenuation of the wanted signal, confirming the on-air results. The FM selectivity was well shaped, but could really have done with being a bit narrower for 12.5kHz channel spacing. The S-meter linearity showed up to be rather poor on FM although it was better on SSB, but still limiting it's use to comparative reports. The SSB AGC (Automatic Gain Control) threshold came in at 0.50uV pd aerial signal, I would have preferred a lower figure myself but this again confirms the effect found on-air.

On transmit the power output was well controlled and the spurious outputs were well down in level. The SSB IMD (Intermodulation Distort-

Laboratory Results

Receiver

Sensitivity: Measured as signal level required to give 12dB SINAD.

Freq (MHz)	SSB/CW	FM
144	0.120uV pd	0.168uV pd
145	0.120	0.158
146	0.120	0.151

Adjacent Channel Selectivity

FM Selectivity: Measured as the increase over 12dB SINAD ref level of interfering signal modulated with 400Hz at 1.5kHz dev. to degrade on-channel signal from 12dB SINAD to 6dB SINAD.

Spacing	Selectivity
+12.5kHz	39.0dB
−12.5	34.5
+25	85.5
−25	85.0

Intermodulation Rejection: Increase over 12dB SINAD ref. level of two interfering carriers to give 12dB SINAD on-channel signal.

Spacing kHz	Rejection dB
25/50	83.0
50/100	79.0

Blocking Rejection: Immunity to blocking by strong off-frequency signals, all modes measured in similar manner to FM adjacent channel method but using wider frequency spacing.

Spacing	SSB/CW	FM
+100kHz	105dB	94dB
−100kHz	104	94
+1MHz	110	102
−1MHz	111	103
+10MHz	115	107
−10MHz	117	109

Image Rejection: Increase in level over 12dB SINAD ref. level of signal at first IF image frequency giving similar 12dB SINAD signal: 84.7dB

IF Notch Attenuation SSB/CW

Offset	Attenuation
750Hz	32dB
1kHz	32dB
1.75kHz	30dB

Squelch Threshold Sensitivity

Mode	Sensitivity
SSB/CW	0.501uV pd (14.2dB SINAD)
FM	0.112uV pd (5.4dB SINAD)

RF Gain Adjustment Range

SSB/CW: 59.6dB	FM: 18.5dB

Maximum Audio Output: Measured at ext. speaker socket, with volume control increased to the point of clipping.

Load	Power
3 ohm	2.55W
8 ohm	1.50W
15 ohm	820mW

S-Meter Linearity

Meter reading	Mode			
	SSB/CW		FM	
S1	0.500uV pd	−17.4dB	0.135uV pd	−16.5dB
S2	0.588	−16.0	0.500	−12.5
S3	0.706	−14.4	0.706	− 9.5
S4	0.879	−12.5	0.899	− 7.4
S5	1.10	−10.6	1.09	− 5.7
S6	1.41	− 8.4	1.30	− 4.2
S7	1.97	− 5.5	1.55	− 2.7
S8	2.63	− 3.0	1.78	− 1.5
S9	3.72	0dB ref	2.11	0dB ref
S9+10db	6.10	+ 4.3	2.51	+ 1.5
S9+20	11.9	+10.1	3.09	+ 3.3
S9+30	19.8	+14.5	3.67	+ 4.8
S9+40	39.0	+20.4	4.41	+ 6.4
S9+50	123	+30.4	6.38	+ 9.6
S9+60	1.08mV pd	+49.3	21.4	+20.1

Transmitter

RF Output Power

Freq (MHz)	Power (Watts)					
	SSP pep		CW		FM	
	Min	Max	Min	Max	Min	Max
144	2.09	33.9	2.58	34.4	2.62	34.5
145	2.04	34.4	2.56	34.5	2.61	34.6
146	2.02	33.3	2.51	33.7	2.56	34.0

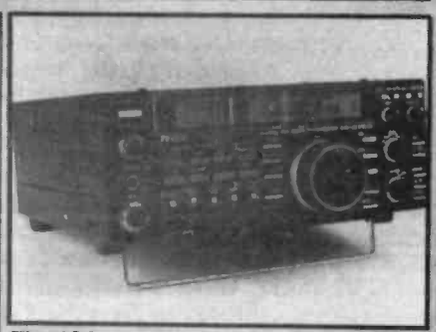
Frequency Accuracy: −32 Hz at switch-on

Harmonics/Spurii

2nd Harmonic	−66dB
3rd	−69
4th	−73
5th	−85
6th	−86
7th	−77
8th	−81
9th	−90

All spurii and other harmonics less than −90dB

FM Peak Deviation:	Toneburst Deviation:
5.42 kHz	3.70 kHz



The IC275E, Icom's latest super-rig.

ion) showed an asymetric response but was otherwise quite acceptable, the ALC did it's job well and introducing the compressor did not degrade the signal width. The FM deviation was a little over the top but within an acceptable tolerance of 5kHz, however a quick audio response check showed transmitted deviation to be 5.5dB down at 6kHz, and only 20dB down with 12.5kHz audio input frequency, measured under non-limiting conditions. This shows that you could be causing a few problems if using square-wave AFSK inputs such as feeding the set directly from a computer using a 'no-interface' program for RTTY or Data. Make sure you use some extra low-pass filtering in line!

"WHAT DID YOU SAY YOU HAD WRONG WITH YOU!"

Conclusions

One or two little niggles, but I have tried to be more critical than usual as the price reflects what would be rather a large investment even for the keen 2m operator. Remember that a good transceiver such as this is useless if used with a poor aerial system, if you're going to feed it into a Slim Jim then I would consider you're wasting your money. If you have a good aerial system for DX working and hence possibly also suffer from strong signal breakthrough, then upgrading to the IC275E should reap rewards. I would however, also recommend a good switchable masthead preamp be used, as this could certainly improve the overal sensitivity.

In general I was very pleased indeed with the set, and in conclusion I can only repeat my previous thoughts of 'just short of superb.'

My thanks go to Thanet Electronics for the loan of the review set, and for the help provided in answering my questions about the equipment.

HAM RADIO TODAY — NEXT MONTH

Crystal Set Renovation

The sets that we were throwing out as junk just a few years ago are, in some cases, now valuable antiques. We will be showing you how to get them going again without spoiling their value.

Foxhunts Are Fun

In radio, foxhunts are fun, even for the 'fox'. If you've never had a go at a bit of direction finding, our article will tell you how to give it a try on either 2m or top band.

IC12E Review

Icom now offer an FM portable in their 23cms range. But just how good is it and is it worth the outlay? We investigate.

Whilst the above articles are at an advanced stage of preparation, we cannot guarantee that they will appear in the next issue of 'Ham Radio Today'.

HIGH PERFORMANCE HF Selectivity Module

They say there's nothing new under the sun — but this high selectivity system by EK0J, should give some designers a few sleepless nights!

Radio communication has always encouraged the competitive spirit. The thrill to work that rare DX station, to own a coveted trophy, or to do better in a contest than the others at the Club, has always been part and parcel of Amateur Radio. There is an old saying, 'If you can't hear them, then you can't work them'. This is still true today as it ever was. It is therefore rather surprising that there is such scarcity of information on receiver construction in amateur radio magazines published over the past 10 to 12 years. This is probably due to the large number of imported black boxes that are used by the majority of amateurs today.

Past performance

During the 1960s, many amateurs used receivers that were surplus equipment from the last war. The receiver performance could be improved by purchasing or building add-on units, adaptors, or modifications and gadgets. But today the amateur radio design technology is changing so rapidly that it is almost impossible to publish a high performance receiver circuit which remains state of the art by the time the work gets to print. As new components and active devices are introduced to the market, better designs become possible and their advantages make obsolete many of the circuits found in the current amateur literature even though the *basic* principles of any communications receiver have not changed. For a communication receiver to be used successfully on the crowded amateur bands, the design must include the three fundamental qualities:—

1 It must amplify the wanted signal to the required level at which the information can be extracted.

2 It must reject unwanted interference to the greatest possible extent without impairing the intelligibility of the wanted signal.

3 It must be possible to accurately tune the receiver and hold the signal for the required period and as selectivity of performance is increased, stability must likewise be improved.

Design Considerations

The vast majority of commercial receiver designs available today incorporate these three principles and therefore leave little scope to improve the performance of the receiver. However, the majority of Computer Aided Designs (CAD) are based on a compromise of tuning to simplify the operation of the equipment. For example, some commercial designs contain broad-band tuning of both the receiver front end and the transmitter intermediate amplifying stages, yet for the receiver to perform well on the crowded amateur bands, the receiver must possess good selectivity. This also includes the receiver front end, RF amplifier and first mixer stages, along with the IF and audio selectivity. The ideal objective is to have the receiver pass only those frequencies to which it is tuned, while rejecting all others. This utopian goal has to date not been achieved in any commercial design, but has been approached closely enough to ensure acceptable performance. Optimum selectivity is obtained when the pass band at the 6dB points is *just* wide enough to pass the required intelligence and the skirt bandwidth at the 60dB point is narrow enough to reject any unwanted signal. The ratio of the width of the pass band at the 6dB and the 60dB points is called the shape factor of the tuned circuit — ideally this should be unity. If you reduce the width of the passband 'nose', the signal being received will become unintelligible because information contained within the wanted signal has been lost. If you go further and the bandwidth of the tuned circuit is reduced to less than 200Hz, the tuned circuit will start to ring.

Receiver Improvement

So, how can we improve the performance of the communication receiver? Those of you who have parted with a large sum of money to purchase your commercially built receiver will not be very keen to want to take a hot soldering iron to it to improve it's performance. The answer seems to be to adopt the solution in the 1960's by adding on an external adaptor to be located between the aerial and the receiver.

The author's interest in a design which would improve the performance of the existing commercial radio was aroused by a chance meeting with Roger Alban, GW3SPA, at a recent Radio Rally. Roger has experienced interference from his adjoining neighbours who are also class A licenced amateurs. What made matters worse, both enjoyed working CW on the 20 metre band. Roger's main station receiver formed

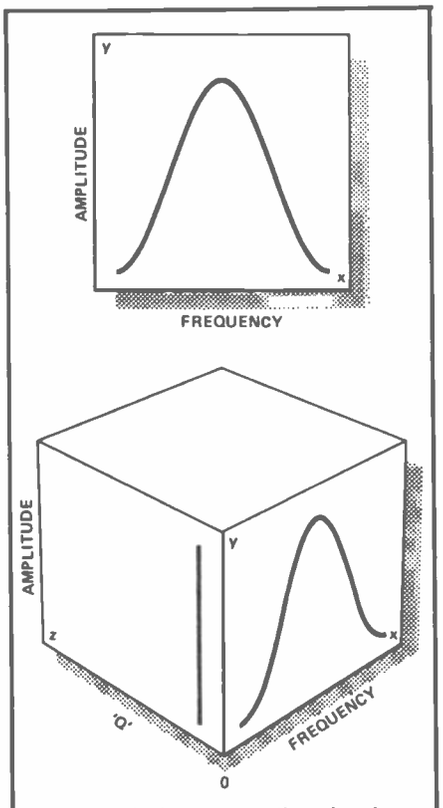


Fig.1 Graphical representation showing the transformation from two (upper sketch) to three (lower) dimensions — see text.

part of a rather expensive Japanese transceiver and therefore was not keen on the idea of modifying its design as this would affect the secondhand price. External filtering had been tried and had not improved the situation so the only solution left was to improve the receiver selectivity by reducing the bandwidth of the front end tuned circuits and at the same time somehow retaining the intelligibility of the received signal.

New Design Concept

How could this be achieved? The classical design of a tuned circuit in most text books, displays the bandwidth by the use of a two dimensional graph of frequency plotted against amplitude. Is this graphical form the best way to display the frequency selectivity of a tuned circuit? Resonance of a tuned circuit is after all a natural phenomenon. Most natural happenings are displayed as a three dimensional image, so why cannot the frequency selectivity of a tuned circuit be shown as a three dimensional image? The fact is that the text books have not been strictly accurate in portraying the graphical description of the functioning of a tuned circuit.

By using a form of mathematical mapping, it is possible to display graphically the operation of the tuned circuit as a three dimensional graph as shown in **Fig. 1.** The traditional method is to view the three dimensional graph from the *x* and *y* axis. However, if you were to view the same graph from the *y* and *z* axis, you will see a thin vertical line which could be made to represent the *effective* bandwidth. This then represents a theoretically infinitely narrow bandwidth which would improve the selectivity performance of the receiver and yet retain the intelligibility of the signal because the *actual* bandwidth is that still portrayed by the graph formed by the x and y axis. Consequently, the noise performance of the receiver will also be drastically improved.

Should this technique sound vaguely familiar, you will probably recall that polyphase SSB generators adopt a similar approach. These devices were quite popular in the 60's and early 70's as a low cost alternative to crystal filters, which were extremely expensive at the time. It is beyond the scope of this article to go into great detail, but the fundamental 'polyphase' principle relied on closely matched phase concellation techniques to suppress the unwanted sideband and carrier to produce SSB.

What is now required is some network to be inserted between the aerial and the receiver to transpose as the x and z axis are rotated through 90 degrees. The network used by the author will unfortunately be frequency selective, and different networks will be required for each of the amateur bands used. The network is shown in **Fig. 2** and in itself is a compromise to simplify the design. The mathematics surrounding the calculation of the value of the components making up the network is complex because a three dimensional mapping technique has been employed to obtain the component values. For this reason, the author has given the resulting formula to calculate the required component values. It must be emphasised that to avoid unnecessary losses, only the best quality components should be used.

$$L = \frac{V}{0.8 \times 2 \times \pi \times f} \text{ Henrys}$$

$$C = \frac{Z_o^3 \sqrt{0.8}}{\sqrt{V} \times 2 \times \pi \times f} \text{ Farads}$$

Where L = inductance in Henries
C = capitance in Farads
V = Free space propagation velocity
Z_o = receiver input impedance
f = receiver operating frequency

Conclusions

The interest in building home-made receivers of the more complex variety has declined in a tragic fashion during the past decade and perhaps this article will attempt to redress the situation and give encouragement for home construction. Tests carried out by the author have shown that the receiver noise level has been *substantially reduced* as a result of the very narrow effective bandwidth, and no ringing has been experienced. Note that receive/transmit switching will be required to bypass the unit unless high voltage components are used. Borrowing from techniques used in radio astronomy, the performance of the unit can be further improved if the network is operated at very low temperatures — noise levels were found to be almost immeasurable on the author's prototype when immersed in a liquid nitrogen bath.

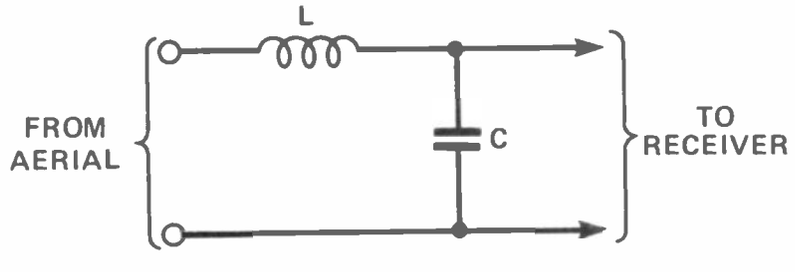
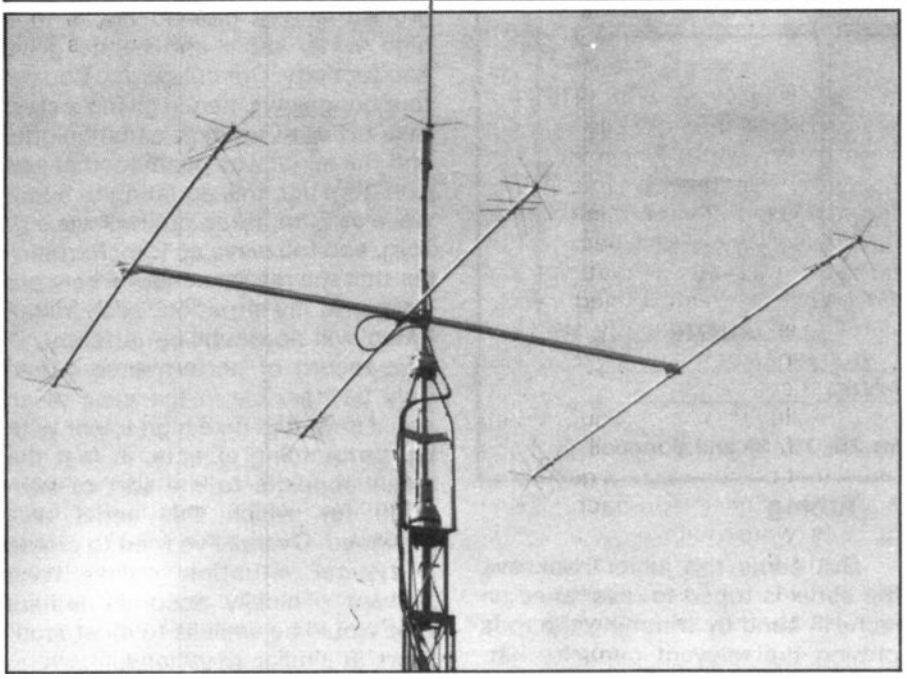


Fig.2 Like most simple ideas, the fundamental building block is very straightforward — here we show the effective circuit.

REVIEW

Altron AQ620 HF mini-beam



The three element version rises majestically above the Lorek ancestral home!

Multi-band HF beams don't exactly blend into the background, but this design may help you to keep the neighbours (relatively) happy. Chris Lorek, G4HCL, tries out the Altron AQ620 mini-beam.

On sunny weekends, my neighbour often used to see me up on the roof of our semi-detached bungalow, 'Another aerial Chris?', 'Yes John, this one's to talk to Australia' or satellites, or down the road, or whatever. After eleven different aerials adorned our property, he gave up asking and later moved. Around a year later, I moved 100m down the road into a larger QTH, the aerials went up one by one, in all thirteen aerials with three masts. I thought it suddenly went quiet next door, they had moved as well! Was there possibly a connection?

Many amateurs such as myself, live on estates where large aerials are frowned upon, by the family and local authorities as well as one's neighbours. We occasionally hear of long-running problems from amateurs in these positions, even when no TVI is experienced. Neighbours dislike anything that would upset their picturesque view, be it of the gasworks or the setting sun. When I eventually decided it was time for a rotary HF beam to adorn my small wind-up tower, a colleague kindly loaned me a three element tribander, just to 'see how it looked' before any financial investment. It went up at dusk and was taken down before daylight, it almost gave *me* a heart attack, never mind anyone else! By itself it may have just about been acceptable, but when combined with a 6m yagi, 2m and 70cm crossed yagis, four 23cm yagis and a dual-band colinear it would have been too much. The tower had to be kept permanently tilted over during daylight hours while a compromise was sought. Studies were made of compact HF yagis, both constructional designs and those available ready built. Discussions with Allweld Engineering led to the generous offer by them of an AQ620 compact yagi for review, which I accepted with great delight, together with a matching AQ40/2E compact 2 element 40m yagi (to be reviewed in a future issue of HRT).

Features

The AQ620 is available in two, three and four element versions, and is physically around the size of an equivalent 6m yagi but capable of operating on the 20m, 15m, 10m and 6m amateur bands. The two element version consists of a driven element together with reflector, the three element adds a director and the four element adds a further director. Each version may be expanded as required to the next larger, so if you wish you could start with a two element and fit 'add-on' kits as your finances or performance requirements increase. **Fig. 1** shows the physical size of the various versions.

On 6m the aerial performs as a conventional full size half-wave beam, whilst on the HF bands the elements are end loaded to resonance using high-Q coils with spoke capacity hats. The physical lengths of the elements together with the element spacings attempt to offer the best resonance and optimisation of the front to back ratio, coupled with a useful forward gain. This is done by selective detuning of the elements individually on each band by the use of loading coils at the element ends, hence a low impedance path is present towards the current maximum path of the aerial to give the best radiation efficiency.

Impressions

I began by putting together the two element version, with the intention of extending this to the three

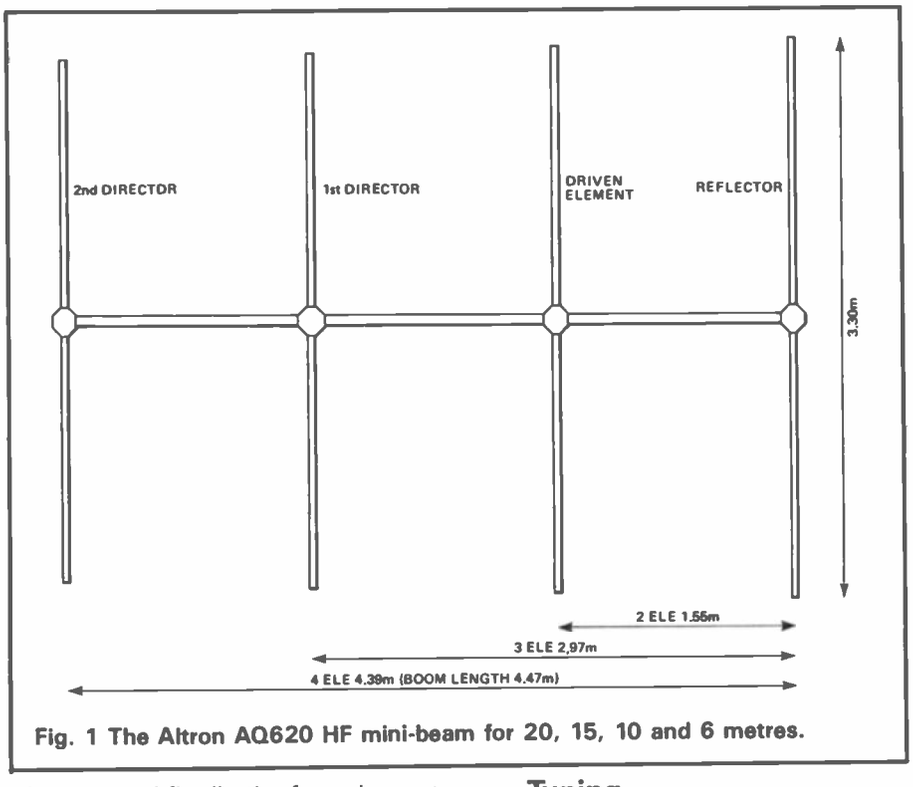


Fig. 1 The Altron AQ620 HF mini-beam for 20, 15, 10 and 6 metres.

element and finally the four element for test purposes. This has the added advantage of breaking the neighbours in gently! No aerial is of use if it comes down in the first high wind, and the very first thing that struck me on looking at the hardware was the good mechanical design. Not surprising really, as the manufacturer is also involved with tower construction, seasoned readers will have seen the series on aerial towers written by the designer in the first few issues of HRT. I was pleased to see the coils were sealed against moisture to prevent detuning effects, and that locknuts were fitted to the capacity hat spokes. These spokes were made from a ductile alloy so they wouldn't tend to snap from perching birds and so on. The supplied mounting hardware was tough and substantial.

Apart from this, the aerial was fairly light, I could easily lift all versions with one finger. When a visiting DXer friend saw the two element, he instantly remarked on the small size; the elements certainly didn't have the characteristic 'droop' often associated with tribanders. The neighbours did not even notice that another aerial had gone up! However there are many old sayings that equate the amount of metalwork in the air to the number of DX stations entered in one's logbook, so the real test was of course on the air.

Tuning

Out came the junior hacksaw. The aerial is tuned to resonance on each HF band by trimming the rods forming the relevant capacity hat. Here's where you get used to raising and lowering the aerial several times! As a starting point, the rods were cut to the length suggested in the instructions and the aerial raised to its final position. The reason for this of course is that the distance from the ground can make quite a difference to the impedance of the aerial, and hence the point of lowest SWR. The higher the 'Q' of the aerial, the more pronounced this effect becomes.

Tuning

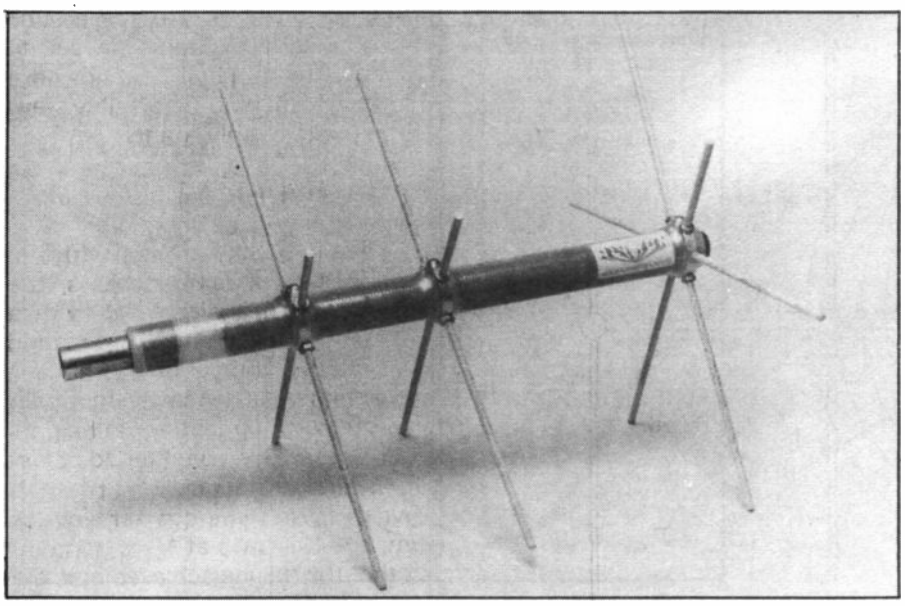
An 'SWR against frequency' plot was taken and the aerial found to be resonant just below each band, showing that more trimming was required. 10mm was cut off one spoke on each band and the effect noted, then by extrapolation a further length was cut and the resonance found to be near the point required. The 'fine tuning' now began, with 2mm cut at each attempt until eventually the desired point of resonance was achieved. Spare capacity hat spokes were supplied with the aerial if one made a mistake and overshot the mark, but luckily I didn't need any. With a windup, tilting tower it took me around two and a half hours in all to resonate the aerial, if I did not have this facility it would certainly have taken considerably longer.

On The Air

I live in a small village with flat open fenland in all directions; the ground is well drained but with a high water table and hence good conductivity. Our cul-de-sac houses four bungalows, hence giving a clear take-off with modest aerial heights and the aerial was positioned at just over 10m agl, this equating to a half wave at 20m, three-quarter wave at 15m, and full wave at 10m. Remember that the results achieved here are unique to my situation, each installation will no doubt be different. A *true* record of performance would only be possible in the case of an aerial mounted on a high tower with no surrounding objects, in fact the exact opposite to the sort of situation for which this aerial was designed. Overall I've tried to create a *typical* situation rather than present clinically accurate results that would be useless to most amateurs in similar situations.

A W3DZZ type trap dipole with an ATU was used as a comparison for DX capability and I was pleased to say that even the two element constantly outperformed the dipole for signal strength at both ends of the contact. What is very important with any HF beam is the rejection of signals from the sides and back of the beam, as QRM is generally the limiting factor in reading weak exotic stations. By switching between dipole and beam, the S-meter reading usually went down on the beam until the rotator was activated, then the desired station was one or two S-points stronger *and* the QRM markedly reduced, which of course is how it should be.

In beaming around, I found the sidelobe rejection to be quite acceptable, but the front to back ratio inferior to the previous 'full size' tribander, especially on 20m and 15m. As the aerial was lowered, down to a minimum height of 4m agl, the directivity reduced further (as would be expected) but still retained noticeable side nulls. The SWR on 15m, 10m and 6m was sufficiently low as to allow operation over both the SSB and CW portions



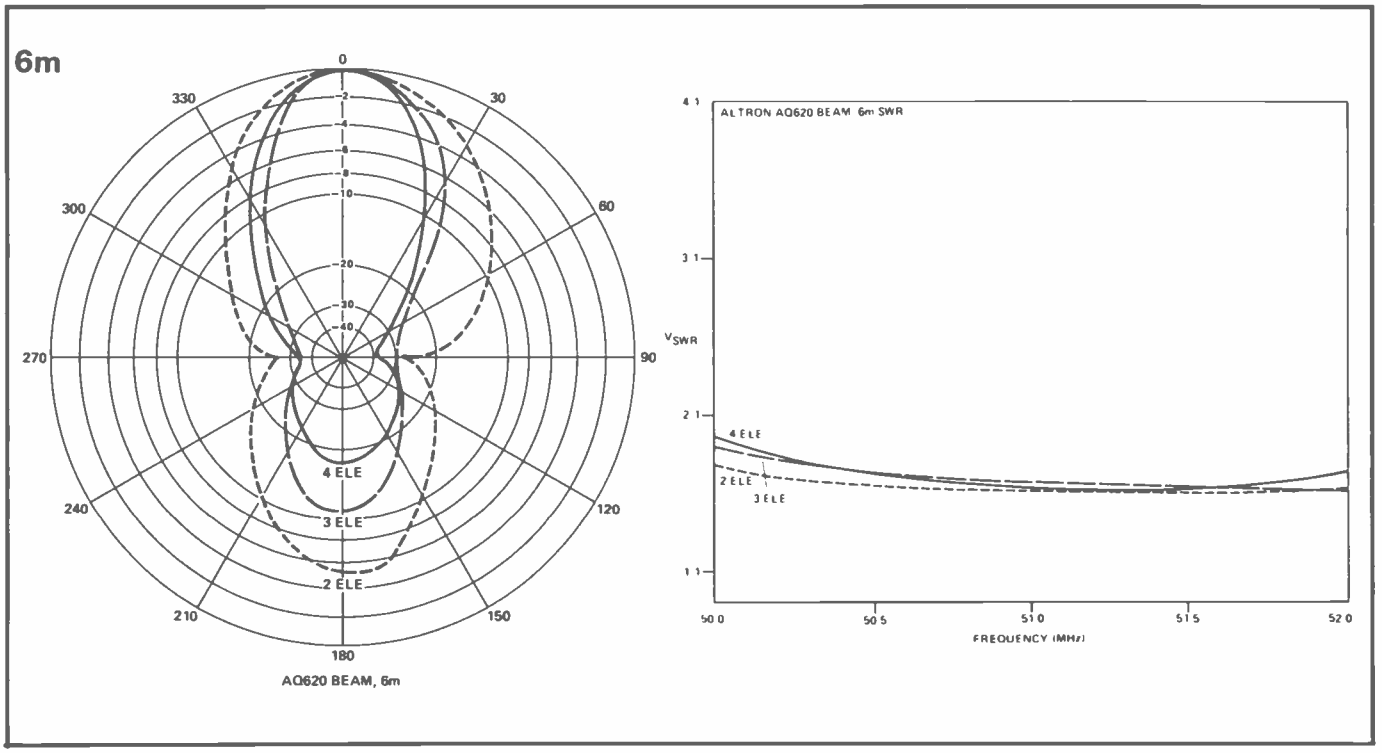
One of the AQ620 sealed coil and capacity hat units.

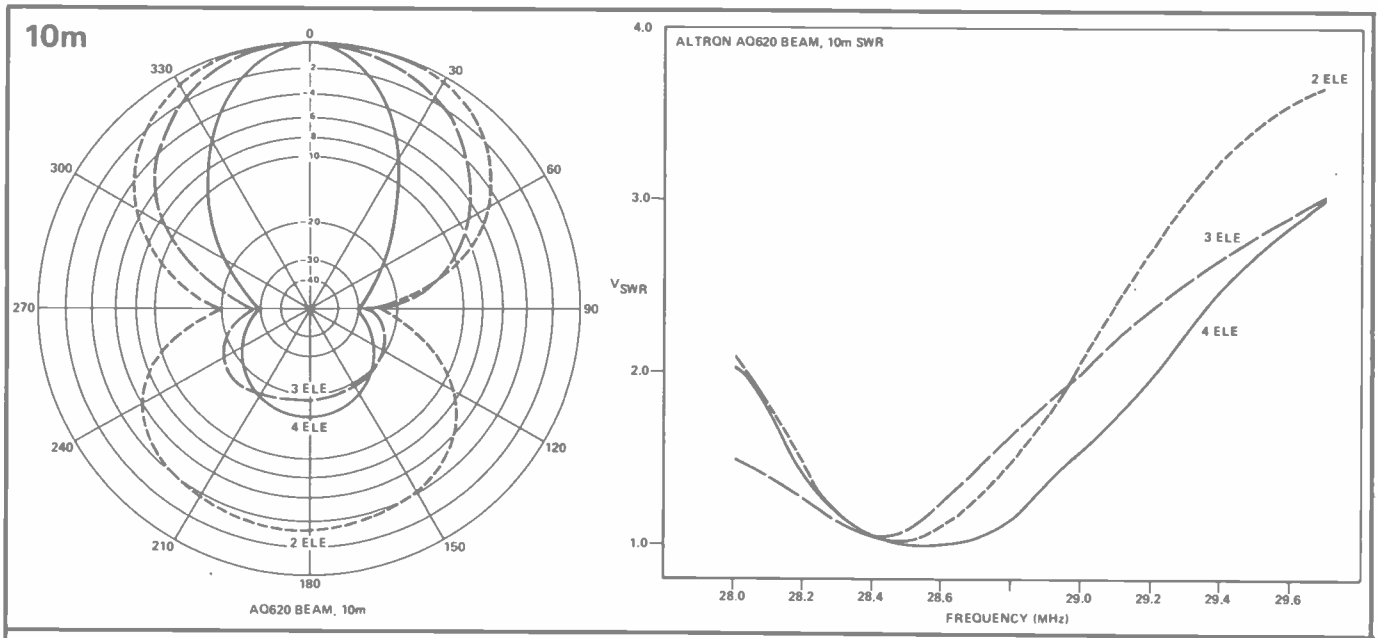
of the bands with my solid-state PA, but on 20m I needed to use the ATU at the HF end, and on the FM portion of 10m.

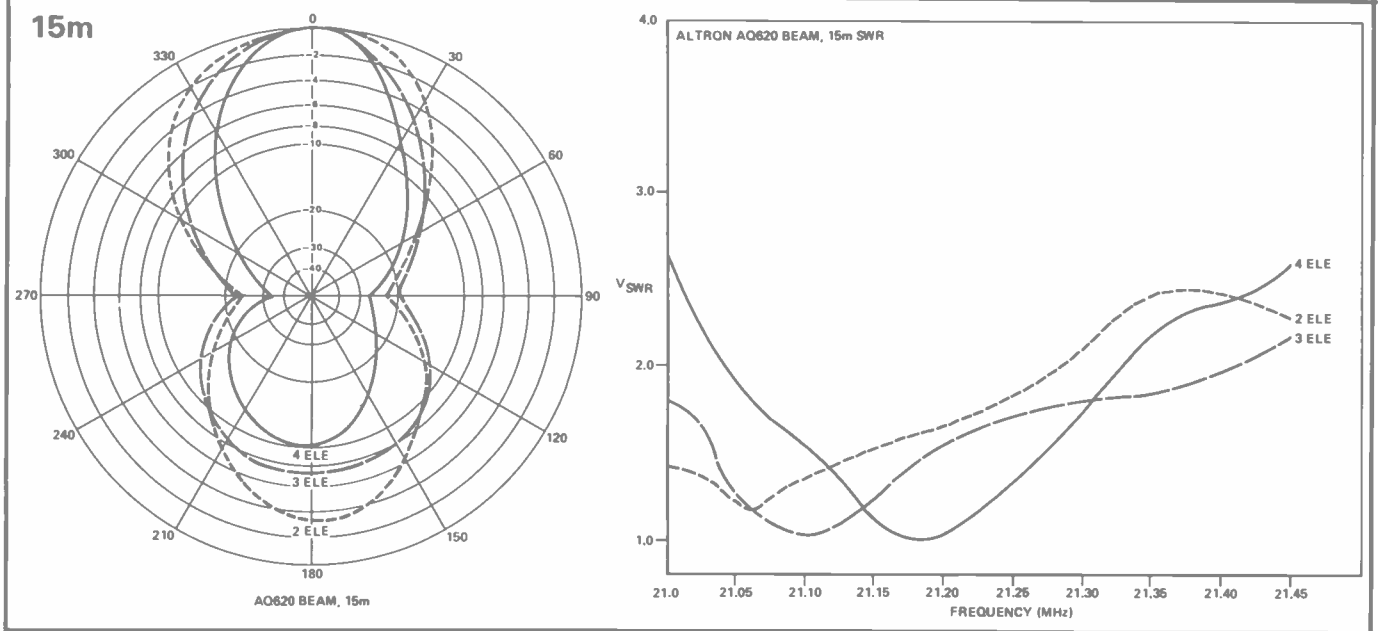
Adding the third element shifted the resonance on all bands lower in frequency, meaning it was time to get the junior hacksaw out again, but the effort was worthwhile. The performance had certainly improved on all bands, the front to back ratio on 10m and 6m was noticeably better and generally signals did indeed seem stronger when compared with the two element. Out came the spanners again to fit the fourth element, this uses a one-piece boom for stability rather than an 'add-on' extension as was the case with the third element, and by now the aerial was getting large — but still a lot smaller than the full size three element. Although I had high hopes, I noticed less difference than previously, confirming the law of diminishing returns does still apply. The forward gain had improved, noticeably so on the higher frequency bands, but the side-lobe and front-to-back rejection seemed to be virtually the same in use. The frequency coinciding with minimum SWR had shifted by less than 100kHz in all cases, so I did not readjust the tuning. The accompanying graphs show the achieved SWR plots with the aerial mounted at 10m agl. In all cases, the minimum SWR frequency shifted by less than 50kHz when the heavens opened up with rain, sleet and snow.

Although a balun was not used, some amateurs prefer to use them when feeding a beam with coax, and an air-cored model suitable for operation up to 60MHz may be supplied, as an option, with the AQ620. I first tested this in the shack at 28MHz into a non-inductive 50 ohm load. The SWR was found to be less than 1.1:1 and the through attenuation less than 0.5dB. However when fitted to the beam it reduced performance both in terms of the gain and minimum SWR achievable, probably due to its close proximity with the metal boom, so it was swiftly removed! This proximity effect would also cause a problem if using balanced twin for the RF feed, however the use of coax proved quite acceptable in this case.

Next came the crucial test — comparing the four element on-air with the three element full-size beam. The forward gain appeared roughly similar as did the side lobe rejection, the front to back ratio did seem a little better on the full size job although without an almost impos-




10m
0
30
60
90
120
150
180
210
240
270
300
330
2
4
6
8
10
20
30
40
3 ELE
4 ELE
2 ELE
AQ620 BEAM, 10m
ALTRON AQ620 BEAM, 10m SWR
4.0
3.0
2.0
1.0
VSWR
2 ELE
3 ELE
4 ELE
28.0
28.2
28.4
28.6
29.0
29.2
29.4
29.6
FREQUENCY (MHz)


15m
0
30
60
90
120
150
180
210
240
270
300
330
2
4
6
8
10
20
30
40
4 ELE
3 ELE
2 ELE
AQ620 BEAM, 15m
ALTRON AQ620 BEAM, 15m SWR
4.0
3.0
2.0
1.0
VSWR
4 ELE
2 ELE
3 ELE
21.0
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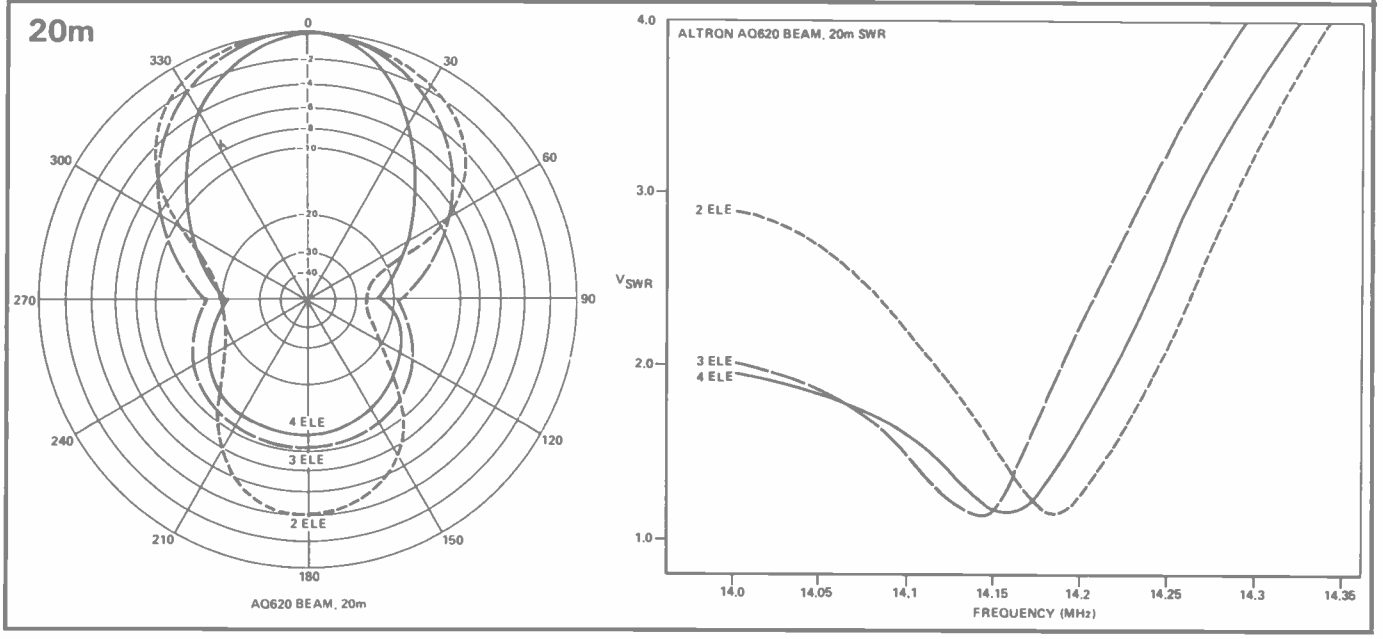
21.10
21.15
21.20
21.25
21.30
21.35
21.40
21.45
FREQUENCY (MHz)


20m
0
30
60
90
120
150
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270
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330
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6
8
10
20
30
40
4 ELE
3 ELE
2 ELE
AQ620 BEAM, 20m
ALTRON AQ620 BEAM, 20m SWR
4.0
3.0
2.0
1.0
VSWR
2 ELE
3 ELE
4 ELE
14.0
14.05
14.1
14.15
14.2
14.25
14.3
14.35
FREQUENCY (MHz)

sible direct comparison it is difficult to say. In general, signals on the bands sounded much the same!

Beamwidth Plots

Throughout the trials, I twisted the arms of several amateurs to assist me with beamwidth tests. As the desire of working DX is often to achieve as low a radiation angle as possible, measurements were taken of constant carriers from stations 8km, 15km, 26km and 37km away, again in flat fenland under line-of-sight conditions between aerials to simulate radiation performance towards the horizon. A signal generator calibrated S-meter was used at my end, the readings in dB noted as I revolved the beam. The results were plotted and reasonably coincided, those achieved from the station 8km away using a five element tribander beamed at me was deemed to be the most representative, and these are reproduced here. Note that these were taken at the resonant point and would vary away from this, also the pattern would probably change with differing radiation angles. I did not attempt to accurately measure the gain as this would vary markedly with the radiation angle, the HRT editor drew the line at a helicopter flying around my QTH at different heights with measuring gear! *(Should think so too! Asst. Ed).* As previously stated, these are results taken from a unique environment and I cannot stress this strongly enough, but they will hopefully give an idea of what can be achieved in typical situations.

Conclusions

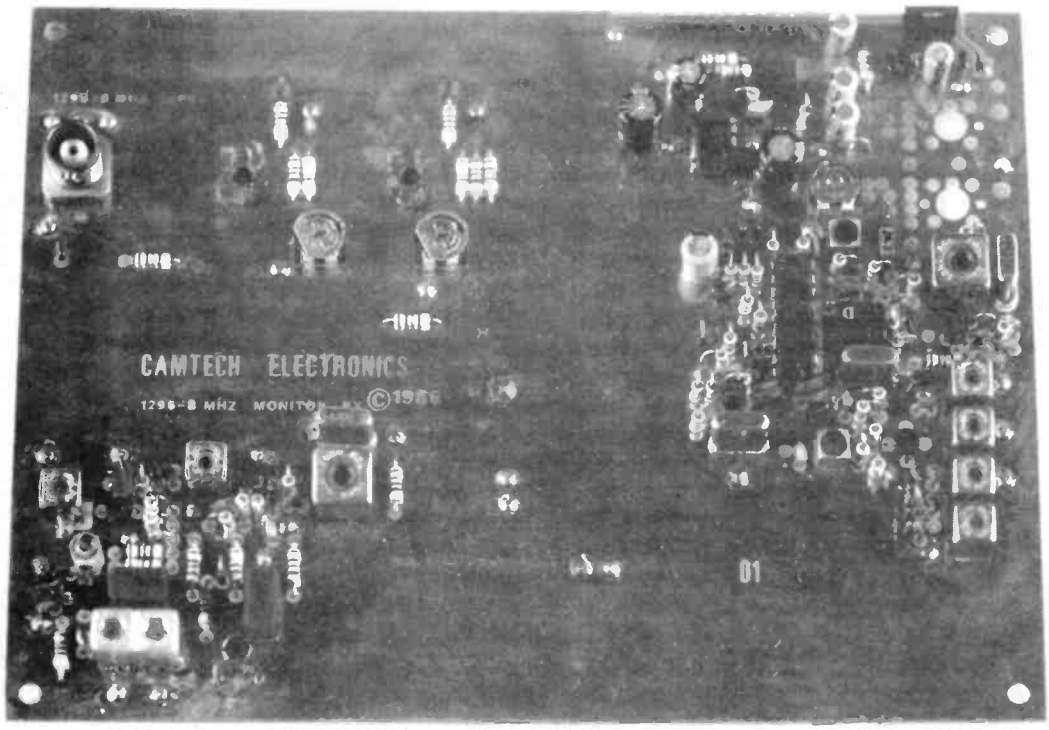
A full size HF tribander, possibly coupled with a 6m yagi could look totally out of place in many situations, causing the amateur often to 'make do' with a bit of wire. If a compromise could be tolerated then the AQ620 should give a good account of itself and this could be beneficial in reducing the mast and rotator loading as well as the visual aspects, as a substantial chimney could even be used as the support. In an area where Band I TV aerials are still apparent, one might not require planning permission as the size and appearance could be considered similar. Remember the aerial's environment can have a large effect, often a smaller aerial higher up can reap rewards over a large one firing right into your house roof.

It depends what you want out of your station, if you're content to run a £1,000 transceiver into a bit of wet string then that's up to you, and if you can put up a monster array then you'll not to compromise. If you're somewhere in between, as many amateurs are, then use whatever you can get away with up in the air. As for myself, I was very pleased with the aerial when compared with a full size tribander (as were the neighbours!) and the three element AQ620 is now a permanent part of my station. Prices for the AQ620 are:— 2 element £114.50, 3 element £169.00, 4 element £230.00 — including VAT but excluding carriage. They are available from: Allweld Engineering, Unit 6, 232 Selsdon Rd, S. Croydon CP2 6PL. Tel: 01-680-2995.

My thanks go to Allweld Engineering for the supply of the review sample.

Part 2

1296 RECEIVER PROJECT



In the second part of his 23cm receiver project, Dave Allen builds and aligns the 2m IF and covers final construction of the unit.

This is the second part of the constructional series on a complete 23cms receiver which covers 1296 to 1298MHz. The following article concludes the series by giving complete details of the IF assembly. The IF is a complete VHF receiver in its own right which covers 144 to 146MHz via three crystalled channels. Combined with the UHF Multiplier, RF Amp. and mixer which was described previously, this forms a 1296-8MHz narrow band FM receiver, all on a single printed circuit board. If you have purchased the complete kit then we suggest that you read and assemble the first section dealing with the UHF Multiplier, RF Amp. and mixer before proceeding.

Circuit Description

The IF local oscillator is a three channel Colpitts design operating at 44MHz with the collector tuned to the third harmonic. Channel selection is achieved by forward biasing either PIN diodes D9, D10 or D11. These diodes switch between the channel crystals and also form part of the bias arrangement for the oscillator. Netting of the channel crystals to the desired frequency is accomplished by L13 to L15 and should be adjusted so that the oscillator operates within its AFC loop range. The AFC is provided by varicap diode D8 which will move the receiver +/−5kHz from the desired channel, thus tracking the IF input signal. Output of the oscillator is tuned by L12 in parallel with C60 and is applied to gate 2 of the mixer Q7, at a level of approx. 1.5V rms.

Q7, the mixer FET, is the universally accepted BF981. The 144-146MHz IF input is applied to gate 1 of the mixer via a band pass filter which is capacitively tapped to provide an input impedance of 50ohms. This filter also provides second IF image rejection. Typical input sensitivity of the mixer is 0.25uV for 12dB SINAD. The output of the mixer is at 10.7MHz which is selected by L10 and matched into the 2 pole crystal filter, FL1. The output of the filter is matched by R36 and applied to the input of the IF preamplifier Q8.

The main IF section IC2 is the ubiquitous MC3359 also manufactured as the ULN3859A. Input is applied to pin 18 where it is subsequently passed to the internal mixer-oscillator circuit. The oscillator is an internally biased Colpitts type with the base and emitter connections at pins 1 and 2 respectively. X2 is coupled to the base of the oscillator, with C41 and C42 providing the necessary decoupling and feedback arrangement. The internal mixer converts the 10.7MHz input down to the final IF frequency of 455kHz. Output of the mixer appears at pin 3 where it is subsequently passed to a four pole ceramic filter — FL2. After suitable bandpass filtering the signal goes to the input of a six stage limiter-amplifier, where most of the amplification is done. The output of the limiter drives the quadrature coil L11 and the internal demodulator to detect the FM. C53 which decouples pin 9, combined with an internal 50k

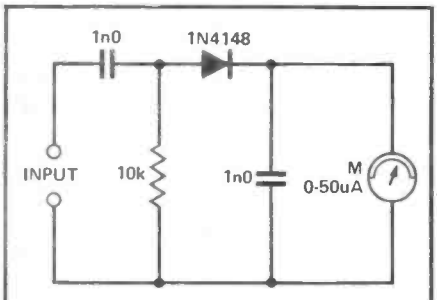


Fig.1 Diagram of a simple diode probe used in the alignment procedure.

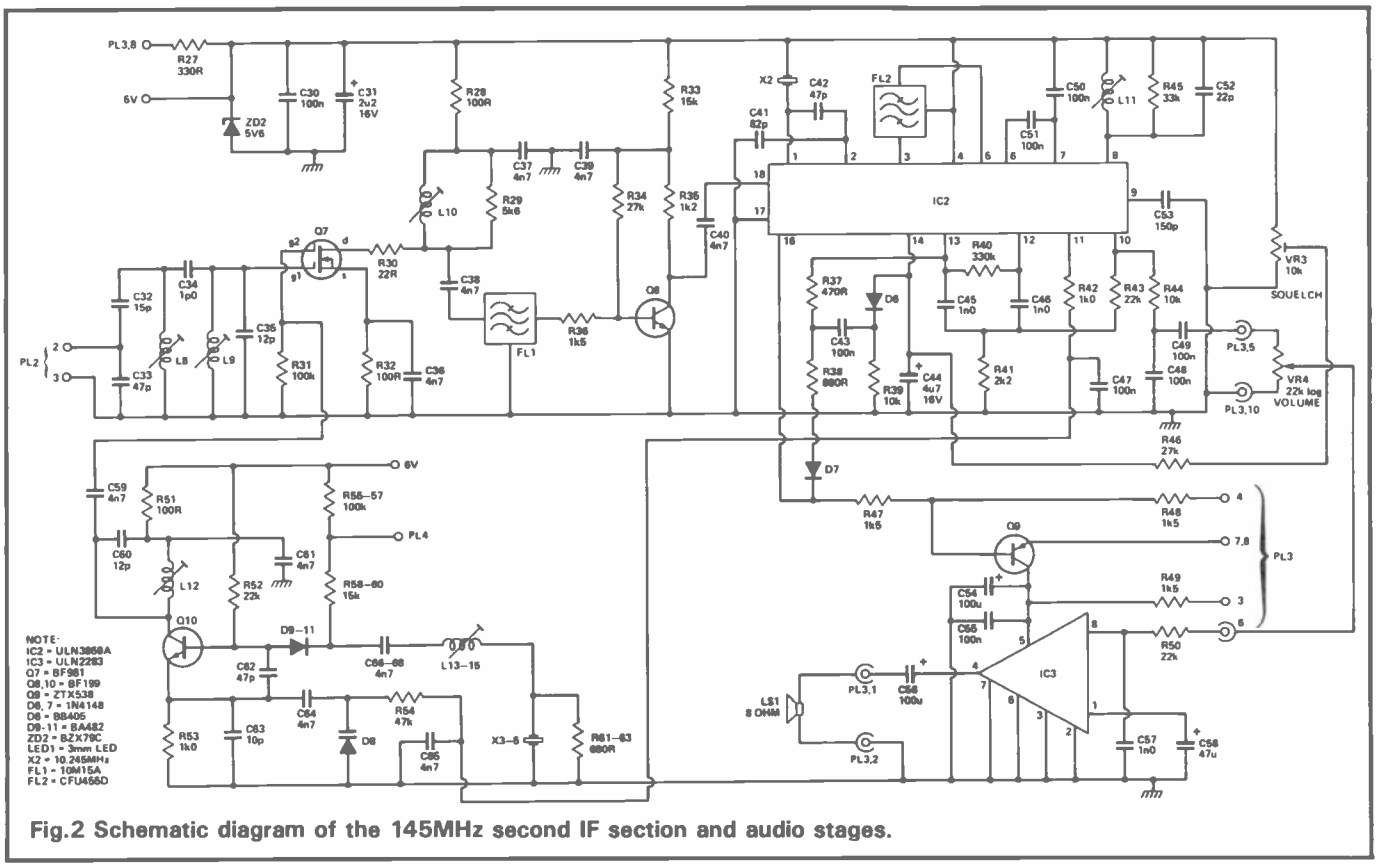


Fig.2 Schematic diagram of the 145MHz second IF section and audio stages.

resistor forms a low pass filter for the recovered audio. The audio is then internally buffered through an emitter follower and passed to pin 10.

The audio output at pin 10 of IC2 is split into two separate paths. R44 combined with C48 tailor the audio frequency response by forming a 6dB de-emphasis filter. The output of this filter is then applied to the top of the external volume control via C49. R43 passes some of the audio output from pin 10 to an active band pass filter, comprising of R40, R41, R43 and C45, C46. In the absence of an IF input signal, the output of the demodulator is purely noise. This noise band is monitored by the active filter and is then applied to the squelch detector.

The squelch threshold detector works as follows, the output of the active filter is applied to R37 which combined with C49 and R39 form a potential divider. D6 is coupled to the output of this divider and acts as a negative charge diode pump. This holds the charge voltage on C44 below threshold, which is detected at pin 14. If the presence of noise is reduced, such as is the case when an input signal is applied, then the charge on C44 will rise to above threshold which is internally set at 0.7 volts. Once pin 14 has reached the threshold voltage the squelch gate will open, forcing pin 16 low. As pin 16 goes low it forward biases Q9, enabling the Rx audio amplifier IC3. The action of pin 16 going low also provides some squelch hysteresis by R38-D7 being in parallel with R39. This reduces the possibility of squelch chatter on weak signals.

The audio amplifier IC3 is the ULN283 which gives 600mW of audio into 8 ohms. Input to the audio amp is applied via a low pass filter comprising of R50 and C57 which cuts off the high frequency response of the amplifier at approx 3.5kHz, improving the clarity of the audio signal. Distortion of the amplifier is typically less than 1%, with the total receiver distoriton at rated output less than 5%.

Construction

Construction of the IF portion of the board should not be hurried and it's wise to take time to properly identify each component before fitting to the PCB. The time required to complete the assembly will be at the very least a good evening's work. It is absolutely essential that modern tools be used for the construction, such as small long nosed pliers, side cutters, a low wattage soldering iron suitable for the components used and thin multicored solder. If you have little experience of soldering and component assembly then we strongly recommend that you get a friend to build the board for you.

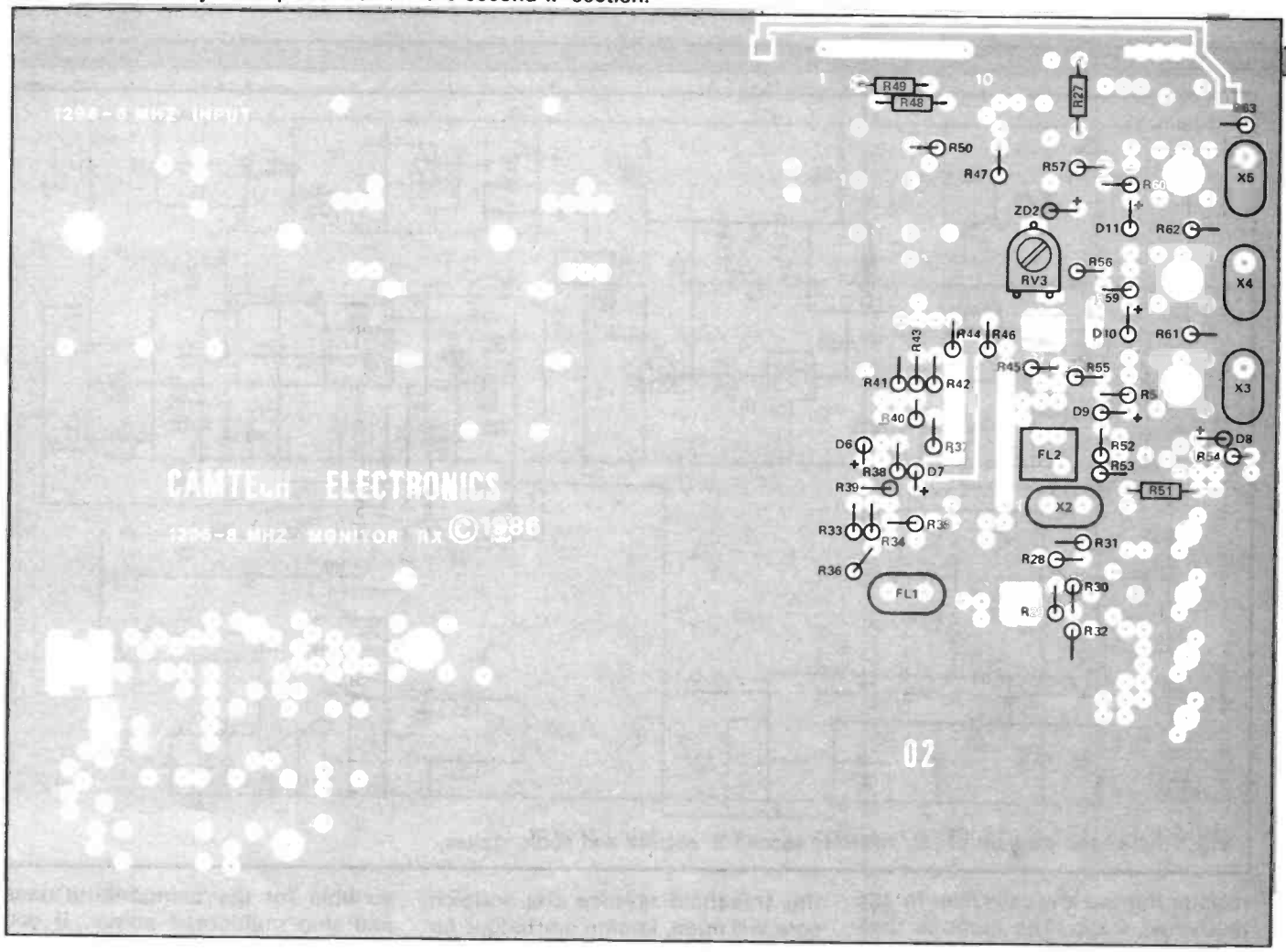
Start construction by identifying the PCB track pins which are shown on the component side and soldered top and bottom. Although the PCB is double-sided there is no additional top soldering required. All the components may be inserted in any order but take particular care when handling semiconductors, and when trimming component leads, ensure that they are cut close to the board, ie. less than 2mm.

NOTE: Certain components are polarised, eg. Electrolytic capacitors and diodes. Refer to the component overlay drawings to check polarity of components.

Alignment

Connect a 22k log potentiometer between PL3 pins 5, 6 and 10. PL3 pin 5 should couple to the top of the pot and PL3 pin 10 to the bottom (earth) whilst the wiper should be connected to PL3 pin 6 (Rx audio amp input). Next, connect a loudspeaker with an impedance

Fig.4 Passive component placement for the second IF section.



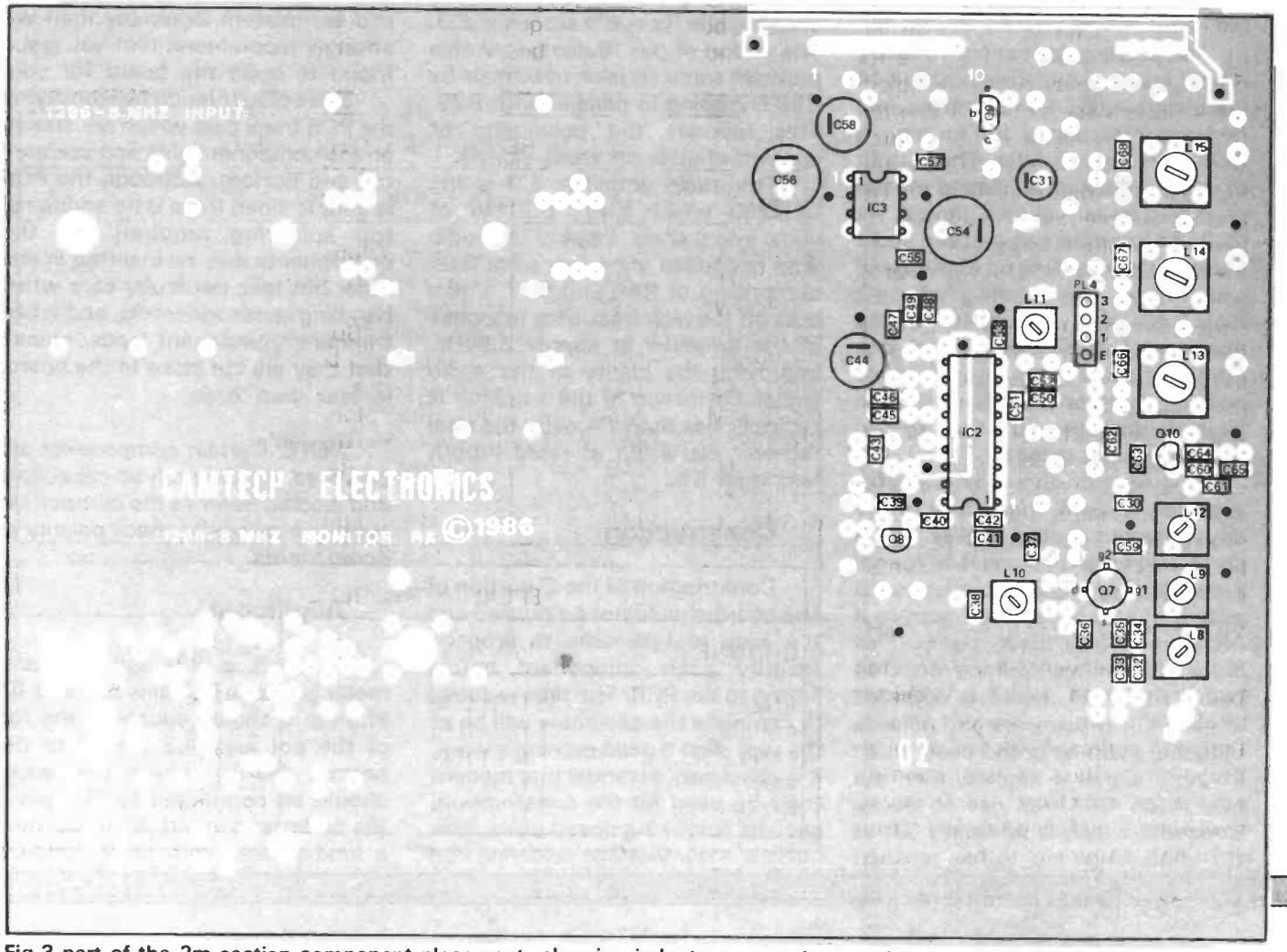


Fig.3 part of the 2m section component placement, showing inductors, capacitors and active components.

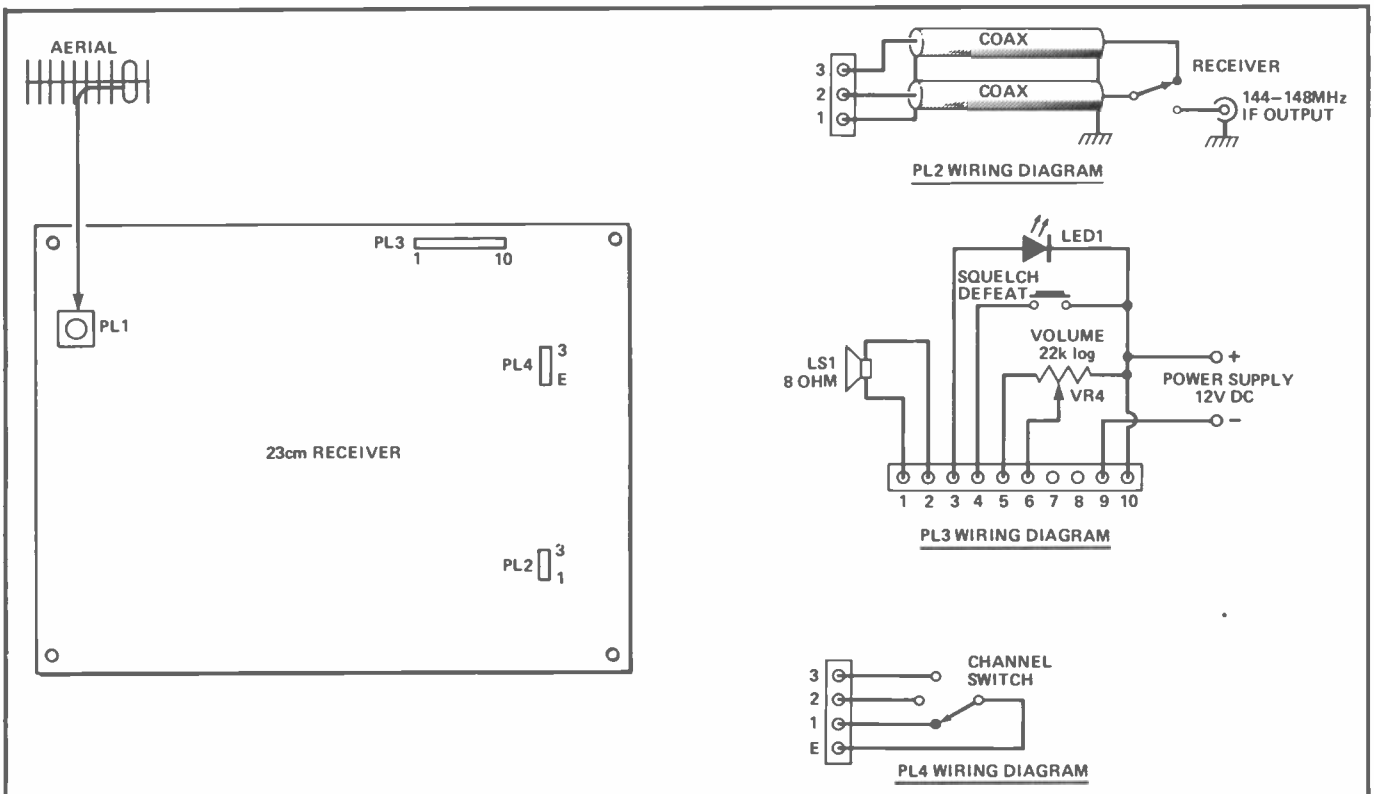


Fig.5 Plug notation and interwiring details for the completed project.

between 4 and 8 ohms to PL3,1 and PL3,2. The power supply can now be connected to the board and set to 12 volts DC. Depending on the setting of the squelch pot. (VR3), the Rx audio may or may not be enabled, but in either case if PL3,4 is shorted to ground the audio will be turned on. With the audio turned on, increase the volume control setting and an audible hiss should now be heard from the loudspeaker.

To align the IF local oscillator, solder a suitable crystal into X3 channel location and link PL4,1 to earth. This will bias the IF local oscillor on and the output can be measured with a diode probe at gate 2 of Q7. Tune L12 for maximum injection at gate 2 then remove the diode probe. Next, apply a VHF signal to the input of the IF at PL2,2 ground to PL2,3. This signal should be at the IF frequency which can be calculated as follows.

VHF IF = X3 FREQ x 3 +10.7MHz

As this frequency lies within the two metre band, a VHF transmitter in close proximity may be used as the signal source. A word of warning, though, in a flash of inspiration do not couple the transmitter directly to the IF input, as Q7 will take a rather unkindly attitude to this, not to mention the rest of the board! Apart from using a VHF transmitter, a suitable signal generator can be used which is both simpler and quicker, so this method will be described. Apply an input of approximately 100mV, modulated with 1kHz at 3kHz deviation, unless there is a fault you should hear the demodulated recovered audio. Reduce the signal

23cms REPEATERS WITHIN THE UK		
CALL	CHANNEL	LOCATION
GB3AA	RM0	Alveston, Avon
GB3BH	RM0	Bushey Heath, Herts
GB3BW	RM6	Bedford
GB3CP	RM3	Crawley, W. Sussex
GB3LN	RM15	Enfield, North London
GB3MC	RM0	Bolton, Lancs
GB3MM	RM6	Wolverhampton
GB3PS	RM3	Barkway, Hertfordshire
GB3RU	RM9	10k West of Reading, Berks
GB3SE	RM3	Stoke on Trent, Staffs
GB3NX	RM9	Race Hill, Brighton, Sussex

REPEATER FREQUENCIES		
CHANNEL	INPUT MHz	OUTPUT MHz
RM0	1291.000	1297.000
RM3	1291.075	1297.075
RM6	1291.150	1297.150
RM9	1291.225	1297.225
RM15	1291.375	1297.375

generator output until you can hear background noise on the signal, then tune L8 and L9 for maximum sensitivity, reducing the input level as the signal gets stronger. You will probably have to tune L8 and L9 several times, as there will be some interaction between tuning these two coils. Next, tune L12 for maximum sensitivity then tune L11 to peak the audio output. L10 should now be tuned to give minimum audio distortion which can be done by coupling the audio output to a distortion analyzer and tuning for about one or two percent distortion, or alternatively tune L10 for best perceived audio quality. Next, measure the voltage at the junction of R54 and C65 which is the AFC input to the IF local oscillator, then tune L13-15 so that the AFC voltage swings to about its mid-position which should be about 2.5 volts DC. The link from PL3,4 to earth which enabled the receiver audio can now be removed and the squelch pot. (VR3) adjusted so that the squelch just opens on weak signals. The signal generator should now be removed and PL2,2 and be coupled to PPL2,1. This connects the 23cms converter output to the IF input and completes the alignment.

This receiver breaks new ground in its simplicity and performance and has been designed to be extremely versatile. It can be used as both a stand alone monitor receiver, or as a 23cms converter. The receiver can also be upgraded with our optional scanning PCB so you can be sure not to miss out on any of the local activity.

Camtech Electonics will service any kits supplied by them provided that they are soldered correctly. Should you have need to return the kit it should be sent by recorded delivery with a cheque crossed 'not over £15'. It is regretted that telephone correspondence cannot be entered into, but if you have any problems please put them in writing enclosed with both your work and home telephone numbers.

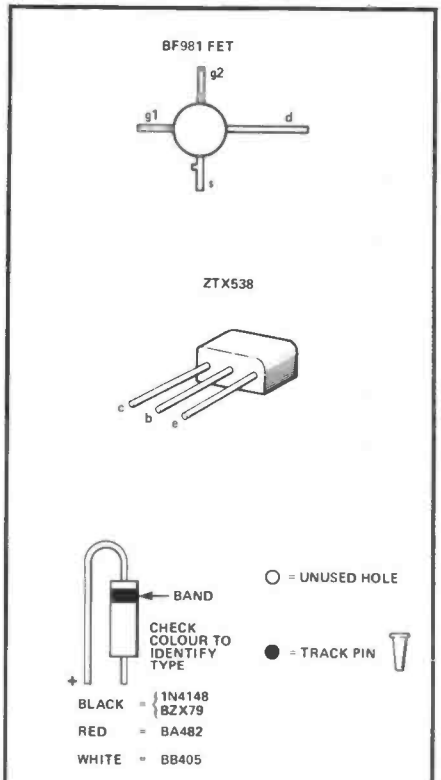


Fig.6 Semiconductor pin-out details.

Components List

RESISTORS

R27	330R
R28,32,51	100R
R29	5k6
R30	22R
R31,55,56,57	100k
R33,58,59,60	15k
R34,46	27k
R35	1k2
R36,47,48,49	1k5
R37	470R
R38,61,62,63	680R
R39,44	10k
R40	330k
R41	2k2
R42,53	1k
R43,50,52	22k
R45	33k
R54	47k
VR3	10k lin pot
VR4	22k log pot

CAPACITORS

C30,43,47,48,49,50,51,55	100n
C31	2u2 16V electrolytic
C32	15p
C33,42,62	47p
C34	1p
C35,60	12p
C36,37,38,39,40,59,61,64, 65,66,67,68	4n7
C44	4u7 16V electrolytic
C45,46,57	1n
C52	22p
C53	150p
C54,56	100u
C63	10p

SEMICONDUCTORS

Q7	BF981
Q8,10	BF199
Q9	ZTX538
IC2	ULN3859A
IC3	ULN2283
ZD2	BZX79C5V6
D6,7	1N4148
D8	BB405
D9,10,11	BA482

INDUCTORS

L8,9,12	MC108 Green
L10	5SPCO2120
L11	5SLO184R
L13,14,15	KXNK3767EK

MISCELLANEOUS

X2	10.245MHz
X3,4,5	44MHz range (see text)
FL1	10M15A filter
FL2	CFU455D filter
PL4	4 pin connector to suit

NB The following components are required for the extra two channels and are not supplied with the kit:

R56,57,59,60,62 & 63
C67,68
D10,11
L14,15
X3,4,5

BIG

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Metre wave

Cognoscenti casting cautious eyes on their radio room barometers at the end of last September were heard to come up on the two-metre band with some such pronouncement as this:
"My barometer says 30.6 here . . . don't ask me how many millibars . . . it's calibrated in good old British inches. It tells me that the pressure is too high for an opening to happen. All the usual markers

"It really was a very big lift": Jack Hum G5UM offers a brief analysis of Anaprop

(meaning the beacons) are at their usual strength. But wait till this lot starts to decline. There will be a *heck* of an opening. And pandemonium will prevail". There was. And it did.

During that last week of September a classic example of anaprop (anomalous propagation) developed as the pressure over Britain slowly went down and metrewave conditions steadily went up. To those aforementioned cogniscenti it was nothing new: they had experienced it all before. But to the thousands of later recruits to the metrewave scene it was unusual and exciting. *'What has been happening?'* they asked, adding that nothing like this was described to them on their RAE courses — which was not surprising: to do justice to the many and varied mechanisms that govern anaprop at VHF and UHF you would need a series of tuition courses devoted to nothing else.

'Do not adjust your sets . . .'

That same last week of September had the television services exhorting viewers not to adjust their sets. *'Reception is being affected by weather conditions'* they said. And if the colour television frequencies in the 500MHz region were being affected then assuredly the metrewave amateur frequencies would be affected too. They were. It was an opening to write home about.

Anaprop, the bane of broadcasters, is a boon to hams. During the great lift they assembled in hundreds in the SSB segments of Two and Seventy. Even soporific Six began to exhibit an unwonted occupancy, while on Four, where new countries, counties and squares are difficult to raise, there was inter-UK communication on an unusual scale.

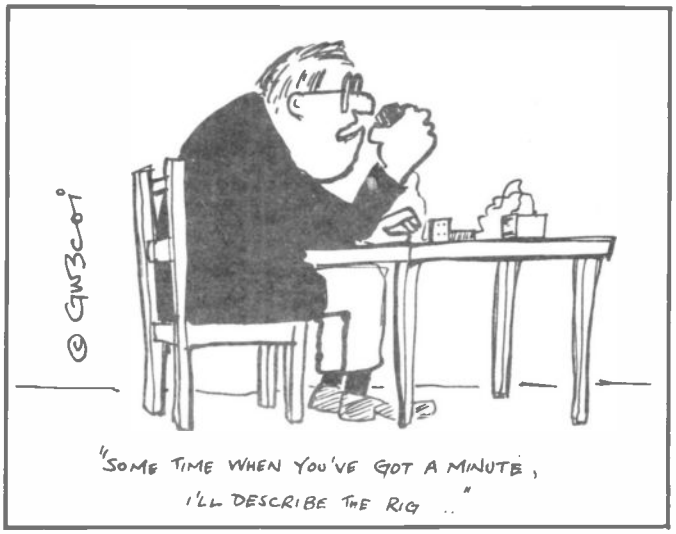
Inevitabaly, when continentals were being worked by the shoal from the UK, formula QSOs were the order of the evening. 'Get them completed quickly by saying the routine things, work as many stations as you can in any given square in the hope that at least one of them will contribute a QSL towards that coveted award.'

This, as always during anaprop, was the philosophy prevalent in the big opening of last September.

New experience

But there was another very different facet to it, and this was the opportunity lent to FM-only operators, especially the more recently licensed, to extend their horizons as never before. It cannot be denied that the excitement of the chase develops when anaprop manifests itself. No matter that much of the FM communication with the Continentals was via their (or our) repeaters: it made a change from the routine of chatting with Charlie down the road through that no-gain omni antenna on the chimney stack. Deep down in the being of nearly every radio ham is the desire for DX — and the events of September 1986 fulfilled this desire in no small measure.

Something else that develops on such occasions is the urge to obtain a piece of cardboard to show that it all really did happen and that one really did talk not just to Charlie down the road but also to Curt in Cuxhaven and Louis in Lyons. No wonder the



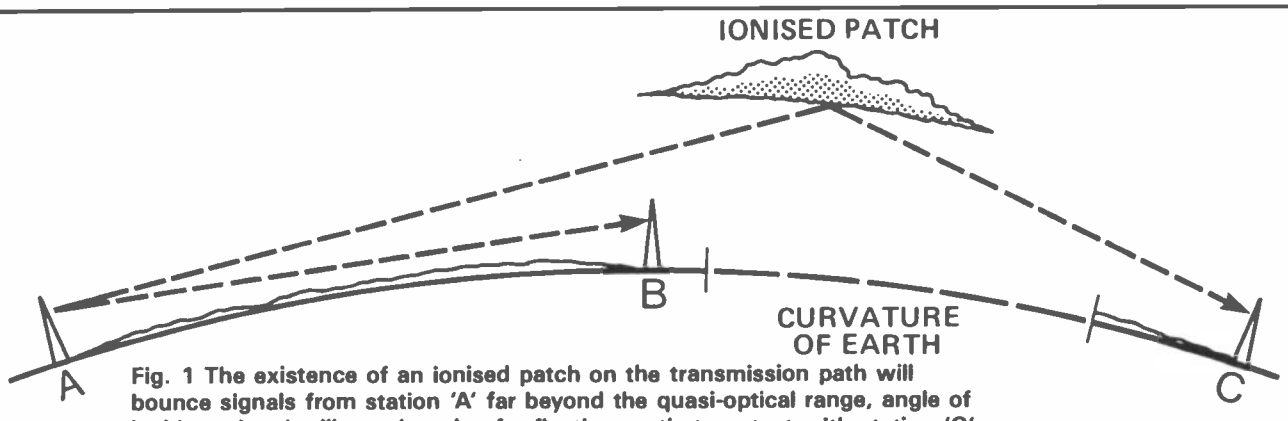


Fig. 1 The existence of an ionised patch on the transmission path will bounce signals from station 'A' far beyond the quasi-optical range, angle of incident signal will equal angle of reflection so that contact with station 'C' could be at many hundreds of miles.

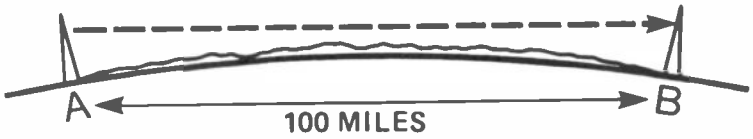


Fig. 2 Normal communication range to be expected at metrewave. Station 'A' will be audible at station 'B' in any conditions if gainy antennas are in use at both sites and solid obstructions are minimal. This is 'line of sight plus'.

phrase *'My QSL sure via buro'* was all-pervading. No matter that many of the QSL cards, being for through-repeater exchanges and not for real QSOs, were of no value. The memento was worth asking for — and giving. So thought many.

Diverse mechanisms

A slowly declining high pressure system plus those 'Don't adjust' warnings on TV, represent the more obvious and easily recognisable symptoms of an opening imminent, or already there. But there is a diversity of other mechanisms of nature that induce long distance communication in the metrewave spectrum. Of these, sporadic-E is perhaps the next best known after the 'warm weather effect'. Another is aurora. All of them rely on the development of reflecting layers 'upstairs' capable of bouncing UK signals out to QRBs far beyond the normal 'line of sight plus' range, and not at all dependent on high barometric pressure. Most obligingly, an intense auroral manifestation greeted the opening of the 6 metre band back in freezing February of 1986. Scores of the stations who were worked at that time have never been heard of again!

Meteor scatter is yet another mode of operation to be attempted by the more experienced — and patient — metrewave aficionados. It has been covered in some excellent contributions to *HRT* written by those who know. Let it never be forgotten, though, that 'lifts' at metrewave are the exception rather than the rule in the high latitudes of the British Isles. Yet the prospects for working DX on the 'very highs' exist more often than might be thought. While it is exciting (and perhaps all too easy) to cover hundreds of miles under anaprop conditions it is even more rewarding to do so at low signal levels and with only a few watts, 'winkling them out' when the bands may appear to be dead but in fact aren't. Try it — but get yourself a good beam aerial first.

METREWAVE DX CHASERS CHARTER

1. Do not call CQ when 2m and 70cm are overfull. Instead —
2. — pick off one by one, stations in wanted countries and squares: work several of them to ensure that at least one will QSL. Do this by —
3. — using the tail-ending technique; as a wanted station completes a QSO give him/her a quick call using wanted station's callsign once and yours twice. In all circumstances —
4. — keep calls brief: avoid needless waffle like 'This is the British station Germany One so-and-so', remembering that —
5. — 'Germany' is not a preferred prefix: use 'Golf' or even good old patriotic 'George', which are shorter and better understood by overseas stations.
6. Be prepared to revert to CW anywhere in the lower meg of 2m and 70cm: it will get through the QRM and QSB when even SSB doesn't.
7. Select QSY frequencies substantially away from centres of activity (new phrase for 'calling frequency'), but never encroach on zones designated for different modes from the one you are using.
8. If you must talk to distant stations through repeaters keep overs brief: hordes of other operators are wanting to do the same, but if you must, then —
9. — never promise a QSL for a through-repeater exchange: you have worked the repeater, not the other party, and it is not a QSO.
10. Never get over-excited or ill-tempered during an opening: it will all happen again another time.

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FOR SALE

AR88D communications receiver, excellent condition, £80. Sony dual standard, 9 inch television, VHF/UHF mains or 12-volt, £40. ST605 SLR camera with standard lens (Fuji), meter, not working, £20. Wanted: HF accessories and equipment. Keith, G0GFD, Locksheath 83870 (South Hampshire).

FOR sale: Trio receiver, model JR-310, plus extension, speaker SP-50, both in mint condition, £60, plus manual or will swop for any radio gear, aerials, rigs, etc. Will consider CB gear. Phone 021 5251254, Shaun.

COMMODORE 64 computer, cassette, colour monitor, Simons Basic, books, games, worth £400, sell £250. Consider exchange for 2 meter mobile rig, preferably multimode or WHY. Tel. 021-421-5625 after 5 pm.

TEN-TEC Corsair for sale. Immaculate, including 8 pole SSB filter, 500Hz CW filter, complete with Shure 142A hand mike and BNOS 25A PSU (Ten-Tec 18A circuit breaker). Going QRT, reluctant sale, £850 plus carriage. Phone 0698 883306 any time.

ACORN Electron, set input mags, Elftone tape recorder, £40. Heathkit HW8 with PSU, £60. G3BPE 0373 826939.

YAESU FT101ZD nine bander with DC/DC converter and FM board. Cabinet slightly soiled, £420. Contact Dave, G40TV on (08926) 4763.

BBC computer, sideways ram, Opus high resolution colour monitor, twin double sided 40/80 track, switchable disk drives, modern, Quinkey, BBC data recorder, Epson RX80 printer, View word processor chip, hundreds of programmes, £999 the lot. David Bowen, Weymouth (0305) 871437.

KW2000B transceiver, Shure hand microphone, manual and circuit, set of spare valves. Reason for sale, gone home brew, £175. Buyer collects. Phone John, GM4AQO, Kirkcaldy (0592) 266287.

FOR sale, Yaesu FT290R with microwave modules, MML144/100-LS, 100 watt linear amp, also Tonna 9 ele crossed Yagi, £350 ono, Western DX24Q, 2 ele quad, 10, 15, 20m, £100 ono. Phone 0885 83428 after 6 pm please, G4ZWY, Steve, QTHR.

KF430 70cms mobile inc. bracket and mic, £110 ovno. TR2200GX 2m portable inc. bracket, mic, 12-chs and Nicads, plus VFO-30G and 15w PA, £125 ovno, MM 144MHz to 28MHz transverter, £75 ovno. Hal DS-2000KSR rtty/cw/ascII terminal, £125. G30JI QTHR, Ware 4316.

TELEREADER CWR67SE, new in Feb. 1986, bargain, £300. Bognor Regis 826449 after 6 pm.

ICOM 2-metres FM, hand-held digital transceiver, 1 watt or 5 watt, 10 memory channels, scan, etc, absolutely brand new due to failure to get licence. Still boxed, £195. Bourne End 23514.

BARGAIN, IC2E hand portable, £900. Microwave modules, 30 watt linear amp (suitable for above), £300. Hansen 1kw SWR and power meter, £12, all in excellent condition. Phone Ivan on Watford (0923) 30762.

SIGNAL R517 hand-held airband receiver, plus case, £45 or nearest offer. Also Amstrad 6010 multiband radio, likewise in very good condition, £15. Phone (0952) 618761.

REVOX A700 professional open reel, half track stereo tape deck for sale, three speeds, maximum spool diameter 10.5 inches, four channel input mixer, also remote control facility, £650. Telephone Tim 021 523 8526 after 6 pm or 021 351 7020 anytime.

FOR sale Yaesu FR50B receiver 160m-10m, good condition, £55 ono. Phone Charlie, Lincoln 46798 evenings.

NPR-934MHz Commtel transceiver in mint condition, fitted with scanning microphone and other extras. Cost £495, selling for £290. Postage and packing paid. Reason for selling, going QRT. M. Marsden, 205 Moss Lane, Burscough, Ormskirk, Lancashire L40 4AS. Tel (0704) 892088.

SONY 2001D, full coverage, 32 memories, mint, £250. (0934) 732700 (Somerset).

JAYBEAM DI5/1296 23cms Yagi (new), £36. Datong SRB2, woodpecker blanker unit, £55. EME 13cms, 7289 24w PW with valve, £230. Kenpro KR500 elevation rotator, as new, £95. Phone Paul G4XHF (0293) 515201.

4-400A valve and HT transformer, two main components to built 700w HF linear, CW circuit diagram, £18. Raybould, 9 Upper Albert Road, Sheffield S8 9HR.

YAESU FC700 ATU 3.5-30MHz, £110, for FT707 etc. Stacker 9FDX 80 channels, UKFM SSB AM, £80. PSU 3A, £8. Tagra 3 element 11m beam antenna, £35. BV131 linear 10m, £80. Please phone Adam 01-874-2142, G0FJJ.

FOR sale, new Trio MC50 Dynamic microphone, £30. Trio VFO520, £50. SP520, £20. Himound key, HK-706, £25. Heathkit valve voltmeter, £10. All in mint cond. Tel. 0246 36496.

TRIO 2200G, very good cond, complete with Nicads, telescopic and rubber helical aerials, BASG charger and mic. Channels include from SIG to S23 plus repeaters, only £75. VGV, Phone (09015) 8819 after 6 pm, ZAC QTH, nr Wetherby.

SX200 scanner, AM/FM modes, coverage 26-88MHz, 108-MHz, 380-514MHz, 16 memories, with indoor/outdoor Gemscan antenna, plus MPU with manual, box, in vgc, only £160. Tel. 01-390-2650. Carriage extra.

MM 144/432R transverter, 3w or 10w input, 12w output, recent realignment by MM, £100. MM 432/50 70cm 50w linear, new, unused, £110. G3MEW, 24 Ascot Road, Copnor, Portsmouth, Hants PO3 6EY (0705) 820315.

ICOM 745 transceiver, 1.8-30MHz, general coverage, FM board fitted, SM6 mike, listening use only, £700. Mini quad, 10-15-20 metres, £100. Wormley 3017 (Surrey).

PARMEKO 50 watt valve amps. Ideal home brew linears, transverters, etc. Good for electric guitars, £12 each. Few non-workers, less valves, £3 each. Circuit available. Vintage Zetavox automatic radio, rosewood cabinet, on legs, offers invited. G0DLN, 01-657 0716 evenings (Croydon).

CONVERTED Cobra 148 GTL DX, 28:00MHz to 29.700, also Nato 40 FM 29:300 to 29:700, both professionally converted. Offers or swap for QRP HF rig. Nato combs with 25w linear. Bob, GM0ECU QTHR, 0563 35738.

FT757GX with mic, £550; FT757HD PSU, £120; TR10 TS780 with mic, £670; TR10 MC-60 mic, £40; Welz AC38M ATU, £45; G-Whip mobile antenna, 10-160M, £30; Drake, low pass filter, £10. Large items, must be collected. Brian, G4TGN, 01-897 3794.

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SS TV Drae, SS TV transceiver, absolutely mint condition, with Hitachi HV62K camera, microphone and all connecting leads, wired for FT290, £280. PFI pocketfones on RB2, with batteries, £22.50. Phone Fakenham, Norfolk (0328) 711192.

BELCOM LS102 mobile rig, 10m, CW/AM, FM/USB, manual/auto scan on Yaesu MH1138 mike batt, b/up for memory, C/W internal charging, 100Hz/1KHz steps, 26-30MHz, h/book, std. mike, 10w o/put, £195 ono. Ring Brian, G1UWV eves, New Milton 0425 615860.

B40D for sale, has problem which current owner does

have knowledge to correct — probably not serious, any offers? Buyer collects. Contact D. Cleak, 8 St. David's Road North, St. Annes, Lancs. Tel 0253 727589.

ICOM 735 with power supply, mint condition, £780 ono. Icom 3200 dual band FM mobile with dual band antenna, £410 ono. Complete rtty station, BBC B, sideways ROM including rtty, monitor, quality printer, terminal, console, valued £940. £600 ono. 0227 276004.

YAESU FT2F transceiver, X- talled S20, 21, 22, 23, 24, R0, R1, 2, 6, 7 144-480 10 watts output, £50. Hallicrafters Sky Challenger, believed circa 1938, £100. Wanted: manual for Sony 2001 mike. 10 Doverfield Road, London SW2 5NB (no telephone).

HAM-MASTER speaker, 8 ohm, noise filter, extension or mobile, £5; crystals 10X 500 KC/S, 1000 KC/S, octal 1000 KC/S for freq meter SCR 211B. BYG 98.1 KC/S, 99.75 KC/S, 100 KC/S, £1.75 each. Edwards, 32 Heldhaw Road, Bury St. Edmunds IP32 7ES. Tel. 0284 60984.

FT77 FM/SSB W-N CW mobile bracket, immaculate, hand mike, manual, original packing, nearest £325 or 70cm FM (not portables) with VSWR and antenna WHY? Must be similar condition. May accept working test gear for V/UHF included. Phone Kevin 0782 314383 evenings.

HALF PRICE: FT1, all options, £1200, FT780R, £300. MML 432/30L linear, £84. MMC 435/600 converter, £20. MTV 435 ATV TX, £100. Last chance, otherwise dealers will get in. So no time wasters please. Ring 0980 862489, G3BKL, Ron QTHR.

YAESU FT101Z, no mods, excellent condition, £375 no offers. Coventry 0203 456128.

AOR 2002 VHF UHF 25-800 1.3, gigs, AM, FM, NFM, PSU bargain, £325. Astatic black eagle mic, £35. 45 watt 26-30MHz multimode burner. Bremi, £30. Audioline 40ch CB81, £25. SWR meter, £3. Peter, 31c Anerley Park, Penge SE20 8NF.

AMSTRAD PCW8256 with CPS8256, about 20 discs inc spreadsheet, database, WP and various public Domain software, all GWO, £425 ono. Tel. (0734) 734263 evenings.

AR40 rotator, 70ft control cable, £50; pair 813s, £15; Kenpro 1 to 1 Balun, £12; Shure 201 mic, unused, £15; Avo Model 7 leads, carrying case, £20. Tel 0494 30019.

LIMPET magnetic mount, fitted with lazer magnets for extra strength and 5mm low loss coax, ideal radio amateur, CB, new, £20 post paid; heavy duty power supplies, input 180-260v, output 54v at 300 watts, £20 each, buyer collects. Tel 0704 892088 (afternoons/evenings).

HQ1 Mini Beam, excellent condition, £100; also Tektronix 545A oscilloscope, good working condition, sensible offers considered. Tel 01-391 0514 (evenings).

ICOM 290D multimode 2m transceiver, 5w-25w, £375; Icom SM8 desk mic, £35; Icom 245E 2m multimode, £195; SEM Sentinental 2m linear, output = 4 × input, maximum 50w with pre-amp, £30. G1DVC QTHR, tel 01-843 0191.

Q.R.O. Redifon linear amp transmitter, own driver and exciter, 1.5 through to 30MHz, switchable power, low/medium/high, perfect working order, single phase 240v, can deliver, manuals and diagrams included, £600 or 2m or HF WHY. Tel 0248 355635 (evenings).

FT209RH, mint condition, boxed, with FNB4 battery pack (5w), NC-9C charger, YH-2 headset, MMB-21 mobile bracket, £230 ono or would consider exchange for FT290R (cash adjustment either way depending on condition). Tel 07948 286, G1SJV QTHR.

FOR sale, Trio TS530S with narrow SSB and CW filters, matching speaker and ATU, Adonis base mic, low pass filter, £400 the lot. Bob, G4MZO, Canvey Island 697906.

PRINTER, Tandy DMP-100 matrix printer, compact, 80 column, RS232 and parallel interfaces, tractor feed, prints enlarged and graphics, £100 including carriage; Mitsubishi 40/80 track double sided bare diskette drive, £90 including carriage. Roger, G6HQK, 0902 69285 (evenings).

TH21E, TH41E trncrs, BT2, DC21, EB2, HMC1, PB21, PB21H, BC6, SC8, SMC30, AD1, etc. access, over £700 worth for sale, £400 ovno. Telephone G6ZNU (day) 01-242 1234 ext. 2981, (eve) 01-886 3548.

LOOK, AOR factory service manual for AOR 2001, AOR 2002, MX 5000, MX 7000, 63 phases, A4 size, 7 A3 circuits, total copy for £20, plus 0.64p postage. Ring for this hard to obtain s/manual, 04738 5526 any time day or night to 11 pm.

FOR SALE, Yaesu FRG7700M general coverage receiver, fitted with 12 channel memory, also matching FRT7700 ATV, both in mint condition, boxed, £300. Tel. Martin, after 6 pm, 0732 882982 (Kent).

WANTED

WANTED, a copy of CB World magazine, January 1982. Contact Tom Valentine, 38 Grampian View, Montrose, Angus, tel 0674 76503.

HEATHKIT RA1 wanted, handbook or alignment details, to buy, borrow or photocopy, your price paid. Mr R. Jackson, 126 King's Lane, Ballykelly BT49 9JY, tel 05047 65841.

WANTED, Radio Amateur's Handbook, April 1986 and 1985, circuit diagram for BC455, Q Fiver command receiver. G3GDC, Plymouth (07527 43551.

MANPACK transceiver wanted for the HF bands, solid state only, BG PRM 4031 or TRA 931 (Syncal 30). Tel 0432 50226 (evenings).

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WANTED, Tektronix 555 dual beam scope, complete or otherwise, particularly need right hand high voltage transformer and associated CRT circuit components. Write with details to M. J. Lee, Baroda, Lower Waites Lane, Fairlight, Hastings, East Sussex TN35 4DB.

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WANTED, FT290 mobile mount, details of Fax reception using BBC micro. Tel Ted G4MID, 0359 31520 (Suffolk).

WANTED, early wireless and crystal sets, particularly WW1 sets or parts, early valves, horn speakers, bound volumes Wireless World, catalogues, pre-war television; also interested in a good HF transceiver. Jim Taylor G4ERU, 5 Luther Road, Winton, Bournemouth, tel 0202 510400.

WANTED, HF transceiver for partially sighted operator, good condition, TS430 TS130 preferred; also interested in any matching ancillary equipment. Tel 0908 75499.

WANTED, base or mobile multimode transceiver, eg Ham Jumbo, Cobra 148GTLDX etc to cover 11 metres, must be in good condition. Write with details SU08 Jim, PO Box 8, Dumfries DG1 1AA. I will pay carriage of transceiver.

WANTED, Codar 250S/ACPU, old Heath RA1/RG1 RXs, any condition, for research projects, radio tuners, types Armstrong AM44, Pye HFT111W, Eddystone 820 and Chapman S6BS. Details and price to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

WANTED, May 1985 Radcom or photocopy of article dual conversion multimode IF/AF strip. Tel Runcorn 719776 or write Chris, 126 Lockgate, West Runcorn, Cheshire WA7 6LE.

WANTED, 3N141 transistors, LFDT4 and OPTI driver/output transformers, also Hallicrafters 5/10 receiver, must be in good condition. Write or telephone R. Hastie, 41 Elm Grove Drive, Dawlish, Devon EX7 0EY,

Dawlish 862918.

WANTED, circuit diagram/ alignment details, service manual or any other info on Cleartone 331A FM Hiband transceiver, any info copied and returned. Tel Bob G1HOP, Coventry 621524 (after 6 pm).

WANTED, Cobra 148 Superstar 360 ham multimode or Concord Hygain Major or any other similar working or non-working transceivers for conversion, up to £60 depending on condition, London and surrounding areas only please. Tel 01-805 1306.

WANTED urgently, tower and beam and any sideband rigs, Gor, best price paid. Tel St Annes (0253) 714076.

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WANTED, BE600 UHF handportable or Pye PFX or Pye PF85. Also wanted, service manual for boot mount Pye Whitehall. Pleae give me a ring, G1DRR, 0302 835280.

WANTED, Trio VFO120, also Yaesu CPU2500R FM trans, both must be in excellent condition. Tel Weymouth (0305) 813202, G4OWY.

WANTED, Kokusai MF455 mechanical filter, 10K or 15K unit, prefer with crystals. Also Shure 201 ceramic Hi2 hand mic. Tel Peter, Taunton (0823) 75973.

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WANTED, Yaesu FR101D or DD receiver with all crystals, etc, good condition essential, in exchange for Trio TR9000 2m multimode and microphone, in excellent condition. G. Matthew, GM4BHH, 2 Old Milnafua Road, Alness, Rossshire, Scotland IV17 0TW, tel 882941.

WANTED, Yaesu FT209RD handheld, FT290R multimode mobile, in good condition, and accessories if any; also good receiver, full coverage model. Tel John, 01-272 9275.

WANTED, Trio 430S or Yaesu 707 75.7GX, any HF TX/RX, condition not important as buyer requires a radio for mobile use only. Prices please, John, 0734 411501.

WANTED, SWR/power meter, 432mHz, 70cm band, also AM/FM CB radio. Mr P. D. Beech, 66 Newpool Road, Knypersley, Staffs ST8 6NS, tel 0782 516213.

WANTED urgently, CW crystal filter type XG-455C for Trio receiver R-2000. Tel 0689 883306 (anytime).

WANTED, Yaesu accessories, monitor scope for 902 transverter modules, 4/6m, wanted, 3 element mini beam, prefer TET but will consider other makes, have HQ1 to sell, swap or PX. Martyn, 112 Leeds Road, Mirfield, Yorks, 0924 495916.

WANTED, top band transceiver, anything considered, must have at least AM + CW. Also wanted, Kenwood T-599S HF TX, any condition. Tel Peter G1TXI on Norwich (0603) 748338 (evenings only) or QTHR.

WANTED, Mullard high speed valve tester operator's manual or photocopy, also workshop manual for Yaesu FT707. Please contact Mr Fox, 558 3522 (after 6 pm).

WANTED, IC260 A or E, FTV707, Txvtr, FT707, FT107 (QRO versions only), ELH230D Alinco linear. Do you have any of the above in perfect condition? If so, contact Mark, G4RGB, Medway (Kent) (0634) 30822, must be in Kent, S. Essex, etc.

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WANTED for Marconi TF1041 valve voltmeter, Eimac 2-01C coaxial diode. For Hewlett Packard 431B (CT495) power meter, thermistor mount type 486A, 8441A 20dB attenuator, adaptor coaxial to waveguide. Bill James, G6XM, 56 Fern Meadow, Okehampton, Devon EX20 1PB, tel 0837 2923.

WANTED, BC348 or BC342 and KW Vanguard or Geloso G212, condition of equipment unimportant as will be rebuilt. Write Harrison, 65 Cyril Street, Northampton NN1 5EJ.

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EXCHANGE my HQ-1 mini quad for 6-10-15-20 metres in very good condition with spare spokes for ATV equipment or frequency counter or 70cm equipment or WHY, to swap or will sell for £75. Tel Rotherham (0709) 554665.

EXCHANGE Akai 4000D professional reel-to-reel tape recorder in excellent condition with alloy spools, for Bird Thru-Line wattmeter and plug-ins for 28MHz. Tel 0380 830654 (Wiltshire).

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JR310 Trio receiver. I need a power transformer for mine. Can anyone help? Will buy complete RX working or not or just transformer, price with post please. Mr Harmer, 9 Park Square, East Jaywick, Clacton, Essex CO15 2NL.

EXCHANGE Sanyo 9300 Beta video recorder, works well, for 9R59DS or similar small general coverage receiver. Also wanted, Trio SP230 and Trio AT230 ATU. Tel Paul G6MTU, Norwich (0603) 39925.

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ICOM MICRO 2
HANDHELD

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ICOM IC-02E

£275

ICOM IC-735

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ALL SONY UK SUPPLIED

SONY AIR 7
PORTABLE-AM-FM
144-174MHz
108-136MHz
150KHz-2194KHz
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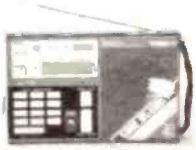
SONY ICF 200ID
76-108 MHz
116-136 AIRBAND
160KHz-29995MHz
FM - AM - SSB 32 MEMORIES
INC PSU
£325

SONY ICF 7600D
76-108MHz
162kHz-29995MHz
MEMORIES, FM, AM, SSB.
£164



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WIDE RANGE OF YAESU/ICOM, TRIO/KENWOOD, H.F., V.H.F., U.H.F. SCANNING RECEIVERS AND TRANSCEIVERS IN STOCK ICOM ICA2 ALL CHANNELS TX/RX 5 WATTS, 108-135 AND 175 MHz £450 — COMMERCIAL, PROFESSIONAL, MARINE, CELLULAR AND AMATEUR RADIO SALES AND SERVICE.

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FT767 YAESU

FULL HF GENERAL COVERAGE TRANSCEIVER
+ 6M-2M+70cm
£1395

ACTIVE ANTENNAS

dressler – ara 30 – active antenna

200 kHz . . . 40 MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glass fibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £120. See Review in August Issue p.15

DRESSLER
ARA 500
ACTIVE ANTENNA
50MHz to 1300MHz
Gain 17dB Typical

TECHNICAL SPECIFICATIONS FOR ARA 500

Gain	17dB Typical (14-17dB)
Frequency Range	50-1300MHz
Noise Figure	1dB at 50-180MHz 1.5dB below 300MHz 2.0dB below 350MHz 2.7dB below 400MHz 3.0dB below 500MHz 3.8dB below 650MHz

£129.00

Operation is possible up to 1300MHz with gain of 10dB
Noise 4-6dB
Intercept Point 3rd Order: +18dbm at Input
Post £2.50 or Securicor £6.00 extra

LINEARS

D200 2 MTR 500W SSB	**£858**
D200S 2 MTR 750W SSB	**£1018**
D70 70 CMS 550W SSB	**£1030**

PRE-AMPS – NEW MODELS

MODEL	FREQ.	NOISE	GAIN	POWER	PRICE
EVV1296C	1.25-1.3GHz	0.9-1.2	16-18dB	100W	**£154**
EVV700SMD	430-440MHz	0.5-0.9	15-18dB	500W PEP	**£117**
EVV2000SMD	144-146	0.6-0.9	16-18dB	1KW PEP	**£117**
EVV200VOX	144-146	0.6-0.9	16-18dB	700W PEP	**£107**
EV2GAAS	144-146	0.6-0.9	15-18dB	100W PEP	**£75**
VV INTERFACE FOR ABOVE PRE-AMPS					**£31**

RECEIVE PRE-AMPS

MODEL	FREQUENCY	NOISE	GAIN	PRICE
EWPA 560	50-600-1GHz		16.5dB-1dB	**£79**
EWPA 560(N)	50-600-1GHz		16.5dB-1dB	**£89**
IP3 order	+18dBM			
ERPA 1296	1.25-1.30	0.8	17-18dB	**£114**
ERPA 435	430-440	0.5	15-18dB	**£65**
ERPA 144	144-146	0.7	16-18dB	**£60**
ASA 12	0-1GHz	Masthead Antenna Switch		**£59**

NEVADA 934 MHz EQUIPMENT

Have you tried this exciting new band yet? Available for private or business use, by simply purchasing a £10 licence from any post office. Range is from 10 - 250 miles according to your location and WX conditions.

DELTA 1 934 Mhz TRANSCEIVER

£365

THE DELTA 1 IS A STATE OF THE ART TRANSCEIVER AND NOW IN USE BY OVER 70% OF 934 MHz ENTHUSIASTS!

FEATURES:
- Scan facility.
- 16 channel memory/scan.
- Sensitive RX.

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P7M-E Mag. Mount. 7dBi Antenna	£49.72
P714R-E GTR Mount 7dBi Antenna	£49.72
PA7-E Base Colinear 7dBi Antenna	£67.75
PA15 Base Colinear 11dBi Antenna	£79
TC12L 12 Element Beam 18dBi Antenna	£39
HRA 934L in line Pre-amp	£139.95
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934 MHz £1

Each catalogue is packed full of info. and includes a £2 voucher.

NEVADA AMATEUR PRODUCTS

HIGH POWER VARIABLE CAPACITORS

IDEAL FOR ATU's OR AMPLIFIERS UP TO 3kW

TC 500...26-500 pF	£28 (£2 p.&p.)
TC 250...13-250 pF	£19.95 (£1 p.&p.)

HIGH POWER "ROLLER COASTER" VARIABLE INDUCTOR

NEW £24 (£1 p&p.)

Suitable for 1 kW ATU
Frequency: 1.8...30MHz
IND: 26.5 uH
SIZE: 5½ x 10½ x 14½ cm

SPECIAL OFFER

TC250, TC500, & ROLLER COASTER, COMPLETE FOR ..... £59 (£2 p&p.)

NEW LOW PRICE 2 MTR HAND HELD

CT1600 Through bulk buying we can now offer this superbly sensitive handheld at an all time low price. Unit covers 2 Mtr Ham Band Plus 142-149 Mhz (For Export)

£167

- Repeater Shift
- Hi/Low power ½ - 1½ Watts.
- Thumbwheel Freq. Selector.

Each set supplied C/W re-chargeable battery pack and free mains charger unit.

VHF MOBILE AMPLIFIERS

MOD. B110 144 MHz 110 Watt FM Plus Low Noise Pre-amplifier Switcheable	£169
MOD. B42 144 MHz 40 Watt FM Mobile AMP.	£64.66

SEE OUR HAM CATALOGUE FOR FULL RANGE

RF AMPLIFIERS

All amplifiers except broadband (2-30 MHz) models are tuned for 29.6 MHz centre freq. Should you require a lower freq. ie. 28.5 MHz please state when ordering. Export models available for 26-30 MHz.

C.T.E. MOD 767

£49.90

76 Watts FM (150W P.E.P.)
INPUT:- 0.5-10 Watts
SWITCHABLE:- Class AB, Class C
SUPPLY:- 13.8 Volt
REMOTE CONTROL FACILITY

MOBILE AMPLIFIERS

C.T.E MOD. 737 50W FM (80W P.E.P.)	£44.76
C.T.E. MOD. 767 80W FM (150W P.E.P.)	£49.90
C.T.E. MOD. 757 150W FM (300W P.E.P.) (3-30MHz)	£116.87

ABOVE MODELS HAVE REMOTE CONTROL FACILITY PLUS CLASS AB & CLASS C SWITCHING. (NOT MOD. 737).

ZETAGI B35 25W FM (26-30MHz)	£23.72
ZETAGI B150 70W FM (160W P.E.P.)	£49.96
ZETAGI B300 200W FM (400W P.E.P.) 2-30 Mhz	£136
NEVADA TC35 DX 25W FM (W/LOW PASS FILTER)	£23.99

MAINS AMPLIFIER

ZETAGI B132 SOLID STATE (240W P.E.P.) 2-30 MHz.... £119

SCANNING RECEIVERS

£26

C.T.E. DISCONE WIDEBAND ANTENNA

RECEIVE	70-700 MHz
TRANSMIT	70-500MHz
MAX POWER	500W
GAIN	3.5dB

WIDEBAND DISCONE RECEIVING ANTENNA (3 Element) 70-500MHz £24.95

NEW BEARCAT H/HELD SCANNING RX. MODEL 100XL

£229

Receives 8 bands plus aircraft band. 16 Channels priority keyboard lock and lighted display.
66-88 MHz 118-174 MHz 406-512 MHz

BEARCAT 175XL

£209

Base receiver covers:-
66-88MHz
118-174MHz
406-512MHz
with 16 channel memory/scan

BEARCAT DX1000 COMMUNICATIONS RECEIVER

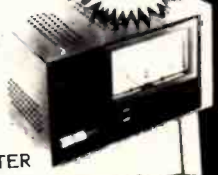
£379

Direct access communications 10KHz-30MHz with 10 channel micro-processor controlled memory.

TEST EQUIPMENT

ZETAGI DL150 RF DUMMY LOAD AND POWER METER

£85.19



A very accurate unit for the service dept. or discerning enthusiast.
FREQ:- 0.5MHz-500MHz
POWER:- 150 Watt Max in 3 ranges 0-3, 0-15, 0-150W.

ZETAGI 500 SWR AND POWER METER

For the enthusiast who wants the very best. A twin meter unit with push button control for either 75 OHM or 50 OHM cable.
FREQ:- 3-200MHz
POWER:- Up to 2KW

£41.46

FD 1350 1.3GHz FREQUENCY COUNTER

FREQ:- 10Hz-1.35GHz
SENSITIVITY:- 43mV at 1GHz
DISPLAY:- 8 Digit
SUPPLY:- 9-12 Volt DC

£139.53

NEVADA

HIGH QUALITY BRITISH MADE 29MHz FM PRODUCTS

NEVADA TC35 DX

£23.99

R.F. POWER AMP. WITH HARMONIC FILTER
INPUT:- 1-4 Watts
OUTPUT:- 25-30 Watts
SUPPLY:- 13.8V DC
FREQ.- 26-30 MHz

Can be centred on 29.6 MHz or 28.5 MHz (state which). A new top quality amp. which now features harmonic filter to reduce harmonic O/P.

NEVADA TC27 RX RECEIVER PRE-AMP FOR 26-30MHz

A superior low noise pre-amplifier for 29MHz FM operation. Variable gain -6dB's to +18dB's suitable for use with transceivers up to 25 Watts output.

£23.99

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