FOR THE RADIO ENTHUSIAST ...

Practical Wireless

FEBRUARY 1983

Australia $1.35
Malaysia $4.95
IR £1.26 (inc. VAT)

85p

ANTENNA SPECIAL
From VLF to VHF

NEW SERIES 'ANTENNAS' by F.C.JUDD

Also
LMS REGENERATIVE RECEIVER

MAIL ORDER OR RETAIL FROM THE COMMUNICATION CENTRE OF THE SOUTH

TO ORDER ANY OF THE ITEMS LISTED BELOW SIMPLY WRITE ENCLOSING A CHEQUE OR PHONE AND QUOTE YOUR CREDIT CARD NO. – WE DO THE REST!

Bredhurst electronics

WELZ SP15M £29.00

WELZ		£	c&p
SP15M	SWR-PWR Meter HF/2M 200W	29.00	(1.00)
SP45M	SWR-PWR Meter 2M/70cm 100W	45.00	(1.00)
SP200	SWR-PWR Meter H.F./2M 1KW	59.00	(1.50)
SP300	SWR-PWR Meter H.F./2M/70cm	79.00	(1.50)
SP400	SWR-PWR Meter 2M/70cm 150W	59.00	(1.50)
SP10X	SWR-PWR Meter H.F./2m compact	19.95	(0.75)
SP380	SWR-PWR Meter H.F./2M/70cm compact	49.00	(1.00)
AC38	A.T.U. 3.5 to 30 MHz 400W PEP	59.00	(1.00)
CT15A	15/50W Dummy Load (PL259)	6.95	(0.75)
CT15N	15/50W Dummy Load (N type plug)	11.95	(0.75)
CT300	300/1kW Dummy Load 250MHz (SO239)	44.00	(2.00)

SWR – POWER METERS			
Model 110	H.F./2M Calibrated Power Reading	11.50	(0.50)
YW-3	H.F./2M Twin Meter	11.50	(0.50)
UH74	2M/70	14.30	(0.50)
T435N	2M/70CM Twin Meter 120W	34.00	(0.75)
DAIWA CN620A	H.F./2M Cross Pointers	52.80	(—)
DAIWA CN630	2M/70 Cross Pointers	75.00	(—)

DUMMY LOADS		
DL30 PL259 30W MAX	5.00	(0.50)
WELZ CT 15A 50W MAX PL259	6.95	(0.75)
WELZ CT 15N 50W MAX N type	11.95	(0.75)
T100 100W MAX 450MHz	22.95	(0.75)
T200 200W MAX 450MHz	34.00	(0.75)
DL600 600W MAX 350MHz	29.95	(1.50)
WELZ CT300 1000W MAX 250MHz	44.00	(2.00)

YAESU			
FT1	Superb H.F. Transceiver	1295.00	(—)
FT902DM	160-10m 9 Band Transceiver	885.00	(—)
FC902	All Band A.T.U.	135.00	(1.50)
SP901	External Speaker	31.00	(1.50)
FT102	160-10m 9 Band Transceiver	725.00	(—)
FT707	8 Band Transceiver 200W Pep	512.00	(—)
FP707	Matching Power Supply	125.00	(5.00)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MMB2	Mobile Mounting Bracket for FT707	16.10	(1.00)
FRG7	General Coverage Receiver	199.00	(—)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	329.00	(—)
FRG7700M	As above but with Memories	409.00	(—)
FRT7700	Antenna Tuning Unit	37.00	(1.00)
FRA7700	Active Antenna Unit	36.40	(1.00)
FT208R	2M FM Synthesised Handheld	209.00	(—)
FT708R	70cm FM Synthesised Handheld	219.00	(—)
NC7	Base Trickle Charger	26.88	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FBA2	Battery Sleeve for use with NC7/8	3.05	(0.50)
FNB2	Spare Battery Pack	17.25	(0.75)
PA3	12V DC Adaptor	13.40	(0.75)
FT480R	2M Synthesised Multimode	379.00	(—)
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	459.00	(—)
FT290R	2M Portable Multimode	249.00	(—)
FT790R	70cm Portable Multimode	299.00	
MMB11	Mobile Mounting Bracket	22.25	(1.00)
CSC1	Soft Carrying Case	3.45	(0.75)
NC11C	240V AC Trickle Charger	8.00	(0.75)
FL2010	Matching 10W Linear	64.40	(1.20)
Nicads	2.2 AMP HR Nicads Each	2.50	(—)
FF501DX	H.F. Low Pass Filter 1kW	23.00	(1.00)
FSP1	Mobile External Speaker 8 ohm 6W	9.95	(0.75)
YH55	Headphones 8 ohm	9.90	(0.75)
YH77	Lightweight Headphones 8 ohm	9.90	(0.75)
QTR24D	World Clock (Quartz)	28.00	(1.00)
YM24A	Speaker/Mic 207/208/708	16.85	(0.75)
YD148	Stand Microphone Dual IMP 4 Pin Plug	21.10	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)

FDK VHF/UHF EQUIPMENT			
Multi 750E	2M Multimode Mobile	259.00	(—)
Expander	70cm Transverter for M750E	199.00	(—)

DRAE

Power Supplies					
4 AMP	27.95	(1.50)	12 AMP	69.00	(2.00)
6 AMP	44.95	(2.00)	24 AMP	99.00	(3.00)
VHF Wavemeter 130-450MHz				24.95	(—

ICOM		£	c&p
IC740	HF Mobile Transceiver 8 Band	699.00	(—)
IC720A	HF Transceiver & Gen. Cov. Receiver	883.00	(—)
PS15	Power Supply for 720A	99.00	(3.00)
IC251E	2M Multimode Base Station	499.00	(—)
IC25E	2M Compact 25W Mobile	239.00	(—)
IC290E	2M Multimode Mobile	366.00	(—)
ICR70	Gen. Cov. Receiver	469.00	(—)
IC2E	2M FM Synthesised Handheld	159.00	(—)
IC L1/2/3	Soft Cases	4.25	(0.50)
IC HM9	Speaker/Microphone	12.00	(1.00)
IC BC30	230V AC Base Charger and Hod	45.00	(1.50)
IC BC25	230V AC Trickle Charger	5.00	(0.75)
IC CP1	Car Charging Lead	3.71	(0.50)
IC BP2	6V Nicad Pack for IC2E	29.50	(1.00)
IC BP3	9V Nicad Pack for IC2E	20.00	(1.00)
IC BP4	Empty Case for 6×AA Nicads	6.95	(0.75)
IC BP5	11.5V Nicad Pack for IC2E	39.50	(1.00)
IC DC1	12V Adaptor Pack for IC2E	9.75	(0.75)
IC ML1	10W Booster	59.00	(1.00)

TV INTERFERENCE AIDS		
Ferrite Rings $1\frac{1}{2}$" dia. per pair	0.80	(0.20)
Toroid Filter TV Down Lead	2.50	(0.50)
Trio Low Pass Filter LF30A 1kW	20.00	(1.00)
Yaesu Low Pass Filter FF501DX 1kW	23.00	(1.00)
HP4A High Pass Filter TV Down Lead	5.95	(—)

ANTENNA BITS		
H1-Q Balun 1:1 5kW pep (PL259 Fitting)	9.95	(0.75)
7-1MHz Traps Pair	7.95	(0.75)
T Piece Polyprop Dipole Centre	1.20	(0.30)
Polyprop Strain Insulators	0.40	(0.10)
Small Egg Insulators	0.40	(0.10)
Large Egg Insulators	0.50	(0.10)
4mm Polyester Guy Rope (strength 400kg) per metre	0.18	(0.04)
75 ohm Twin Feeder – Light Duty-Per Metre	0.16	(0.04)
300 ohm Twin Feeder – Per Metre	0.14	(0.04)
URM67 Low Loss 50 ohm Coax-Per Metre	0.60	(0.20)
UR76 50 ohm Coax-Per Metre	0.25	(0.05)

Please send total postage indicated. Any excess will be refunded.

TRIO TS 930S £1154

Amateur band transceiver/General coverage receiver

TRIO			
TS930S	New Transceiver	1154.00	(—)
TS830S	160-10m Transceiver 9 Bands	678.00	(—)
VFO230	Digital V.F.O. with Memories	231.00	(2.00)
AT230	All Band ATU/Power Meter	129.00	(2.00)
SP230	External Speaker Unit	39.00	(1.50)
DFC230	Dig. Frequency Remote Controller	145.00	(1.50)
TS430S	160-10m Transceiver	TBA	(—)
TS130S	8 Band 200W Pep Transceiver	531.00	(—)
TS130V	8 Band 20W Pep Transceiver	433.00	(—)
VFO120	External V.F.O.	93.00	(1.50)
TL120	200W Pep Linear for TS120V	159.00	(1.50)
MB100	Mobile Mount for TS130/120	17.00	(1.50)
SP120	Base Station External Speaker	25.00	(1.50)
AT130	100W Antenna Tuner	88.00	(1.50)
PS20	AC Power Supply – TS130V	54.95	(2.50)
PS30	AC Power Supply – TS130S	96.35	(5.00)
MC50	Dual Impeadance Desk Microphone	29.00	(1.50)
MC35S	Fist Microphone 50K ohm IMP	14.00	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.00	(0.75)
LF30A	HF Low Pass Filter 1kW	20.00	(1.00)
TR9130	2M Synthesised Multimode	411.00	(—)
BO9A	Base Plinth for TR9130	37.00	(1.50)
TR7800	2M Synthesised FM Mobile 25W	257.00	(—)
TR7730	2M Synthesised FM Compact Mobile 25W	268.00	(—)
TR2300	2M Synthesised FM Portable	144.00	(—)
VB2300	10W Amplifier for TR2300	62.00	1.50)
MB2	Mobile Mount for TR2300	20.00	1.50)
TR3500	70cm Handheld	TBA	(—)
TR2500	2M FM Synthesised Handheld	220.00	(—)
ST2	Base Stand	49.45	1.50)
SC4	Soft Case	13.00	0.50)
MS1	Mobile Stand	30.36	1.00)
SMC25	Speaker Mike	15.40	1.00)
PB25	Spare Battery Pack	23.69	1.00)
TR8400	70cm FM Synthesised Mobile Transceiver	299.00	(—)
PS10	Base Station Power Supply for 8400	64.00	2.00)
TR9500	70cm Synthesised Multimode	428.00	(—)
R2000	200KHz-30MHz Receiver	TBA	(—)
R600	Gen. Cov. Receiver	244.00	(—)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	64.40	(1.50)
HS5	Deluxe Headphones	21.85	(1.00)
HS4	Economy Headphones	10.80	(1.00)
SP40	Mobile External Speaker	13.57	(1.00)

TELEREADERS (CW & RTTY)	£	c&p
TASCO CWR 680	189.00	(–)
TONO 500	299.00	(–)
TONO 9000	650.00	(–)

MORSE EQUIPMENT			
MK704	Squeeze Paddle	10.50	(0.75)
HK708	Up/Down Key	10.50	(0.75)
—	Practise Oscillator	8.75	(0.50)
EK121	Elbug	33.00	(0.75)
EKM12A	Matching Side Tone Monitor	10.95	(0.75)
EK150	Electronic Keyer	78.00	(—)

ROTATORS			
Hirschman	RO250 VHF Rotor	39.95	(2.00)
9502B	Colorotor (Med. VHF)	56.95	(2.00)
KR400RC	Kenpro – inc lower clamps	110.00	(2.50)
KR600RC	Kenpro – inc lower clamps	145.00	(3.00)

DESK MICROPHONES		
SHURE 444D Dual Impeadance	39.00	(1.50)
SHURE 526T Mk II Power Microphone	53.00	(1.50)
ADONIS AM 303 Preamp Mic. Wide Imp.	29.00	(—)
ADONIS AM503 Compression Mic 1	39.00	(—)
ADONIS AM 802 Compression Mic+Meter 3 O/P	59.00	(—)

MOBILE SAFETY MICROPHONES		
ADONIS AM 202S Clip-on	21.00	(—)
ADONIS AM 202F Swan Neck +Up/Down Buttons	33.00	(—)
ADONIS AM 202H Head Band+Up/Down Buttons	31.00	(—)

TEST EQUIPMENT		
Drae VHF Wavemeter 130-450MHz	24.95	(—)
DM81 Trio Dip Meter	67.60	(0.75)
MMD50/500 Dig. Frequency meter (500MHz)	75.00	(—)

Co-AXIAL SWITCH		
2 Way Diecast (V.H.F.) SA450	10.00	(0.75)
2 Way Diecast with N sockets	12.95	(0.75)
2 Way Toggle (V.H.F.)	5.00	(0.50)
LAR 3 Way 1KW Switch	16.95	(1.00)

HELIAL ANTENNAS		
2M BNC or PL259 (state which required)	4.50	(0.50)
2M Thread for TR2300 or FT290R (state which)	4.50	(0.50)
70cm BNC or Thread	4.50	(0.50)

MICROWAVE MODULES			
MMT144/28	2M Transverter for HF Rig	109.95	(—)
MMT432/28S	70cm Transverter for HF Rig	159.95	(—)
MMT432/144R	70cm Transverter for 2M Rig	184.00	(—)
MMT70/28	4M Transverter for HF Rig	119.95	(—)
MMT70/144	4M Transverter for 2M Rig	119.95	(—)
MMT1296/144	23cm Transverter for 2M Rig	184.00	(—)
MML144/30	2M 30W Linear Amp	69.95	(—)
MML144/100S	2M 100W Linear Amp (10W I/P)	139.00	(—)
MML144/100LS	2M 100W Linear Amp (3W I/P)	159.00	(—)
MML432/30	70cm 30W Linear Amp (3W1/P)	99.00	(—)
MML432/50	70cm/50W Linear Amp	109.95	(—)
MML432/100	70cm 10/100W Linear Amp	228.64	(—)
MM2001	RTTY to TV Converter	189.00	(—)
MM4000	RTTY Transceiver	269.00	(—)
MMC50/28	6M Converter to HF Rig	29.90	(—)
MMC70/28	4M Converter to HF Rig	29.90	(—)
MMC144/28	2M Converter to HF Rig	29.90	(—)
MMC432/28S	70cm Converter to HF Rig	37.90	(—)
MMC432/144S	70cm Converter to 2M Rig	37.90	(—)
MMC435/600	70cm ATV Converter	27.90	(—)
MMK1296/144	23cm Converter to 2M Rig	69.95	(—)
MMD050/500	500MHz Dig. Frequency Meter	75.00	(—)
MMD600P	600MHz Prescaler	29.90	(—)
MMDP1	Frequency Counter Probe	14.90	(—)
MMA28	10M Preamp	16.95	(—)
MMA144V	2M RF Switched Preamp	34.90	(—)
MMF144	2M Band Pass Filter	11.90	(—)
MMF432	70cm Band Pass Filter	11.90	(—)
MMS1	The Morse Talker	115.00	(—)

D70 MORSE TUTOR £56.35

DATONG PRODUCTS			
PC1	Gen. Coverage Converter HF on 2M Rig	137.42	(—)
VLF	Very Low Frequency Converter	29.90	(—)
FL1	Frequency Agile Audio Filter	79.35	(—)
FL2	Multi-mode Audio Filter	89.70	(—)
FL3	Audio Filter + Notch	129.00	(—)
ASP/B	Auto RF Speech Clipper (Trio 4p Plug)	82.80	(—)
ASP/A	Auto RF Speech Clippers (Yaesu 4p Plug)	82.80	(—)
D75	Manually controlled RF Speech Clipper	56.35	(—)
RFC/M	RF Speech Clipper Module	29.90	(—)
D70	Morse Tutor	56.35	—)
AD270	Indoor Active Dipole Antenna	47.15	(—)
AD370	Outdoor Active Dipole Antenna	64.40	(—)
MPU1	Mains Power Unit	6.90	(—)
MK	Keyboard Morse Sender	137.42	(—)
RFA	Broadband Preamplifier	33.92	(—)
Codecall	Selective Calling Device (link prog)	32.20	(—)
	(switch prog)	33.92	(—)

MAIL ORDER Mon-Sat. 9-12.30/1.30-5.30

All prices correct at time of going to press.

BREDHURST ELECTRONICS

RETAIL Mon-Sat. 9-12.30/1.30-5.30

Buy it with Access — BARCLAYCARD VISA

HIGH STREET, HANDCROSS, WEST SUSSEX. TEL. 0444 400786 E.&O.E.

Goods normally despatched within 24 hrs.

Practical Wireless

FEBRUARY 1983 VOL. 59 NO. 2 ISSUE 911

EDITORIAL OFFICES
Practical Wireless
Westover House
West Quay Road
Poole, Dorset BH15 1JG
Poole 671191

Geoff Arnold T.Eng(CEI) G3GSR
Editor

Dick Ganderton C.Eng., MIERE,G8VFH
Assistant Editor

Steve Hunt
Art Editor

John Fell G8MCP
Technical Editor

Alan Martin G8ZPW
News & Production Editor

Elaine Howard G4LFM
Technical Sub-Editor

Rob Mackie
Technical Artist

Keith Woodruff
Assistant Art Editor

Sylvia Barrett
Secretarial

ADVERTISEMENT OFFICES
Practical Wireless
King's Reach Tower
Stamford Street
London SE1 9LS
Telex: 915748 MAGDIV-G

Dennis Brough
Advertisement Manager
01-261 6636
01-261 6872

Roger Hall G8TNT (Sam)
Ad. Sales Executive
01-261 6807

Claire Gerrish
Secretary
01-261 6636

Barbara Blake
Classified Supervisor
01-261 5897

Dave Kerindi
Make-up & Copy
01-261 6570

contents

four **new** models from Trio

for the HF man, the **TS 430S**

£698.00 inc vat carriage £5.00

A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology s we know it today.

The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on todays busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceivers features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.

The TS430S, Trio's rig for todays operator.

for the SWL who deserves the best, the **R 2000**

£391.20 inc vat carriage £5.00

Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode – why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174 MHz – then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150 KHz to 30 MHz

Use of an innovative up conversion digitally controlled PLL circuit provides maximum ease of operation and superb receiver performance. Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150 KHz-30 MHz range.

Ten Memories Store Frequency, Band and Mode Data

Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFO's. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and mode is stored in the selected memory. The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan

Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan

Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Three Built In Filters with Narrow/Wide Selector

In the AM mode 6 KHz wide or 2.7 KHz narrow may be selected. In the SSB mode 2.7 KHz is automatically selected. In the CW mode 2.7 KHz is again chosen and if the optional YG455C filter is installed then 500 Hz in the narrow position. In the FM mode 15 KHz bandwidth is automatically selected.

Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, optional 13.8V DC operation, record jack and, of course, provision for a VHF converter.

All in all, a truly remarkable receiver.

and later in the year for the **R 2000** a 118 to 174 MHz internal vhf converter.

LOWE IN LONDON, Open monday to saturday, six days a week
lower sales floor, Hepworths, Pentonville Rd, London. telephone 01.837.6702
LOWE IN GLASGOW, Open tuesday to saturday
4,5 Queen Margarets Rd, Glasgow. telephone 041.945.2626

for the VHF operator, the **TR7930** mobile transceiver

£289.80 inc vat carr £5.00

Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the UHF enthusiast, a handheld transceiver, the **TR3500**

Without a doubt one of life's great mysteries to me is why, when the two metre band is at times so busy, few people are to be found communicating on the wide open spaces of the seventy centimetre band.

I have come to the conclusion that misapprehensions exist about the band. The first being the lack of activity. From my first comments you will have gleaned the fact that seventy centimetres is not a busy band, however there are stations on, myself G8GIY, my colleagues David G4KFN and Roy G8ROR form the nucleus of a UHF group here in Matlock, there are many others like us up and down the country. Seventy centimetre repeaters abound and are a perfect means of communication, their somewhat shorter range serving well their immediate area and, please remember, in the words of that doyen of seventy centimetres Jack G5UM, "Activity breeds activity," simple but true. The second misapprehension is that the equipment is expensive. Not so, the Trio TR3500 costs only slightly more than its matching stable mate, the TR2500, and here again, with the same sensible approach which we have all come to expect from Trio, the accessories which you bought for your TR2500 are compatible with the new TR3500. The appearance, size and weight are similar to the TR2500, output power is 1.5 watts high and 300 milliwatts low, repeater shift is programmable, ten memory channels are provided and frequency scan between operator-defined limits is included. The conventional memory scan and reverse repeater facilities help to make operating a pleasure no matter how difficult the conditions. With the Trio TR3500 handheld as part of your station, you are equipped to expand your operating and begin communicating on the wide open spaces of the seventy centimetre band.

£238.50 inc vat carriage £5.00

and we now stock the superb **vibroplex** range of keys.

RING FOR DETAILS NO, THE VIBROPLEX IS NOT A MARITAL AID.

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

SHORT WAVE LISTENING BRINGS THE WORLD TO YOUR FINGERTIPS

WIDE COVERAGE ALL MODE MEMORY RECEIVER; FRG7700M £399 inc VAT @ 15% + Securicor

- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @ – 6dB.
- ★ 3 Selectivities on AM, squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500Ω to 1.5MHz, 50Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.

'7700 THE ONE WITH FM!
Non memory version £335

- ★ 110 and 240V ac, 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ Acc; Tuners, Converters, LPF, Memory.
- ★ **FRT7700**; 150kHz-30MHz, Switch, etc.
- ★ **FRV7700A**; 118-130, 130-140, 140-150MHz.
- ★ **FRV7700B**; 118-130, 140-150, 50-59MHz.
- ★ **FRV7700C**; 140-150, 150-160, 160-170MHz.
- ★ **FRV7700D**; 118-130, 140-150, 70-80MHz.
- ★ **FRV7700E**; 118-130, 140-150, 150-160MHz.
- ★ **FRV7700F**; 118-130, 150-160, 170-180MHz.
- ★ **FF5**; 500kHz (for improved VLF reception).
- ★ **MEMGR7700**; 12 Channels (internal fitting).
- ★ **FRA7700**; Active Antenna.

COMMUNICATION RECEIVER; NRD 515 £825 Inc. VAT @ 15% + Securicor.

- ★ 30MHz to 100KHz or lower, 100Hz steps.
- ★ PLL digital VFO stability.
- ★ Backlash free, 10KHz rev, 500Hz analogue calib.
- ★ Fast tune up/down switch, dial lockout.
- ★ SSB (USB/LSB), CW, AM, RTTY.
- ★ 6 and 2.4 KHz, 600* and 300* Hz @ –6dB.
- ★ Passband tuning ±2KHz on SSB and CW.
- ★ Variable BFO on CW for preferred tone.
- ★ Modular plug in design with mother board.
- ★ High reliability – low power schottky & CMOS.
- ★ Designed for maximum ease of operation.
- ★ Noise blanker. 0-10-20dB attenuator.
- ★ Small (140 × 340 × 300mm) light 7½Kg, rugged.

PROFESSIONAL MONITOR

- ★ Up conversion, 70.455 MHz and 455 KHz.
- ★ No R.F. amplifier, balance U310 mixer.
- ★ Crystal filter before first IF amplifier.
- ★ Transceiver provisions; mute, trip etc.
- ★ Frequency data input/output port.

NHD518	96 (4 × 24) channel memory unit.
NCM515	Remote frequency keypad controller, LCD readout. Up/down step tuning, 4 channel memory.
CQE515	Junction unit (NCM515 to NHD518).
NVA515	External 3W speaker 130 × 140 × 200mm.
CFL260	600Hz mechanical filter.
CFL230	300Hz crystal filter.

TWO OR SEVENTY; FT230R, FT208R, FT708R, FT730, 2030, FT726 PLUS:–

- ★ Multimode USB, LSB, FM, CW.
- ★ 100Hz backlit LCD Frequency display.
- ★ 10 memory channels '5 year' backup.
- ★ Any TX/Rx split with dual VFOs.
- ★ Up/Down tuning from microphone.
- ★ AF output 1W @ 10% THD.
- ★ Bandwidth 2.4kHz and 14kHz @ – 6dB.
- ★ LED's; 'On Air', 'Busy'. m/c meter; S, PO.
- ★ 58(H) × 150(W) × 195(D) (1.3kg).

SMC2.0C	NiCad 2.0A/hr "C"	2.35
SMC8C	Slow Charger (220mA)	8.80
MMB11	Mobile Mount	22.25
CSC1A	Soft carrying case	3.45
FL2010	Linear Amplifier 2m 10W	59.00
FL7010	Linear Amplifier 70cms	91.00

6, 2 or 70!

FT290R

£265
Inc. VAT @ 15% + Securicor.

- ★ 144-146MHz (144-148) possible.
- ★ 2.5W PEP, 2.5W RMS/300mW out.
- ★ FM: 25kHz and 12.5kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ ±600kHz repeater split 1750Hz burst.
- ★ Integral telescopic antenna.
- ★ Rx, 70mA, Tx; 800mA (FM maximum).

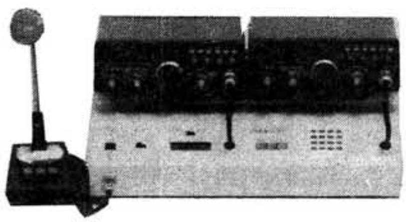
FT790R

£325
Inc. VAT @ 15% + Securicor.

- ★ 430-330MHz (440-450 alternative).
- ★ 1W PEP, 1W/250mW FM/CW out.
- ★ FM: 100kHz and 25kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ 1.6MHz shift with input monitor,
- ★ 1750Hz burst.
- ★ Rx; 100mA/200mA. Tx; 750mA max.
- ★ BNC Mounting ¼λ flexi antenna.

6, 2 or 70!

- ★ USB-LSB-CW-FM (A 3j, A1, F3).
- ★ 30W PIP A3j, 10/1W out A1 F3.
- ★ Any Tx Rx split with dual VFO's.
- ★ Four easy write-in memory channels.
- ★ Memory scanning with slot display.
- ★ Up/down tuning/scanning from mic.
- ★ Priority channel on any memory slot.
- ★ Digital RIT. Advanced noise blanker.
- ★ Satellite mode allows tuning on Tx.
- ★ Semi break in with side tone.
- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx & Rx freq (inc RIT).
- ★ String LED display for "S" and PO.
- ★ LED's; "On Air" Clar, Hi/Low, FM mod.
- ★ Size (Case): 8.3" D, 2.3" H, 6.9" W.



Ills. c/w SCI station consol and YD 148 mic.

★ LOWER PRICES ★

FT480R £369 Inc. VAT @ 15% + Securicor.

- ★ 144-146 MHz (143.5-148.5 possible).
- ★ ±600kHz standard repeater split.
- ★ Excellent dynamic range and sensitivity.
- ★ FM; 25, 12½, 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.

- ★ 430-434MHz (440-445 possible).
- ★ GaAs Fet RF for incredible sensitivity.
- ★ FM; 100kHz, 25kHz, 1kHz, steps.
- ★ SSB; 1,000, 100, 10Hz steps.
- ★ FT780R 1.6 fitted 1.6MHz Shift **£459** inc.

FT780R £399 Inc. VAT @ 15% + Securicor.

SMC; LARGEST STOCKISTS OF ANTENNAS, MASTS, CABLES ETC.

SOUTH MIDLANDS COMMUNICATIONS LTD

MAIL ORDER; AS NEAR AS YOUR 'PHONE OR PEN

SMC SERVICE
Free Securicor delivery on major equipment.
Access and Barclaycard over the phone.
Biggest branch agent and dealer network.
Securicor 'B' Service contract at £4.49.
Biggest stockist of amateur equipment.

FREE FINANCE
On many regular priced items SMC offers
Free Finance (on invoice over £100)
20% down and the balance over 6 months or
50% down and the balance over a year.
You pay no more than the cash price!!

GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-four years of professional experience.

We welcome Access

S.M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON, SO4 4DP, ENGLAND
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton

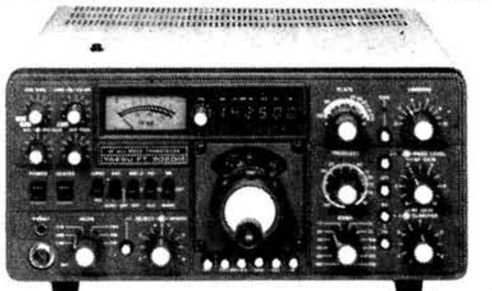
BARCLAYCARD VISA

HF TRANSCEIVERS; FTONE, FT980, FT707, FT101Z & JST100 PLUS:–

★ 160-10 metres including new allocations.
★ Variable IF bandwidth 2.4kHz down to 300Hz.
★ Audio Peak and independent notch controls.
★ AM, FSK, USB, LSB, CW, FM, (Tx and Rx).
★ Semi-break in, inbuilt Curtis IC Keyer.
★ Digital plus analogue frequency displays.
★ VOX built-in and adjustable.
★ Instant write in memory channel.
★ Tune up button (10 sec, of full power).
★ Switchable AGC and RF attenuator.
★ 350 or 600 Hz CW, 6kHz, AM filters.
★ Clarifier (RIT) switchable on Tx, Rx or both.
★ Plug in modular, computer style constructor.
★ Fully adjustable RF Speech processor.
★ Ergonomically designed with necessary LEDS.
★ Incredible range of matching accessories.
★ Universal power supply 110-234V AC and 12V DC.

NOW WITH CW FILTER, AM FILTER, CURTIS KEYER‡ INCLUDED

FT902DM, £185 Inc. VAT @ 15% + Securicor.



FT102, £785 Inc. VAT @ 15% + Securicor.

FREE FINANCE

★ 1.8-3.5-7-10-14-18-21-24.5-28MHz.
★ All modes:- LSB, USB, CW, AM‡, FM‡, (‡Option board).
★ Front end: extra high level, operates on 24V DC.
★ RF stage bypassable boosts dynamic range over 100 dB!
★ Variable bandwidth 2.7KHz→500Hz *and* IF Shift.
★ Fixed bandwidth filters, parallel or cascade configurations.
★ IF notch (455KHz) *and* independent audio peak.
★ Noise blanker adjustable for pulse *width.* (Woodpecker).
★ External Rx and separate Rx antenna provisions.
★ *Three* 6146B in special configuration – 40 dB IMD!
★ Extra product detector for checking Tx IF signal.
★ Dual meter, peak hold ALC system.
★ Mic amp with tunable audio network.
★ **SP102**:– Speaker, Hi and Lo AF filters, 12 responses!
★ **FV102**:– VFO. 10Hz steps and readout, scanning, QSY.
★ **FC102**:– ATU,1.2KW, 20/200/1200 W FSD PEP, wire.
★ **FAS-1-4R**:– 4 way remote waterproof antenna selector.

COAXIAL CONNECTORS, CABLES, MASTS AND TOWERS, ANTENNAS, HF MOBILE, VHF/UHF MOBILE PLUS:–

ANTENNAS HF FIXED

HY GAIN					
12AVQ	Vertical 10-15-20M		14.0'H	£50.60	2.20
14AVQ/WB	Vertical 10-15-20-40M		18.0'H	£64.40	2.20
18AVT/WB	Vertical 10-15-20-40-80M		25.0'H	£109.25	2.20
14RMQ	Roof mount kit for above			£36.22	2.20
18V	Vertical 10-15-20-40-80M, tapped		19.0'H	£29.78	2.20
103BA	3 Ele Yagi 10 metres	17.0'LE	8.0'B	£67.85	2.20
105BA	5 Ele Yagi 10 metres	18.5'LE	24.0'B	£143.75	3.95
153BA	3 Ele Yagi 15 metres	23.0'LE	12.0'B	£90.85	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	26.0'B	£217.35	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	16.0'B	£166.75	4.90
204BA	4 Ele Yagi 20 metres	36.5'LE	26.0'B	£286.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	34.0'B	£362.25	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	16.0'B	£247.25	6.50
DB10/15A	3 Ele Yagi 10-15M	23.0'LE	13.0'B	£146.05	4.80
TH3JNR	3 Ele Yagi 10-15-20M	24.2'LE	12.0'B	£194.35	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	6.0'B	£169.05	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	14.0'B	£274.85	5.30
TH5DXX	"Thunderbird" 5 Ele	31.0'LE	18.0'B	£378.35	6.70
TH6DXX	"Thunderbird" 6 Ele	31.1'LE	24.0'B	£281.75	8.50
TH7DXX	"Thunderbird" 7 Ele	31.0'LE	20'TR	£458.85	8.75
18TD	Dipole Tape 10-80M		132'	£113.85	2.80
JAYBEAM					
VR3	Vertical 10-15-20M. DC Short	6lb	13.5'H	£46.00	2.30
TB3	3 Ele Yagi 10-15-20M PEP	14.6'TR	14.1'B	£189.75	5.40
MINI BEAM					
C4	Vertical Mini 10-15-20M	8lb	11.5'H	£54.99	2.30
HQ1	"Mini" Quad 10-15-20M	11.0'LE	4.5'B	£119.00	4.00
G4MH MINI BEAM					
	Mini Beam 10-15-20M			£82.50	4.00
SMC TRAPPED DIPOLE 10-15-20-40-80M					
SMCTD/HP	14SWG, hard drawn Cu, 1000W PEP			£40.83	2.30
SMCTD/P	Portable, Cu/terylene, c/w 75' coax.			£52.33	2.30
SMCHPT	High Power, 1kW, 7MHz		per pair	£13.80	1.10
SMC – HS ANTENNA					
SMCHF5V	Vertical 10-15-20-40-80M		15.7'H	£40.25	2.30
SMCHF5R	Radial kit loaded		6.5'-7,3'	£29.90	2.30
SMCHF3VNB	Vertical 10-18-24MHz 1KW pep		16.0'H	£47.90	2.30
SMC3Y1015D20	3 ele 10-15, Dipole 20M		13.2'B	£134.95	5.00

ANTENNA ROTATORS

KR500	Kenpro, elevation Meter calb ± 90°		£90.85	Free
KR400	Kenpro bell, box as KR500		£90.85	Free
RLD3	SMC, Bell	Auto control	£38.53	Free
9508	Channel Master, offset		£79.92	Free
9502B	Channel Master, offset		£56.92	Free
AR40	CDE	Turn and Push	£79.35	Free
KR400RC	Kenpro	Round meter 360°	£102.35	Free
Ham IV	CDE	8 × 4cm meter readout	£228.85	Free
KR2000RC	Kenpro	Heavy Duty 360° meter	£270.25	Free
T2X	CDE	8 × 4cm meter readout	£287.50	Free
H300	Hy Gain	Digital readout	£451.95	Free
ROTOR ACCESSORIES				
50425	Clamps/U Bolts ST CDE AR40 etc		£4.95	1.25
50463	Clamps/U Bolts HD CDE CD45 HAM4		£7.36	1.85
51472	Mast Mount Kit ST CDE HAM4 etc.		£12.08	2.10
51467	Mast Mount Kit HD CDE T2X etc.		£24.15	2.10
9523	Support Bearing Channel Master		£14.38	1.70
KS050	Rotary Bearing 1⅜" Kenpro		£29.32	1.40
KS065	Rotary Bearing 2" Kenpro		£18.69	1.85
KC038	Lower Mast Clamp KR400, KR600		£10.92	1.70
RC5W	5 Way AR30 AR40 KR400RC	p/m	£0.35	
RC6W	6 Way KR250/400/500/600RC	p/m	£0.48	
RC8W	8 Way CD45 Ham 4 T2X KR2000RC	p/m	£0.52	

CARRIAGE

Carriage charges (shown after the item price) are for the mainland only (excluding post) and the rates shown are for one off of the item. Where more than one article is ordered, total freight charge is likely to be *much* lower than the sum of the individual charges.

Cables, ropes and masting are normally despatched by Roadline. Carriage is £2.00 to 7Kg thereafter add an extra £0.15 per Kg. (Mainland.)

Where Securicor delivery on an item, or items is possible (i.e., less than 25Kg/55lbs and 5'6" long) it is charged at £4.49 per lot.

If in doubt of carriage send a cheque crossed, "not more than £ . ."

ALL PRICES INCLUDE VAT @ 15%.

ANTENNAS VHF FIXED

JAYBEAM						
4Y/4M	Yagi 4 ele	7.5'B		7dBd	£29.90	2.20
PMH2/4M	Harness 2 way				£16.10	1.70
HO/2M	Halo head only	1' sq		ϕdBd	£5.98	0.70
HM/2M	Halo with 24" mast	1' sq		ϕdBd	£6.55	0.95
UGP/2M	Ground plane	1.7'		ϕdBd	£12.65	2.20
C5/2M	Colinear	13.1'	7.1lb	4.8dBd	£54.62	2.20
5Y/2M	Yagi 5 ele	5.2'		7.8dBd	£12.08	2.20
8Y/2M	Yagi 8 ele	9.2'		9.5dBd	£15.53	2.20
10Y/2M	Long Yagi 10 ele	14.4'		11.4dBd	£33.35	2.20
14Y/2M	Long Yagi 14 ele	17.5'		12.8dBd	£36.23	2.20
D5/2M	Yagi 5 over 5 slot	5.2'		10.6dBd	£21.85	2.20
D8/2M	Yagi 8 over 8 slot	9.2'		12.3dBd	£29.33	2.20
PBM10/2M	10 ele parabeam	12.9'		11.7dBd	£44.85	2.20
PBM14/2M	14 ele parabeam	19.5'		13.7dBd	£55.77	2.20
Q4/2M	Quad 4 ele	4.9'		9.5dBd	£29.32	2.20
Q6/2M	Quad 6 ele	8.7'		12dBd	£39.10	2.20
Q8/2M	8 ele quad	11.6'		13.8dBd	£44.85	2.20
5XY/2M	Yagi 5 ele cross	5.5'		7.8dBd	£28.17	2.20
8XY/2M	Yagi 8 ele cross	9.2'		9.5dBd	£35.65	2.20
10XY/2M	Yagi 10 ele cross	11.8'		10.8dBd	£46.00	2.20
PMH2/C	Circular polarisation harness				£9.77	1.20
PMH2/2M	Harness 2 way				£12.65	1.20
PMH4/2M	Harness 4 way				£28.75	1.20
X6/X12	6 ele 2, 12 ele 70	7.2'		8.5/12	£42.55	2.20
SMC-HS						
GDXA	Discone 100-440MHz				£34.90	2.20
SMCGDX1	Discone 80-480MHz 3dB¼			3.3'	£41.40	2.20
SMCGDX2	Discone 50-480MHz 3dB¼			6.2'	£47.95	2.20
SMCVHFL	Discone 65-520MHz, Rx only			5.0'	£16.85	2.20
SMC	Colinear 2M 3×⅝λ, 7.8dB¼			14.6'	T.B.A.	2.20
SMCGP144W	Colinear 2M 2 × ⅝λ, 6.5dB¼			10.2'	£24.90	2.20
SMCGP2M	⅝λ, 2M ground plane, 3.4dB¼			4.6'	£15.70	2.20
SMCSQ144	2M Swiss Quad. Vertical polarised				£52.90	2.20
SMCGP432X	Colinear 70cm, 3×⅝λ, 6.8dB¼			5.6'	£25.70	1.70
SMC70N2V	Vert. 2.8dB¼ 2M, 5.7dB¼ 70cm			3.6'	£25.70	2.20
SMCHS770	144/432MHz Diplexer 50w max.				£13.80	1.30
SMC2HB6	6M, 2ele, HB9CV Beam				£19.95	2.20

A LARGE SAE BRINGS MORE DATA PLUS 26 PAGE STOCK LIST

SOUTH MIDLANDS COMMUNICATIONS LTD

SHOWROOMS: SPANNING THE UK – TO SERVE YOU

SOUTHAMPTON
S.M.C. Ltd.,
36-38 Rumbridge Street,
Totton, Southampton.
Southampton (0703) 867333
9-5.30 Mon.-Sat.

LEEDS
S.M.C. (Leeds),
257 Otley Road,
Leeds 16. Yorkshire
Leeds (0532) 782326
9-5.30 Mon.-Sat.

CHESTERFIELD
S.M.C. (Jack Twendy) Ltd.,
102 High Street,
New Whittington, Chesterfield,
Chesterfield (0246) 453340
9-5 Tues.-Sat.

BUCKLEY
S.M.C. (T.M.P.),
Unit 27, Pinfold Lane,
Buckley, Clwyd.
Buckley (0244) 549563
9.30-5.30 Tues.-Sat.

STOKE
S.M.C. (Stoke),
76 High Street,
Talke Pits, Stoke
Kidsgrove (07816) 72644
9-5.30 Tues.-Sat.

GRIMSBY
S.M.C. (Grimsby),
247A Freeman Street,
Grimsby, Lincs.
Grimsby (0472) 59388
9.30-5.30 Tues.-Sat.

SMC AGENTS

Neath	John	GW4FOI	(0639) 55114 Day (0639) 2942 Eve
Stourbridge	Brian	G3ZUL	(03843) 5917
Bangor	John	GI3KDR	(0247) 55162
Tandragee	Mervyn	GI3WWY	(0762) 840656
Edinburgh	Jack	GM8GEC	(031657) 2430 Day (031665) 240 Eve
Jersey	Geoff	GJ4ICD	(0534) 26788

QRV? FER ICOM

The World's most popular portables IC-2E £159. IC4E and now the marine version IC-M12

Nearly everybody has an IC-2E, the most popular amateur transceiver in the world, now there is the 70cm version which is every bit as good and takes the same accessories.
Fully synthesized – Covering 144-145.995 in 400 5KHz steps. (430-439.99 4E). **Power output** – 1.5W. **BNC antenna** output socket. **Send/Battery indicator. Frequency selection** – by thumbwheel switches, indicating the frequency. 5KHz switch-adds 5KHz to the indicated frequency. **Duplex Simplex switch** – gives simplex or plus 600KHz or minus 600KHz transmit (1.6MHz and listen input on 4E). **Hi-Low switch** – 1.5W or 150mW. **External microphone jack. External speaker jack.**

The IC-4E is revolutionising 70cm!

Multimode Mobiles IC-290E IC-490E

290E-144-146 MHz/490E-430-440 MHz. 10 W RF output on SSB, CW and FM. Standard and non-standard repeater shifts. 5 memories and priority channel.

Memory scan and band scan, controlled at front panel or microphone. Two VFO's. LED S-meter. 25KHz and 1KHz on FM – 1KHz and 100KHz tuning steps on SSB. Instant listen for repeaters.

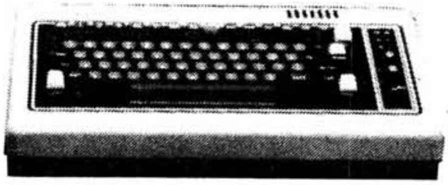
IC-720A Possibly the best choice in HF.

One way of keeping up with rapidly advancing technology is to look at what the IC-720A offers in it's BASIC form. How many of it's competitors have two VFO's as standard, or a memory which can be recalled, even when on a different band to the one in use, and result in instant retuning AND BANDCHANGING of the transceiver? How many include really excellent general coverage receiver covering all the way from 100KHz to 30MHz? How many need no tuning or loading whatsoever? and take care of your PA, should you have a rotten antenna. How many have an automatic RIT which cancels itself when the main tuning dial is moved? How many will run full power out for long periods without overheating? How many have band data output to automatically change bands on a solid state linear AND an automatic antenna tuner unit?

The IC-720A may be just a little more expensive than some, but it's better than most! Make your choice an IC-720A.

IC-PS15 Mains PSU

Tono RTTY and CW computers 9000E



The TONO range of communication computers take a lot of beating when it comes to trying to read RTTY and CW in the noise. Others don't always quite make it!

Check the many facilities offered before you buy – especially look at the 9000E which also throws in a Word Processor.

Call us for further information and a brochure.

Receive only version – **Tono 550**

IC-730 The best for mobile or economy base station

ICOM's answer to your HF mobile problems – the IC-730. This new 80m–10m, 8 band transceiver offers 100W output on SSB, AM and CW. Outstanding receiver performance is achieved by an up-conversion system using a high IF of 39MHz offering excellent image and IF interference rejection, high sensitivity and above all, wide dynamic range. Built in Pass Band Shift allows you to continuously adjust the centre frequency of the IF pass band virtually eliminating close channel interference. Dual VFO's with 10Hz, 100Hz and 1kHz steps allows effortless tuning and what's more a memory is provided for one channel per band. Further convenience circuits are provided such as Noise Blanker, Vox, CW Monitor APC and SWR Detector to name a few. A built in Speech Processor boosts talk power on transmit and a switchable RF Pre-Amp is a boon on today's crowded bands.

Great base stations IC-251 £499. IC-451

ICOM produce a perfect trio in the UHF base station range, ranging from 6 Meters through 2 Meters to 70 cms. Unfortunately you are not able to benefit from the 6m product in this country, but you CAN own the IC-251E for your 2 Meter station and the 451E for 70 cms.
Mains or 12 volt supply.
SSB, CW and FM.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

Thanet Electronics
143 Reculver Road, Herne Bay, Kent. Tel: (02273) 63859.

Barclaycard Visa · Buy it with Access

Same day despatch if possible.

QRV? FER ICOM

IC-R70, The very latest from Icom!

Now that we have tried the R70, we believe that it is going to be a real winner.

The R-70 covers all modes (when the FM option is included), and uses 2 CPU-driven VFO's for split frequency working, and has 3 IF frequencies: 70MHz, 9MHz and 455KHz, and a dynamic range of 100dB.

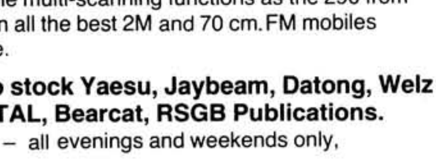
Other R-70 features include: input switchability through a pre-amplifier, direct or via an attenuator, selectable tuning steps of 1KHz, 100Hz or 10Hz, adjustable IF bandwidth in 3 steps (455KHz). Noise limiter, switchable AGC, tunable notch filter, squelch on all modes, RIT, tone control. Tuning LED for FM (discriminator centre indicator). Recorder output, dimmer control.

The R-70 also has separate antenna sockets for LW-MW with automatic switching, and a large, front mounted loudspeaker with 5.8W output. The frequency stability for the 1st. hour is ± 50Hz, sensitivity- SSB/CW/RTTY better than 0.32 μv for 12dB (S+N)÷N, Am-0.5μv, FM better than 0.32 for 12dB Sinad. DC is optional on the R-70. It has a built-in mains supply.

The IC-R70 measures 286mm x 110mm x 276mm and weighs 7.4Kg., making it a very attractive package indeed. Are you ready for this truly excellent receiver? You must hear it, we know you will be impressed!

IC-25E The Tiny Tiger

And NOW the 70cm version IC-45E.



Amazingly small, yet very sensitive. Two VFO's, five memories, priority channel, full duplex and reverse, LED S-meter, 25KHz or 5KHz step tuning. Same multi-scanning functions as the 290 from mic or front panel. All in all the best 2M and 70 cm. FM mobiles ICOM have ever made.

Remember we also stock Yaesu, Jaybeam, Datong, Welz G-Whip, Western, TAL, Bearcat, RSGB Publications.

Agents (phone first – all evenings and weekends only, except Scotland).

Scotland – Jack GM8 GEC (031 665 2420)
Midlands – Tony G8AVH (021 329-2305)
North West – Gordon G3LEQ Knutsford (0565)4040
Ansafone available

Introducing the NEW IC-740.

This latest transceiver contains all the most asked-for features, in the most advanced solidstate HF base station on the amateur market...performing to the delight of the most discerning operator.

Study the front panel controls of the ICOM IC-740. You will see that it has all of the functions to give maximum versatility to tailor the receiver and transmitter performance to each individual operator's requirements.

Features of the IC-740 receiver include a very effective variable width and continuously adjustable noise blanker, continuously adjustable speed AGC, adjustable IF shift and variable passband tuning built in. In addition, an adjustable notch filter for maximum receiver performance, along with switchable receiver preamp, and a selection of SSB and CW filters. Squelch on SSB Receive and all mode capability, including optional FM mode. Split frequency operation with two built-in VFO's for the serious DX'er.

The IC-740 allows maximum transmit flexibility with front panel adjustment of VOX gain and VOX delay along with ICOM's unique synthesized three speed tuning system and rock solid stability with electronic frequency lock. Maximum versatility with 2 VFO's built in as standard, plus 9 memories of frequency selection, one per band, including the new WARC bands.

With 10 independent receiver and 6 transmitter front panel adjustments, the IC-740 operator has full control of his station's operating requirements.

See and operate the versatile and full featured IC-740 at your authorized ICOM dealer.

Options include:
- FM Module
- Marker Module
- Electronic Keyer
- 2 - 9MHz IF Filters for CW
- 3 - 455MHz Filters for CW
- Internal AC Power Supply

Accessories.
- SM5 Desk Microphone
- UP/DWN Microphone
- Linear Amplifer
- Autobandswitching Mobile Antenna
- Headphones
- External Speaker
- Memory Backup Supply
- Automatic Antenna Tuner

Ask about the new range of CUE DEE antennas, the winners in recent tests!

Securicor or post despatch free

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

COMMISSION SALES AVAILABLE ONCE AGAIN...
Call for details and have a cup of Brenda's coffee when you do the deal...

AMATEUR RADIO-EXCHANGE

There's a lot of talk among the radio fraternity about "grey imports," but what does this term really mean?

To the UK distributors of TRIO and ICOM it means enterprising retailers by-passing them and purchasing direct from overseas sources. (The YAESU situation is somewhat different as there are two importers in healthy competition.)

To you, the customer, cutting out the monopoly middle-man in this way means quite simply lower prices, of which more later. It also means choice – the ability to come to one showroom and try out **all** the rigs on the market side by side, and then select the one that's right for you, rather than having some salesman push a particular make because that's the one he's "authorised" to sell.

Sometimes you may hear doubts expressed about the suitability for UK use of "non-approved" imports, or about after-sales service on them. Well, if you're buying from us... relax. We haven't become London's leading Amateur Radio store by selling **anything** that's not serviceable, or by giving your repair to the first likely lad to walk in clutching a soldering iron!

We think that TRIO for example is great stuff. That's why we've always tried to have as much of it passing through our doors – back or front! – as possible, but at prices that are fair on the customer, like these...

TS-530S Good value at £537. Even better value at £489 here.
TS-830S Why pay £695 when you can buy it from us for just £649?

TWO - AMAZING NEW RECEIVERS - BREAKTHROUGHS IN TECHNOLOGY AND PRICE

As sole UK importers we are proud to present two superb new scanning receivers – the AR – 3000 for Air Band listening and the MK – 4000 for Amateur and Public Service Band coverage – both with absolutely tremendous specifications and both priced at only £99.

AR-3000

Fully synthesized AM coverage of 110–139.995MHz in 10kc steps with 5kc option.
Manual control or auto-scan.
Integral speaker, all within super-compact dimensions of 120mm x 222mm x 44mm.
12v operation – ideal for mobile, portable or base station use.

MK-4000

FM coverage of 70 – 87.9875MHz and 140 – 175.9875MHz in 12.5kc steps on both bands.
8 memories with manual selection.
Auto-scan of full frequency range or memories only.
Lock-out facility.
Built-in digital clock.
12v operation, making it suitable for base station or mobile use.

FRG-7

YAESU's evergreen communications receiver giving continuous coverage from 500kc to 30MHz on AM/SSB/CW. Still the best value for money in the market... and even better value from us at

only £169 including FREE Heliscan aerial.

IC-R70

Presenting the best in today's receiver technology from ICOM, featuring:

- Two VFOs • Frequency range 100kc – 30MHz
- Three IFs 70MHz/9MHz/455kHz • HF pre-amp
- Sensitivity 0.5 μv AM – 0.32 μv S/N 12dB

All this... and much more... for £469

LICENSED CREDIT BROKERS ❊ Ask for written quotation on HP terms. Also interest-free terms with 50% deposit.

BARCLAYCARD VISA | Access We welcome Access

CREDIT CARD SALES BY TELEPHONE.

All prices include VAT and are correct as we go to press. However, we reserve the right to vary them if forced to do so by the time this advertisement appears.

Rapid mail order dispatch, with FREE carriage by insured Post or Securicor within the UK mainland.

YAESU

FT 980	NEW All-mode Transceiver with AM/CW/FM/SSB/AFSK	P.O.A.
FT 102	160-10M 9-Band Trans. **NEW**	699.00
FC 102	Atu inc PEP Meter	189.00
FT-ONE	Gen. Coverage Trans. **NEW**	1295.00
FT 790R	70cm all-mode portable **NEW**	295.00
FT 101ZFM	160-10m 9-Band Transceiver	590.00
FT 101ZDFM	160-10m 9-Band Transceiver	665.00
DIGT 101Z	Digital unit	90.00
DCT 101Z	DC Adaptor	42.50
FV 101Z	Remote vfo	112.00
FT 902DM	9-Band AM/FM Transceiver	885.00
FC 902	9-Band atu, swr/pwr etc.	135.00
FTV 901R	Transverter fitted 2m module	285.00
430TV	70cm module for above	185.00
144TV	2m module for Transverter	100.00
70TV	4m module for Transverter	80.00
FV 901DM	Remote vfo for 901	260.00
SP 901	External speaker	31.00
FL 2100Z	9-Band 1200W linear	425.00
FT 707	8-Band solid state 100W	499.00
FP 707	230 volts AC power supply	125.00
FC 707	Aerial tuner (unbalanced only)	85.00
MR 7	Metal rack for above	15.70
MMB 2	Mobile mounting bracket	16.00
FRG 7	0.5-30MHz receiver	169.00
FRG 7700	SSB/AM/FM recvr. dig. readout	299.00
MEM 7700	Memory unit for above	90.00

CONVERTERS FOR ABOVE

FRV 7700A	118-150MHz	69.75
FRV 7700B	50-60MHz & 118-150MHz	75.50
FRV 7700C	140-170MHz	65.95
FRV 7700D	70-80MHz & 118-150MHz	72.45
FRT 7700	Receiver aerial tuner	37.85
FF 5	LF filter for above	9.95
FT 480R	2m all-mode transceiver	365.00
FP 80A	230V AC power supply	63.00
FT 780R	70cm all-mode transceiver	449.00
FT 290RM	**SPECIAL** 2m all-mode portable with ARE mods	249.00
NC 11C	AC charger	8.00
CSI-1	Carrying Case	3.45
MMB-11	Mobile mounting bracket	22.25
FT 208R	2m synthesized portable FM	199.00
NC 9C	AC charger	8.00
FT 708R	70cm hand-held	209.00

TRIO-KENWOOD

TS 930	Gen. coverage trans. **NEW**	1,078.00
TS 830S	160-10m transceiver 9 bands	650.00
AT 230	All-band ATU power meter	110.00
YK 88C	500Hz CW filter	29.60
YK 88CN	270 Hz CW filter	32.60
TS 530S	160-10m trans. 200W pep digital	489.00
TS 130S	8-band 200W pep	499.00
TS 130V	8-band 20W pep	445.00
AT 130	100W antenna tuner	79.00
TR 2300	2m FM synthesised portable	166.75
TR 2500	2m FM synthesised handheld	207.00
HC 10	Digital desk World	58.75
DM 801	Dip meter	60.00
TR 7730	New 25W FM transceiver	247.00
R 600	Gen. Coverage Receiver	199.00

ROTATORS

KR 250	Kenpro Lightweight 1-1½" mast	44.95
9502B	Colorotor (Med. VHF)	55.00
KR 400RC	Kenpro – inc. lower clamps	99.95
KR 600RC	Kenpro – inc. lower clamps	139.95

ICOM

IC 740	Multimode H.F. trans. **NEW**	649.00
ICR 70	New multimode receiver	469.00
IC 730	HF mobile transceiver 8-band	586.00
IC 720A	HF trans. and gen. cov. receiver	795.00
PS 15	Power suply for 720A	99.00
IC 251E	2m multimode base station	499.00
IC 25E	2m synth. compact 25W mobile	259.00
IC 290E	2m multimode mobile	366.00
IC 24G	2m FM mobile 10W	169.00
IC 2E	2m FM synthesised handheld	159.00
IC 4E	70cm handheld	199.00
IC L1/2/3	Soft cases	3.50
IC HM9	Speaker/microphone	12.00
IC CP1	Car charging lead	3.20
IC BP2	6V Nicad p-ack for IC 2E	22.00
IC BP3	9V Nicad pack for IC 2E	17.70
IC BP4	Empty case for 6 X AA Nicads	5.80
IC BP5	11.5V Nicad pack for IC 2E	30.50
IC DC1	12V adaptor pack for IC 2E	8.40

MICROWAVE MODULES

MMT 144/28	2m Transverter for HF Rig	109.95
MMT 432/28S	70cm Transverter for HF Rig	159.95
MMT 432/144R	70cm Transverter for 2m Rig	184.00
MMT 70/28	4m Transverter for HF Rig	115.00
MMT 1296/144	23cm Transverter for 2m Rig	184.00
MML 144/30LS	2m 30W lin. Amp (3W1/P)	69.95
MML 144/50S	2m 50W lin. Amp (10W1/P)	85.00
MML 144/100S	2m 100W lin. Amp (10W1/P)	139.95
MML 144/100LS	2m 100W linears (1/3W1/P)	159.95
MML 432/20	70cm 20W linear Amp (3W1/P)	85.00
MML 432/50	70cm 50W linear Amp	109.95
MML 432/100	70cm 10/100W linear Amp	228.65
MM 2001	RTTY to TV converter	189.00
MM 4000	RTTY transceiver	269.00
MM 4000KB	Ditto with Keyboard	299.00
MMC 50/28	6m converter to HF Rig	29,90
MMC 70/28	4m converter to HF Rig	29.90
MMC 114/28	2m converter to HF Rig	29.90
MMC 432/28S	7cm converter to HF Rig	37.90
MMC 432/144S	70cm converter to 2m Rig	37.90
MMC 435/600	70cm ATV converter	27.90
MMK 1296/144	23cm converter to 2m Rig	69.95
MMD 050 500	500MHz dig. frequency meter	75.00
MMD 600P	600MHz prescaler	29.90
MMDP 1	Frequency counter probe	14.90
MMA 28	10 meter pre amp	16.95
MMA 144V	2m RF switched pre amp	34.90
MMF 144	2m band pass filter	11.90
MMF 432	70cm band pass filter	11.90
MMS 1	The morse talker	115.00
MMS 2	Bldrs. Adv. morse trainer	169.00

DATONG

PC 1	Gen. Cov. Converter HF on 2m	137.42
VLF	Ver Low Frequency Converter	29.90
FL 1	Frequency Agile Converter	79.35
FL 2	Multi-mode Audio Filter	89.70
FL 3	FL 2 with Auto Notch	129.37
ASP	Auto R.F. Speech Clipper (Trio or Yaesu plug)	82.80-89.70
D 75	Manually controlled R.F. Speech clipper	56.35
RFC/M	R.F. Speech Clipper Module	29.90
D 70	Morse Tutor	56.35
AD 2700	Indoor Active Filter (inc. PSU)	54.05
AD 370	Outdoor Active Filter (inc. PSU)	71.30
MK	Keyboard morse sender	137.42

PS 1	Programmable Tone Squelch System (2 units)	45.99
RFA	Wideband preamplifier	33.92
MPU	Mains Power Unit	6.90

MORSE EQUIPMENT

MK 704	Squeeze paddle	10.50
HK 707	Up/Down key	10.50
EK 150	Electronic Keyer	74.00

MUTEK

SLNA 144S	144MHz switched pre-amp	33.90
SLNA 144U	Unswitched version of above	20.38
SLNA 144UB	Unboxed version of SLNA 144U	12.41
TLNA 144S	432MHz 1.4dB NF/13dB gain switched pre-amp	54.90
TLNA 432U	Unswitched version of above	26.40
TLNA 432UB	Unboxed version of TLNA 432U	18.50
BLNA 432UB	1.3dB NF/13dB gain sub-mini 432MHz pre-amp	12.43

BENCHER

BY 1	Keyer Paddle (black base)	32.00
BY 2	Keyer Paddle (chrome base)	39.95
BY 3	Keyer Paddle (gold plated)	92.00
ZA 1A	Balun 3.5-30MHz for dipoles	12.65
ZA 2A	Balun 14-30MHz for beam antennas	13.80

TONO

THETA 9000E	RTTY/CW/ASC11	650.00
THETA 550	The latest – "A Winner"	299.00

AMPLIFIERS

UC 70	430MHz 55W + preamp	149.00
2M-50W	144MHz 30-50W	65.00
2M-100W	144MHz 100W + preamp	115.00
MR 150W	144MHz 130-150W + preamp	159.00
MR 250W	144MHz 250W + preamp	259.0(

TASCO

TeleReader CWR 685E	RTTY/CW/ASC11	699.00
TeleReader CWR 670E	As above RX only	259.00
MorseMaster CWR 600	As above basic unit	189.00

All units include U.H.F. modulators

WELZ

SP 200	1.8-160MHz 20W-200W-1KW	59.00
SP 300	1.8-500MHz 20W-200W-1KW	79.00
SP 400	130-500MHz-5W-20W-150W	59.00
SP 15M	1.8-150MHz 0-2.5-20-200W	29.00
SP 380	1.8-500MHz 20-200W	49.00
AC 38M	8-band ATU 400W	59.95
CT-15A	DC-450MHz dummy load	6.95
CT-15N	As above N-type socket	11.75
CH 20A	DC-450MHz coax switch SO239	15.95
CH 20N	As above – N-type sockets	27.95

MOBILE SAFETY MICROPHONES

ADONIS AM 202S	Clip on	20.95
ADONIS AM 202F	S/neck + up/down btns.	30.00
ADONIS AM 202H	H/Band + up/down btns.	30.95

DRAE

FULLY PROTECTED POWER SUPPLIES

4 amp 27.95	6 amp	44.95
12 amp 69.00	24 amp	99.00
VHF Wavemeter	130-450MHz	24.95
Morse Tutor		47.00

373 UXBRIDGE ROAD, ACTON, LONDON W3 9RH
Tel: 01-992 5765/6/7 *Just 500 yards east of Ealing Common station on the District and Piccadilly Lines, and 207 bus stops outside.*

136 GLADSTONE STREET, ST HELENS, MERSEYSIDE
Tel: 0744 53157 *Our North West branch run by Peter (G4KKN) just around the corner from the Rugby Ground.*
Closed Wednesday at Acton and Monday at St Helens, but use our 24-hour Ansafone service at either shop.

KEEP AHEAD WITH THE NEW FT-102!

Once again YAESU lead the field with the exciting new FT-102 HF transceiver– no other manufacturer offers so many innovative features.

Better Dynamic Range
The extra high-level receiver front end uses 24 VDC for both RF amplifier and mixer circuits, allowing an extremely wide dynamic range for solid copy of the weak signals even in the weekend crowds. For ultra clear quality on strong signals or noisy bands the high voltage JFET RF amplifier can be simply bypassed via a front panel switch, boosting dynamic range beyond 100dB. A PLL system using six narrow band VCOs provides exceptionally clean local signals on all bands for both transmit and receive.

Total IF Flexibility
An extremely versatile IF Shift/Width system, using friction-linked concentric controls and a totally unique circuit design, gives the operator an infinite choice of bandwidths between 2.7kHz and 500Hz, which can then be tuned across the signal to the portion that provides the best copy sans QRM, even in a crowded band. A wide variety of crystal filters for fixed IF bandwidths are also available as options for both parallel and cascaded configurations. But that's not all; the 455kHz third IF also allows an extremely effective IF notch tunable across the selected passband to remove interfering carriers, while an independent audio peak filter can also be activated for single-signal CW reception.

New Noise Blanker
The new noise blanker design in the FT-102 enables front panel control of the blanking pulse width, substantially increasing the number of types of noise interference that can be blanked, and vastly improving the utility of the noise blanker for all types of operation.

Commercial Quality Transmitter
The FT-102 represents significant strides in the advancement of amateur transmitter signal quality, introducing to amateur radio design concepts that have previously been restricted to top-of-the-line commercial transmitters; far above and beyond government standards in both freedom from distortion and purity of emissions.

Transmitter Audio Tailoring
The microphone amplifier circuit incorporates a tunable audio network which can be adjusted by the operator to tailor the transmitter response to his individual voice characteristics before the signal is applied to the superb internal RF speech processor.

IF Transmit Monitor
An extra product detector allows audio monitoring of the transmitter IF signal, which, along with the dual meters on the front panel, enables precise setting of the speech processor and transmit audio so that the operator knows exactly what signal is being put on the air in all modes. A new "peak hold" system is incorporated into the ALC metering circuit to further take the guesswork out of transmitter adjustment.

New Purity Standard
Three 6146B final tubes in a specifically configured circuit provide a freedom from IMD products and an overall purity of emission unattainable in two-tube and transistor designs, while a new DC fan motor gives whisper-quiet cooling as a standard feature. For the amateur who wants a truly professional quality signal, the answer is the Yaesu FT-102.

New VFO Design
Using a new IC module developed especially for Yaesu, the VFO in the FT-102 exhibits exceptional stability under all operating conditions.

ANCILLARY EQUIPMENT

SP-102 EXTERNAL SPEAKER/AUDIO FILTER
The SP-102 features a large high-fidelity speaker with selectable low- and high-cut audio filters allowing twelve possible response curves. Headphones may also be connected to the SP-102 to take advantage of the filtering feature, which allows audio tailoring for each bandwidth and mode of operation to obtain optimum readability under a variety of conditions.

FC-102 1.2 KW ANTENNA COUPLER

FV-102DM SYNTHESIZED, SCANNING EXTERNAL VFO

NEW! FT-230R 25watt 2m FM mobile

- Two independent VFO's
- 10 memories
- Priority function
- Memory and band scan
- 12.5/25 KHz steps
- Large LCD readout.

FT-290R All-mode 2m portable

LCD display,
10 memories, 2 VFO's, C size battery,
easy car mounting tray, 2·5 watts out.

AGENTS
North West – Thanet Electronics Ltd. Gordon, G3LEQ, Knutsford (0565) 4040
Wales & West – Ross Clare, GW3NWS, Gwent (0633) 880 146
East Anglia – Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT, Norwich 0603 66189
North East – North East Amateur Radio, Darlington 0325 55969
Shropshire – Syd Poole G3IMP, Newport, Salop 0952 814275

Access · BARCLAYCARD VISA — or attractive H.P. terms readily available for on-the-spot transactions. Full demonstration facilities. Free Securicor delivery.

WISHING ALL OUR CUSTOMERS A HAPPY NEW YEAR
Come and see us at the N.E.C. Birmingham

For full details of these new and exciting models, send today for the latest YAESU PRICE LIST & LEAFLETS. All you need do to obtain the latest information about these exciting developments from the World's No.1 manufacturer of amateur radio equipment is to send 36p in stamps and as an added bonus you will get our credit voucher value £3·60– a 10 to 1 winner!

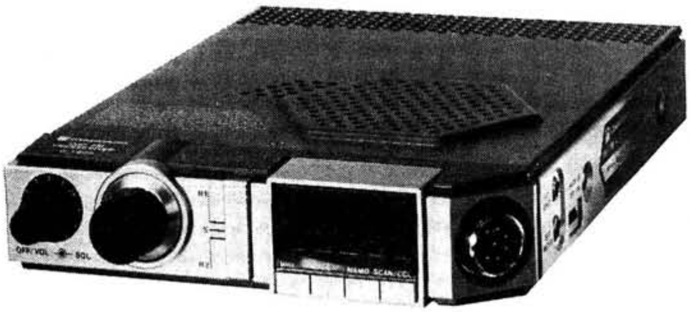
As factory appointed distributors we offer you– widest choice, largest stocks, quickest deal and fast sure service right through–

Lee Electronics Ltd

LEE

TWO NEW SLIMLINES FROM STANDARD

C7900 70cms - C8900 2mtr



Prices: C7900 - £269 inc. & C8900 - £239 inc.

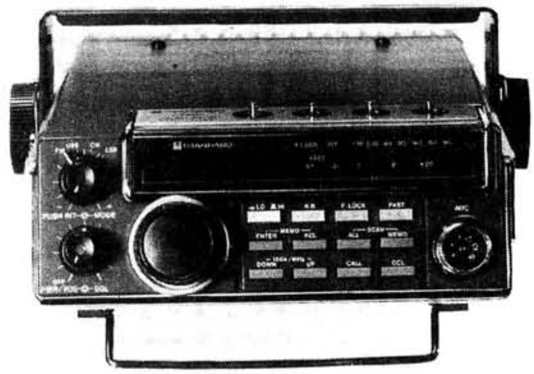
SPECIFICATIONS

General	
Frequency coverage	144-146MHz
Mode of operation	F3
Voltage	DC 13.8V
Power drain	2.8 Amp TX. 0.4 Amp RX-Standby
Polarity	Negative only
Dimensions (H x W x D)	**31 x 138 x 178 mm**
Weight	**1.1Kg**
Transmitter	
RF power output	10 watt minimum •
Spurious emission	60dB
Maximum deviation	± 5 KHz
Modulation	Reactance modulation
Receiver	
Sensitivity	− 10dB (12 dB SINAD)
Bandwidth	± 7.5 KHz (−6dB)
Receiver system	Double superheterodyne
Intermediate frequency	1st IF 10.7 MHz 2nd IF 455 KHz
Selectivity	More than 60 dB
Squelch sensitivity	− 16 dB
Audio output	2W (into 8 ohms with 10% THD)

The specifications for both sets are the same, it's the frequency that's different!!

We have improved and enlarged our workshop facilities to provide a better service for our customers.

C5800 MULTIMODE



At long last Standard have released the C5800. They have taken a long time to satisfy themselves (and us) that there are no bugs to sort out. I hear you snigger "No Bugs?"
Well, after 6 months of field testing what do you expect!! Now read on.

SPECIFICATIONS

1. General Specifications

Transmission frequency	144.00000 − 147.99999MHz (E) 144.00000 − 145.99999MHz (W)
Type of emission	FM (F_3), SSB (A_3J), CW (A_1)
Frequency stability	±300Hz within 1-60 minutes after power on 50Hz every 30 minutes
Power supply	13.8VDC
Power consumption	Transmission: H1, 3, 7A, LOW; 1.5A Reception standby: 450mA
Microphone input impedance	600Ω
Anetenna impedance	50Ω
AF output impedance	4 or 8Ω
Grounding system	Negative
Dimensions	149mm (W), 55mm (H), 218mm (D)
Weight	1.90 kg

2. Reception Specifications

Reception system	FM: Double super heterodyne SSB, CW: Single super heterodyne
Intermediate frequency	FM: 1st IF 10.7MHz 2nd IF 455kHz SSB, CW: 10.7MHz
Sensitivity	FM: 0.19μV (12dB SINAD) SSB, CW: 0.15μV (10dB S/N)
Pass bandwidth	FM: ±6kHz, SSB, CW: 2.2kHz
Selectivity (60dB)	FM: 25kHz, SSB, CW: 4.2kHz
Squelch selectivity	0.15μV (FM)
AF output	More than 2W (into 8 ohms with 10% THD)

3. Transmission Specifications

Power output	25W/1W
Modulation	FM: Reactance modulation SSB: Balanced modulation
Maximum frequency tolerance	$\pm 15 \times 10^{6}$ (-10−+50°C)
Spurious attenuation	60dB
Carrier suppression	40dB
Undesired side band suppression	40dB
Maximum deviation	±5kHz

Price: £359 inc.

These specifications are subject to change without notice in the event of improvements.

400 EDGWARE ROAD,
LONDON W2
01-723 5521 Tlx 298765

Please allow up to 14 days for delivery

NEAREST TUBE:
EDGWARE ROAD
PADDINGTON

OPENING TIMES:
9.30am-5.30pm Mon, Tues, Wed, Fri.
9.30am-1pm Thurs.
10am-4.30pm Sat.

ELECTROVALUE

- 24 HOUR NORMAL DESPATCH TIME
- ESTABLISHED 1965
- ALL GOODS GUARANTEED BRAND NEW AND TO SPECIFICATION
- APPOINTED SIEMENS DISTRIBUTORS

I.Cs – DIGITAL & ANALOGUE

DIGITAL

74LS

74LS00	11
74LS02	11
74LS04	12
74LS05	12
74LS08	12
74LS10	12
74LS11	12
74LS14	30
74LS20	12
74LS30	12
74LS32	14
74LS37	14
74LS38	15
74LS42	28
74LS47	56
74LS51	14
74LS73	18
74LS74	18
74LS75	22
74LS76	19
74LS85	48
74LS86	20
74LS90	27
74LS92	32
74LS93	24
74LS107	40
74LS112	22
74LS123	38
74LS125	29
74LS126	27
74LS132	40
74LS136	25
74LS137	110
74LS138	30
74LS139	35
74LS145	70
74LS148	89
74LS151	40
74LS153	40
74LS153	40
74LS155	38
74LS156	36
74LS157	30
74LS161	37
74LS163	36
74LS164	43
74LS165	60
74LS166	90
74LS173	55
74LS174	45
74LS175	40
74LS191	50
74LS193	40
74LS195	39
74LS196	48
74LS197	60
74LS221	51
74LS240	55
74LS241	55
74LS242	75
74LS243	75
74LS244	60
74LS245	85
74LS251	55
74LS253	43
74LS257	35
74LS259	84
74LS266	28
74LS273	60
74LS279	40
74LS299	250
74LS367	34
74LS368	24
74LS373	84
74LS374	68
74LS378	60
74LS393	60

7400

7400	11
7401	11
7402	12
7403	12
7404	13
7405	15
7406	20
7407	20
7408	14
7409	14
7410	14
7413	18
7414	20
7420	15
7430	14
7440	14
7442	32
7443	60
7444	60
7447	36
7448	40
7450	14
7451	14
7453	14
7454	14
7460	14
7470	24
7472	26
7473	28
7474	23
7475	32
7476	30
7480	35
7482	65
7483	38
7485	60
7486	20
7489	159
7490	28
7491	35
7492	25
7493	25
7494	35
7495	36
7496	40
74100	80
74104	40
74107	22
74121	24
74123	40
74125	34
74126	33
74141	51
74151	40
74154	60
74155	39
74156	40
74157	30
74190	48
74192	48
74193	48
74393	95

CMOS

4000	10
4001	10
4002	12
4006	50
4007	14
4008	40
4009	24
4010	24
4011	12
4012	15
4013	20
4014	46
4015	40
4016	20
4017	35
4018	45
4019	25
4020	42
4021	40
4022	35
4023	14
4024	32
4025	14
4026	80
4027	20
4028	39
4029	45
4030	16
4041	44
4042	40
4043	40
4044	40
4046	46
4049	23
4050	23
4060	45
4069	14
4070	14
4071	14
4072	14
4081	14
4082	14
4093	20
4510	46
4511	46
4511	120
4516	53
4518	40
4520	60
4543	120
4583	130

All above prices are NET and shown in pence

ANALOGUE

709C5	49
709C14	44
723C14	36
741C5	57
741C8	18
741C14	47
747C14	65
748C8	35
1458C5	62
1458C14	40
7106	450N
7107	500N
555	23
7555	86
556	45
CA3046	78
CA3080E	86
CA3130E	99
CA3140E	55
LM301AN	26
LM308N	60
LM317K	321
LM324N	45
LM348N	65
LM380N	75
LM380N8	104
LM381N	146
LM382N	115
LM3900N	50
LM3914N	200
LM3915N	200
NE555V	23
NE556A	45
NE567N	104
RC4151NB	80
S041E	290
S041P	121
S042E	364
S042P	138
S89	11.23
S178B	31.00
S187	13.28
S566B	214
S576A	235
S576B	235
S576C	235
S576D	225
S1469	468
SAB0600	302
SAB3209	497
SAB3210	311
SAB3211	168
SAB3271	329
SAB4209	497
SAB8256C	35.40
SAD1024	15.50
SAJ131	238
SAJ141	224
SAJ205	810
SAS231W	260
SAS251	142
SAS580	196
SAS590	196
SDA5680A	15.55
TAA761	104
TAA761A	49
TAA765A	62
TAA861	103
TAA865A	59
TAA2761A	72
TAA4761A	113
TAA4765A	120
TAB1041W	187
TBA120AS	62
TBA120U	72
TBA400	100N
TBA800	75
TBA10S	75
TBA820	75
TBB1458	62
TBB1458B	40
TCA105	120
TCA105B	108
TCA105G	140
TCA250A	186
TCA205K	200
TCA335A	66
TCA345A	109
TCA345W	177
TCA671	131
TCA780	211
TCA871	114
TCA955	228
TCA965	136
TCA965K	170
TCA971	92
TCA991	80
TCA991K	100
TDA2002	120
TDA2003	126
TDA2030	150
TDA4050B	144
TDA4290	169
TDA4600	184
TDA4700A	546
TDA4713A	435
TFA1001W	252
TL071CP	45
TL072CP	75
TL074CN	120
TL081CP	46
UAA170	165
UAA170L	152
UAA180	165
UAA190	141
XR2206	520
ZN414	85
ZN424P	99
ZN425E	350

CRYSTALS

(in MHz)

0.032768	102
0.100000	453
1.000	453
1.8432	320
2.000	268
2.4576	268
3.2768	188
3.579	128
4.000	102
4.194	128
4.433	128
4.915	157
5.000	157
5.026	128
6.000	157
6.144	157
6.5536	128
8.000	1.88
8.867	128
10.000	157
18.432	188

ZENER DIODES

400mW/2.7-30V	7p
1-3W/3.3-100V	15p
20W/7.5-75V	£1.98

CONNECTORS

DIN AUDIO — Pins, plug, skt
PARALLEL TYPE — Plug, Skt
Plugs have retainers. Sockets have strain relief.
IC Sockets
JACK PLUGS SKTS
MONO, STEREO
TERMINALS
D - SERIES
IDC Connectors
QUICK TEST
Mains connector – block, fused 525

Very wide range of many other types in stock – see latest price list.

CAPACITORS

Polystyrene, Siemens 5% Tolerance 160V
5, 7, 10, 12, 15, 18, 22, 27, 33, 39pF **15p**; 47, 56, 68, 82, 100, 120, 150, 180, 220, 270, 330, 390, 470, 560, 680, 820pF, 1n, 1n2, 1n5, 1n8, 2n2, 2n7, 3n3, 3n9, 4n7, **10p**; 5n6, 6n8, 8n2, 10n, **13p**

Ceramic Very small 1.8, 2.2, 2.7 etc, up to 1n **5p each**. 1n5, 2n2, 3n3, 4n7, 6n8, **5p**; 10n, 22n, **6p**; 33n, 47, **7p**; 100n, **8p**

Polyester, Siemens Layer Type 7.5mm lead spacing 100V
1n, 1n5, 2n2, 3n3m **6p**; 4n7, 6n8, 8n2, 10n 12n, 15n, 18n, 22n, 33n, 47n, **7p** 56n, 68n, **7p**; 82n, 100n, **9p** 120n, 150n, **15p**; 180n, 220n, **12p**; 270n, 330n, 330n, 390n, 470n, **15p**; 560n, 680n, **24p**; 10mm spacing 1uF **25p**; 15mm spacing 2u2 **35p**; 22.5mm, spacing 1uF 400V **50p**; 3.33uF 100V **69p**; In depth stocks.

ELECTROLYTICS

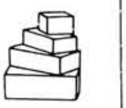
1/63	10
2.2/25	13
2.2/63	10
4.7/63	11
4.7/100	14
6.8/40	10
10/6	13
10/25	10
10/40	11
10/63	14
10/100	15
22/10	10
22/25	11
22/40	14
22/63	15
22/100	16
47/3	03
47/10	11
47/25	12
47/40	15
47/63	17
47/100	18
100/3	03
100/10	13
100/16	14
100/25	15
100/40	15
100/63	20
100/100	27
220/10	16
220/16	16
220/25	18
220/40	20
220/28	28
220/100	42
470/10	19
470/16	19
470/25	19
470/40	27
470/63	45
470/100	73
1000/10	19
1000/16	26
1000/25	38
1000/40	44
1000/63	76
2200/6	09
2200/16	44
2200/25	
2200/40	73
4700/16	72
4700/25	90

TANTALUM BEARS

0.1/35	13
0.22/35	13
0.47/35	13
1.0/35	13
2.2/16	13
2.2/35	16
4.7/16	16
4.7/35	18
6.8/16	16
6.8/25	24
10/6.3	16
10/16	18
10/25	18
22/6.3	18
22/16	30
22/25	30
33/6.3	24
33/10	30
47/6.3	30
100/10	80

For full ranges of very many other types please see Cat 82 and/or current price list.

BOXES



High quality Black ABS plastic or die-cast plain or stove grey.

L	W	D	ABS		Plain		Stove Gr	
50	50	25	–		5001P	90p	5001	123p
100	60	25	2002	96p	5002P	117p	5002	154p
113	63	31	2003	109p	5003P	143p	5003	184p
121	66	40	2004	115p	5004P	162p	5004	210p
152	82	50	2005	134p	5005P	216p	5005	268p
192	113	61	2006	235p	5006P	314p	5006	401p

VERO RANGE plastic boxes

L	W	D		
72	47	25	21024	51p
120	50	35	21390	83p
180	110	55	21391	151p

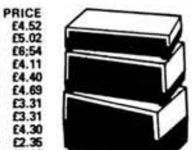
G RANGE professional Instrument Cases

134	90	44	21089	£7.28N
224	140	64	21090	£11.02N
302	170	84	21091	£14.96N

VEROBOX CASES

to give a completely professional finish to a much valued project.
ABS, light grey top; dark grey bottom + 2 anodised panels

L	D	H	TYPE	PRICE
205	140	40	21034	£4.52
205	140	75	21035	£5.02
205	140	110	21036	£6;54
180	120	39	21037	£4.11
180	120	65	21038	£4.40
180	120	90	21039	£4.69
155	85	39	21040	£3.31
155	85	60	21041	£3.31
155	85	80	21042	£4.30
125	65	30	21047	£2.35
125	65	39	21048	£2.99
125	65	50	21049	£3.37



METERS

Large range of types in stock; also probes, leads, accessories, etc.
PANEL MOUNTING in 50, 100, 500µA; 1, 5, 10, 50, 100, 500mA; 1A either model.

T Range 60 × 45mm **£5.96**

MU Range 50 × 45mm **£2.68**

MULTIMETERS

NH56A NEW – 20KΩ/V AC/DC/-RES/dB in 23 ranges: 130 × 88 × 37mm £11.20N

YN360TR 20KΩ/V: AC/DC/R/dB/Transistor Test: in 21 ranges: 145 × 96 × 45mm **£16.45N**

RF Chokes

1, 1.1, 4.7, 10, 47µH ea **42p**. 100, 22µH **53p**. 470µH, 1mH **73p**.

PANEL LAMPS

LED chrome, red **54**
LED yellow or green **70** (high efficiency)
Filament in red, amber, green or clear.
6V 60 mA **48**
14V 40 mA **54**

5V filament
3015F 8 mA **256**
3015F 15 mA **256**

LED's
5mm red **10**
yellow **19**
green **16**
Mountings, B65 **3**

KNOBS black plastic
K1 skirted with spot **16**
K2 as K1, 35mm **21**
K3 pointer **15**
K7 19 mm knurled **23**
K8 as K7 + skirt **23**

DISPLAYS
7-segment
Common anode
MAN72A red **75**
MAN82A yellow **110**
MAN52A green **110**
Common cathode
MAN74A red **85**
MAN84A yellow **110**
MAN54A green **110**

RECHARGEABLE CELLS
AA **99p** C **227p**
D (4AH) **376p**
PP3 cell (7-2V) PP3 charger **495N 410**
CHARGERS FOR ABOVE
for any two pairs AA, C or D No NC1230 **820N**

BUZZERS
6-15V solid state **70**

SOLDERING IRONS

Also large stocks of bits, desoldering devices, accessories, etc.
ANTEX C 240V **£4.60N**; X.25-240V **£5.30N**; CSBP **£5.45N**; XSBP **£5.56N**; ST4 Stand **£1.70N**
ORYX 50 watt temp. controlled **£13.75N**
SOLDER 500gm/18SWG **£7.60N**; Desolder braid 1.5m **54p**

SWITCHES

Type CK – 1P/12 way, 2P/6 way, 3P/4 way, 4P/3 way **48p**; Min Toggles – S7101 SPDT **57p**; S7201 DPDT **80p**; S7301 3PDT **£1.64**; S7203 DPDT **96p**; Push Button min. 8531 make/8533 break **62p**; 8225 DPDT **£1.34**.
DUAL IN LINE ERG colour coded 0.3" × 0.1" format. On/Off single throw 2P SDS2 **54p**; 4P SDS4 **95**; 6P SDS6 **£1.38**; 8P SDS8 **£1.87**; 10P SDSO **£2.10**. *Low cost* D-I-L 4P DNS04 **65p**; DNS08 **£1.00**

LATEST PRICE LIST
includes many new additions to items in our catalogue. Large S.A.E. brings price list FREE.
CATALOGUE incl 70p refundable voucher, 70p post free U.K. with price list.

SEMICONDUCTORS

1N914	03
1N914B	10
1N916	06
1N4007	06
1N4148	03
1N5402	14
1N5407	18
2N697	23
2N706	18
2N930	20
2N1132	23
2N1302	110
2N1303	58
2N1304	62
2N1305	62
2N1306	90
2N1307	67
2N1308	147
2N1309	99
2N1599	100
2N1613	25
2N1711	25
2N1893	32
2N2218A	31
2N2219A	25
2N2222A	25
2N2369A	21
2N2484	25
2N2646	45
2N2904	28
2N2904A	25
2N2905A	25
2N3053	23
2N3054	56
2N3055	48
2N3405	84
2N3663	15
3702-11	09
2N3771	180
2N3794	21
2N3819	22
2N3820	40
3823	60N
2N3904	15
2N3906	15
2N4036	46
2N4058-62	09
2N4124	25
2N4126	25
2N4284	30
2N4286	18
2N4289	23
2N4291	24
2N4292	21
2N4991	62
2N5062	32
2N5192	110
2N5195	106
2N5457	32
2N5458	32
2N5459	36
2N6050	380
2N6057	375
6F40	152
16F40	165
40HF40	225
40361DIS	
40362	65
40406	71
40408	95
40412	108
40430	100
40594	123
40595	123
40636	147
40673	145
A9903	16
AA113	13
AA116	13
AA117	13
AA118	14
AA119	13
AC126	25
AC127	25
AC128	25
AC151R	55
AC153K	20
AC176	25
ACY17	155
ACY18	120
ACY19	99
ACY20	90
ACY21	85
ACY39	170
ACY41	10
AD136	530
AD142	90
AD149	88
AD161	35
AD162	35
AF114	37
AF115	37
AF116	57
AF117	110
AF124 AF125	37
AF126	37
AF127	37
AF200	10
AF239	114
AF279	30
AFY12	204N
AFY16	327N
AFY180	310N
AFY18E	615N
AFY42	461N
AU106	240
AU111	(use
AU116)	
AUY22	10.96
BO140	25N
BO146	30N
BO226	45N
B1906	38
BA379	25
BAS40-03	36
BAS70-03	41
BAT14-036	11.75
BB409	33
BC107A,B	16
BC108A,B,C	16
BC109B,C	18
BC121W	30N
BC122Y	100
BC125	20
BC125	20
BC140	30
BC141	30
BC147A	10
BC149	10
BC154	25
BC160	30
BC161	30
BC167A	09
BC167B	09
BC168A	09
BC168B	09
BC169B	09
BC169C	09
BC177B	16
BC178B	16
BC179B	18
BC182	09
BC182L	09
BC183	09
BC183L	09
BC184	09
BC184L	09
BC202Y	120
BC212	09
BC212L	09
BC213	09
BC213L	09
BC214	09
BC214L	09
BC238C	09
BC239C	09
BC258B	09
BC267B	16
BC300	26
BC301	24
BC303	30
BC327	16
BC328	11
BC337	14
BC338	11
BC413	09
BC414	09
BC477	29
BC546	10
BC547	09
BC548	09
BC549	09
BC550	10
BC556	10
BC557	09
BC558	09
BC559	09
BC560	10
BC879	38
BC880	43
BCY31A	157
BCY58	18
BCY70	18
BCY71	18
BCY72	18
BD130	45N
BD131	48
BD132	48
BD135	27
BD136	27
BD139	30
BD140	32
BD644	42N
BD679	62
BD680	64
BF115	35
BF167	25
BF173	25
BF177	25
BF178	25
BF244B	40
BF254	14
BF255	14
BF420	31
BF421	34
BF457	35
BF458	35
BF459	35
BF597	12N
BFR34A	84
BFR39-41	23
BFR79-81	23
BFT65	119
BFT66	192
BFX29	24
BFX84	24
BFX85	24
BFX87	28
BFX88	26
BFY50	24
BFY51	24
BFY52	24
BFY90	143
BR34	70
BR64	110
BRY39	45
BSX20	22
BSX26	22
BSX63	769N
BT106	147
BT108	136
BU105	170
BU124	85
BU208	180
BUX26	350N
BUX28	545
BUX81	744
BUX85	249
BUZ10A	478
BUZ15	12.27
BUZ20	523
BUZ23	787
BUZ24	12.50
BUZ32	625
BUZ33	844
BUZ41A	637
BUZ44A	9.67
BUZ45	12.76
BUZ48	18.94
BUZ50A	763
BUZ54A	21.43
BUZ80	739
BUZ83	11.29
BUZ83A	11.95
BUZ84A	12.75
BY164	48
C106D1	45
C0326	460N4
C0340	490N4
C407	17
C0546	126N1
C762	40
C1406	77
D4 clip for C1406 and E2506	10
D1046	88
E1110	78
E1210	76
E2506	154
EB383	20
MJ2955	90
MJE340	55
MJE2955	95
MJE3055	70
MPF102	40
MPS6531	40
MPS6534	42
MPSA12	36
MPSA63	38
NAS206S5	81
OA47	12
OA90	10
OA91	10
OA95	DIS
OA202	14
OC28	75
OC29	75
OC35	75
OC36	90
OC84	25
PM7A2	373
PN70	10
PN72	05
Q4006LT	104
Q4010LT	115
Q4025H	450
T2700D	189
T2800D	104
TAG3-400	100
TAG209-400	85
TAG209-600	130
TIC106D	48
TIC106M	55
TIC126D	64
TIC206D	54
TIC226D	61
TIC236D	96
TIC246D	105
TIP31A	36
TIP32A	36
TIP41A	45
TIP41C	60
TIP42A	45
TIP42C	60
TIP150	75
TIP2955	55
TIP3055	55
TIS43	50
U763	50
VN10KM	55
VN46AF	93
VN66AF	105
VN88AF	123
W02	25

POTENTIOMETERS

Carbon Rotary (P20) 100ohms – 4M7 lin. 220ohms – 2M2 log. **32p each** w.switch **87p**. Dual gang (JP20) 4K7 – 1M2 lin, or log **95p** w.switch **£1.50**

SLIDERS
58mm, low cost 10K 1M log only **29p**. Std 58mm mono 4K7 – 1M lin. or log **74p** stereo matched **£1.25**. Graduated bezels **34p each**.
PRESET
Min. 10mm dia. Hrix. or Vert. 100ohms – 1M **13p**
Preset Cermet rectilinear type 89P 100ohm – 1m **£1.06 each**
Preset Cermet 10mm dia. Horiz. or Vert. 100ohm – **29p**
Plesseyu MPW T moulded carbon 47ohms – 2M2 **59p each.**

RESISTORS

1/4, 1/3, 1/2, 3/4 watt – **all 2p each**, 10 of one value **15p**
2% Mullard metal film 5.1 ohms – 300K **5p each**, 10 of one value **40p**
5% wire wound 3W or 7W, most E12 values 1.2ohms to 8K2 **9p each** 10 for **70pN**

CREDIT CARD ORDERS can be accepted via Mail Order or Telephone. Giro A/c no. 38/671/4002

VAT additional at 15% on all UK orders
FREE POSTAGE and packing on UK C.W.O. orders value £5.75 (inc. VAT) and upwards. Under £5.75 add 40p (inc. VAT)
DISCOUNTS on orders over £23.00 – 5%
££57.50 – 10%
Not applicable to 'Net' items (shown by 'Net' after the price) or to orders paid for by credit cards.

PLEASE MENTION THIS JOURNAL WHEN ORDERING OR WRITING IN TO US

ELECTROVALUE LTD

Head Office, Mail Order Dept and Shop
28B St. Judes Road, Englefield Green, Egham, Surrey TW20 0HB Telephone Egham (STD 0784: London 87) 33603; Telex 264475
Also in Manchester for personal shoppers at:—
680 Burnage Lane, Burnage, Manchester M19 1NA
Telephone 061-432 4945
EV Computing Shop
700 Burnage Lane, Manchester Telephone 061-431 4866

comment...

Tightening Up

THE LONG-AWAITED AMENDMENTS to the Wireless Telegraphy Acts 1949 and 1967, which presently control the use of radio in the UK, were included as part of the Telecommunications Bill[1], published on 19 November 1982. The provisions have two purposes: to rationalise and update the penalties for wireless telegraphy offences, and to introduce new powers to enable more effective enforcement of the law.

The provisions include: powers for the police or members of the Radio Interference Service of British Telecom to seize apparatus for the purpose of proceedings; a limited power of arrest without warrant for the police in cases involving the illegal use of radio transmitters; power for the Secretary of State to control the sale and possession of specified wireless telegraphy equipment.

This last provision is aimed particularly at illegal CB transceivers, which are still generating about 1000 complaints of interference to domestic TV and radio reception every week. Under present legislation it is illegal to manufacture or import such transceivers. The new law would make it possible also to prohibit their advertisement, sale or possession. It is likely that a limited amnesty period—perhaps six months—would be allowed.

The powers of seizure and arrest should certainly improve the effectiveness of action against the illegal use of transmitters, jamming and the sending of misleading messages. The new Criminal Justice Act 1982 will raise the maximum fine for the unlicensed use of a transmitter from £400 to £1000.

The Telecommunications Bill was due to have its second reading in the House of Commons on November 29, and then goes into Committee. We have not yet had time to analyse the Bill in detail, but it appears at first sight to be a step in the right direction towards curbing some of the more antisocial abuses of radio, whilst not unduly restricting responsible users, among which the majority of licensed amateurs are to be numbered.

Geoff Arnold

[1] *Telecommunications Bill, 162pp (0 10 301583 3) £7.60*

services

QUERIES
While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST
The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

CONSTRUCTION RATING
Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate
A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS
Subscriptions are available to both home and overseas addresses at £13 per annum, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

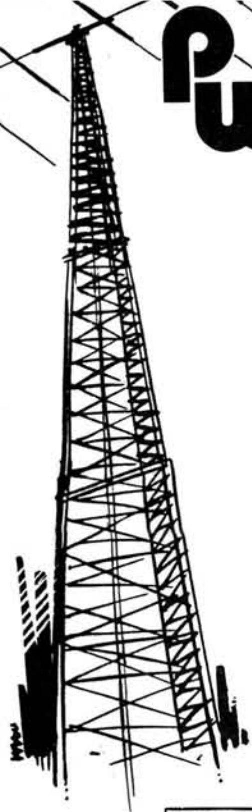
BACK NUMBERS AND BINDERS
Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.00 to UK addresses, £5.25 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

INSURANCE
Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.



PW RADIO USERS INSURANCE SCHEME

Practical Wireless Radio Users Insurance Scheme was devised by Registered Insurance Brokers B. A. LAYMOND & PARTNERS LIMITED following consultation with PRACTICAL WIRELESS to formulate an exclusive scheme designed to meet the needs and requirements of:

Amateur Radio Enthusiasts ● CB Radio Users ● Taxi Companies and Fleet Users with Radio Telephones and any individual or company needing cover for communications equipment which is legal to use and properly licensed.

SPECIAL FEATURES

- All Risks Cover
- "New Lamps for Old" Cover (as defined in policy)
- Index Linked Cover to combat inflation
- Licence protection—covers legal costs arising from any breach of your licence conditions
- Equipment covered anywhere in the UK, Channel Islands and Isle of Man, but not Northern Ireland and Eire
- Fixed Antennas (Aerials) covered
- Frequency, Power and SWR Meters and similar radio-related test equipment covered
- 30 days cover in Western Europe included Free of Charge
- Absolute Security as this scheme is underwritten by a leading member of the British Insurance Association on the London Insurance Market
- Practical Wireless radio receiver and transmitter projects covered (when stated in feature)
- Available to Clubs and Organisations†
- Available to Companies†

†Write directly to B. A. LAYMOND & PARTNERS LTD, 562 North Circular Road, London NW2 7QZ, for a special application form and full details, enclosing the coupon below.

B. A. Laymond & Partners Limited, Practical Wireless and the Underwriters wish to make it clear that it is an offence to install or use an unlicensed radio transmitter in the United Kingdom and it is not their deliberate intention to encourage or condone the illegal use of any radio communications equipment.

COST OF PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME:

Sum to Insure	£100	£150	£300	£500	£750	£1000	£2000
Annual Premium	£6.00	£6.50	£8.00	£9.00	£10.00	£12.00	£14.00

The premium is charged on sums insured in pre-selected bands. Thus equipment totalling £250 would be in the band up to £300. Quotations for larger sums available on application.

Claims will be settled after deduction of the Policy Excess which is: £10 on sums insured up to £500; £25 on sums insured up to £3000.

HOW TO INSURE: Complete the application form below to obtain immediate insurance cover. Photocopies will not be accepted.

APPLICATION FOR PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME PW2/83

Name in full (State Mr, Mrs, Miss or Title)

Address

Post Code

Occupation Age Phone No. (Home) (Work)

I/We hereby apply to insure the equipment detailed below

COMPLETE IN BLOCK LETTERS

	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3					
4					
5	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary

TOTAL SUM TO INSURE £

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by Laymond's and the premium paid in full and a Certificate issued.

* If you have, please give details on a separate sheet.

Date Signed

Rush us details of PW Club Insurance ☐
PW Company Insurance ☐

DELAY IN ARRANGING COVER COULD COST YOU A GREAT DEAL OF MONEY. COMPLETE THIS APPLICATION AND POST WITH YOUR PREMIUM MADE PAYABLE TO "LAYMOND'S" NOW. ADDRESS TO: PRACTICAL WIRELESS (INSURANCE), B. A. LAYMOND & PARTNERS LTD., 562 NORTH CIRCULAR ROAD, LONDON NW2 7QZ. TELEPHONE: 01-452 6611.

NEWS NEWS NEWS

Electronics Hobbies Fair — 1982

Following many months of preparation, Thursday 18 November 1982 arrived and for the staff of *Practical Wireless, Practical Electronics* and *Everyday Electronics* it was all systems go at the Electronics Hobbies Fair, our first venture into running an exhibition for the radio and electronics enthusiast.

The early arrivals queue

The Fair was held over four days in the new Alexandra Pavilion, next to Alexandra Palace. Most of the available stand space was taken, and the variety of exhibits included amateur radio equipment, live satellite TV programmes from the USSR, component suppliers, home computing and video games, holography display, robotics, demonstration by the Royal Corps of Signals and many other interesting stands.

G8VFH working 432MHz

A talk-in station on S22 was run by the North London RAYNET Association and for our part we ran v.h.f., u.h.f. and h.f. stations, using the special event callsigns GB8EHF and GB2PW, we also demonstrated the reception of slow-scan ATV on the h.f. bands and a fast-scan ATV link, on 10GHz, with the assistance of Wood and Douglas. Our transmissions on the 934MHz CB service gave us contacts with mobile operators and two base stations in South London, distanced 13 and 18 miles away. The transceiver used was a Reftec 934 through a conventional (and legal) 4-element beam. This demonstration certainly generated a lot of interest among the more serious CB operators who visited the stand. Our antennas, other than the 32m long trap dipole for the h.f. bands, were mounted on a 10m mobile mast kindly loaned to us by Allweld Engineering.

PW also ensured that interest for the radio enthusiast was guaranteed by arranging a stand for the RSGB plus demonstrations of radio control by Model Land and RTTY by the British Amateur Radio Teleprinter Group.

The Model Land demonstration with PW's stand beyond

With over 11 000 visitors during the four days, the first Electronics Hobbies Fair represents for *PW* a great success, that encourages us to make the Fair an annual event. In fact plans are now under way for this year's Electronics Hobbies Fair on 27 to 30 October 1983.

ISKRA3 Now You See It, Now You Don't

Following a report by Tass News that a second amateur radio satellite, called ISKRA3, has been successfully launched by the crew of the Salyut 7 manned space laboratory currently circling the earth, Ron Broadbent G3AAJ, Hon Sec of AMSAT-UK, promptly sent us further information on the space vehicle.

ISKRA3 was launched, by hand, at 0756GMT on 18 November 1982, from the Salyut 7 spacecraft, and since then ground control tests confirm it was operating well. For the record the satellite carried a 21–28MHz active transponder with telemetry output on 28·587MHz.

Unfortunately, the altitude and orbital velocity of this spacecraft dictated a rapid orbital decay and re-entry. By the time this issue of *PW* is printed, ISKRA3 will, most likely, have re-entered the Earth's atmosphere and deposited its burnt-up remains somewhere in the Indian Ocean.

Reporting news of this satellite proves the need for constantly updated information, particularly if your interest lies with satellite communications. One of the best ways to obtain this information is to become either a member of AMSAT-UK or listen-in on the several nets AMSAT-UK run (which are open to non-members) where news is disseminated and questions can be asked. The most regular of these is on 3780 kHz (±QRM) every Sunday morning at 1015 UK local time. Other, more local, nets take place from time to time: usually weekly and mostly on 144·28MHz. There is also a half hour information net on 3780kHz every weekday evening at 1900 hrs.

Further afield AMSAT-USA also run nets on Sunday evenings on 14·282 and 21·280MHz usually at 1800 and 1900GMT.

For details of membership etc. contact: *AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ.*

NEWS NEWS NEWS

FM for the IC-720A & IC-730

Owners or prospective purchasers of either the top of the range IC-720A base station or mobile/base station IC-730 h.f. transceivers, will be pleased to know that purpose designed f.m. modules are now available.

For the IC-720A the module (FM04) costs £79·00 and for the IC-730 (FM03) costs £49·00. Both units are available from: *Thanet Electronics, 143 Reculver Road, Herne Bay, Kent. Tel: (02273) 63859.*

GB3WD — 144MHz Repeater Project

When next you visit or are perhaps taking your annual holidays in the deep South West, take a look at R4 and if the current progress has been maintained, the West-Devon 144MHz repeater GB3WD will probably be there.

The local repeater group has been formed there for some time with the prime objective of providing v.h.f. coverage into the exceedingly hilly geography of Devon, currently isolated from existing repeater coverage.

As is usually the case with such devices, the greatest practical problem facing this group has been the logistics of acquiring a suitable site. Many repeater groups throughout the UK have benefited from the exemplary policy of the BBC and IBA to assist by allowing the radio amateur to share the use of their sites in these ongoing experiments. Negotiations, over siting GB3WD, have progressed to an advanced state, not without considerable assistance from both the BBC and the RSGB Repeater Working Group. It is hoped that GB3WD will become operational in early 1983, from North Hessary Tor on Dartmoor.

The omni-directional antenna system will consist of two Jaybeam 7050 folded dipoles mounted 70m a.g.l. on the NE and SW faces of the BBC mast, spaced off by $\lambda/4$. A single run of Andrews LDF4-50 coaxial feeder will carry r.f. to the antenna, and the system's RX/TX isolation will be achieved by a locally constructed six section cavity diplexer. Control functions will be handled by a GB3US logic system.

The group have modified an Icom IC-240 for the TX and RX sub-systems with an outboard 25W p.a. stage for transmit.

A video film of the installation and constructional phases of the project is being prepared and will be made available to local radio clubs and any other interested parties.

Membership of the West Devon Repeater Group can be obtained for the modest sum of £3·00 per annum — each applicant will receive a comprehensive newsletter containing full technical details of the system etc., in addition, the first 150 applicants will receive an impressive "Founder Member" endorsed certificate.

If sheer enthusiasm were the only criteria for success, this group would achieve all its goals; however, as with all repeaters, their continued operation lies entirely in the hands of those who USE and support them. Think about it!

Further details of GB3WD, applications for group membership and offers of assistance/funds should be addressed to: *Membership Secretary, Trevor Day G3ZYY, QTHR or tel: Saltash (075 55) 5913.*

Testmex '82

Attendance at Testmex '82 was $12\frac{1}{2}$ per cent up on the 1981 figure, quite an achievement at a time of generally declining exhibition attendances. Several new and exotic test and measurement instruments were on show, but the thing that really came home was the reversal of the trend towards digital test instruments, logic analysers and the like. Radio communications test gear was the "in-thing", with particular interest being shown in spectrum analysers covering frequencies up to at least 2GHz.

For your new diary, make a note that Trident, the organisers of Testmex for the past five years, will be staging their own show, called Test '83, at the Wembley Conference Centre between 15 and 17 November, 1983. This follows a serious disagreement with the SIMA Exhibition Committee as to the future shape of the Testmex exhibition.

Extension Course for Radio Amateurs

Readers living in the Bedford area may be interested in a course designed particularly for radio amateurs who have passed the RAE and wish to extend their knowledge.

Subject areas of the course are v.h.f./u.h.f. propagation, antennas, s.w.r., modulation and digital integrated circuits.

The course commences on Monday 17 January 1983 and will run for eight weekly sessions. The lecturer will be C. P. Meadows G4KWH.

For further details contact: *Bedford College of Higher Education, (Mander) Cauldwell Street, Bedford MK42 9AH. Tel: (0234) 45151 Ext. 240.*

PW ZX81 Programs — 1

The ZX81 programs described in the *ZX Computing for the Radio Amateur* supplement (December 1982) are available on a special cassette. The cassette costs £3.50, which includes post and packing, and is available from the Editorial Office at our Poole address. Please allow 28 days for delivery.

We hope soon to produce a version of these programs that is suitable for the Sinclair ZX Spectrum.

Old and New

Since the company's launch some 15 years ago to pioneer the concept of the second-user market in the UK—the purchase, refurbishment and resale of electronic test and measuring equipment—Electronic Brokers Ltd. has made that market both respectable and successful.

From a humble beginning, selling to small firms and the hobbyist, the company has grown to become the largest of its type in Europe, handling computers as well as T&M.

Now Electronic Brokers *have signed* an agreement to distribute a wide range of new test instruments from Philips Electronics Instruments Division, and will have these on display at their *61/65 Kings Cross Road, London WC1* showroom. In charge of new products for EB is Tony Morris G4LCD.

NEWS NEWS NEWS

Passport to Amateur Radio — Reprint

The long-awaited reprint of the very popular *Passport to Amateur Radio* series is now available. Full details of how to obtain a copy are published on page 52 of this issue.

First for British Telecom

The world's longest optical fibre telephone cable came into service on 22 July 1982, between London and Birmingham, the busiest trunk route in Britain. This is the latest addition to British Telecom's "Lightlines" optical fibre network.

Optical fibres are hair-thin strands of glass carrying messages and information as pulses of light. The glass used is so pure that a block 20km (12 miles) thick would be as transparent as a window pane.

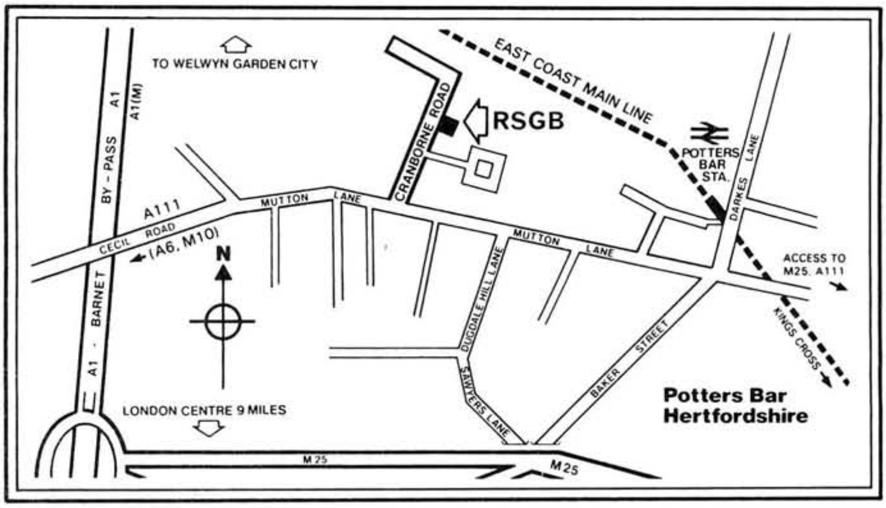
Each hair-thin strand is capable of carrying up to 2000 simultaneous telephone calls, and five strands, enough to carry 10 000 calls, would pass through the eye of a needle.

Because the message is carried as digital light pulses, it means that more and different types of information can be carried, faster and with better reception. Optical fibres are immune to electrical interference, eliminating cross-talk and noise, and allowing perfectly clear transmission.

Traditional copper cable needs to have the signal boosted every two kilometres (just over one mile), whilst with optical fibres the signal requires boosting less frequently. With this installation, the new cable is the first in the UK to operate at long wavelength, and boosters can be placed ten kilometres (six miles) apart.

Other advantages in the system are, optical fibres take up less room than copper cable, allowing more calls to be carried using the same cable duct, and very important, is the fact that glass fibres are inexpensive, the raw material being sand, which is both cheap and abundant.

The cable has been made by BICC Telecommunication Cables Ltd. and Plessey Telecommunications Ltd. has supplied the associated electronic equipment.



RSGB's New HQ

As reported last month, the RSGB are now well established in their new HQ. Visitors will no doubt be interested in this map of how to get there. The new address, once again, is: *RSGB, Alma House, Cranborne Road, Potters Bar, Hertfordshire EN6 3JW. Tel.: (0707) 59015.*

US News

Morse code free licence: Against the unanimous recommendation of the ARRL executive (the US equivalent of the RSGB) the FCC is to introduce a "code free" licence as soon as the Goldwater Senate Bill and corresponding House of Representatives Bill amendments to the amateur licensing procedures have been adopted, and additionally, the ratification of the WARC 79 recommendations.

The FCC Commissioners approved the proposal, in a 7 to 0 vote, to introduce a "high technology" licence similar to the Canadian digital licence. To obtain the new licence, the applicant will, amongst other things, be capable of passing a "difficult" technical examination on digital theory. Privileges awarded to this category of licence holder will be the same as for the existing technician class for use on frequencies above 30MHz. There are currently 74 000 technician class licensed operators in the US.

Mobile r.f.i.: An interesting report in the October 1982 issue of *CQ* magazine, is that the Japanese car manufacturer Subaru are warning potential customers to avoid installing CB or amateur radio transmitting equipment into their 1982 model vehicles. The reason being, the cars are fitted with electronically controlled carburation, and strong r.f. fields could cause all sorts of problems. The ramifications of this sort of problem could prove to be quite serious or indeed positively dangerous.

Cable TV: Current specified levels for maximum permitted equivalent radiation (r.f. leakage) from cable TV distribution systems are set by the FCC at 20µV/m at 3m. The FCC are considering **relaxing** this level to between 50 and 100µV/m at 3m, apparently in response to requests for a lowering of the specification from the cable industry. The cable industry's request is based on the results of extensive study and monitoring that has revealed that no significant interference has yet been caused to aeronautical frequencies. No similar study has been carried out as to the effects either to or from amateur radio transmissions.

ANTENNA WIND LOADING

G3UDO

For the growing number of radio amateurs and s.w.l.s putting up beams, it is useful to be able to calculate the wind resistance of the antenna and extension mast. A number of antenna manufacturers specify wind loadings, but in many cases these are not true figures as they include a factor of safety. This means you could end up using a tower, mast or rotator that is much larger than is really necessary for the antenna it carries.

It is a relatively simple matter to work out the wind resistance of an antenna so long as some basic rules are followed—there is no mystery.

Horizontal Antennas

A typical 5-element Yagi is shown in Fig. 1. To obtain the wind resistance, one must first find the maximum area that the antenna will present to the wind at any time. This is **not** the area of the side profile.

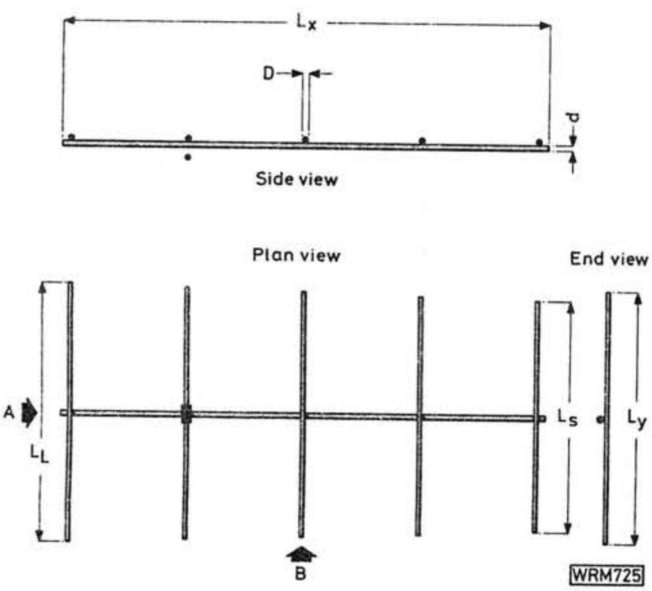


Fig. 1

To find the maximum area, we must first calculate the area of the antenna as viewed from the end "A", and the area as viewed from the side "B".

Area A is the average area of a single element multiplied by the number of elements N in the antenna, though if the driven element is a folded dipole that counts as two. The average area is found by taking the average length L_Y and multiplying it by the diameter D. The average length is simply obtained by using the formula:

$$L_Y = \frac{L_L + L_S}{2}$$

Since the end profile of the boom is small in comparison to the area of the elements, it can be ignored except by the purists, so the Area A is:

$$A = D \times L_Y \times N.$$

Area B is basically the area of the boom, which is equal to its length L_X multiplied by its diameter d. Again, the ends of the elements can be ignored. Where traps are fitted, find the area of the circle corresponding to their diameter, multiply by the number of traps, and add this figure to the area of the boom.

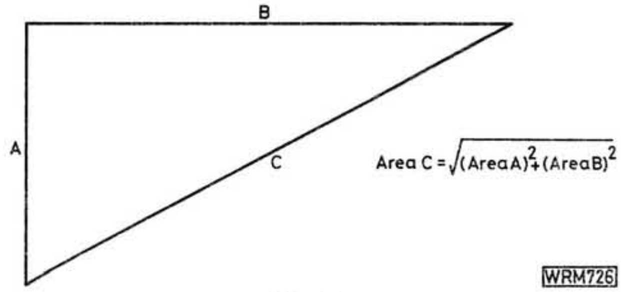


Fig. 2

Referring to Fig. 2, you will see a right-angled triangle whose sides represent the areas in question. This shows that C is the maximum area to be found. This is obtained by using Pythagoras (remember him?), thus:

$$\text{Area C} = \sqrt{(\text{Area A})^2 + (\text{Area B})^2}$$

The area calculated is as it would be for a flat plate of equivalent size at right angles to the air flow. However, if the antenna is made of round-section tubes or rods, it presents a much better aerodynamic shape, and the resulting wind pressure would be much less than that on the equivalent flat plate. This should be allowed for by multiplying the maximum area C by an aerodynamic factor of 0·6.

Having got the maximum effective area of the antenna, the wind resistance is calculated by multiplying the area by the wind pressure relative to the wind speed being used. There are a number of variables that have to be considered in relation to wind speed and pressure, but in order not to confuse the issue, the wind speed used here is applicable to antennas at a height of 15 metres, situated in open country with scattered wind breaks.

The values of wind pressure quoted are taken from *CP3, Chapter V, Part 2, 1972* and are as follows:

Wind speed (miles/hour)	50	60	70	80	90	100	110	120
Dynamic pressure (lb/ft^2)	6·4	9·2	12·5	16·4	20·7	25·6	31·0	36·9

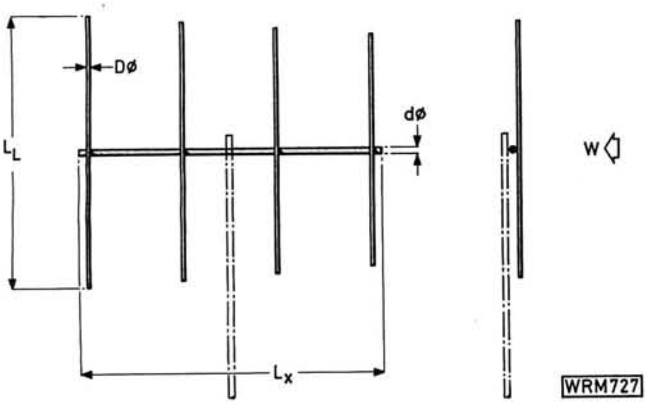
Note that CP3 states that the basic wind speed is taken as a 3-second gust speed estimated to be exceeded on average once in 50 years. It is assessed for the UK on a statistical basis from continuous wind records.

Vertical Antennas

Antennas mounted with their elements in the vertical plane, i.e., for vertically polarised signals, are considered a little differently from those mounted horizontally. In this case the maximum wind force will result when the wind is sideways on to the antenna (Fig. 3). The effective area is then worked out as follows. Area of the longest element multiplied by the total number of elements, plus the area of the supporting boom. Thus:

$$\text{Total area} = (L_L \times D \times N) + (L_X \times d).$$

Fig. 3



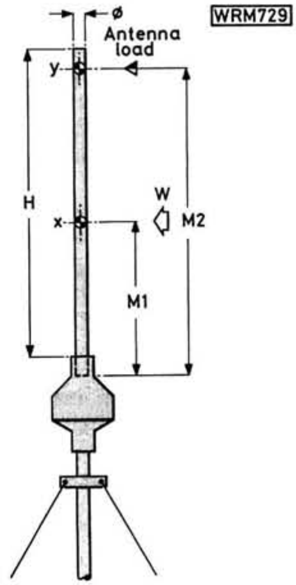
If the boom and elements are made of round rod or tube, then the result must be multiplied by the aerodynamic factor of 0·6, as for horizontal antennas.

Television-type antennas are a little more difficult to deal with because they are generally constructed from flat formed strips screwed onto square section tube (Fig. 4). These behave quite differently from round tube in an air stream and produce more turbulence and drag, i.e. wind resistance. However, without going into the domain of pundits of aerodynamics, for our purpose it will be enough to consider the antenna as being made of flat strips or plates of the equivalent dimensions. The total area of the antenna can be worked out as before, but in this case no correction is made for aerodynamic effect as with round tube; i.e., total area = effective area. In order to allow for "turbulence" add an extra 10 per cent to the wind pressure to get a reasonable approximation to the wind load.

When considering wind load for antennas, it is advisable to take into account the wind load of the supporting mast or extension, i.e., the bit above the rotator or mast top. The total area, effective area and wind pressure are worked out as for antennas using round section tube. However, there are two things to take into account (see Fig. 5): 1. The sideways load caused by the wind load of the antenna; 2. The sideways load due to the wind pressure on the extension mast itself. These two forces (loads) result in a bending load being exerted at the bottom of the extension tube, which is transmitted to the rotator or mast top.

The bending load due to the antenna is found by multiplying the antenna wind load at point Y by its distance above the bottom of the extension (M2). Taking these in pounds and inches respectively gives an answer in lb in.

Fig. 5



The wind load on the extension mast is taken as acting at the mid-point X of the exposed length H, i.e., half of the length which is above the rotator or mast. The bending load due to the wind resistance of the extension is then equal to the wind load at point X multiplied by its distance above the bottom of the extension (M1), which is half of the length H plus the bit inside the rotator clamp.

The total bending load at the bottom of the extension is the total of the two bending loads, again in lb in.

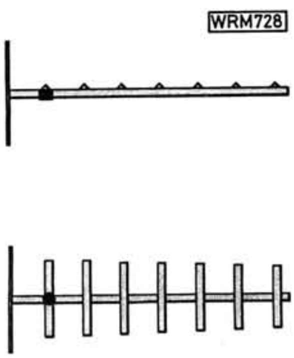


Fig. 4

Ice

Iced-up antennas will present a greater area to the wind than a clear un-iced array as so far considered. However, we are now in no-man's-land with no real guidelines. For all practical purposes, iced-up conditions as applicable on average to the UK can be allowed for by adding 25 per cent to the final value of wind resistance calculated.

Conclusion

This is not intended as a scientifically precise method of getting a value for wind resistance, but is intended to enable the average radio amateur to get some idea of the forces acting upon the antenna he puts up. ●

LMS REGENERATIVE RECEIVER R.F.HAIG

PART 1

Superhet receivers with general coverage of the long, medium and all of the short wave bands are expensive to buy and home construction is a daunting prospect for all but the more experienced amateur.

Simple regenerative receivers are, however, capable of very worthwhile results. Indeed, there can be few other circuits which give such high performance with so great an economy of components. Extremely weak signals can be rendered audible, and selectivity is increased to a very significant extent.

The technique of regeneration, which dates back to the early days of radio, is combined with modern components to form the receiver which is the subject of this article. A novel method of connecting the tuning coils into circuit eliminates the problems associated with band change switching.

The Circuit

The complete circuit of the LMS receiver is given in Fig. 1, where inductor L1 couples the antenna to the tuned circuit formed by L2, C6, C8 and C9. The r.f. signal is applied, via C7, to gate 1 of the 40673 dual gate MOSFET transistor, Tr1. This transistor acts as the regenerative detector, the audio signal being developed across the drain load resistor, R5. Residual r.f. is filtered by R8, C11 and C13 and the signal is fed, through the d.c. blocking capacitor, C14, to the base of Tr2.

Transistor Tr2 is used as a conventional grounded emitter audio amplifier stage to boost the low level output from the detector. The amplified signal is taken from the collector of Tr2 and applied to the volume control, R12, via C16. Capacitor C17 imparts a measure of "top cut" and improves the general tonal quality of the receiver.

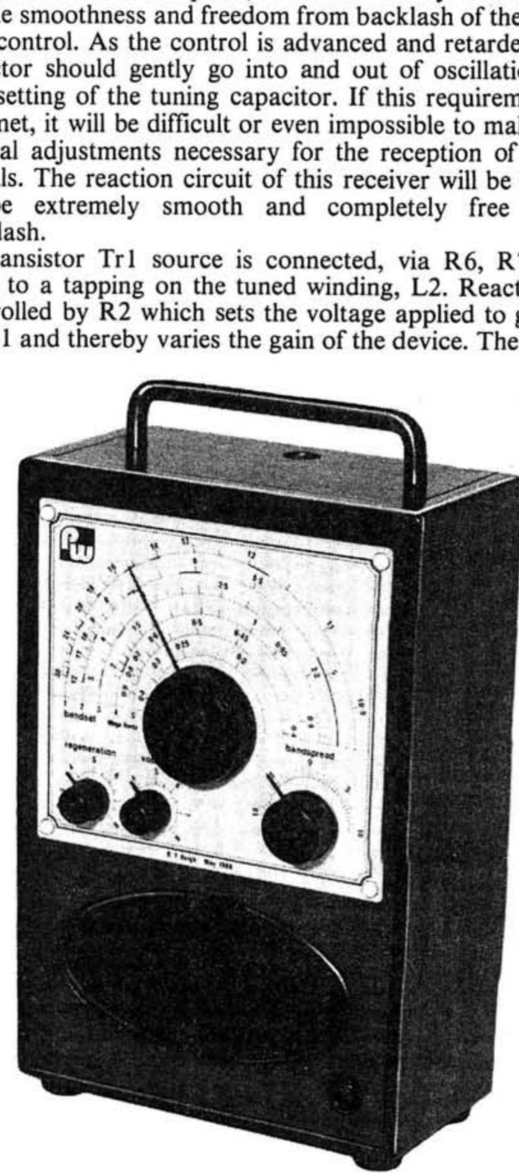
The slider of the volume control is connected to the input pin of IC1, a TBA820M integrated circuit audio power amplifier. The specified device is capable of supplying about 1·5 watts into the 3Ω loudspeaker LS1, when connected to a 9 volt d.c. supply. In this application, the amplifier is battery powered and the ripple rejection capacitor normally connected to pin 8 of the i.c. was found to be unnecessary.

Considerable a.f. gain is developed by the circuit, and decoupling has to be thorough in order to avoid low frequency instability or "motor boating". Accordingly, the supply decoupling capacitor, C15, has the rather high value of 1000μF.

Regeneration and Tuning

The effectiveness of a regenerative detector, especially one used for s.w. reception, is almost wholly determined by the smoothness and freedom from backlash of the reaction control. As the control is advanced and retarded, the detector should gently go into and out of oscillation, at any setting of the tuning capacitor. If this requirement is not met, it will be difficult or even impossible to make the critical adjustments necessary for the reception of weak signals. The reaction circuit of this receiver will be found to be extremely smooth and completely free from backlash.

Transistor Tr1 source is connected, via R6, R7 and C12, to a tapping on the tuned winding, L2. Reaction is controlled by R2 which sets the voltage applied to gate 2 of Tr1 and thereby varies the gain of the device. The drain



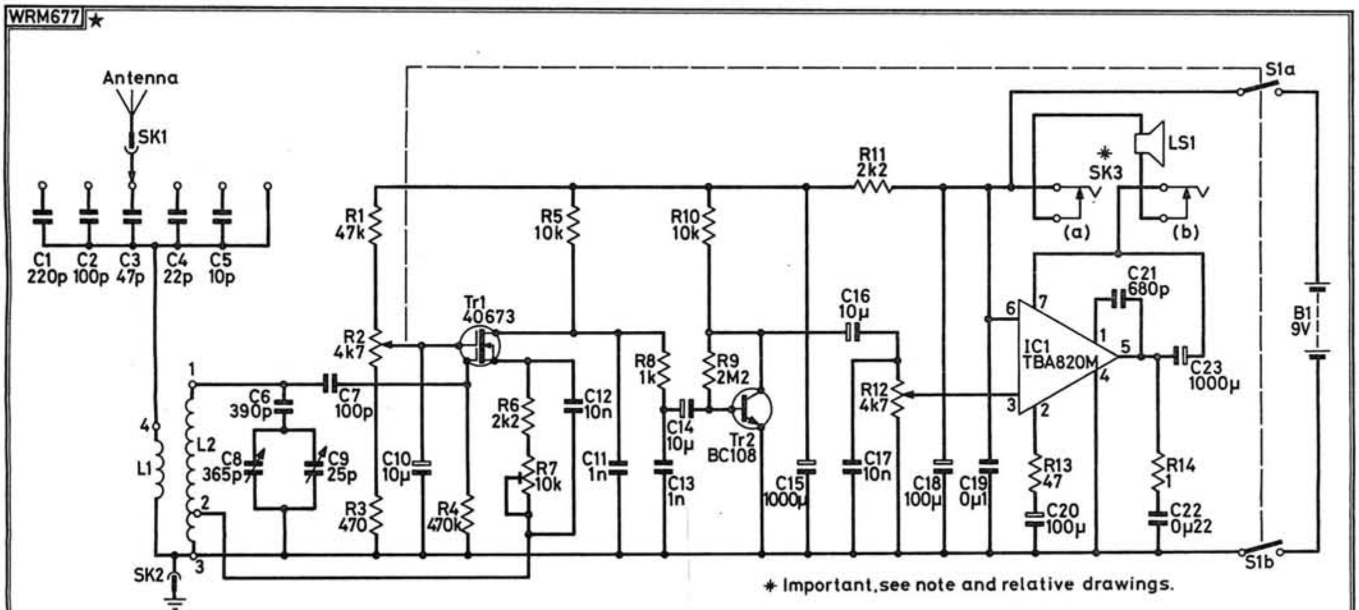


Fig. 1: Circuit diagram of the LMS receiver. Inductors L1 and L2 are constructed as coil packs (Fig. 2). Headphone socket SK3 is wired to connect both earpieces in series

of Tr1 is grounded at r.f. by C11. Many constructors will recognise this arrangement as the transistor equivalent of the electron coupled circuit, once popular for mains valve regenerative detectors and renowned for its stability and smoothness.

Some specimens of the 40673 MOSFET oscillated more readily than others. Pre-set resistor R7 adjusts the source bias to compensate for this spread in characteristics and enables the performance of the detector to be optimised.

On the s.w. bands, it was found impossible to maintain completely smooth control of regeneration over tuning capacitor swings greater than about 200pF. Because of this, the 390pF capacitor, C6, is connected in series with the tuning capacitors, C8 and C9, to reduce the combined maximum capacitance to approximately 195pF. This tuning capacitance still permits continuous coverage from 190kHz to 30MHz with only six coils.

The larger of the two tuning capacitors, C8, is known as the BANDSET control, as it enables the tuning of the receiver to be set to one or other of the various amateur or broadcast bands. The smaller variable capacitor, C9, is known as the BANDSPREAD control. This permits the fine tuning of the receiver across an individual band.

Capacitors C1 to C5 prevent reaction "dead spots" which can sometimes arise when long wire antennas are connected directly to the receiver. The higher value capacitors will be effective on m.w. and l.w., whilst the lower value components should eliminate dead spots on the s.w. bands.

Coil Holder and Coils

Figure 2 gives full details of the construction of the coil holder and coil packs. The coils comprise one continuous winding, with tappings anchored to solder tags. The 6BA bolts which secure the tags, which are gripped by the coil holder clips, should preferably be new, brass or plated ones, as this will ensure a good contact. A pair of tweezers will be found useful for inserting the contact bolts into the holes in the middle of the formers.

The spacing of the bolts must, of course, accurately match the spacing of the crocodile clips on the holder. Construction of these items should, therefore, begin by soldering the crocodile clips to the tag strip. The position of the holes on the coil formers can then be marked out by placing the formers against the ends of the clips.

A bar of insulating material is secured across the clips. When pressed, this opens all of the jaws at once. The bar can be cut from thick Perspex or Paxolin sheet, or the plastic barrel of a ball point pen. It is fixed to the outer clips by 8BA nuts and bolts.

Appropriate tags on the strip are carefully removed, and the holes gently enlarged to accept the 4BA bolts which rigidly secure the assembly to the platform inside the top of the cabinet. Make sure that the bolt heads and stand-offs are not shorting adjacent clips together.

Before commencing the coil winding, check that the 6BA contact bolts are correctly aligned and are gripped properly by the crocodile clips when the former is inserted into the holder. Winding the coils is not difficult, as the

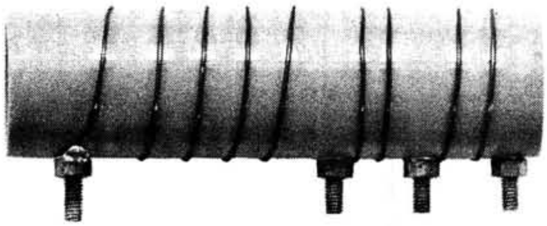
CONSTRUCTION RATING **Beginner**

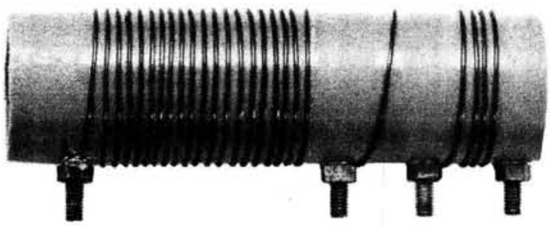
BUYING GUIDE

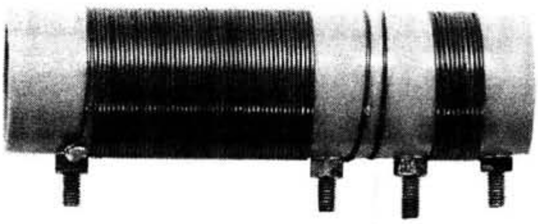
All components for this project are available from a number of sources. Variable capacitors used in the prototype were obtained from Electrovalue. The coils are mounted on plastics overflow pipe available from most d.i.y. shops.

APPROXIMATE COST **£18·50**

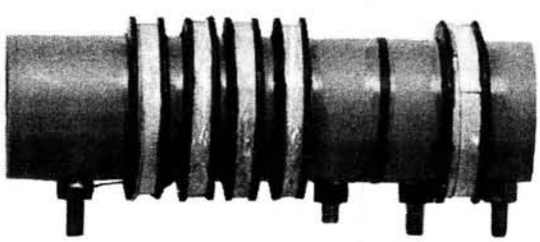
Coil	Coverage	Number of turns 1-2	2-3	3-4	swg
1	30MHz – 10·4MHz	5 spaced over 38mm	2	2	24
2	12MHz – 4·8MHz	20 spaced over 38mm	1	4	24
3	5MHz – 2·1MHz	50 close wound	2	10	24
4	2·2MHz – 900kHz	90 close wound	4	60	38
5	900kHz – 400kHz	208 4 piles of 52 turns	8	100	38
6	400kHz – 180kHz	500 4 piles of 125 turns	10	200	38

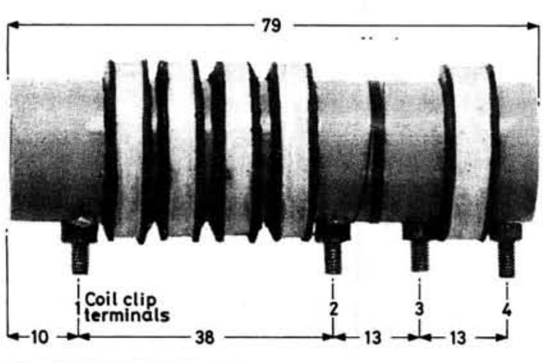
1


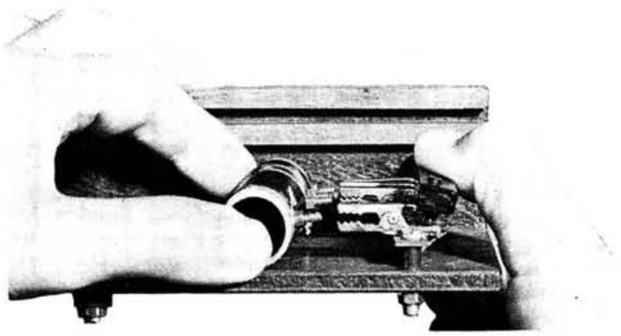
2


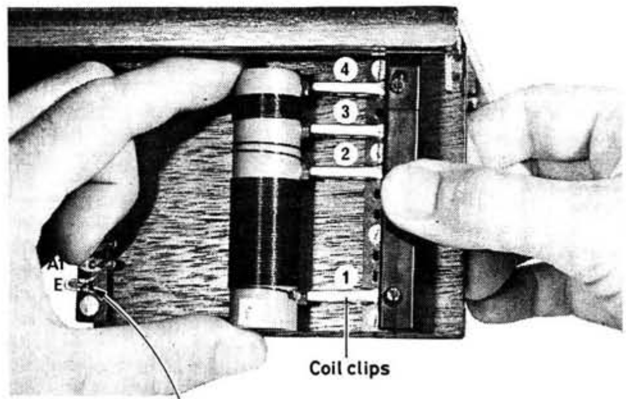
3


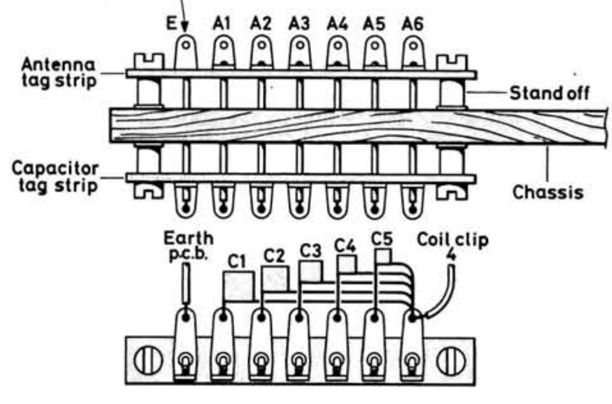
4


5


6








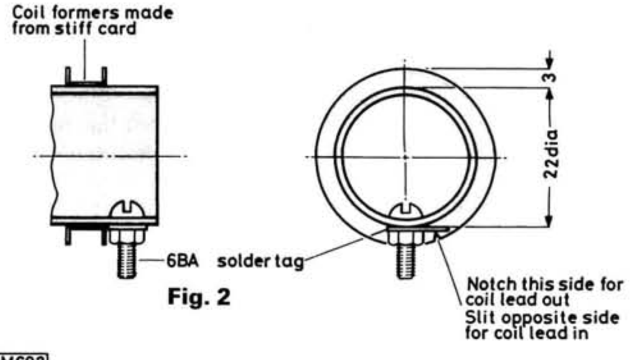


Fig. 2

WRM692

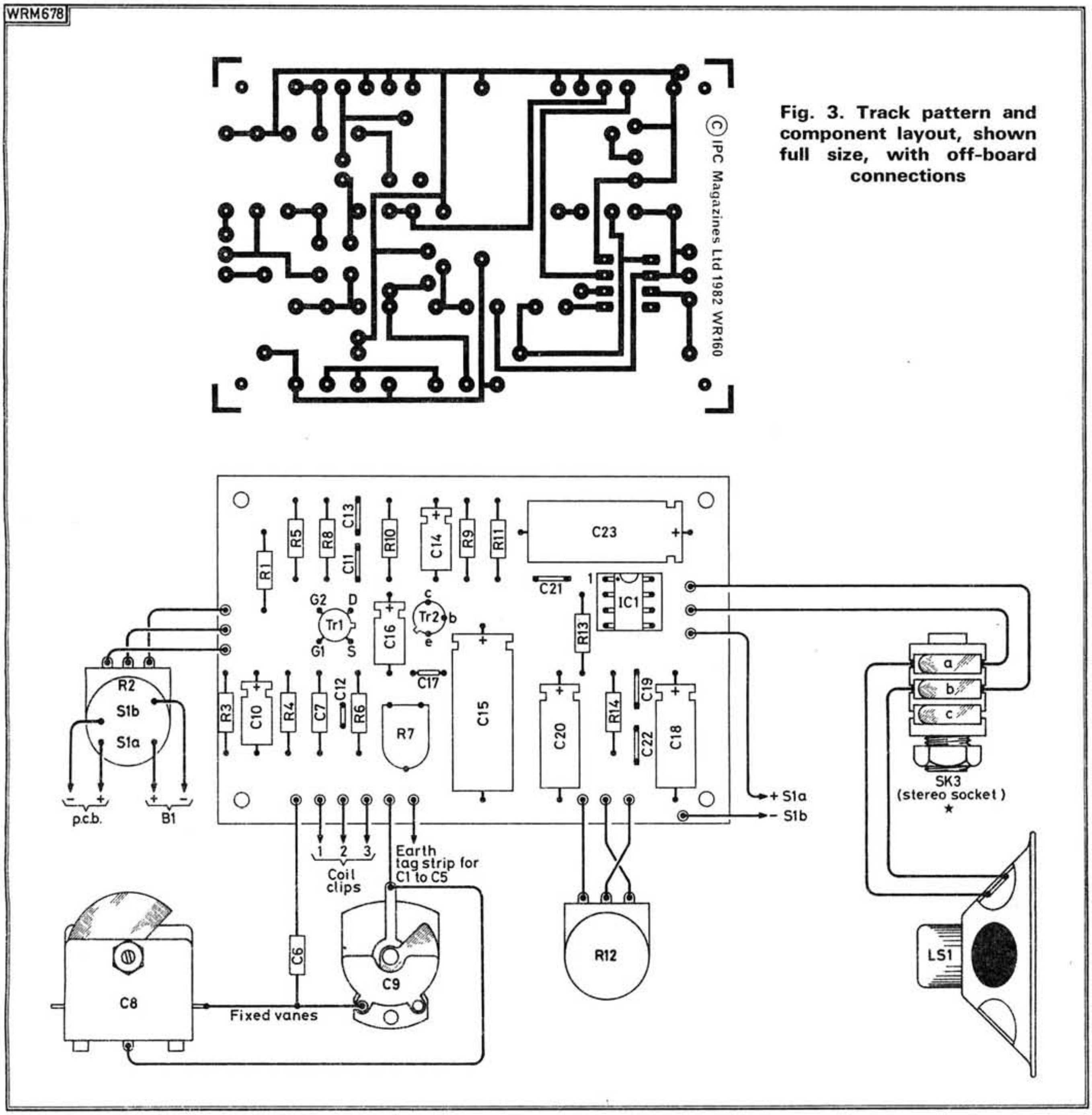


Fig. 3. Track pattern and component layout, shown full size, with off-board connections

wire can be anchored to the solder tags at the beginning and end of the windings and at the tappings. Care must however be taken to completely remove the enamel, before wrapping the wire around the tags, to ensure good soldered connections.

All turns are wound in the same direction and can, if desired, be fixed in position on completion by a coat of clear cellulose or Denfix polystyrene cement.

The pile windings which make up the m.w. and l.w. coils are held in place by cardboard bobbins, which are slid onto the formers before the end contact bolts are inserted. Cut a strip of card as wide as the spacing between the bobbin cheeks, wind this round a former and glue it with balsa cement or other quick setting adhesive. Cut out the card rings which form the bobbin cheeks, slide these onto the former, and glue them to the paper strip with a liberal application of balsa cement. Note that the bobbins for the l.w. coil are slightly wider than those for the m.w. coil. After the coils have been wound, the turns can be protected by a strip of masking tape.

Construction

All small components, with the exception of C1–C6, are mounted on the single-sided glassfibre p.c.b. Details of component placement and the p.c.b. track layout are given in Fig. 3. Vero pins inserted at the lead out points aid wiring up and the component layout shown should be adhered to. Of particular importance is the point at which the negative supply lead is connected to the p.c.b. track. Low frequency instability, or "motorboating", is almost certain to result if this lead is connected to the earth line close to the early stages of the receiver.

The layout of the remaining components is not critical, but interconnecting leads should be as short and direct as

★ components

Resistors

$\frac{1}{4}$W 5% Carbon film

1Ω	1	R14
47Ω	1	R13
470Ω	1	R3
1kΩ	1	R8
2·2kΩ	2	R6, 11
10kΩ	2	R5, 10
47kΩ	1	R1
470kΩ	1	R4
2·2MΩ	1	R9

Miniature horizontal preset

10kΩ	1	R7

Carbon track potentiometer

4·7kΩ (log)	1	R12
4·7kΩ	1	R2 (with d.p. switch)

Capacitors

Miniature ceramic plate

10pF	1	C5
22pF	1	C4
47pF	1	C3
100pF	1	C2
220pF	1	C1
1nF	2	C11, 13
10nF	2	C12, 17
0·1μF	1	C19
0·22μF	1	C22

Polystyrene

100pF	1	C7
390pF	1	C6
680pF	1	C21

Electrolytic double-ended, 10V

100μF	2	C18, 20
1000μF	2	C15, 23

Electrolytic double-ended, 25V

10μF	3	C10, 14, 16

Variable

25pF	1	C9 (Jackson type C804)
365pF	1	C8 (Jackson type 5250/1)

Semiconductors

Transistors

BC108	1	Tr2
40673	1	Tr1

Integrated Circuits

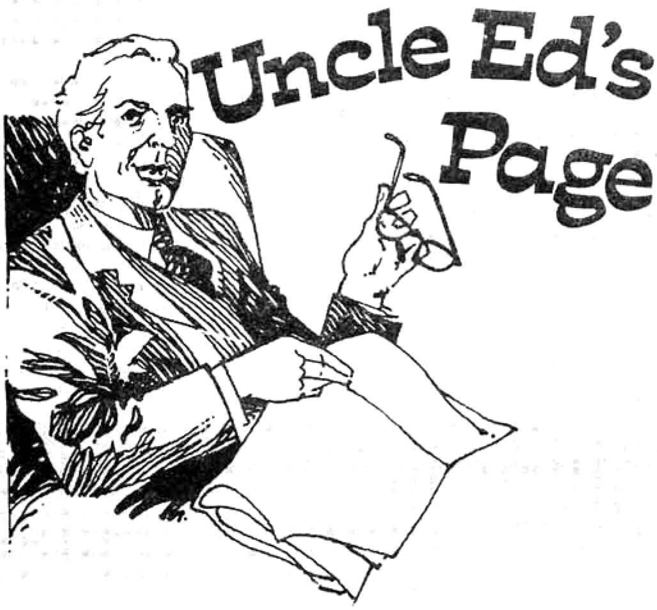
TBA820M	1	IC1

Miscellaneous

177 × 100mm 3Ω speaker; 19mm i.d. plastic pipe (see text); 24 s.w.g. and 38 s.w.g. enamelled copper wire. 3-pole jack socket (6mm). Case materials.

possible. It was not found necessary to screen the leads to R12. Figure 2 shows how C1–C5 are mounted on a tag strip located beneath the top shelf. The bolts which hold this tag strip also secure an identical strip above it, and holes bored through the shelf enable the two sets of tags to be connected together. Antenna and earth leads are attached to the appropriate upper tags by means of crocodile clips. This arrangement is cheaper than sockets or terminals and facilitates the quick selection of the most suitable antenna input capacitor. Capacitor C6 is soldered directly to the fixed vanes tag on C8.

Final part: Full setting up and operating details



A monthly look at some aspect of the radio/electronics hobby that seems to bug the beginner, or occasionally a more advanced topic seen from an unusual angle.

TRANSFORMERS—3

The voltage rating of a mains transformer secondary winding is the voltage it should produce when on full load, when it is supplying its maximum rated current. When the winding is more lightly loaded, its output voltage will rise. The change between the "no-load" (or "off-load") output voltage and the "full-load" voltage is converted into a percentage and called the regulation of the transformer.

$$\text{Regulation} = \frac{\text{Off-load voltage} - \text{full-load voltage}}{\text{Off-load voltage}} \times 100\%$$

Notice that it's the **change** versus the **off-load** voltage, in other words it's a measure of how much the output voltage falls when the load is connected. That fall is due to the resistance of the windings, and leakage of the magnetic flux linking primary and secondary. Typical values of regulation for a small low-voltage transformer range from about 10 to 25 per cent.

Losses of various sorts mean that any transformer is less than 100 per cent efficient. Therefore, more power (V × A) will be taken by the primary than can be drawn from the secondary windings. As a general rule, efficiency is greater for high-power transformers than for low-power.

If you look at a text-book covering the basic theory of transformers, you'll find that the voltage step-up or step-down from primary to secondary is proportional to the ratio of the number of turns in each winding. Say we had a transformer with a 240V primary having 1200 turns. This works out at 5 turns per volt (fairly typical for a small transformer), so for a 12V secondary winding the calculation would come out at $5 \times 12 = 60$ turns. If you actually wound a transformer like this though, you'd find that the output voltage was low by anything up to 10 per cent. This is again due to losses in the transformer, and the manufacturer will compensate for it by increasing the number of turns on the secondary winding. This does mean, though, that should you want to use a transformer "back-to-front"—applying the input to what was the secondary winding and taking the output from the primary—you'll get a lower voltage out than you'd expected. An example would be a mains isolating transformer (240V in/240V out) intended for use when servicing or testing live-chassis equipment like TV receivers. Connect that back-to-front and you'll be lucky to get as much as 220V out even before you connect a load to it.

At one time, it was common to find a tag or terminal on a mains transformer labelled "E.S.", which stands for Electrostatic Screen. If the transformer you're using does have one, it should be connected to the equipment chassis or earth line. The electrostatic screen, which is an incomplete loop of copper foil, placed between the primary and secondary windings, serves two purposes. First, as its name implies, it serves as a screen to prevent noise pulses being coupled electrostatically from primary to secondary or vice versa. Secondly, it provides an earthed safety barrier between the windings, so that if the insulation on the primary turns should break down, the mains supply would leak first to the earthed screen, whereupon the input fuse should blow, instead of to the secondary winding where it could be very dangerous both to the equipment and the user.

Nowadays this second function (which is generally the most important) is often taken care of by the "split-bobbin" technique, where the primary and secondary windings are put on quite separate sections of the bobbin, side by side with a substantial plastics cheek between them, rather than being wound one over the other with just layers of fabric between as used to be normal. So, many transformers no longer have that E.S. terminal.

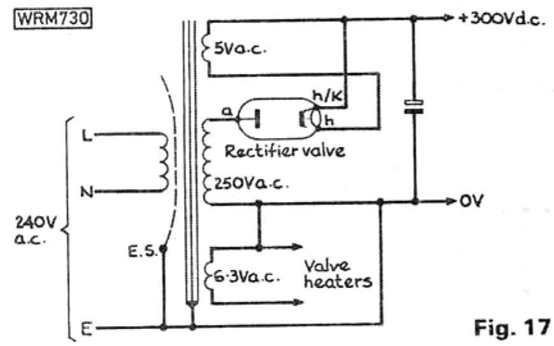


Fig. 17

On the subject of winding insulation, remember that most transformers with more than one secondary are intended to be used with all those windings connected to circuits sitting at around the same potential. In a valved receiver of bygone days, there would typically be three secondary windings (Fig. 17), the h.t. (high tension) winding might give 250V, an l.t. (low tension) winding would give 6·3V to drive most of the valve heaters, and another l.t. winding might give 5V to drive the heater of the rectifier valve. The valve heaters connected to the 6·3V winding would be at or near chassis or earth potential, but the rectifier heater would be up at the voltage of the h.t. rail of the receiver, which could be in the region of +300V d.c. So the rectifier heater winding would have to have insulation suitable for at least 300V, even though it only gave out 5V itself.

That sort of situation isn't come across very often in modern equipment, but it can happen. If you want to produce two 12V supplies, one of which has one side earthed whilst the other has to be tied to a point in a circuit which is at high potential, it's wiser to use two separate transformers rather than two secondary windings on a single transformer. Unless, of course, the transformer manufacturer can assure you that his particular product is suitable for that purpose. ●

2M BEAM ANTENNA

C. LOFTUS G6AFJ

★components

Broomstick or dowel; Motor car brake pipe 584mm long (2 lengths); Aluminium tube 12·5mm dia (2m total); Wood block 75 × 50 × 12mm; Screws 2BA × 50mm long with nuts and washers (6); Solder tags 2BA (2).

Simple antennas are always popular with *PW* readers especially if they use easily obtainable and cheap materials. This design meets these criteria and offers a respectable performance. The original antenna allowed the author to work into a Belgian repeater using one watt output from his home QTH in Birmingham.

Construction

The boom is a standard wooden broomstick to which the three elements are attached by long 2BA screws. The reflector and director are plain lengths of 12mm diameter aluminium tube cut to the lengths shown in Fig. 1 with a 4·8mm diameter hole drilled at the centre for the mounting screws.

The driven element is constructed from two lengths of car brake pipe. Flatten one end of each length of pipe using a vice and drill a 4·8mm hole through the flattened ends to clear the 2BA fixing bolts. Carefully bend the pipes to the shape and dimensions shown and screw the two elements to a wood block as shown in Fig. 2.

Adjustment

The feed impedance with the driven element as shown should be 50Ω but the antenna can be tuned by altering the position of the bends in the folded elements to vary the gap. After the antenna has been successfully adjusted it can be given a coat of varnish to render the wooden boom waterproof. ●

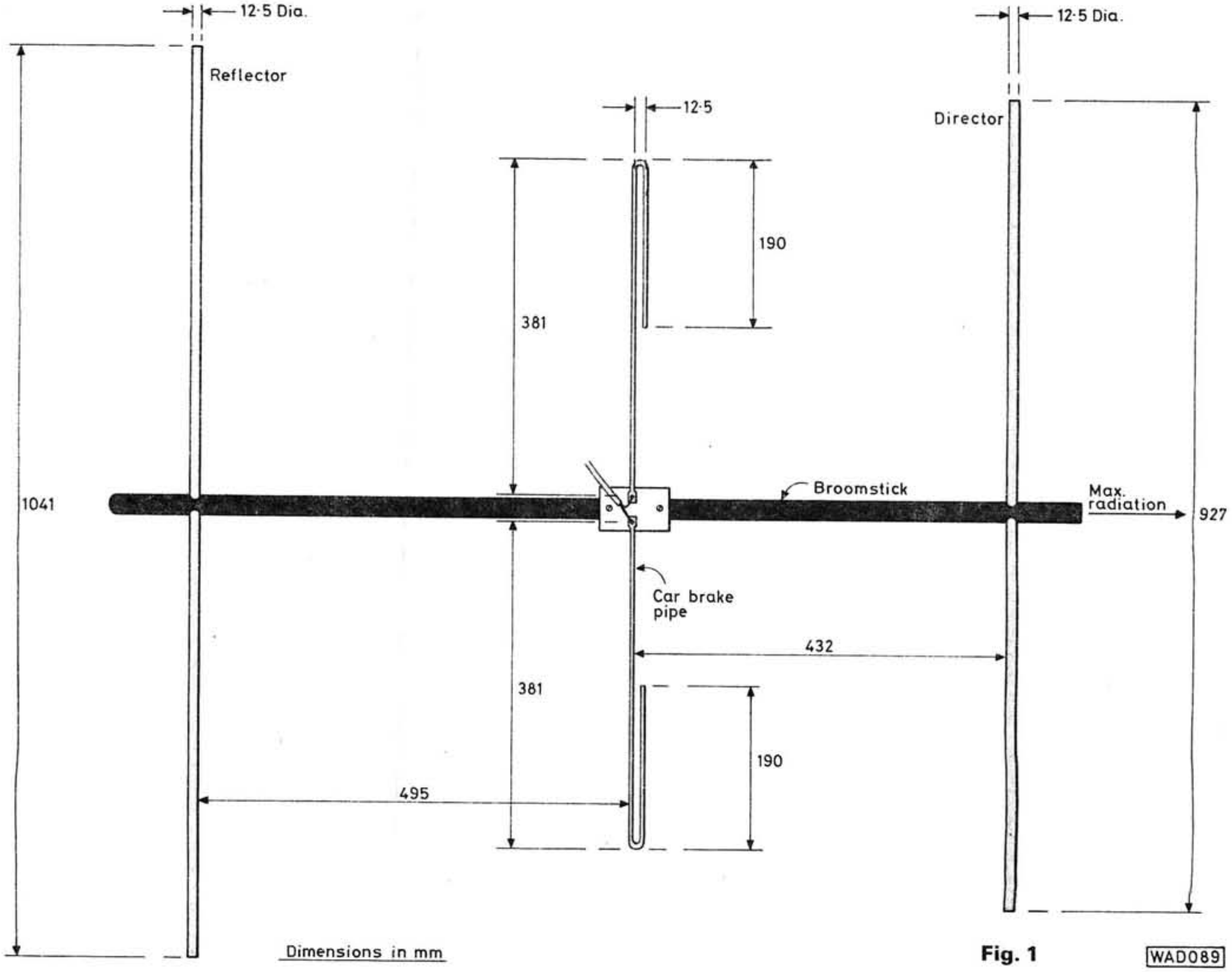


Fig. 1

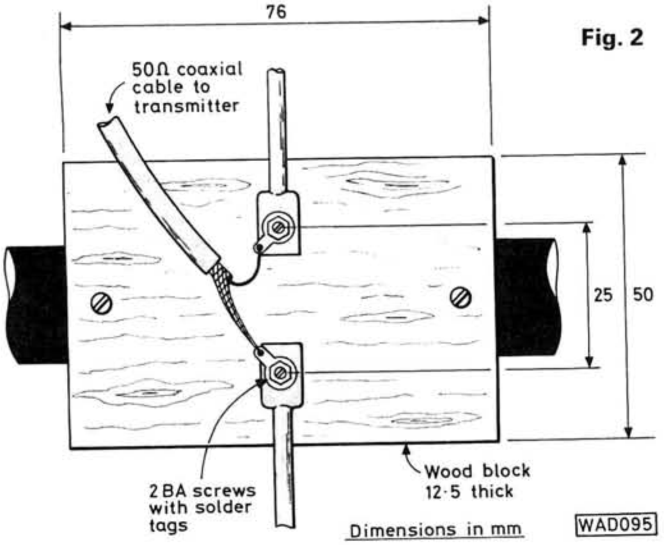


Fig. 2

CONSTRUCTION RATING **Beginner**

The aluminium tube used for the reflector and director can be obtained from your local aluminium stockist (Yellow Pages) while the brake pipe should be available from motor factors.

APPROXIMATE COST **£3**

Modifying the 3·5/7 MHz G-WHIP

Ian H. CROWTHER G3KLF

The arrangement described in this article has been used by the author for some time now, with good results, as an alternative to the full sized version recommended by the manufacturer.

The G-Whip has, of course, been used by h.f. mobiles world-wide for many years with great success. Indeed for the 14, 21 and 28MHz band (20, 15 and 10m) operation the antenna is an exceptional performer with an attractive appearance.

There is however a slight problem on the 3·5 and 7MHz bands (40 and 80m) in that the height of the antenna is about 2 metres. It also tends to be relatively rigid and noticeable to various sections of the public who might wish to steal or vandalise it.

At first, it seemed that this was just something to be lived with, and hopefully remembered prior to driving into multi-storey car parks etc. Then whilst browsing through the mobile antenna section of a popular radio handbook, it was noted that the inductance of a centre loading coil on a standard 2·6 metre mobile whip was about double that of the base loaded equivalent coil.

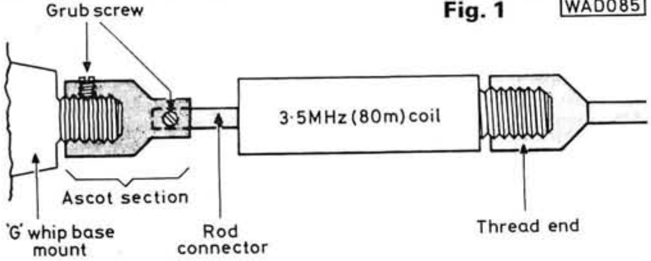
This fact promoted some thought as to whether the G-Whip 3·5MHz centre loading coil might function in a base loading mode, and if so, what length of element might be required above it to resonate over the 3·5MHz band.

Adaptor

As the intention was to use the standard G-Whip base already fitted to the car, the first problem was to design or modify some sort of adaptor to join the coil to the base mount.

The coil was mounted in its normal way, i.e. threaded end uppermost to take the G-Whip telescopic whip and the

Fig. 1 WAD085



rod connector fitted to the G-Whip base mount using the centre section of an Ascot v.h.f. mobile antenna base as shown in Fig. 1.

The Ascot base section was drilled to accept the coil rod connector at the narrow end and the G-Whip base mount thread at the other. Grub screws fitted to the Ascot section were used to secure the assembly.

Obviously any method of joining the coil to the G-Whip base mount would be satisfactory, but the method described is certainly quick and easy.

The antenna was assembled and the whip section extended to about the usual length necessary in the full size version. Using an Atlas transceiver about 100 watts of r.f. was applied and the s.w.r. observed.

To the author's amazement, sweeping the 3·5MHz band indicated resonance at 3·7MHz with unity s.w.r. Subsequently it was found that the entire 3·5MHz band could be correctly matched by simple adjustment of the telescopic whip length. The overall length of the complete antenna was measured at around 900mm.

The 7MHz coil was tested in the same way and a similar result was obtained, this time with an overall length of around 760mm at midband.

Tests

Obviously the big question was, how would the short antennas radiate? A series of tests on the 3·5MHz and 7MHz bands was required, comparing signal strengths between the short and normal versions of the G-Whip. On the 3·5MHz band the short version was found to be about one "S" point down on the standard version, and on the 7MHz band half an "S" point loss was noted.

In the author's opinion, this is acceptable in view of the absolute "S" meter readings obtained over the test distance of 250km i.e. "S"8 on the standard version and "S"7 on the short version.

The author is now able to work the 3·5 and 7MHz bands with an antenna scarcely longer than that used for the 144MHz band. He can also forget the worries of losing the antenna under low bridges or in a car park! The G-Whip can be quickly restored to full length if required by simply slackening off the two grub screws in the Ascot adaptor. ●

are the Voltages correct?

PART 9

ROGER LANCASTER

Solution to last month's problems: The circuit is reproduced here in Fig. 9.1.

No. 1: The estimated potential at Tr3 emitter was 0V and that at Tr4 collector was +20V. A 20 000Ω/V meter was used to carry out these measurements and readings of +1·2V and +19·5V respectively were obtained. You were asked to decide whether these readings were reasonable or whether a fault existed.

The potential at Tr1 collector was estimated to be +1·7V and Tr3 was shown to be non-conducting. This meant there was no path for D4 to conduct and so Tr3 emitter was "floating" and therefore at 0V. When a meter is connected between the point and earth, however, a conduction path for the diode is completed. The equivalent circuit of this is shown in Fig. 9.2. Used on its 20V range, the meter's resistance will be 20 × 20 000 = 400kΩ. Since this is a large resistance and the applied voltage is only 1·7V, there will be about 0·5V across the slightly-conducting diode, leaving 1·2V across the meter, which will be the voltage indicated: no fault, the reading is reasonable.

Transistor Tr4 was shown to be cut off and therefore its collector potential should be at +20V. However, when the meter is connected we have a potential divider, R9 and R_{meter}, between the +20V line and earth, as shown in Fig. 9.3. So the voltage across the meter will be

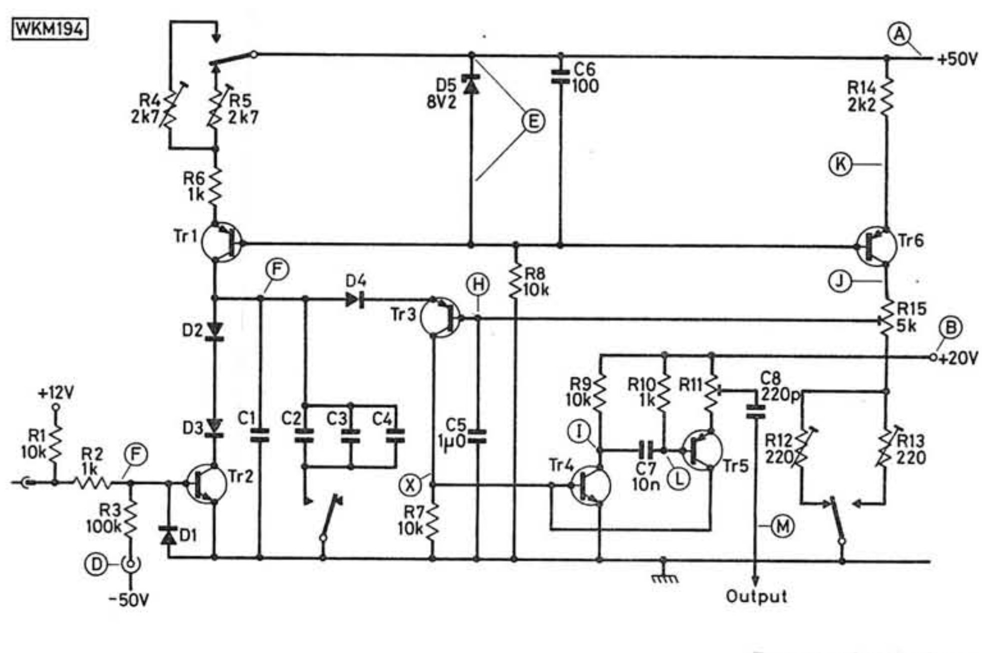
$$\frac{400}{410} \times 20 = 19{\cdot}5\text{V},$$ which the meter will show: again no fault, a reasonable reading.

No. 2: The circuit is reproduced here in Fig. 9.4. You were asked to estimate all transistor electrode potentials.

Diodes D1 and D2 conduct because there is a circuit through them and R2 between the −50V line and earth. Thus there will be 0·6V across D2, leaving the base of Tr3 at **−0·6V** and reverse biasing D3. Similarly, D4 conducts via R5 and therefore its cathode (and Tr1 emitter) is also at **−0·6V**. With −0·6V on both base and emitter, there is no forward bias for Tr1, which is therefore cut off. The only current which can flow through R4 is therefore the sum of any base currents of Tr2 and Tr3. Since both these transistors have emitter resistors and we usually ignore base currents in these circumstances, there will be negligible voltage developed across R4 and Tr1 collector will therefore be at **+12V**.

Transistor Tr2 will conduct heavily since its open-circuit base-emitter potential is 62V (12V plus 50V) and its

Fig. 9.1



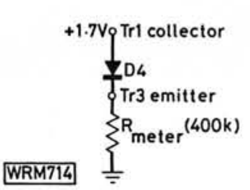


Fig. 9.2

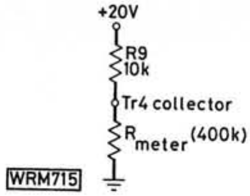


Fig. 9.3

base resistor is only 1kΩ. With its base at **+12V** its emitter will be at about $+12 - 0{\cdot}8 =$ **+11·2V**. Its collector is connected to the **+12V** line direct.

Transistor Tr3 open-circuit base-emitter potential is 12V and its base resistor is only 1kΩ so it too will conduct heavily, with base at **+12V**, emitter at **+11·2V** and collector connected to **+12V**.

In practice, since Tr2 and Tr3 are conducting heavily, base currents will be relatively high, so the collector potential of Tr1 and the base and emitter potentials of Tr2 and Tr3 will all be slightly lower than our estimations. (When measured, these potentials were actually 0·2V lower than estimated.)

The +12V line is not quoted on the manufacturer's circuit diagram. It is one of those key points whose potential we must measure and accept as being correct until any faults have been repaired, as explained in part 8.

If you have been following this series from its commencement in the June 1982 issue, you should now be in a position where you can estimate potentials in any transistor circuit. It is an easy matter to put your knowledge to the test.

Take any item of transistor circuitry which is in good working order and estimate the emitter, base and collector potentials of all the transistors using the techniques described in this series. Then verify these by measurement. Whenever you are faced with a discrepancy between estimated and measured voltages, search for the reason: it may be meter resistance modifying the circuit, it could be due to an error in your calculations, something you have overlooked, or the reading might be accurate enough when you take into account base currents and/or resistor tolerances.

If you give yourself plenty of practice at this sort of exercise, you will gain confidence and develop valuable fault-finding skills which will stand you in good stead for the day when you are faced with a circuit which is faulty.

When looking for faults, remember they can be either component or wiring faults. If the circuit is newly constructed and has never been working, your suspicions should be biased towards wiring errors, whereas if the gear was working satisfactorily before the fault occurred then component failure is perhaps more probable. Whichever type of fault it is, however, estimation of voltages and subsequent measurements within the suspect area will reveal the trouble in the vast majority of cases.

The remainder of this series will be devoted to voltage checks around various common circuit elements, such as f.e.t.s, i.c.s and valves.

Field Effect Transistors

FETs are characterised by high input impedance and are found in many applications, in particular r.f. amplifiers, oscillators and mixers. They are sometimes used simply as variable resistors whose resistance is controlled by voltage rather than by manual means.

There are several different types of f.e.t. and they will be considered separately.

JUGFETs

This term stands for junction gate field effect transistor. There are two main types: *n*-channel and *p*-channel. Their symbols are illustrated in Fig. 9.5 (a) and (b) respectively. Note the names of the electrodes are not part of the symbols.

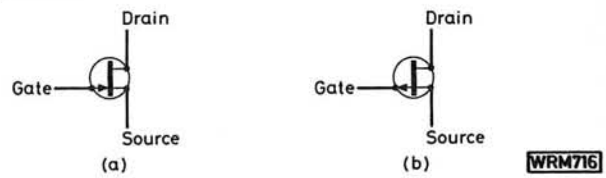


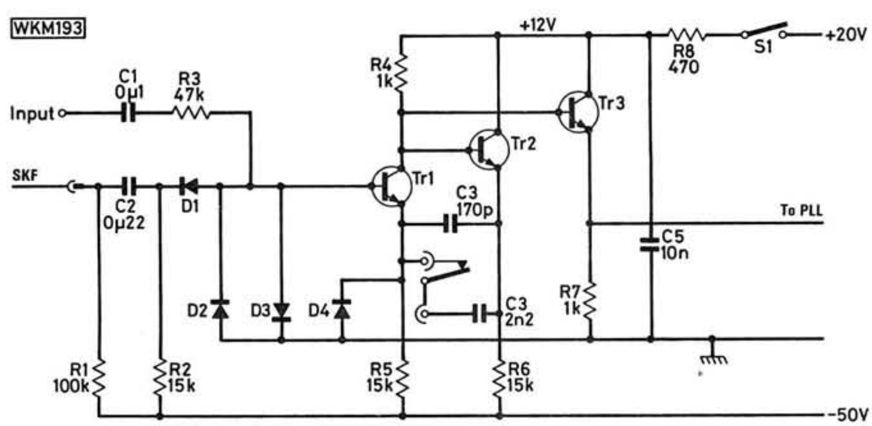
Fig. 9.5

The thick line represents the channel of semiconductor material between source and drain, the width (and hence the resistance) of which is controlled by the voltage on the gate electrode. It is useful to remember that, as with bipolar transistors, the arrow points towards *n*-type material (and away from *p*-type).

Before a gate voltage is applied, the source-drain resistance is very low (a few hundred ohms) but there is a *p-n* junction between the gate and the channel and when this is **reverse** biased the resulting field causes a narrowing of the channel and hence an increase in source-drain resistance.

So when the gate-source bias is zero, the device conducts heavily from source to drain when a circuit is completed. The gate-source junction is normally reverse biased, however, thus limiting drain current. Small variations in g-s bias can cause large changes in s-d current, enabling the device to function as an amplifier.

Fig. 9.4



Since the g-s junction is reverse biased we shall not be certain what potential to expect across it beyond the fact that it is typically somewhere between 0V and 8V. We shall, however, know what its polarity should be: gate negative with respect to source for the *n*-channel and gate positive with respect to source for the *p*-channel.

The g-s bias voltage can be derived from its own separate supply line or it can come from an a.g.c. (automatic gain control) line, but usually it is derived by developing a voltage across a resistor in the source line, as shown in the circuit of a simple common-source amplifier (Fig. 9.6).

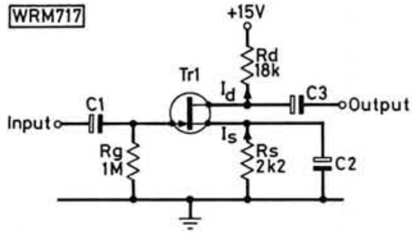


Fig. 9.6

The source current (I_s) develops a voltage across R_s to give the source a positive potential with respect to earth (in the case of the *n*-channel JUGFET here). There is virtually no current in the gate lead or R_g (because of the reverse biasing) as the gate is at 0V with respect to earth. Thus the gate is **negative with respect to source** by the voltage developed across R_s (see "Points of Reference" in part 1).

The source current flows through **both** R_s and R_d, that is $I_s = I_d$. We cannot calculate this current without knowing a p.d., however, because we are unlikely to have sufficient information available to enable us to calculate the resistance of the channel under any particular operating conditions. All we can do is to check that the correct **relationship** between the electrode potentials exists.

Gate potential should be **zero** (no current through R_g). Source potential should be positive between 0V and 8V. Suppose we measure it and find it to be **+1·2V**. This seems reasonable, and we should now be able to calculate the drain potential from it.

$$I_s = \frac{V_s}{R_s} = \frac{1{\cdot}2}{2{\cdot}2} = 0{\cdot}55\text{mA}$$

This flows through R_d, so voltage across R_d

$= I_dR_d = 0{\cdot}55 \times 18 = 9{\cdot}9\text{V}$

Therefore, drain potential $= +15 - 9{\cdot}9 =$ **+5·1V**.

A *p*-channel circuit would be the same apart from all polarities being reversed.

Whatever the type of circuit, the same sort of relationship between the electrodes should be found.

Fig. 9.7 shows an r.f. amplifier circuit. Here the source resistance is variable to provide gain control. This means the source potential will vary with the setting of R_s. Gate potential will be **0V** via R_g regardless of the setting of R_s. Suppose R_s is set to maximum resistance and source potential is +4V under these conditions.

$$I_s = \frac{V_{Rs}}{R_s} = \frac{4}{10} = 0{\cdot}4\text{mA}$$

$V_{Rd} = I_dR_d = 0{\cdot}4 \times 1{\cdot}8 = 0{\cdot}7\text{V}$

Drain potential $= +12 - 0{\cdot}7 =$ **+11·3V**

Very often there is no R_d and drain potential is then equal to the supply potential via the r.f. transformer primary.

If the voltages are unreasonable, we may suspect the f.e.t. itself, in which case it must be removed from the circuit (or at least two of its leads unsoldered) and tested by ohmmeter.

G-S and g-d readings should be similar to those of the b-e and b-c of a bipolar transistor. With one prod on the gate, g-s and g-d readings should be **either** both high

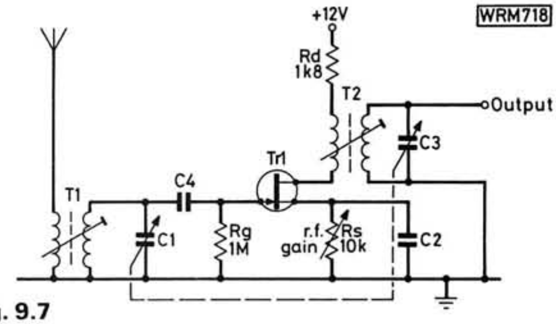
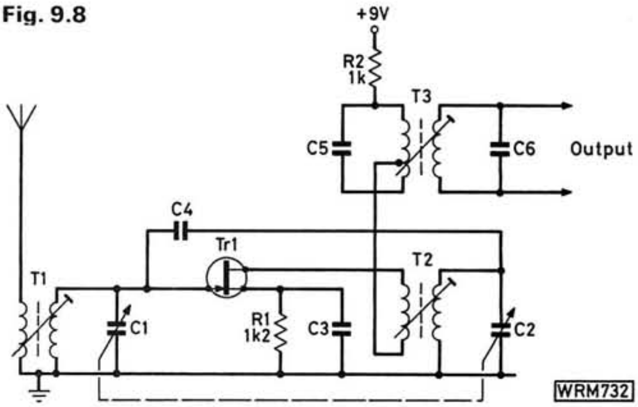


Fig. 9.7

resistance (needle barely moving off the back stop) **or** both low resistance (about 1kΩ). Reversing the prods, the two readings should again be the same as each other but **opposite** to that recorded in the first pair of tests. S-D resistance should be **low** (anything from 5Ω to 5kΩ), regardless of which way round the meter is connected.

Fig. 9.8



If the f.e.t. passes the ohmmeter test, we measure the voltages with it out of circuit. These should be: source = 0V, gate = 0V, drain = +15V (Fig. 9.6) or +12V (Fig. 9.7). Any errors here could point to a faulty component or wiring.

If these measurements still do not reveal the fault, take the readings with respect to the supply rail rather than earth (still with the f.e.t. out). These should be: source = −15V (Fig. 9.6) or −12V (Fig. 9.7), drain = 0V.

The taking of gate potential with respect to the supply rail with the f.e.t. in circuit is not recommended as the meter resistance would provide a potential divider with R_g thus **forward** biasing the g-s junction and resulting in totally misleading readings.

This month's problems are based on the mixer circuit of Fig. 9.8. The source potential was measured as +2V with respect to earth when the circuit was working properly. Capacitor C2 is short-circuited during measurements to prevent oscillations upsetting the d.c. conditions (see part 7). Transformer T1 primary is shorted out to prevent any received signals doing the same (unlikely as this would be). Full solutions will be given next month.

No. 1: What should the gate and drain potentials be with respect to earth?

No. 2: Suppose the following voltage readings are measured with respect to earth with Tr1 in circuit: source = +4·5V, gate = 0V, drain = +5·25V. The f.e.t. is removed, checked by ohmmeter and found to be good. The following voltages are measured with the f.e.t. still out of circuit (again with respect to earth): source = 0V, gate = 0V, drain = +9V. Finally, still with the f.e.t. out of circuit, the following readings are obtained with respect to the +9V line: source = −9V, gate = 0V, drain = 0V.

Which component is faulty and what is wrong with it? Next month we shall be taking a look at IGFETS.

CALL **Western** FOR YOUR YAESU AND TRIO REQUIREMENTS

A selection from the range . . . LOWEST PRICES . . . FINE SERVICE

YAESU WAS INTRODUCED TO THE UK BY 'WESTERN'.

BUY WHERE EXPERIENCE COUNTS!

NEW! TR-9130

2m. ALL-MODE TRANSCEIVER

NEW! FT-102

HF ALL-MODE TRANSCEIVER

Not only . . . ***but also . . .*** ***the . . .***

NEW! TS-930S

Save at 'Western'!

TS-930S,	**£990.**	**You save £88**
TR-9130,	**£360.**	**You save £35**
FT-102,	**£690.**	**You save £35**

YAESU PRICE LIST. 2 YR WARRANTY. FREE DELIVERY.

Prices include Carr/VAT

HF EQUIPMENT

Cat. No.			£
1265	FT-1	150Khz-30Mhz TCVR	1240.00
1222	FT-101Z	Transceiver	539.00
1223	FT-101ZD	Transceiver	599.00
1224	FT-101Z/AM	101Z plus AM unit	555.00
1225	FT-101ZD/AM	101ZD plus AM unit, digital	619.00
1226	FT-101/FM	101Z plus FM unit	570.00
1227	FT-101ZD/FM	101ZD plus FM unit	635.00
1263	FV-101	Remote VFO	109.00
1274	Fan B	Fan for FT-101	13.00
1275	DC Unit	DC/DC PSU for FT-101	40.00
1230	FT-107	Solid state broad band	699.00
1231	FP-107	PSU for FT-107	99.00
1232	DMS-107	Memory for FT-107	89.00
1264	FV-107	VFO for FT-107	95.00
1265	SP-107	Speaker	28.00
1266	FC-107	ATU	106.00
1268	FT-902DM	SSB/AM/FM TCVR	850.00
1244	SP-901	Spkr for 101Z/902	30.00
1267	SP-901P	Phone patch/spkr	55.20
1247	FV-901DM	Remote VFO for 901	250.00
1245	FC-902	ATU for 101Z/902	130.00
1269	FTV-901R	T.VTR plus 2M unit	270.00
1270	430TV	70cm Unit for above	170.00
1271	144TV	2M Unit for FTV-901R	95.00
1272	YO-901P	Monitor scope/pan ad	315.00
1239	FT-707	Mobile TCVR	549.00
1238	FP-707	AC PSU	119.00
1237	FC-707	ATU for FT-707	82.00
1273	MR-7	Rack for FT-707	15.00
1203	MMB-2	Mobile mount for '707'	16.00
1246	FL-2100Z	HF 1200W linear	399.00
1206	FRG-7	Receiver	189.00
1248	FRG-7700	Receiver	315.00
1255	FRV-7700A	Conv 118/130 130/140 140/150Mhz	69.75
1257	FRV-7700D	Conv 118/130 140/150 70/80Mhz	72.45
1254	FRT-7700	Antenna tuner	37.00

VHF Equipment

1233	FT-227RB	2M FM 10W TCVR	179.00
1234	FT-290R	2M Multi-mode	235.00
1202	CSC-1	Case for FT-290R	3.90
1210	MMB-11	Mounting bracket 290	22.00
1211	NC-11C	Charger for FT-290R	8.00
1595	C Nicads	Set of 8 for FT-290R	21.20
1348	FL-2010	10W linear for FT-290R	62.00
1252	FT-208R	2M Hand held	199.00
1251	FT-708R	70cm Hand held	209.00
1236	FT-480R	2M All mode	360.00
1243	FT-780R	70cm Multi-mode	435.00
1220	FP-80A	AC PSU, 4.5A	59.00
1200	NC-1	Desk charger	19.00
1204	NC-2	Charger	39.00
1201	PA-1	DC Unit	19.00
1205	FP-4	AC PSU 4A, 13.8v	42.00
1258	NC-7	Base trickle charger	26.00
1253	NC-8	Base fast/trickle charger	42.00
1260	FBA-2	Battery sleeve for NC-7, NC-8	3.00
1262	NC-9C	Compact trickle charger	8.00
1349	FNB-2	Spare battery pack	17.00
1350	FL-2050	Linear amp FT-480R etc	120.00
1351	YM-24A	Spkr/Mic, FT-208/708	16.00
1241	FT-720RU	70cm FM mobile transceiver	264.00
1242	FT-720RV	2m FM mobile transceiver	239.00
1263	FT-230R	2m FM mobile transceiver	229.00

HEADPHONES, MICS, Etc.

1208	YE-7A	Hand mic., 600 ohm	6.90
1213	QTR-24D	Quartz 24hr clock	27.00
1215	YM-36	Noise cancelling mic	13.00
1214	YM-35	Hand, scanning	13.00
1352	YM-37	Hand mic	6.90
1353	YM-38	Desk scanning	24.00
1221	YD-148	Desk mic	20.00
1216	YH-55	Headphones	10.00
1217	E72-L	Remote cable for FT-720	19.50
1218	S72	Switching box, FT-720	52.00

TRIO-KENWOOD PRICE LIST. 2 YR WARRANTY. FREE DELIVERY.

"Carriage Free"

Cat. No.		Item	Inc VAT £
1301	ST-1	Base stand/charger for TR-2400	42.94
1302	MB-2	Mobile mount for TR-2300/VB-2300	16.50
1303	SC-3	Soft vinyl case for TR-2400	10.95
1305	BO-9	Base plinth for TR-9000/TR-9500	35.00
1307	PS-20	DC PSU for TR-9000	47.95
1308	PB-24k	Spare battery pack for TR-2400	16.00
1309	MC-30S	Hand microphone; 500 ohm	12.95
1310	PS-30	DC PSU for TS-120S/130S/180S	89.00
1312	MC-50	Desk microphone; 500 ohm/50k	26.45
1315	YK-88CN	270Hz CW filter for TS-130S/830S	30.00
1316	YK-88SN	1.8kHz SSB filter for TS-130S/830S	24.50
1317	MB-100	Mobile mount for TS-130S	16.50
1318	SP-100	Matching speaker for R-1000	25.00
1319	SP-120	Matching speaker for TS-130S etc.	23.00
1321	AT-130	Antenna tuner to match TS-130S	79.00
1322	TS-130S	Solid state HF transceiver	515.00
1323	DFC-230	Dig. rem. frequ. controller	175.00
1324	TS-180S	Solid state TCVR, 160-10m	669.00
1325	AT-230	Antenna tuner to match TS-830S	119.00
1326	TS-530S	All-band HF TCVR, digital	529.00
1327	SP-230	Speaker to match TS-530S/830S	35.00
1330	TS-830S	All-band HF TCVR, digital	679.00
1332	R-1000	Gen. cov. receiver, digital	295.00
1333	DCK-1	DC operating kit for R-1000	8.26
1334	TR-2300	2m FM portable TCVR, synth.	164.95
1337	TR-2400	2m FM hand portable transceiver	195.00
1338	TR-7625	2m FM 25W TCVR + memory	215.00
1341	TR-9500	70cm FM/SSB/CW mobile TCVR	440.00
1343	TR-8400	70cm FM mobile TCVR, synth.	289.00
1344	DS-2	DC-DC converter	39.00
1345	SMC-24	Speaker/microphone for TR-2400	15.95

SSB POWER METER

GIVES STEADY READING ON SPEECH.

The PM-2000A is an accurate means of measuring your peak envelope output of power on SSB. The unit has been inspected by the home office and found suitable for its purpose. SWR measurements can also be made, but the PM 2000 does what all other SWR meters cannot do; i.e. tell you your peak output power as required in your licence. **PRICE £56.35**

PM-2000A 1.5-30MHz, 2Kw. PM-2001. 50-150MHz £46

Western Electronics (UK) Ltd

FAIRFIELD ESTATE, LOUTH, LINCS LN11 0JH
Tel: Louth (0507) 604955 Telex: 56121 WEST G

PRODUCTION LINES

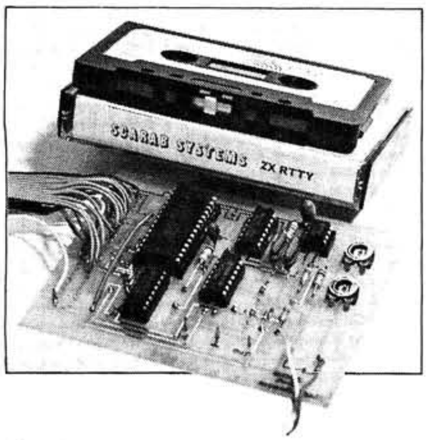
ALAN MARTIN G8ZPW

RTTY Breakthrough

The usual view of the radio amateur's shack running an RTTY mode transmission would include a large, very noisy, oily smelling electro-mechanical piece of equipment. Now a relatively cheap method of receiving and transmitting RTTY signals is available.

First, you must own a ZX81 microcomputer, 16K RAM pack and terminal unit, then with the addition of the Scarab RTTY cassette program and interface board, a RTTY mode station can be run without the previously mentioned drawbacks.

With the use of the 16K RAM pack, the program, written by C. G. Barker, has five programmable memory stores enabling your callsign and other relevant station details to be called-up and transmitted by single key operation. Other features include "Scrolling Screen" presentation, auto carriage return and line feed plus an adjustable Baud rate.



The Scarab System. Note the components shown are available, but not included in the prices quoted

Circuit details of the interface board, which can be wired direct to the RAM pack thus avoiding the need to open the computer to make connections, are included with each cassette, and a pre-drilled p.c.b. is also available. The BARTG ST.5 terminal unit can be used, with slight modification to convert the output to "logic level" (5V). Details of the circuit, the modifications and availability are also supplied by Scarab.

The VAT and p&p inclusive prices are, £9·75 for the cassette and £3·70 for the interface board. Both products are available from: *Scarab Systems, 141 Nelson Road, Gillingham, Kent ME7 4LT. Tel: (0634) 575778.*

Safety System for Mobile Operators

We have recently received reports of both radio amateurs and CB operators being stopped by the police and warned, that operating hand-held microphones whilst driving, could result in them being prosecuted for "not having proper control of the vehicle". I have details of a product that could provide the mobile operator with the means of avoiding police attention in this particular circumstance.

Called the Monolock Safety Microphone System, it comprises an Electret condenser microphone with clip for attaching to the lapel, and a small unit containing a send/receive switch, microphone pre-amp with adjustable gain control and time-out facility, which mounts on the car's gear lever.

The unit is simply installed on the gear lever and, using a suitable microphone socket for the particular rig in use, power to automatically recharge the NiCad cell is derived from the p.t.t. line.

The time-out facility allows approximately four minutes of transmit time, on any over, after which the unit automatically drops transmission until the circuit is reset by operating the concealed reset switch. The unit is also supplied with a connecting lead and connectors, for recharging the NiCad cell from the car's cigar lighter socket, should the charge drop over a period of months.

The inclusive price of the Monolock safety microphone system is £31·45 and is available from: *Automatic Safety Lighting Ltd., 311 Lidgett Lane, Leeds 17, West Yorks. Tel: (0532) 682682.*

432MHz Beam Antenna

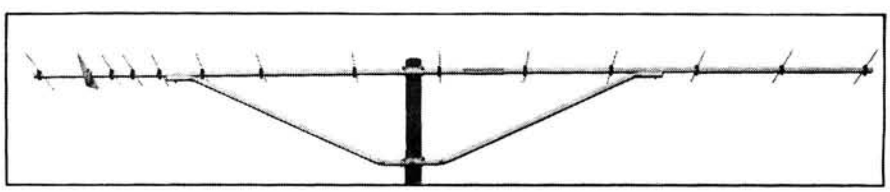
Latest addition to the product range of Ant Products is the Silver 70, a 14-element, high gain long Yagi, for use on the 432MHz (70cm) band.

A major feature of the antenna is a silver plated driven element which requires no setting-up adjustments prior to use. The remaining elements are made from stainless steel, fastened into quick fitting clips insulating them from the boom. The makers claim that by using this combination of materials the antenna will retain its specified performance, and not suffer from atmospheric contamination with subsequent detuning effects.

Principal technical specifications for the antenna are: gain 16dBd; bandwidth at 2:1 v.s.w.r. is in excess of 10MHz; beamwidths at the half power points are 24° in the H-plane, 22° in the E-plane and the front-to-back ratio is 24dB.

The overall boom length of the Silver 70 is 2·7m with a wind loading figure of 0·08 sq. metres and it weighs only 1·1kg. Connection to the driven element is via an N-type connector, feeding a gamma match to the dipole assembly thus ensuring an accurate match to 50Ω coaxial cable.

The Silver 70 is manufactured in the UK from the highest quality materials, costs £31·95 plus £4·00 for delivery via Securicor and is available from: *Ant Products, All Saints Industrial Estate, Baghill Lane, Pontefract, West Yorks. Tel: (0977) 700949.*



BASIC QSOs in German

PART 1

G.W. Roberts GW4JXN

The format and outline of this article is very similar to that in *Basic QSOs in French* which appeared in the June and July 1982 issues of *PW*. Thus, this article will not teach you how to speak German, it will only give you enough for a basic QSO with a German speaking contact.

German is spoken as the first language in Germany, both East and West, Switzerland (where approximately 70 per cent of the inhabitants speak German as their first language) and Austria. In addition, German is often spoken as a second language in many countries, and also by expatriate Germans around the world. The importance of German to us, however, is that it is not only an important commercial language but is the native language of a large number of very active and keen radio amateurs.

QTH Locations

It is possible to locate a station to a region in Austria from the number which follows "OE" e.g. OE6 is Steiermark around Graz, OE7 is the Tyrol. Similarly, the last letter of a callsign in East Germany denotes the district, e.g. "O" indicates Berlin, "A" is the area around Rostock, "M" is the area round Leipzig.

The author has found it very useful to have an atlas of Europe with a detailed index of place names, so that one can check fairly easily and predict the spelling of certain place names. The German alphabet is given in the appendix as this might be used instead of the International Phonetic Alphabet for the spelling of place names and operators' names. Again, the appendix has a list of first names to help make identification as easy as possible.

Bilingual Conversations

Many German speaking amateurs speak very good English and revel in the chance of using it, but this is not true of all, especially East Germans with whom contacts have, in my personal experience, tended to be rather short and formal. Many German speakers unexpectedly are pleased and relieved to speak German. Many such amateurs have admitted that they hadn't quite understood the English answers and repeated the questions in German! It is not unusual either to find it easier to overcome the interference on h.f. by speaking the other person's language, i.e. the German contact speaks English for your benefit and you speak German for his benefit. It is after all much easier to understand your own language than a foreign one in the QRM.

What we should learn from the Germans speaking English is that they are willing to try and speak English and we should try and speak German. Even a few words of German promotes a favourable reaction.

The German used in this Article

Many German stations can be heard on the 7MHz (40m) band but these are usually conversations between friends. These are unlikely to be of use to the English listener. The topics covered are much wider ranging than those covered in this short series. There is, furthermore, a much greater dialectal variation in German than say French and there is a great pride in these dialects. North German is different from Southern German, and Swiss and Austrian German can be quite distinctive. In talking to strangers and to foreigners, however, a standard German "Hochdeutsch", i.e. "book German" is used and this is the form used in the article.

The QTH is one metre above sea level

In using the information contained in the article please note that the amount of English technical words, e.g. "fading" instead of the German "Schwund", "callbook" instead of the "Rufzeichenliste", "das Sked" instead of "Verabredung" will vary from individual to individual. It is better to follow the lead given by the person you are talking to. Purity of German language can be appreciated by the speaker as a sign of politeness. The amount of "hamisms", e.g. the use of the Q Code will also vary — here the Q code is pronounced as in the German alphabet given in the appendix.

As there are variances in language usage the author would welcome any corrections or alternatives offered by native German speakers, though the contents are the result of many hours' listening on the air and checks on usage with native speakers over the air. The whole article has been checked for correctness and authenticity by linguistically sensitive German speakers.

Now a very short word about the nature of German. Historically German is more closely related to English than say French and, in fact, many children learning languages prefer German to French. However, German tends to use home-made long compound words rather than borrow an English/French word of possibly Latin/Greek origin. For example "Fernsprecher" in addition to "Telephon". Consequently, many words look strange. There is one great consolation — the pronunciation of German is much more closely related to the written form than either the French or English.

German is different to English in that it has "cases". This need not concern us too greatly in teaching such basic German but it does mean that you will see, for example, many words for "the", not just the masculine "der", the feminine "die", neuter "das" and plural "die". Do not be confused by them. German also has a very strict word order system, the verb sometimes comes at the end of the sentence. Try to stick accurately to the text given, you do not have the flexibility of French and English.

How to use this Article

I suggest that you choose from the different headings your own basic QSO by writing down suitable sentences from the article and keeping this by your rig. Later, when you have more practice and confidence, you can add to this and make your conversation longer. But if you do not try you will get nowhere, so try — even if your first attempt is only "auf Wiederhoren": "until we hear each other again" or "vielen Dank": "thank you very much".

German Pronunciation

The stress varies on German words and in the pronunciation hints with the article the stressed syllables are set in bold type. The following German consonants are to be noted:

"v" is pronounced as "f"; "w" is pronounced as "v" (remember Volkswagen); "ch" varies dialectally between "sh" and "ch" as in loch (technically it is in between them) and "z" is pronounced as "ts". All letters in a word are pronounced. Vowels followed by a single consonant are generally long, but two consonants are generally short. German has one accent, the "umlaut" which changes the sound of the vowels as follows:

ö becomes "oeuh"; ü like the French "u" or a sound between "i" and "w" and ä becomes "ay".

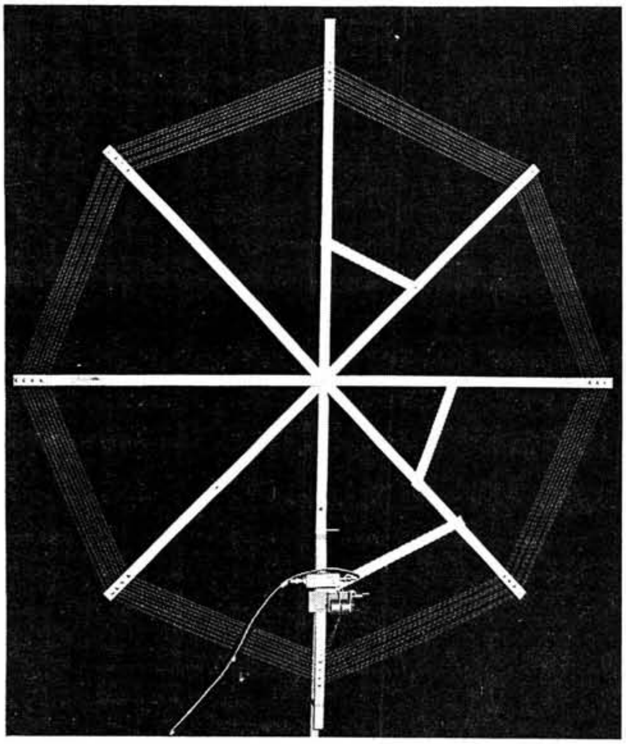
The author would like to thank Dr Jo Desch, Lector in German, University College of North Wales, Bangor and Manfred Grab DL7GAB for their help in preparation of this article.

Making a call CQ Germany, Switzerland, Austria or a German speaking country. This is (own callsign) calling CQ and standing by.	CQ Allgemeiner Anruf an Deutschland, die Schweiz, Österreich oder eine deutschsprechende Station. Hier ruft (own callsign) mit einem allgemeinem Anruf und geht jetzt auf Empfang. Bitte kommen!	Tsay Koo **Al**goe**main**er **an**roof an d**oits**hlant, dee Shwaits, **Oe**sterr**aich** odoe **aine doits**hshprechendoe shtatsion. Hear rwft (own callsign) mit **ai**nem **alg**em**ain**em **an**roof unt gayht yetst awf empfang. **Bi**tter komen.
Replying to a call (Other callsign phonetically) this is the British/English/Welsh/Scottish/Irish/Australian/American/Canadian/New Zealand/South African station (own callsign) calling you/returning your call.	(Other callsign phonetically) Hier ruft der Britische/Englische / Walisische / Schottische / Irische / Australische / Amerikanische/Kanadische/Neuseeländische/Südafrikanische Sender (own callsign), der auf ihren Anruf zurückkommt.	(Other callsign phonetically) Hear rooft der Br**i**tische / **Eng**lishe / **Va**lisishe / Sh**oh**tische / **I**rishe / **Aw**stralishe / Ameri**can**ishe / Kan**a**dishe / Noyzeal**end**ishe / Sidafri**kan**ishe **Zen**der (own callsign) der awf **ee**hren **an**roof **tswrik**komt.
The German speaking station this is . . .	Die deutschsprechende Station hier ruft . . .	Dee D**oits**hshprechende sh**tat**sion hear rooft . . .
After someone has replied to your call I heard more than one station replying. Go ahead (XYZ). Try again (XYZ) please wait. This is (own callsign). Good morning/afternoon/evening old man. Thank you for returning my call.	Mehrere Sender haben gleichzeitig geantwortet. Bitte schön (XYZ). Versuchen Sie noch einmal (XYZ). Warten Sie bitte! Hier spricht (own callsign) Guten Morgen/Tag/Abend mein Lieber. Ich danke Ihnen für die Antwort auf meinen Ruf.	M**e**rere **zen**der haben gl**aichtsai**tig goe**ant**vortet. **Bit**ter shoen (XYZ). Ferz**oo**chen zee noch ainmal (XYZ). **Var**ten zee **bit**ter. Hear shpricht (own callsign) **goo**ten **M**orgen/Taag/**A**bent main leahber. Ish danke **ee**hnen fear dee antvort awf m**ai**nen roof.
I think this is the first time we have worked each other.	Ich glaube das ist das erste Mal daß wir miteinander sprechen.	Ish gl**aw**be das ist das **er**ste mal das viir mitain**an**der sh**pre**chen.

I think we have worked before.	Ich glaube, wir haben schon miteinander gesprochen.	Ish glawbe viir h**a**ben shoon mitain**an**der geshp**roc**hen.
The name is . . .	Ich heisse . . .	Ish haise . . .
I'll spell it for you phonetically.	Ich buchstabiere phonetisch.	Ish boochsh**tab**iere fon**ee**tish.
I repeat.	Ich wiederhole.	Ish **veeder**hole.
Location		
The location is . . . I'll spell it for you, in the county of . . ./ state of . . . in North/South/West/East England/ Wales/Scotland/Ireland/Canada/USA etc.	Der QTH/Sendeort ist . . . ich buchstabiere ihn für Sie, in der Grafschaft von . . ./im Staat von . . . in Nord/Süd/West/Ost England/Wales /Schottland/Irland/Kanada/in der USA.	Der **Koo** T**ay** **H**a/**Zender**ort ist . . . Ish boochs**hta**biere een fear zee, in der **graf**shaft fon . . . / im shtaat von . . . in Nord/Zid/Vest/Ost **Eng**lant/V**a**les/S**ho**tlant/I**r**lant/K**a**nada/ in der **Ooessah**.
The location is in the centre of . . .	Der Sendeort ist in der Mitte von . . .	Der **zende**rort ist in der **mi**te fon . . .
On the island of . . .	Auf der Insel . . .	Awf der **in**zel . . .
In the small/big town/city of . . .	In der kleinen/grossen Stadt/Großstadt von . . .	In der kl**ai**nen/gr**o**ssen shdat/Grossshdat fon . . .
In the seaside town of . . .	Am Seebad . . .	Am **zay**baat . . .
About . . . kilometres from . . .	Ungefähr . . . Kilometer von . . . entfernt.	**Wn**gefayr . . . Kilo**me**ter fon . . . entf**er**nt.
The longitude and the latitude is . . . degrees — minutes North/South, degrees — minutes East/West.	Die Länge und die Breite sind . . . Grad-Minuten nordlich/südlich, Grad-Minuten östlich/westlich.	Dee **lay**nge unt dee br**ai**te zint . . . Graad-Min**ww**ten n**o**rdlich/s**i**dlich, Graad-Min**ww**ten o**e**stlich/v**e**stlich.
Signal report		
You are five and nine in . . .	Sie sind fünf und neun in . . .	Zee sint finf wnt noin in . . .
Your report is . . .	Ihr Rapport ist . . .	Ear **ra**por ist . . .
Your signal is variable/very weak/weak/strong/very strong/excellent.	Ihr Signal ist schwankend/sehr schwach/schwach/stark/sehr stark/ausgezeichnet.	Ear signal ist sh**wan**kend/seer shwach/shwach/shtark/seer shtark/**aws**get**sai**chnet.
There is no interference.	Es gibt keine Störungen.	Es gibt k**ai**ne sh**tirwn**gen.
There is a lot of local interference.	Es gibt viele örtliche Störungen.	Es gibt **fee**le o**er**tliche sh**to**er**wn**gen.
Your signals are fading.	Ihre Signale schwinden.	**Ea**re signa**l**e sh**vin**den.
Your modulation is good/bad.	Ihre Modulation ist gut/schlecht.	Eare modiwlats**ion** ist goot/shlecht.
I can understand you very easily.	Ich verstehe Sie ganz leicht.	Ish fersh**tay**he zea gants laicht.
I can understand you only with great difficulty.	Ich verstehe Sie nur mit grossen Schwierigkeiten.	Ish fersh**tay**he zea noor mit g**ro**ssen S**hve**erig**kait**en.
Asking for information and commands		
Please state your name/your location/your callsign.	Geben Sie mir bitte Ihren Namen/Ihren Standort/ihr Rufzeichen.	**Ge**ben zee mir bitter **ea**ren n**a**men/**ea**ren sh**tan**dort/ear **roo**fts**ai**chen.
What is your country?	In welchem Land sind Sie?	In v**el**shem lant zint zee?
Please spell your name/location/callsign phonetically.	Buchstabieren Sie bitte Ihren Namen/Standort /Rufzeichen!	Bwchsht**a**bearen zee bitter **ea**ren n**a**men/sh**tan**dort/ **roo**fts**ai**chen.
Please can you give me a report?	Können Sie mir bitte einen Rapport geben?	K**oe**nen zee mir bitter **ai**nen rapor **gay**ben?
Please repeat.	Bitte wiederholen Sie.	Bitter **veeder**holen zee.
Please speak more slowly.	Bitte sprechen Sie langsamer.	Bitter sh**pre**chen zee l**ang**zamer.
Do you have a lot of interference?	Haben Sie viele Störungen?	**Ha**ben zee f**ee**le sh**toe**rwngen?
Are my signals fading?	Schwanken meine Signale?	Sh**van**ken m**ai**ne sign**al**e?
Have we worked each other before — on this band/on 10, 15, 20, 40, 80, 160 metres?	Waren wir schon mal verbunden — auf diesem Band/auf zehn, fünfzehn, zwanzig, vierzig, achtzig, hundertsechszig Metern.	Varen veer shon mal ferb**wn**den — awf d**ee**zem Bant/awf tsayn, **fin**ftsayn, t**vant**sig, f**ear**tsig, a**ch**ttsig, **hwndert**sextig metern.
I'm sorry, I do not understand you.	Es tut mir leid, ich verstehe Sie nicht.	Es toot mir lait, ish fersh**tay**he zee nicht.
I do not understand/speak German very well.	Ich verstehe/spreche nicht sehr gut deutsch.	Ish fersh**tay**he/shp**re**che nicht zer goot doitsh.
Please stand by.	Warten Sie bitte.	**Var**ten zee bitter.
Please go again.	Versuchen Sie es nochmal.	Ferz**wch**en zee es n**och**mal.
Do you receive/hear/understand me?	Können Sie mich aufnehmen/hören/verstehen?	**Koe**nen zee mich **aw**fn**ay**m**en/h**oer**en/fersh**tay**hen?
How do you copy?	Wie nehmen Sie mich auf?	Vee **nay**men zee mich **awf**?
Is this frequency free/occupied?	Ist diese Frequenz frei/besetzt?	Ist **dee**ze freqvents frai/bez**ets**t?

This frequency is in use old man, I'm sorry.	Diese Frequenz ist schon besetzt old man, Tut mir leid.	Deeze freqvents ist shon bez**ets**t old man, toot mir lait.
I have a sked.	Ich habe eine Verabredung.	Ish **hab**e **ai**ne fer**abray**dwng.
Can we change frequency? How about 10kHz up/down if the frequency is free?	Können wir die Frequenz wechseln? Wie wäre es mit zehn Kilohertz höher/tiefer, wenn die Frequenz frei ist?	K**oe**nen veer dee freqvents v**ech**seln? Vee **vay**re es mit tsayn kiloherts h**oe**her/**teaf**er ven dee freqvents frai ist?
How about S19?	Wie wäre es mit S neunzehn?	Vee **vay**re es mit ess **neun**zehn?
Can we go simplex?	Können wir eine Direktfrequenz benutzen?	koenen veer aine **direk**tf**re**qvents be**nwt**sen?
I shall see you on the . . . repeater.	Ich werde Sie über das . . . Relais wiedehören.	Ish verde zee iber das . . . relay **veeder**ho**er**en.
Shall we try sideband?	Versuchen wir mal Seitenband?	Ferz**wch**en veer mal **sai**tenb**ant?**
How about Morse?	Wie wäre es mit Morsezeichen?	**Vee vay**re es mit M**ors**ts**aic**hen?
I'll give you a report on the next over.	Ich werde Ihnen einen Rapport während Ihres nächsten Durchgangs geben.	Ish **ver**de **een**en **ai**nen rapor v**ay**rend **ee**rer **nex**ten besh**pre**chwng g**ay**ben.
Net working		
I think it is (XYZ's) turn.	Ich glaube daβ (XYZ's) d'ran ist.	Ish glawbe das (XYZ's) dran ist.
I've forgotten whose turn it is.	Ich habe vergessen wer d'ran ist.	Ish habe ferg**es**en ver dran ist.
Over to . . . with the group.	Mikrophon an . . . mit der Gruppe.	Mik**rofon** an . . . mit der g**rou**pe.
Break.	Unterbrechung.	**wnter**brechwng.
Over.	Zurück.	tsw**rick**.
Rig and Antenna		
The rig here is . . .	Meine Station ist ein . . .	**Ma**ine **stat**sion ist ain . . .
I'm using a . . . transceiver.	Ich benutze einen . . . Senderempfänger.	Ish benwtse ainen . . . **zender**empfaynger.
I have here a . . . receiver and . . . transmitter with a transverter/with a linear amplifier.	Ich habe hier einen . . . Empfänger und einen . . . Sender mit Transverter/und Linear (Verstärker).	Ish habe here **ain**en . . . emp**fay**nger wnd **ai**nen . . . **zen**der mit transverter/und linearfer**stayr**ker.
I am putting out 10, 20, 50, 100, 150 watts.	Ich sende mit zehn, zwanzig, fünfzig, hundert, hundertfünfzig Watt.	Ish zende mit tsayn, **tsvan**tsig, **fin**ftsig, h**wn**dert, **hwndertfinf**tsig vat.
The rig is home-brew with modifications.	Mein Gerät ist Selbstbau mit Verbesserungen.	Main ger**ayt** ist **selbs**tbaw mit ferbeser**wn**gen.
My antenna is a dipole/is a trapped dipole/a beam with three elements.	Mein Antenne ist ein Dipol/ein Dipol mit Traps/(ein Beam) ein Richtstrahler mit drei Elementen.	Main an**tene** ist ain **di**pol/ein **di**pol mit traps/(ain beam) **rich**tsh**traa**ler mit drai ele**men**ten.
A Yagi with 10 elements.	Ein Yagi mit zehn Elementen.	Ain **Yag**i mit tsayn elem**en**ten.
with horizontal/vertical/circular polarisation.	mit horizontaler/vertikaler/Kreis-polarisation.	mit horitson**ta**ler/vertic**a**ler/k**raiz**-polari**zat**sion.
with a gain of . . .	mit einem Gewinn von . . .	mit ainem ge**vin** fon . . .
A quad/a long wire/an end fed Zeppelin/a centre fed Zeppelin.	Ein Quad/eine Drahtantenne/eine am Ende/eine in der Mitte gespeiste Zeppelin.	Ein kvad/**ai**ne d**raa**tan**tene**/**ai**ne am **en**de/**ai**ne in der **mi**te gesh**pais**te **Tse**pelin.
The antenna is about . . . metres above ground level.	Die Antenne ist ungefähr . . . Meter über Grund.	Dee an**tene** ist unge**fayr** . . . m**et**er **i**ber grwnt.
The QTH is . . . metres above sea level/at sea level/below sea level.	Der QTH ist . . . Meter über Meereshöhe/auf Meereshöhe/unter Meereshöhe.	Der koo tay ha ist . . . meter iber mereshoehe/awf mereshoehe/wnter mereshoehe.
The antenna has a rotator.	Die Antenne hat einen Rotor.	Dee ant**ene** hat **ain**en r**otor.**
I'll turn the antenna on you during the next over.	Ich werde die Antenne an Sie während ihrer nächsten Besprechung richten.	Ish **ver**de dee an**tene** an zea wayrent **ea**rer naychsten beshshp**rech**wng richten.
I rotate the antenna by hand.	Ich richte die Antenne mit der Hand.	Ish r**icht**e dee an**ten**e mit der hant.
The antenna is in the garden/attic/on a . . . metre high mast.	Die Antenne ist im Garten/auf dem Boden/auf einem . . . Meter hohen Mast.	Dee an**tene** ist im g**art**en/awf dame b**od**en/awf **ain**en . . . Meter **ho**en mast.
I am testing the rig.	Ich prüfe die Anlage/Ich prüfe das Gerät.	Ish p**rif**e dee **an**lage/Ish p**ri**fe das ger**ayt.**
I am glad of your report.	Ich freue mich über Ihren Rapport.	Ish froye mish **i**ber **ea**ren **ra**por.
I like my . . . I want to change my . . .	Mein . . . gefällt mir. Ich will mein . . . umtauschen.	Main . . . gef**ayl**t mere. Ish vil main **wmt**awshen . . .
How do you like your . . .	Wie gefällt Ihnen Ihr . . .	Vii gef**ayl**t e**en**en ear . . .

The second part of this article will appear next month



MW LOOP DIFFERENTIAL AMPLIFIER

S. WHITT

Several years ago an article was published in *PW* describing a differential amplifier for a m.w. loop antenna. The author constructed and used this circuit for some time and felt that the original design could be improved upon.

Despite a recently published design for a *Q* multiplier for a m.w. loop, there is still a need for a high performance balanced amplifier if the inherently balanced output of a loop is not to be upset by direct connection to the unbalanced input of a receiver.

Circuit Description

No great claim of originality is made for the circuit of Fig. 1, since the circuit shown will be found in many design books. However, it has a number of advantages over the design originally published.

Transistors Tr1a and Tr1b are an accurately matched pair of Siliconix *n*-channel j.f.e.t.s contained in one package. They form a long-tailed pair differential amplifier stage with a very high input impedance thus applying negligible loading to the loop tuned circuit.

Semiconductor Tr3 operates as a constant current source ensuring satisfactory operation of the long-tailed pair. The use of a matched dual f.e.t. and 1 per cent tolerance components for R1 and R2 ensures an excellent common-mode rejection ratio for the circuit, thus maintaining the sharpness of the loop's directional null.

The stage formed by Tr2 operates as a unity gain source follower amplifier, acting as a buffer between the relatively high output impedance of the long-tailed pair and low impedance of the receiver input. The input bias resistors R6 and R7 are chosen to be 1MΩ to prevent loading of the *Q* of the loop. In the original article these resistors were 47kΩ and this would significantly degrade the performance of high *Q* loops. Table 1 provides details of loop loading variations. Note all measurements were made with the amplifier driving a 50 ohm load.

The overall amplifier has a 12dB voltage gain and is happy handling large input signals, as shown in Table 2.

The circuit was constructed on a small p.c.b. as shown in the photographs and due to its simplicity should cause

Table 1: LOOP LOADING

UNLOADED LOOP Q	PARALLEL RESISTANCE	LOADED LOOP Q
70	100kΩ	46
70	2MΩ	70
100	100kΩ	57
100	2MΩ	100
140	100kΩ	70
140	2MΩ	132

Table 2: SIGNAL HANDLING @ 1MHz

GAIN dB	INPUT LEVEL mV r.m.s.	COMPRESSION dB
11·9	1·16	0
11·9	3·67	0
11·9	11·6	0
11·8	36·7	0·1
11·7	116	0·2
11·5	223	0·4
11·3	366	0·6

WAD084

Test point	Voltage
A	17
B	17
C	3·2
D	−22·3
E	10·3

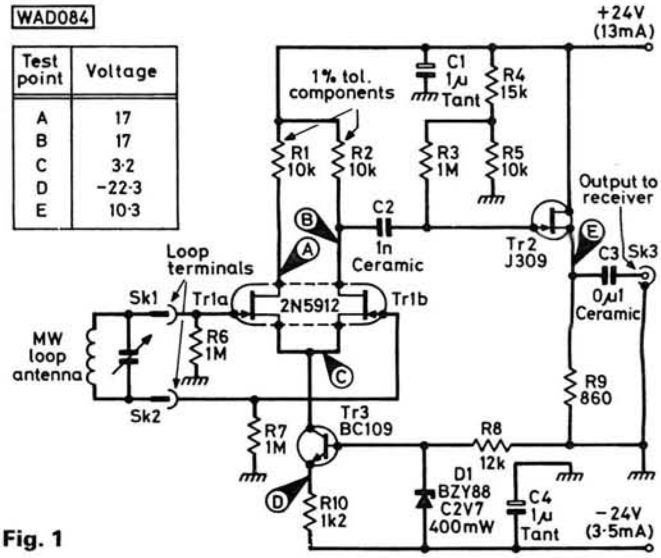


Fig. 1

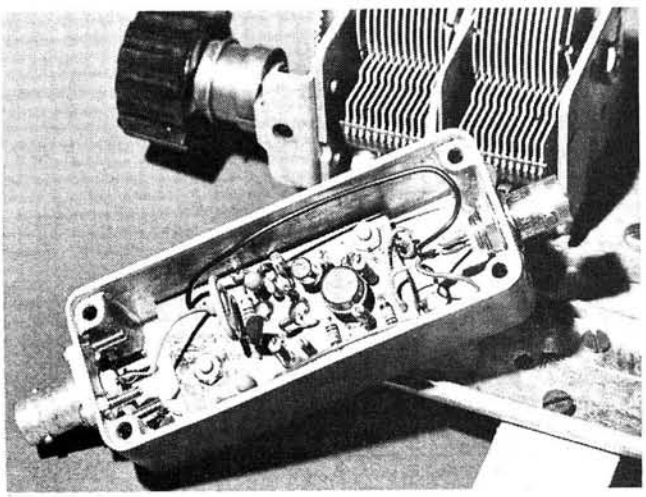
Table 3: FREQUENCY RESPONSE

GAIN dB	FREQUENCY MHz
12·4	0·5
11·9	1·0
10·9	1·5
9·4	2·2 (−3dB point)
6·4	3·6
0	8·3

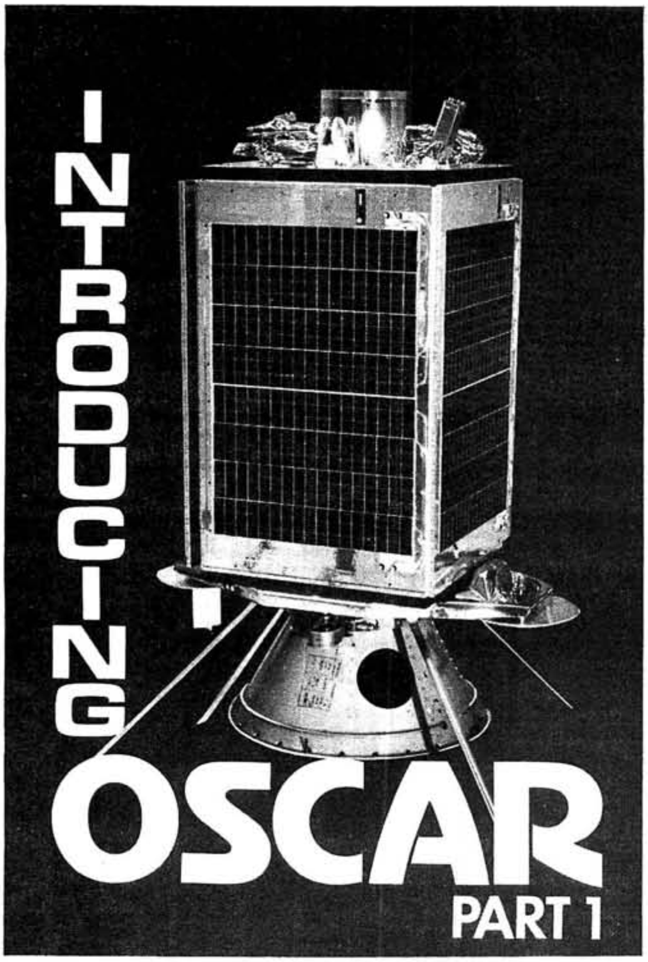
no constructional problems. Both Tr1 and Tr2 are obtainable from several sources including Semiconductor Specialists (UK) Ltd., of West Drayton, Middlesex. Total constructional cost of the amplifier and housing should be approximately £7.50.

Applications

Primarily this amplifier allows the easy interconnection of a loop antenna and a receiver input without degrading the loop's performance. The additional gain provided will help compensate for the proportionately smaller signal pick-up of small loops. However, large signals, from larger loops, are likely to overload the subsequent receiver input stages long before the amplifier is affected. If this problem does occur a solution is provided by the insertion of an attenuator between the amplifier and the receiver.



The prototype amplifier shown above was built and housed in a small diecast box attached to a 1·3m diameter octagonal spiral loop and used in conjunction with an Eddystone 940 receiver. This combination produced some excellent DX and revealed no particular operating problems, although it was possible to overload the valve input stage of the receiver unless an attenuator (variable 1–31dB) was inserted in circuit. ●



M.J.AXSON B.A.G8WHG

One of the attractions of Amateur Radio lies in the very wide range of activities which it covers, and the opportunity it gives to become involved in other branches of technology. Working DX on the v.h.f./u.h.f. bands through an OSCAR series communications satellite is a very good example (OSCAR stands for Orbital Satellite Carrying Amateur Radio).

In essence this is a very simple procedure. The satellite is in effect suspended high in the sky somewhere above you, and it contains a receiver and a transmitter, which operate on different frequencies. You transmit a signal up to it, which is then received and retransmitted (Fig. 1). Any other station within "line of sight" of the satellite can then receive your signal via the satellite.

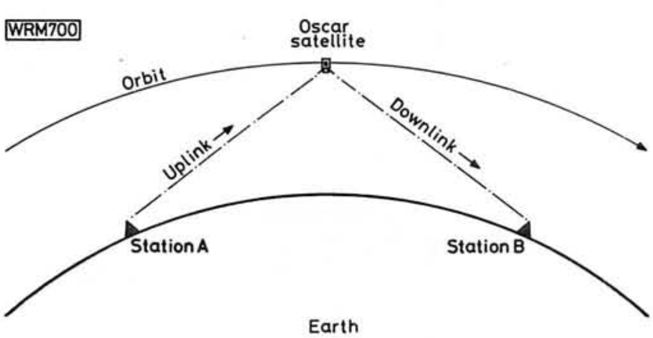


Fig. 1: The basic principle of satellite communication between distant ground stations

The system is rather like the very familiar repeater units used on 144MHz and 432MHz for mobile/portable working, but with two main differences.

Firstly, the satellite is at a height of several hundred miles, so the line of sight from it extends over a very wide area, hence the possibility of DX communication. The second difference is that the satellite, which is about the size of a tea chest, is moving round the Earth at a speed of several km a second, so that the area which is in line of sight is constantly changing. Furthermore, the e.r.p. of its transmitter is only in the region of a few watts, so in theory it would seem that sophisticated tracking equipment would be required so as to keep your TX and RX antennas lined up on it. Fortunately, in practice this is not the case and many amateurs have had a lot of satisfying contacts using relatively simple equipment, so why not join them?

Orbit Principles

The first requirement is to know a little bit about the mechanics of satellites and their orbits, so that they can be located from the published data. There is no need to go into the mathematics involved, just simply to understand the basic principles and learn some of the associated jargon. Let us first consider the case of a satellite in a circular (or near circular) orbit, such as OSCAR 8.

We all know that what goes up must come down, but satellites don't, at least not for quite a long time in human terms, so why should this be so? Imagine that you are throwing stones or some other object parallel to the ground. You throw one fairly gently and it hits the ground close to you, throw a bit harder and it lands further away. The harder you throw, the further the object travels before hitting the ground. This is so elementary that babies learn it in their prams, but have you ever thought why it should be?

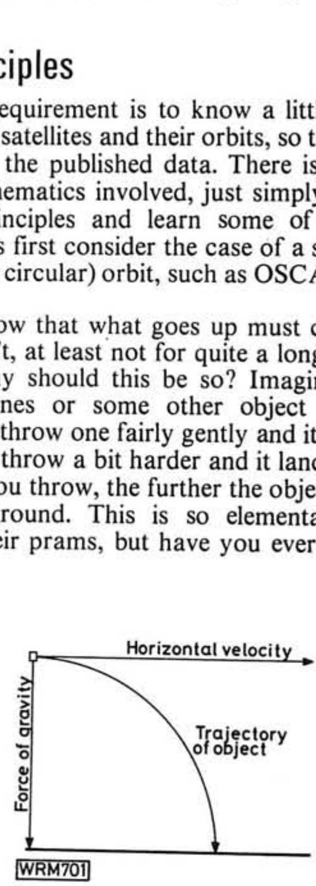


Fig. 2: The basic trajectory of a falling object is determined by two separate forces

Conveniently ignoring air resistance, there are two forces acting on the object. One is the force of gravity which pulls the object down to the ground. Near to the Earth's surface gravity gives an acceleration of 9·75m/sec/sec, which simply means that the object will fall 9·75m in the first second after it is released, 19·50m in the next second and so on, therefore if you are 9·75m above ground level your object will hit the ground after one second.

Now for the other force which you supply by throwing the object. It is going to hit the ground after one second so, the greater its horizontal velocity, the further it will travel, Fig. 2. Of course if you are only 9·75m above ground level no matter how much horizontal velocity you give to the object, it won't travel very far because a tree, house, or rise in the ground will soon intrude and stop it abruptly. But, if you could stand on a point say 256km high, these problems would not arise and the same basic principle applies: the greater the horizontal velocity given to the object, the further it will travel before hitting the ground, in this case after a period of approximately 250 seconds.

However, as the velocity rises and the distance travelled increases, the curvature of the Earth's surface comes into play, and although the object has fallen 256km in 250 seconds the ground has curved beneath it and it still retains some height. Eventually, a velocity will be reached at which the fall due to gravity is matched by the curvature, so the object remains at a constant height above the Earth's surface; in other words it is in orbit, Fig. 3.

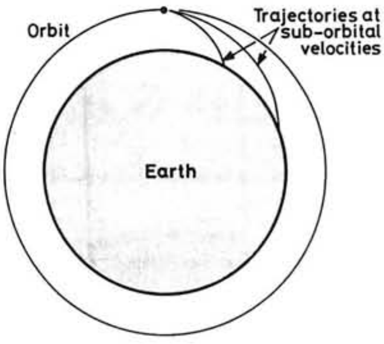


Fig. 3: At the correct velocity an object will remain in orbit above the earth

At an altitude of 256km, this critical orbital velocity is approximately 28 000 km/hr. It is thus easy to calculate the time required for the satellite to complete one orbit, which is known as its "period", and in this case it is about 90 minutes.

The gravitational pull of the Earth on any object decreases slowly with distance. At an altitude of 160km it still has 99 per cent of its sea-level value, but at 1600km it is down to 64 per cent and at 2720km it is halved. This means that the object will fall through a lesser distance in any time period and so the orbital velocity is slower at greater heights. It is therefore obvious that the period will be longer, and this is of course accentuated by the fact that the distance it has to travel to complete one orbit has also increased. For orbital heights of 1600km and 2720km the periods are about 118 minutes and 143 minutes respectively.

Increment and Inclination

Having got the satellite into Earth orbit, we want to know what path it traces over the surface, so back to school geography, from which you will remember that the Earth rotates around an imaginary axis through the North and South poles in a west to east direction, completing one revolution in 24 hours.

This means that from the Earth's surface, on every orbit, the satellite's track will appear to move to the west. How far it moves depends on the period of the satellite since the Earth's rotation is a constant 360 degrees in 24 hours. The number of minutes in 24 hours is $24 \times 60 = 1440$ so the Earth rotates through 1440/360 degrees in one minute. Hence the apparent westward move of the satellite will be its period in minutes $\times$ 0·25 degrees e.g. period 90 minutes, westward move is $90 \times 0{\cdot}25 = 22{\cdot}5$ degrees. In the jargon, this is the "increment" of the satellite. OSCAR orbits are tilted at an angle with respect to the Earth's equator and this angle is called the "inclination", Fig. 4.

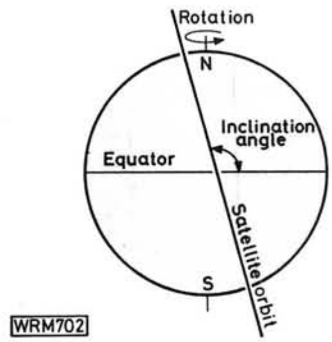
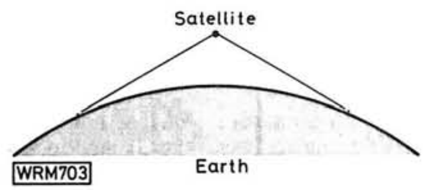


Fig. 4: The angle between the orbital plane and the equator is known as the inclination angle

Coverage Area

As has been said, the satellite has to be within line of sight in order to be used, and the area of the Earth's surface for which this is so at any moment in time is a circle whose centre lies directly below the satellite and whose diameter depends on the orbital height, Fig. 5.

Fig. 5



Since the satellite is moving round the Earth, this circle of visibility is also moving and the satellite can be seen for the longest period when its orbit passes directly overhead, Fig. 6. In practice, of course, most passes are to one side of your location and the visibility period, the time available to communicate via the satellite, is less.

Let us put some figures to these parameters for the OSCAR 8 satellite. In real life nothing is perfect and they vary slightly from time to time, so the figures are approximate, but near enough for our purpose. The orbital height is 904km, inclination 98·9 degrees, increment 25·8 degrees, with a period of 103 minutes and a maximum ground range of 6400km.

It is possible to work out the orbital details for yourself, but quite unnecessary since predictions are available from several sources, notably AMSAT-UK, and occasionally on the RSGB GB2RS News. Of course if you have a ZX81 you can use the program on the *PW Radio Programs–1* cassette.

Look up tables are available which will then give the time of acquisition of satellite, bearing, elevation and loss of satellite. The predictions give the time of the start of the orbit, which is taken to occur when the satellite crosses the equator going north, and is given in Universal clock time.

continued on page 57▶▶▶

R.F. Dummy Loads

PART 2

F.C. JUDD G2BCX

This lower power version, similar to the h.f. dummy load described in Part 1, caters for frequencies above 30MHz and up to 500MHz with a slight rise in insertion v.s.w.r. in the region 400-500MHz.

The load is housed in a small syrup tin as shown in the photograph with the load resistors mounted on a printed circuit board. As the circuit (Fig. 4) shows, nine 470 ohm 2 watt high stability carbon film resistors are used in parallel to give 470/9 = 52 ohms. The diode and load resistors for the l.e.d. bring this down to 50 ohms ±1 ohm.

Construction

The p.c.b. is shown in Fig. 6 and measures 60mm diameter so as to fit inside the tin used. The 470 ohm 2 watt resistors R1 to R9 are mounted upright on the board as in Fig. 5 and the free-end wires all join in a tight bunch for soldering to the "N" type input socket. The resistor R10 is soldered vertically in the centre of the resistor assembly. Four 16 s.w.g. copper wires support the p.c.b. and are soldered to four solder tags bolted to the fixing bolts holding the "N" type input socket to the lid. Note that the centre resistor R10, which is part of the l.e.d. voltage network, is coupled across to the diode via the single printed circuit strip from the centre of the circuit board.

The final resistance will be 50 ohms ±1 ohm but attempts to measure this with an ordinary ohmmeter may well give a false reading as such meters are not very accurate at low ranges. A number of assemblies of this dummy load were compared with a laboratory grade 50 ohm dummy load rated for use up to 500MHz in conjunction with a Bird Thruline r.f. power meter and found to be within the tolerances given.

RF Power Meters for VHF

A meter such as the Daiwa model CN630 operates from 140 to approximately 500MHz and will give direct r.f. power reading up to 200 watts as well as simultaneous indication of v.s.w.r. by means of the crossed-needles meter system employed in these instruments.

There may be others capable of providing this facility of course and one expensive but really accurate meter for use

CONSTRUCTION RATING **Beginner**

BUYING GUIDE

All components are readily available from many of our regular advertisers. The "N" type socket must be a square-flange type (RS Components 455-769 or similar). A suitable housing is a well washed-out syrup tin, small size, although a small rectangular aluminium box was successfully used by the author for one of the prototypes.

APPROXIMATE COST **£3·50**

A small syrup tin is a convenient source of a box for the dummy load

★components

Resistors

¼W Carbon film 5%

2·2kΩ	2	R10, 11

2W Carbon film high stability 5%

470Ω	9	R1 to 9

Semiconductors

Diodes

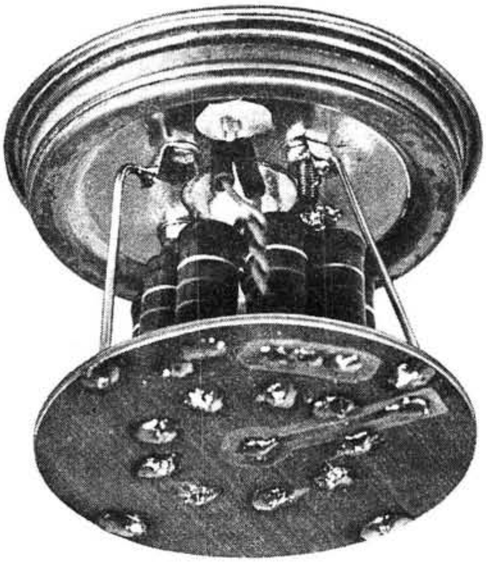
1N4148	1	D1
Red l.e.d.	1	D2

Miscellaneous

Socket "N" type (RS 455-769); Printed circuit board; Small syrup tin (see text).

Table 2

	Power	Time	Can Temp.
Continuous carrier	10W	Indefinite	24°C
	20W	6 min. max	25°C
Carrier with white noise or speech and s.s.b. mod.	25W	6 min. max	27°C
Carrier and/or peak s.s.b. power	100W	$\frac{1}{2}$-1 min.	27°C



Constructional details of the v.h.f./u.h.f. 50Ω dummy load

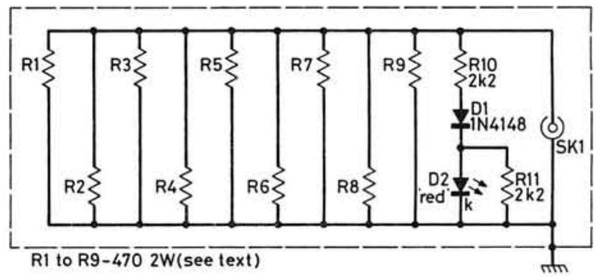
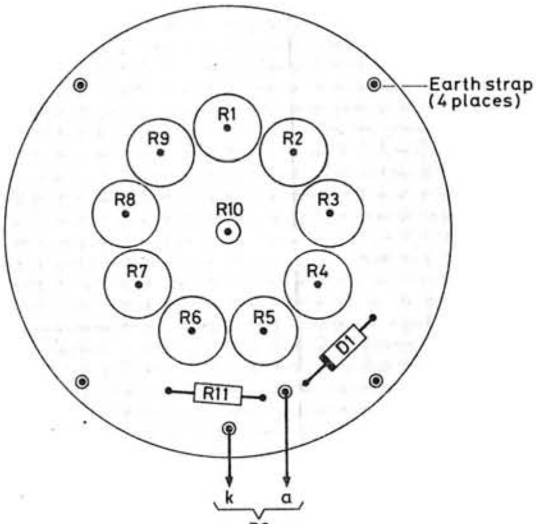
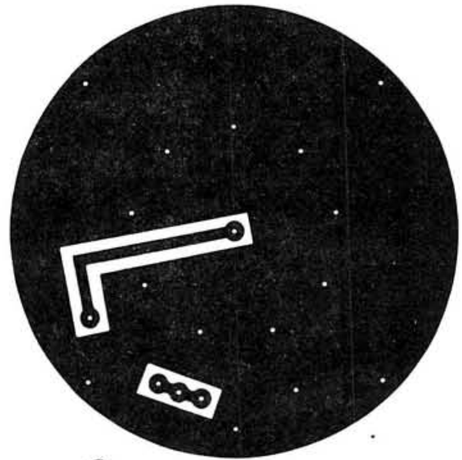


Fig. 4: The circuit diagram of the dummy load





ⓒIPC Magazines Ltd WR162

Fig. 6: Full-size p.c.b. copper track pattern

WRM731

in the region of 500MHz (or higher) with suitable couplers is the Bird Thruline directional r.f. wattmeter model 43. Ordinary power/v.s.w.r. reference meters are of no use for direct measurement of power.

The only meter known to the writer that will give accurate "peak" power readings from s.s.b. modulated r.f. power in the v.h.f. range above 150MHz is the Bird Thruline directional r.f. wattmeter model 4314/4311. There may also be other meters that have this facility as well but the reader should beware of cheap foreign-made instruments claiming to measure such parameters.

Meter Reading Errors

With the exception of high grade laboratory meters that will read with an accuracy, or rather inaccuracy, of around plus or minus 2 per cent, some may not be better than to within 20 per cent or more, which can give very false indication as the graph Fig. 7 illustrates. For example a *negative* inaccuracy of 20 per cent can account for nearly 1dB. This may not sound much but does in fact account for about 1 watt out of 10 when the meter has for example a full scale reading of 10 watts. A study of meter accuracy specifications is always worthwhile.

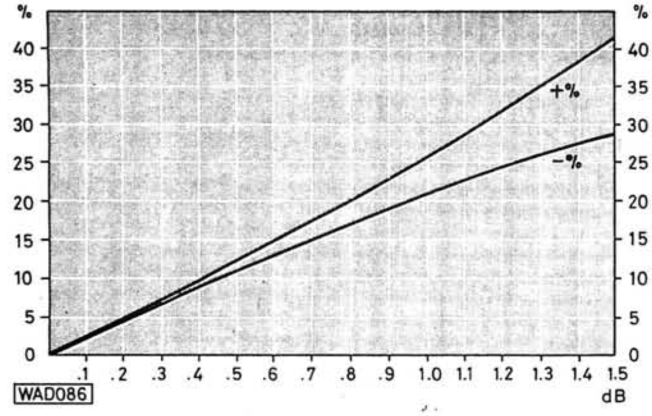


Fig. 7 ▲

Fig. 8 ▼

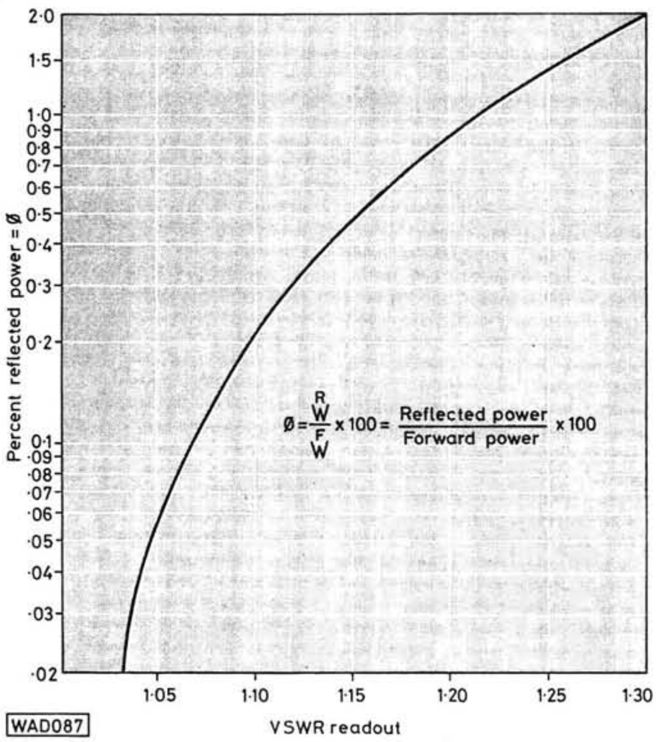
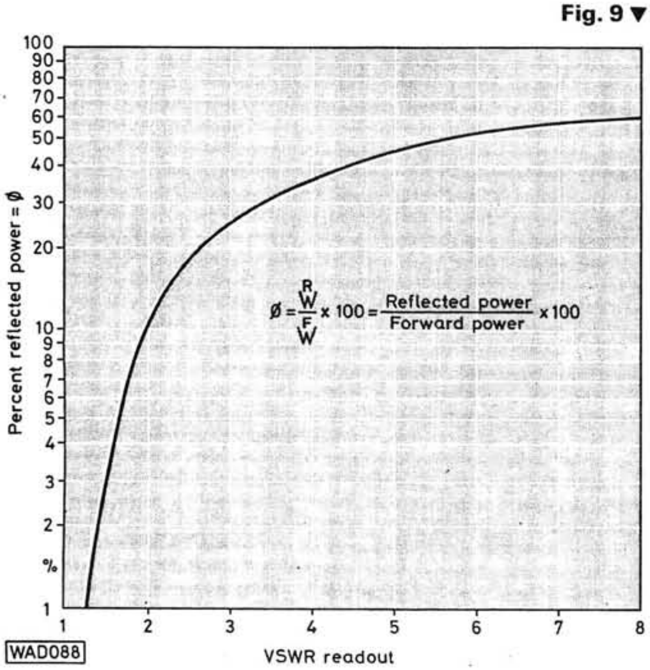


Fig. 9 ▼



The inclusion of the other two graphs may be found useful to those new to amateur radio with Fig. 8 covering the v.s.w.r. range from 1 to 1 up to 1·3 to 1. For higher ranges refer to the graph Fig. 9 which covers the range from 1·3 to 1 up to 8 to 1. From these graphs it is interesting to note that a v.s.w.r. of 2 to 1 represents approximately a 10 per cent reflection of power from a poorly matched antenna and which is power lost. One should certainly aim for the lowest possible v.s.w.r. particularly with low power transmitters but how accurate is your v.s.w.r. meter?

dB or not dB and what is a dB Watt?

The new Home Office amateur licence schedules now quote permitted power output in dBW which simply means dB related to a reference power of 1 watt. *It is important to understand that a decibel is not a measure of anything* but merely a ratio of one power (or voltage, or current) level to another which is why a reference must always be given. The ratios for decibels in power are quite different to those of voltage or current and normally given as follows:—

Voltage and Current The formula is

$20\ \mathrm{Log}_{10}\ \frac{V2}{V1}$ or $\frac{I2}{I1}$ = positive dB where either V1 or I1 is the reference. If the ratios are inverted e.g. $20\ \mathrm{Log}_{10}\ \frac{V1}{V2}$ then the dB ratio is negative.

Power The decibel power ratio is derived from

$$10\ \mathrm{Log}_{10}\ \frac{P2}{P1} = \text{positive dB or}$$

$$10\ \mathrm{Log}_{10} \frac{P1}{P2} = \text{negative dB.}$$

The reference should be quoted as for example dBW which equals dB relative to a reference power of 1 watt, or as another example, dBd which is the power gain of an antenna with reference to a dipole (d) or we can have dBi which is antenna gain with reference to an isotropic (i) and so on.

Referring to the new amateur radio schedule we have for example peak envelope power for s.s.b. as 26dBW for the h.f. bands 3·5 through to 29·7MHz. So what is this in real watts? The answer may be found from 10^{yx} the index yx being derived from the figure given as dBW divided by 10. So for 26dBW, $yx = \frac{26}{10}$ or 2·6. The actual wattage is therefore $10^{2 \cdot 6}$ which is 398·107 watts. As another example we have a continuous power supplied to the antenna for the frequency band 1·81 to 1·85MHz (top band) of 9dBW. The power in watts will therefore be 10^{yx} where yx $= 9 \div 10$ or 0·9, the final answer being $10^{0 \cdot 9} = 7 \cdot 943$ watts. For the 144MHz band with continuous power to the antenna, as for f.m. operation, we have 20dBW which is 10^2 or 100 watts.

Finally the writer would like to thank Aspen Electronics Limited (UK), who are the agents for Bird RF Measuring Instruments, and Messrs. Bredhurst Electronics and Western Electronics for photographs and information on the meters mentioned in these articles. ●

WATERS & STANTON ELECTRONICS

18/20 MAIN ROAD, HOCKLEY, ESSEX. TEL (0702) 206835

CALL IN AT OUR SUPER STORE
LARGEST STOCKS IN SOUTH EAST

SEND CHEQUE OR P.O.
BY RETURN DESPATCH

TELEPHONE YOUR CREDIT CARD NO.
SAME DAY DESPATCH

PART EXCHANGE WELCOME. NOW STOCKING DRAGON COMPUTERS

TRIO – Official UK Dealers

NEW FROM TRIO
TS 430S HF TRANSCEIVER

SSB-CW-AM-FM

Price T.B.A.

It really is a fantastic performer!

TS830S	160 10m transceiver	£678.00	(£4.50)
VFO 230	Digital VFO	£231.00	(£4.50)
AT230	All band ATU	£129.00	(£1.50)
TS430S		T.B.A.	
VFO 240	External VFO	£92.50	(£4.50)
PS30	AC power supply for TS180S	£96.00	(£4.50)
TS130S	8 band 200W mobile transceiver	£531.00	(£4.50)
TS130V	8 band 20W mobile transceiver	£433.00	(£4.50)
TL120	200W pep linear	£159.00	(£4.50)
MB100	Mobile mount	£17.71	(£1.00)
VFO 120	External VFO	£93.50	(£4.50)
SP120	External speaker unit	£25.00	(£1.25)
AT130	100w antenna tuner	£88.50	(£1.50)
MC50	Deluxe desk microphone	£29.40	(£1.50)
MC35S	Fist mic 500ohm impedance	£14.00	(£1.00)
MC30S	Fist mic 500ohm impedance	£14.00	(£1.00)
LF30A	HF low pass filter	£17.90	(£1.00)
TS780E	2m/70cm all mode duobander	£799.00	(£4.50)
TR9000	2m multimode mobile	£359.00	(£4.50)
B09	Base plinth for TR9000	£37.26	(£4.50)
TR7800	2m FM synthesised mobile 25W	£257.00	(£4.50)
TR2300	2m FM synthesised portable	£144.00	(£4.50)
TR2500	2m FM handheld transceiver	£220.00	(£2.00)
R2000		T.B.A.	

ICOM – the full range stocked

IC720A DELUXE HF TRANSCEIVER

£883

IC730	HF mobile transceiver 8 band	£889.00	(n.c.)
IC720A	HF transceiver and gen. cov. receiver	£879.00	(n.c.)
PS15	Power supply for 720A	£99.00	(£3.00)
IC251E	2m multimode base station	£499.00	(n.c.)
IC25E	2m synthesised compact 25w mobile	£259.00	(n.c.)
IC290E	2m multimode mobile	£366.00	(n.c.)
IC2E	2m FM synthesised handheld	£159.00	(n.c.)
ICL1/2/3	Soft cases	£3.50	(£0.50)
ICHM9	Speaker Microphone	£12.00	(£0.75)
ICBC30	230v A.C. Base charger & hod	£39.00	(£1.50)
IBC25	230v A.C. Trickle Charger	£4.25	(£0.75)
ICCP1	Car Charging Lead	£3.20	(£0.50)
ICBP2	6v. nicad pack for IC2E	£22.00	(£1.00)
ICBP3	9v. nicad pack for IC2E	£17.70	£1.00
ICBP4	Empty case for 6 × AA nicads	£5.80	(£0.75)
ICPB5	11.5v nicad pack for IC2E	£30.50	(£1.00)
ICDC1	12v Adaptor Pack for IC2E	£8.40	(£0.75)
ICML1	10w booster	£49.00	(£1.00)

KILL TVI DEAD
HP4A
with braid breaker
IT REALLY WORKS

£5.95

FDK – Sole UK Distributors

2M ALL-MODE AMAZING VALUE!

£269
NEW
M750X

M700AX	2m FM 25w 12½/25kHz trans.	£169.00	(n.c.)
M.750E	2m FM/SSB/CW 144-146 trans.	£289.00	(n.c.)
Expander	70cm transceiver	£219.00	(n.c.)
PS750	230v AC 6amp psu	£66.00	(£2.50)
T1200	2m/FM synthesised handheld transceiver	£149.00	(n.c.)
P11	2m FM 6 channel portable	£109.00	(n.c.)
Palm IV	70cm FM 6 channel portable	£125.00	(n.c.)
TB1	1750Hz tone burst	£10.00	(n.c.)
TM56B	2m FM monitor	£89.00	(n.c.)
CC2	Case for Palm II/IV	£5.75	(£0.50)
BC2	230V AC battery charger	£4.50	(£0.50)
Xtals	for Palm II and Palm IV	£3.00	(£0.15)

FDK 2M FM 25W Look at the price!
BRITAINS NUMBER ONE SELLER!

£169
SPECIAL WINTER DEAL

M700AX

YAESU – Good stocks. Good prices & on the spot service.

LATEST FRG 7700 IN STOCK

£329
plus FREE ATU with all orders placed before 31st January

FT102	160-10m 9 band trans. FM	£725.00	(n.c.)
FT101ZD	160-10m	£569.00	(n.c.)
FT707	80-10m 8 band trans. 10w	£569.00	(n.c.)
FP707	230v AC PSU	£125.00	(£2.50)
FC707	160-10m atu	£85.00	(£1.50)
FV707DM	Digital vfo for FT707	£203.00	(n.c.)
MMB2	Mobile mount	£16.10	(£1.50)
FL2100Z	160-10m 1200 watt linear	£425.00	(n.c.)
FT902DM	160-10m 9 band receiver	£885.00	(n.c.)
FC902	All band ATU	£135.00	(£1.50)
FT208	2M FM synthesised handheld	£209.00	(n.c.)
FT708	70cm FM synthesised transceiver	£219.00	(n.c.)
NC9C	Compack trickle charger	£8.00	(£0.75)
FT480R	2m 10w SSB/CW/FM transceiver	£365.00	(n.c.)
FT290R	2m portable synthesised multimode	£249.00	(n.c.)
NC11C	240v trickle charger	£8.00	(£0.75)
FRG7	General coverage receiver	£189.00	(n.c.)
FRG7700	1981 version of FRG7000	£329.00	(n.c.)
FRT7700	Antenna tuning unit	£37.85	(£1.00)

SEND S.A.E. FOR 16 PAGE FULL CATALOGUE

NEW!
2M SSB PORTABLE
ONLY £89!

144.25 to 144.35MHz.
Any 100KHz segment possible
¼ watt output power.
Ideal for driving amp.
SSB/CW with built in key.
Noise blanker.
Superb performance.
Rubber duck whip included.
Ext. mic and case extra.

DATONG MORSE TUTOR D70

Self contained electronic morse sender £56.00 post free

NOTE: Some prices are about to increase because of exchange rate – please phone for latest details.

TUNE INTO THE AIRBAND WITH THESE TWO MODELS

CD6000
Mobile or base

£89.95

Range – 110-140MHz
Display – Digital readout
Steps – All 5kHz steps
Sens. – 0.50v for 10dB SN
Audio – 1.5 watts 8 ohm
Power – 12v DC 400ma

ATC720 handheld
118-136MHz

£129

Range – 118-136MHz
Display – Digital thumbwheel
Power – Internal nicads
Aerial – Flexible whip

Pocket size
complete with AC charger

THESE ARE PROFESSIONAL MODELS FULLY GUARANTEED.

Prices correct at time of going to press. Carriage charges in brackets.

18-20 MAIN ROAD, HOCKLEY, ESSEX.
Open Mon-Sat 9-5.30 E.C. Wed 1.0 pm.

BARCLAYCARD VISA

FASTEST MAIL ORDER SERVICE IN THE BUSINESS!

Buy it with Access

CB RIG CHECK

CB is a mobile short-range telephone system. You require a licence to use it, £10 p.a. from Post Offices.

From experience gained in testing an assortment of CB rigs in our laboratory, plus quite a lot of listening and a little talking on the band from 27·6 to 28MHz, it seems that the transmitter function, fairly tightly defined in HO Specification MPT1320, is pretty much of a muchness. Speech quality varies a bit, and there are one or two "rogue" rigs around which put out signals in places where they really didn't ought to!

A particular hate of mine at the home QTH is a mysterious spurio, apparently the result of a mixing process inside one or more models of CB transceiver, which comes up in the bottom megahertz of the 28MHz amateur band. When the CBer is on Channel 1, the spurio is around 28·01MHz, and when he's on Channel 40 it's at about 28·79MHz. So the spurio shifts in frequency at twice the rate of the fundamental. If the CBer is "S9 + 40dB" with me (which one of these rigs is), the spurio is about "S3". I haven't checked the "S" meter on that particular receiver, but if it's accurately calibrated it would mean that the spurio is about 76dB down on the fundamental, which is within specification for that band segment under MPT1320 (0·25μW against 4W). Not that this is very much comfort when I'm trying to listen to a weak amateur signal.

Anyway, all the transmitters tested seem well behaved from the point of view of frequency tolerance and stability, deviation limiting, power output and spurious radiation. What is becoming a real problem though, in areas with a large CB population, is receiver selectivity—particularly the ability to reject a signal on the adjacent channel.

So in the group of CB transceivers covered this month, I've concentrated on that very aspect of performance where lab tests are concerned, and tabulated them along with the other salient features of each set. The measurement method adopted was that laid down in BS6160: Part 3: 1981 (IEC 489-3: 1979) for testing f.m. receivers used in the mobile services. The outputs of two signal generators are mixed in a hybrid combiner and applied to the receiver antenna socket. One generator represents the wanted signal, with a level which is adjusted to give a standard receiver output SINAD ratio (12dB), and then increased by 3dB. The second generator, which must have very low noise, repre-

CB 27/81	 LUCAS ACB888	 OSCAR CBM271
Sensitivity (e.m.f. input for 12dB SINAD)	0·42μV	0·22μV
Adjacent channel selectivity	54dB	66dB
Signal/power meter	●	●
Channel indicator	Green l.e.d.	Red l.e.d.
Front panel finish/controls	Satin and bright chrome	Satin chrome and black
Microphone socket	Front panel 4p NEMA	Left-hand side, 5p DIN
Ext. loudspeaker socket	3·5mm jack, 4–8Ω	3·5mm jack, 8Ω
Selective calling socket		
10dB Attenuator switch	Front	Front
RF Gain control		
Tone control		
Noise blanker		
Channel 9 selector		●
Delta tune		●
Roger bleep		
PA Facility		
Handbook	Fair (8pp installation, operation, circuit, Code of Practice)	Excellent (30pp installation, operation, antennas, suppression, circuit, p.c.b.s, parts list)
Dimensions H × W × D (mm)	51 × 146 × 190	57 × 160 × 205
Power lead (length)	Plug and socket (500mm)	Plug and socket (220mm)
Price	£88.00	£85.00

sents the unwanted signal on the adjacent channel, either 10kHz up or 10kHz down in the UK 27MHz CB system. Its output level is increased until the receiver output SINAD level falls to 12dB, due to the "interference". The ratio of the output level of generator 2 to the output level of generator 1 that originally gave 12dB SINAD, is the adjacent channel selectivity of the receiver. If the results on the two adjacent channels differ, the *worst* one is taken. Generators used for these tests were Marconi Instruments 2019 and 2017 respectively, plus a Hatfield 3159 hybrid combiner and a Marconi Instruments TF2337A distortion and SINAD meter.

Accessories

A wide range of accessories—antennas, power supplies, s.w.r. meters, etc., is available from most CB stockists, but some rig suppliers produce their own branded accessories which have been designed and tested to complement their product.

Lucas produce voltage-dropping units which allow the ACB888 (and presumably any other 12V equipment drawing a similar current) to be used in commercial vehicles having 24V electrical systems.

The SMC Oscar range includes a wide variety of antennas and mounts for mobile and base station use, s.w.r. meters and extension loudspeakers. For base station operation, the RU-12-04-06 power supply gives 4A constant, 6A surge, and has proved very reliable and quite impervious to r.f. in our tests. Foldback current limiting is provided, and regulation was measured at 8·8 per cent. The Oscar 100LP30 low-pass filter is one of the most effective we've tested, giving 35dB attenuation at the second harmonic of 27MHz and an ultimate rejection of 70dB, with a power rating of 100W.

From Shogun comes a selective calling unit which simply plugs into the rear of their rig. It controls the receiver so that the audio output is muted except when a call is received from another CB rig equipped with selective calling and transmitting the appropriate coded sequence of audio tones. A front-panel switch allows 40 different codes to be selected, although the total capacity is increased to 2560 possible codes by using an internal bank of six switches, providing $2^6 = 64$ sets of 40 codes. Once the called receiver has been alerted, its audio circuits remain operational, and further "overs" can proceed without use of the

The Shogun Selective Calling unit simply plugs into the rear of the rig, replacing a linked connector

 PLANET 2000	 SHOGUN 82	 TELECOMM TC-9000
0·7µV 48dB	0·76µV 64dB	1·04µV 69dB
● Red l.e.d. Matt black	Separate l.e.d. bargraphs Green l.e.d. Matt black	● Red l.e.d. Matt black
Front, 4p NEMA 3·5mm jack, 4–8Ω	Left-hand side, 5p NEMA 3·5mm jack, 4–8Ω ●	Left-hand side, 5p DIN 2p DIN, 4Ω ●
Rear ● ● ●	Front ● ●	Front ● ●
● ● ●	 ● ●	● ● ●
Fair (11pp installation, operation)	Fair/good (10pp installation, operation, circuit)	Poor/fair (8pp installation, operation)
53 × 180 × 200 Plug and socket (270mm)	38 × 176 × 210 Attached (410mm)	62 × 203 × 195 Attached (440mm)
£49.95	£99.00	£59.95

Some of South Midland Communications' range of CB accessories—at the top, a 12V 4A regulated p.s.u. and a 100W low-pass filter; at the bottom, twin-meter and single-meter s.w.r. bridges. Note that the photographs are not all to the same scale

Sel-call. Until a selective call is acknowledged, the l.e.d. code-number indicator flashes to show that a call has been received. The Shogun Sel-call unit measures 38 × 60 × 102mm, and is provided with a CALL button and NORM/SEL switch, which selects the mode of operation and also cancels the received call, to return the receiver to the muted state. Price of the unit is £49.50. The system worked reliably on tests with receiver input levels down to that giving 12dB SINAD, which is below the squelch threshold of the rig.

Geoff Arnold

Acknowledgements

Our thanks for the loan of the review transceivers go to the following companies, who can also supply further information.

Lucas ACB888: Lucas Electrical Limited, Audio Service Department, Parts & Service Division, Great Hampton Street, Birmingham B18 6AU.

Oscar CBM271: South Midlands Communications Ltd., 36–38 Rumbridge Street, Totton, Southampton.

Planet 2000: Amateur Electronics UK, 508–516 Alum Rock Road, Birmingham 8.

Shogun 82: Sunrise Products—Japan, Colliers Farm, Frieth, Henley-on-Thames, Oxon RG9 6NR.

Telecomm TC-9000: Lee Electronics Ltd., 400 Edgware Road, London W2.

ANTENNAS
PART 1

F.C. JUDD G2BCX

This series of articles is intended for newcomers to amateur radio, whether licensed for Class B operation on the v.h.f.-u.h.f. and microwave bands only, or for the Class A holder with access to the h.f. bands as well.

The influence of natural environment over the performance of any antenna is difficult, if not impossible to fully assess and express in meaningful terms. This is particularly so in view of the fact that amateur radio antenna installations differ widely, even though the same basic antenna may be used by a number of different stations.

Measurement Techniques

Evaluation of the normal electrical performance of antennas can be carried out under so called "free space" or ideal conditions so as to obviate the effects of proximity to ground and/or surrounding structures etc. Whilst this is not difficult to do at frequencies in the v.h.f./u.h.f. regions where a few wavelengths (λ) represent only a small physical distance or height difference, the problem becomes difficult where large h.f. band antennas are concerned and the wavelengths are therefore relatively long.

The measurement of general parameters such as gain, front-to-back ratio, and free-space radiation fields etc., should be made with the measuring equipment and its antenna at least 10λ from the antenna being tested. Both antennas should be at least that number of wavelengths above ground. Obviously it is not exactly a practical proposition to erect a tower 500 metres high and have a helicopter fly round and round in order to plot the free-space polar patterns of an h.f. antenna in both vertical and horizontal mode without the influence of ground! One alternative is to use very high frequency scale models of antennas so that heights and distances in wavelengths are reduced to convenient dimensions, permitting the free-space condition to be simulated.

Since accurately made high frequency models of low frequency antennas behave the same way electrically, so the various parameters mentioned can be measured with a reasonable degree of accuracy. On the other hand simulated effects due to other structures in the vicinity, as well as the effect of ground itself, can be introduced to obtain pretty close approximation of the performance of an antenna in what we may now call a normal environment. It must be remembered that many h.f. band antennas rely on ground reflection to attain suitable vertical angles of radiation.

Some of the work carried out by the author in this direction has been previously published in *PW* and by various investigators in other technical publications. However, the equipment shown for the first time in Fig. 1.1 was specially constructed by the author so that the radiation patterns of antennas at various heights above ground could be measured at all vertical angles through 180 degrees and all horizontal angles through 360 degrees.

The frequency of operation is 3000MHz (10cm) and the system is based on that used by the American National Bureau of Standards. Simulation of environmental effects, i.e. the presence of other structures, reflecting and conducting objects and wires, height of antenna above ground etc., can be introduced as required. Results obtained by simulation with models reveal very close approximations to what might be expected in "real size" situations.

Obviously natural radio propagation conditions cannot be simulated but answers to localised problems can usually be obtained. For example: will a different antenna, or re-siting the existing antenna, result in some worthwhile improvement? Would increasing the height of an existing antenna above ground prove more effective than using one with a higher gain factor at the original height?

In this series of articles we will delve into the performance of antennas generally, see what effects environment can have and at the same time investigate the merits of some of the popular commercially made antennas presently available for amateur radio use. For instance, are combination multi-band antennas as efficient as they are made out to be? How true are the claims made for gain from all

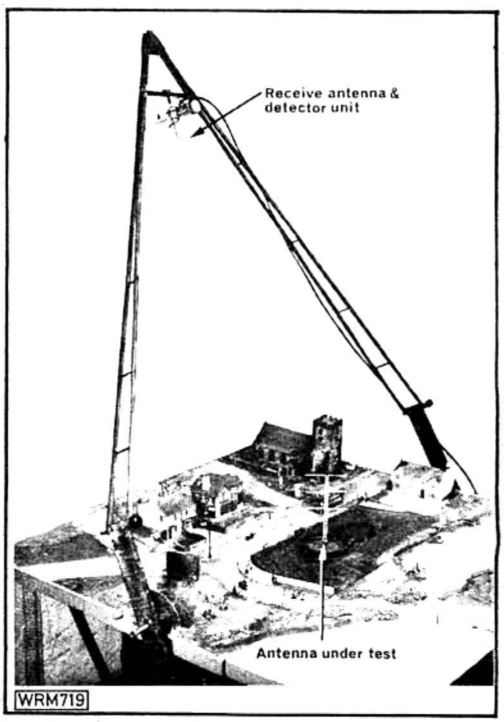


Fig. 1.1: The author's 3GHz (3000MHz) antenna test table

regular types of antennas and so on and do such claims agree with recommendations laid down by the International Electro-Technical Commission.

We now have h.f. amateur bands based on 1·8, 3·5, 7, 10, 14, 18, 21, 24, and 28MHz. What are the possibilities of combined, but efficient, antennas for at least the last five of these bands? The two most used v.h.f.-u.h.f. bands are 145 and 432MHz and Class A licensees also have 70MHz. Combination multi-band or broad-band antennas for these three bands seem feasible but would the higher efficiency of three separate and fully resonant antennas specifically designed for each band prove far more effective despite cost and space requirements?

Broad-band Omni-directional Antennas

Considerable interest has been aroused by the appearance on the market of "discone" type antennas intended for use with multi-frequency scanner receivers. The discone is a vertically polarised broad-band omni-directional antenna capable of maintaining a v.s.w.r. of 1·5:1, or less, over its working frequency spectrum.

Little real information is available on the electrical function of the discone but the general design dimensions are given in Fig. 1.2. The configuration of the discone is such that the dimension Lλ of the equilaterally skirted bottom section (the cone) is approximately equal to the free-space **λ/4 at the lowest frequency at which the antenna is to be used.** This is known as the **design frequency** and below this the v.s.w.r. rises rapidly. However, within the "resonant" region the antenna provides a reasonably good match to a 50 ohm source.

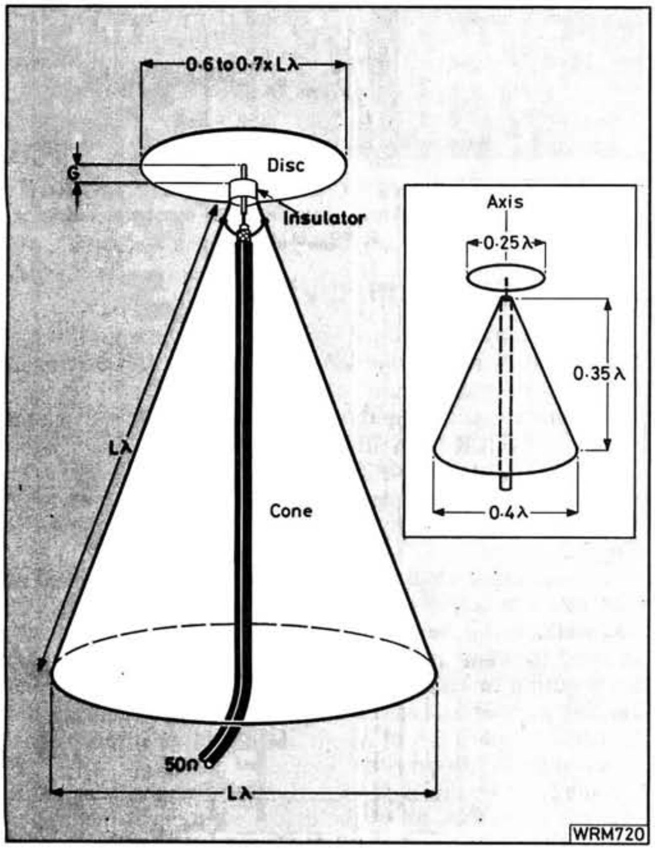


Fig. 1.2: The discone antenna configuration. Dimension Lλ equals λ/4 at the lowest frequency of operation; see text regarding construction. The inset shows the J.D. Kraus dimensions referred to in the text

Because of its relatively large size the discone has little application for h.f. band operation but does offer possibilities at v.h.f. and u.h.f. If designed for a lowest frequency of around 70MHz it will also operate on 144 and even up to 432MHz, if the claims made for v.h.f.-u.h.f. discones of Japanese manufacture can be supported.

Construction for v.h.f. or u.h.f. operation does not require the use of sheet metal cones or discs as the diagrams might imply. Both can be made from aluminium rods or tubes spaced about 0·02λ apart as shown in Fig. 1.3, which illustrates a discone made by the author for operation with a lowest frequency of 70MHz.

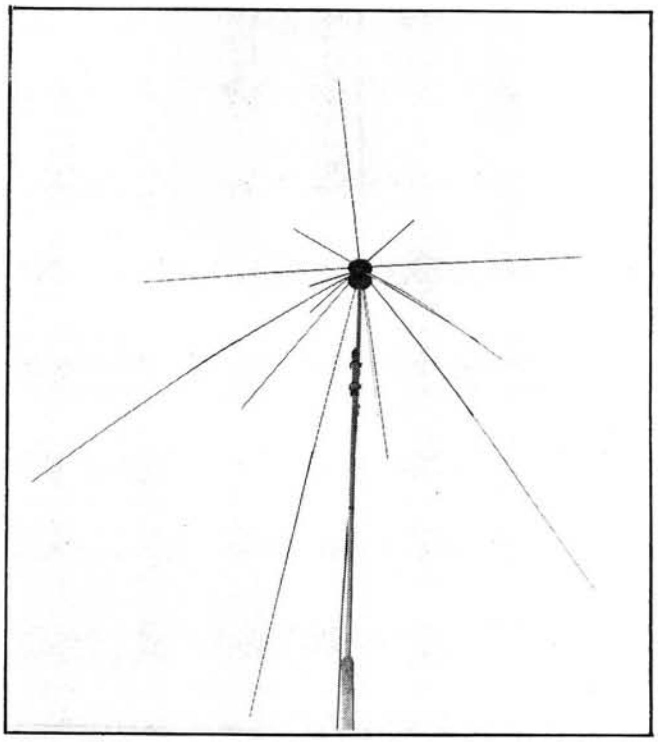


Fig. 1.3: Discone antenna constructed by the author to the dimensions given in Fig. 1.2

The disc section must be insulated from the cone and this is accomplished with a block of insulating material such as Tufnol or Delrin with a metal centre inserted and strong enough to support the disc. The inner of the coaxial cable feed to the antenna is connected directly to the disc and the shielding braid to the top of the cone, as in Fig. 1.2.

The optimum spacing or gap between the cone and disc is not critical in the v.h.f.-u.h.f. region and dimension G of Fig. 1.2 need be only about 25mm. The vertical angle radiation is low and in fact virtually broadside to the antenna as indicated in Fig. 1.4, which also shows the relative omni-directional radiation pattern. The discone has unity gain over its working bandwidth, i.e. its gain may be referred to 0dBd as direct comparison with a reference dipole has indicated.

Other Discone Dimensions

The dimensions given in Fig. 1.2 are generally used to obtain the lowest working frequency for a bandwidth which then extends upwards in frequency by about two octaves as illustrated in Fig. 1.7. The inset to Fig. 1.2 shows the J.D. Kraus *Dimensions for the Centre Frequency of a Discone* but it is estimated that the actual bandwidth will be about the same, i.e. two octaves. The commercially made Japanese discone antennas appear to be dimensioned on the J.D. Kraus configuration although in some instances are modified to obtain an extended bandwidth by lengthening some of the cone spines.

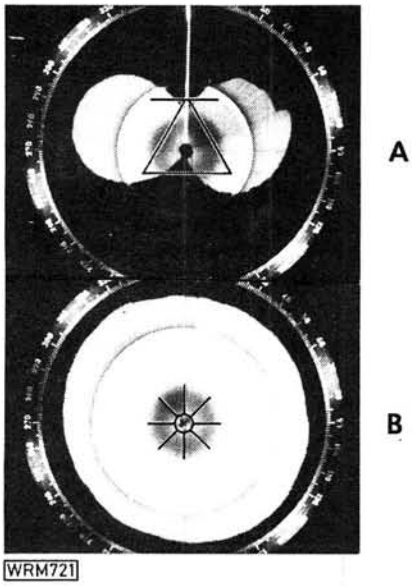


Fig. 1.4: The discone antenna has an omni-directional radiation pattern (B) and vertical angle radiation (A) that is at right angles to the axis of the antenna. Gain = 0dBd or unity

A selection of discone antennas are available from various UK suppliers including South Midlands Communications and some are quite suitable for transmitting on 144 and 432MHz, including one which it is claimed will cover the 70MHz band as well (Fig. 1.5). Amongst these are the SMC GDX1, SMC GDX2, SMC GDXA(N) and the TW435D which is a small discone for operation between 400 and 1200MHz. This proved to be an excellent mobile antenna for 432MHz when used on a standard gutter mount. It is only about 380mm high and rather unusual looking as can be seen from Fig. 1.6. Direct comparison between this and a 432MHz version of the *PW* Slim Jim for mobile operation proved to be interesting. This latter antenna design will be dealt with in Part 2 of this series.

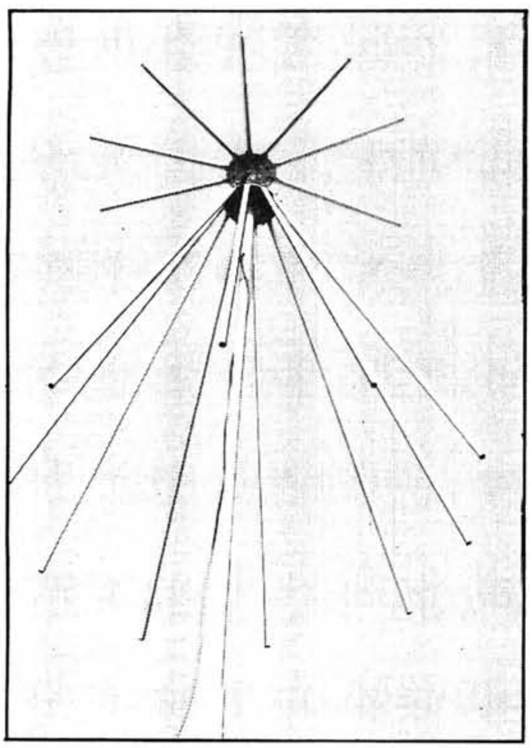


Fig. 1.5: Typical GDX discone antenna with extended cone spines. Frequency range is approximately 70 to 480MHz

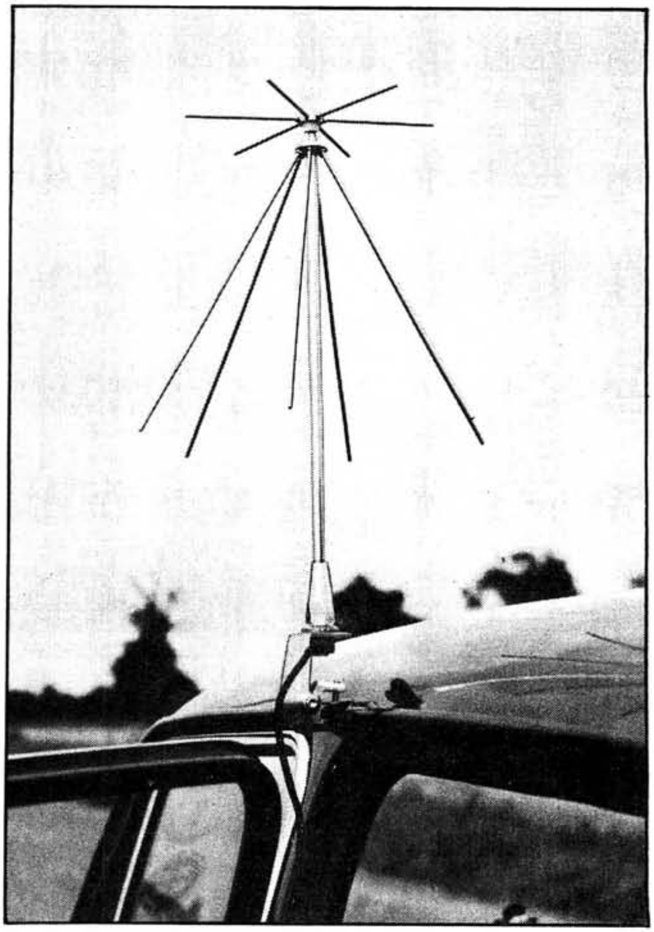


Fig. 1.6: The SMC type TW435D 400MHz to 1·2GHz discone antenna, gutter mounted for mobile working on 432MHz

Discone Bandwidth v VSWR

As already mentioned the discone antenna has a bandwidth of about two octaves and the v.s.w.r. remains fairly flat over the whole bandwidth, as shown in Fig. 1.7, rising sharply at the band ends. Tests carried out using the Yaesu FT-720R plus the FT-720RV and FT-720RU combination 144 and 432MHz transceivers, revealed a flat v.s.w.r. over the complete frequency range of each band when using the GDXA(N) discone antenna, shown in Fig. 1.8.

In addition a duplexer unit, type HS770, was used so that two transceivers, one on 144MHz and the other on 432MHz, could be operated simultaneously. This device allowed the same antenna to be used with either, or both, transmitting or receiving at the same time, without either causing interference to the other. The HS770 duplexer has a channel separation of about 30dB and an insertion loss of less than 0·5dB on either frequency band.

Finally, for those who are multi-frequency scanner receiver operators, all of the discone antennas mentioned (the GDX series and the VHFL, which is an RX only device) were found to give excellent results with scanner sets such as the JIL SX200N and the Bearcat 220. It is recommended that ultra low loss semi-airspaced 50 ohm coaxial cable is used with these antennas, whether for

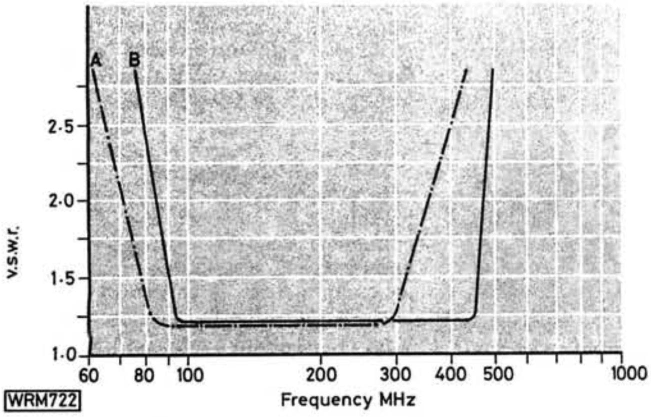


Fig. 1.7: Typical discone antenna v.s.w.r. curves over the designed bandwidth. (A) receiving type by JAIA 80–300MHz, (B) JAIA (GDX type) transmitting 80–480MHz. (From Japanese edition *CQ Ham Radio No 4*)

transmitting or receiving. Coaxial cable such as UR43 or similar will result in more than half the transmitted power (or received signal) being lost, even with a length as short as 6 metres. Cable such as RG8U or UR67 (MUR67) will also result in considerable loss at 432MHz and higher when the cable length exceeds 30 metres.

Recommended 50 ohm coaxial cables for use at 432MHz and higher frequencies are shown in Table 1; all these cables have a loss of 3dB or less per 30 metres at up to 600MHz.

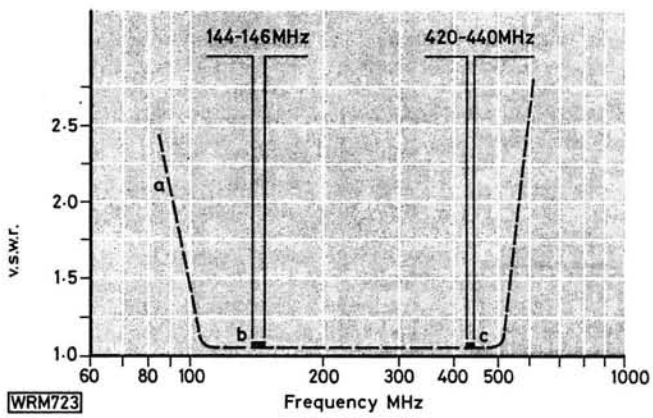


Fig. 1.8: Plot of v.s.w.r. from discone antenna type GDXA(N) (a) over normal bandwidth, (b) 144MHz band, (c) 432MHz band (including USA allocation)

Table 1

BICC No	RG Number	MUR Number
T3348	221U	—
T3347	220U	—
T3346	219U	75
T3345	218U	74

One discone antenna which has not been mentioned is the DC1/WB made by Jaybeam Ltd. Its physical appearance and size is similar to that shown in Fig. 1.3 except that the cone base diameter is wider. It has been designed for transmitting, has an input impedance of 50 ohms and a power handling capacity of 250 watts. Gain is unity and although the v.s.w.r. readout over the whole bandwidth may look a bit variable this is normal with most discones. However, as the graph of Fig. 1.9 shows, v.s.w.r. can be less than 1·5:1 for operation in the region of both the 144-146MHz and 430-440MHz amateur bands. Further information on this antenna from Jaybeam Ltd. Northampton NN3 1QQ. The radiation patterns for this antenna would be similar to those shown in Fig. 1.4.

Details of the other discone antennas mentioned are available from South Midlands Communications Ltd., SM House, Rumbridge Street, Totton, Southampton SO4 4DP.

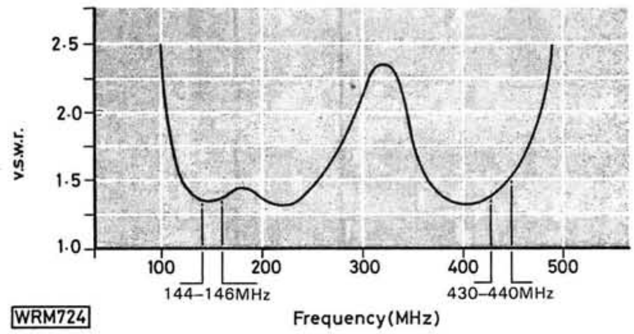


Fig. 1.9: The v.s.w.r. readout of the Jaybeam Ltd. discone antenna type DC1/WB

References

Designing Discone Antennas. Nail J.J. *ELECTRONICS*. Vol. 26. August 1953, pp 167–169.
Discone 40-500MHz Skywire. Bower J.M. *CQ Magazine*. Vol. 5. July 1950. (Information by courtesy of The I.E.E.)

Part 2 of this series will provide full constructional details of a 432MHz version of the *PW* Slim Jim antenna, together with a discussion on other types of wide band antennas including helical and log-periodic dipole arrays.

INTRODUCING OSCAR–1

▶▶▶*continued from page 45*

The point where this occurs is given in degrees west of Greenwich (the zero degree meridian), unlike longitude which uses degrees east and west of Greenwich.

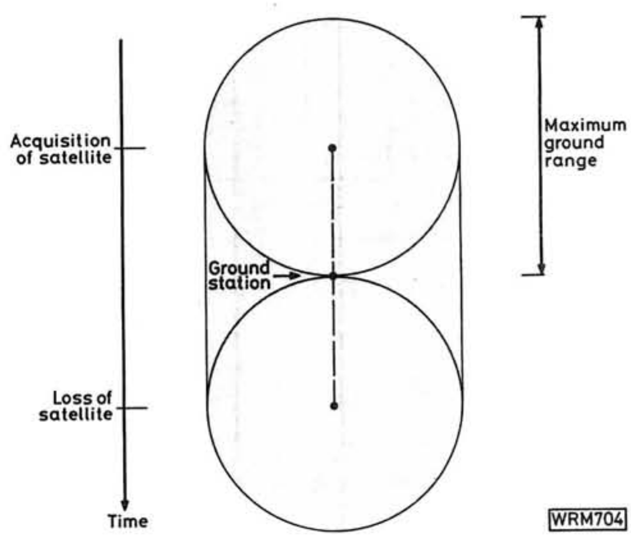
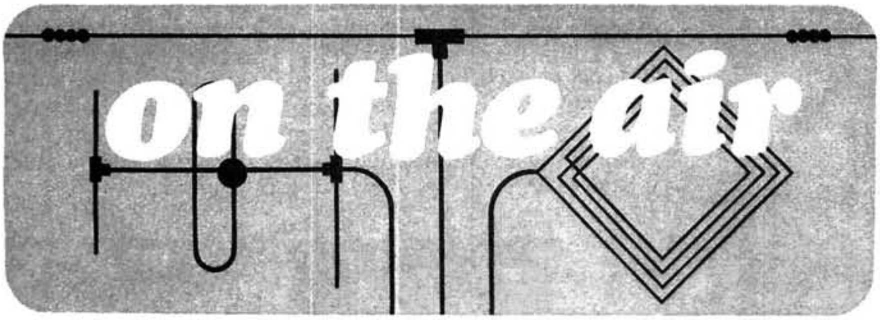


Fig. 6: Satellite on overhead pass

Having got the details of the orbit, you will then know in what direction to point your antenna and what time to start listening.

The next article in this series will discuss the actual equipment required to operate through OSCAR 8.



Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.

Logs by bands in alphabetical order.

Although many readers are now running communications receivers which use the latest technology the constant complaint is still that of apparent interference between stations and of the set's inability to sort them out.

Given two s.s.b. signals on the same frequency and of reasonably similar strength there should not be any more difficulty in copying the wanted one than there would be in holding a conversation in a room with several other people talking at the same time. It has oft been said that the human ear is the best filter in the chain between the antenna and the brain, and I have certainly found this to be true. It is not difficult, more a matter of experience, to develop the ability to pick out the signal YOU want from a mass of others.

This ability shows up particularly well on c.w. A good op will tell you that he can copy code from a station so weak that an inexperienced listener can't even hear it! He can also cope with c.w. beat notes that may be only a hundred or so hertz apart.

But what if one of the s.s.b. signals is much stronger than the other? Well, it should not be any more difficult than listening to someone talking when someone else is shouting. A few words might be missed here and there, but that doesn't matter very much. However, in the case of our receiver certain factors come into play that certainly do not help the op to resolve weak signals.

All receivers incorporate automatic gain control (a.g.c.) in which a bias voltage is derived from the amplified signal's carrier component and then fed back to the i.f. amplifying stages and frequently to the r.f. stages as well. This negative feedback means that the receiver's gain is reduced on strong signals and increased with weaker ones. The object is to keep the resultant audio signal at as constant a level as possible with the wide changes of signal level that are generally due to fading.

In older receivers (Fig. 1) a.g.c. was a permanent feature but nowadays on a communications set it can be switched off and there may be a choice of fast or *slow* a.g.c. As there is no carrier as such with an s.s.b. signal the a.g.c. has to be derived from the resultant audio signal but as the speech level fluctuates over a very wide range it is necessary to introduce a circuit which will "hold" the signal at a given level to prevent these violent fluctuations, reflected otherwise as variations in the set's noise level which would be very objectionable. The duration of the hold represents the fast and slow positions.

The reader may be surprised to learn that in the many receivers I have constructed over the years I have never incorporated a.g.c! Being mainly interested in contest operation, both c.w. and s.s.b., the average QSO only lasts a few seconds during which time the signal does not change very much, so why complicate matters with a.g.c.? It also means simpler circuitry, improved stability and a saving in components.

The benefits of a.g.c. fall down when there are, say, two signals in the receiver's i.f. passband (and probably more!) one weak and wanted and one strong and unwanted, Fig. 2. The a.g.c. will now operate on the stronger signal, pushing the set's gain down, possibly to the extent of reducing the wanted signal to inaudibility! All is not lost, as the simple answer is switch the a.g.c. off, and to read the wanted station through the unwanted one.

Where the two signals are slightly different in frequency the elegant solution is to move, electronically, the whole i.f. passband to one side or the other of the nominal i.f. (Fig. 3). Very few receivers have this added facility but it is becoming increasingly available on transceivers and it works amazingly well in practice, mainly because the principle is a sound one, for a change, rather than a sales gimmick.

For existing receivers the op is advised to keep the a.g.c. off for best results with weak signals. If an a.g.c. switch is not

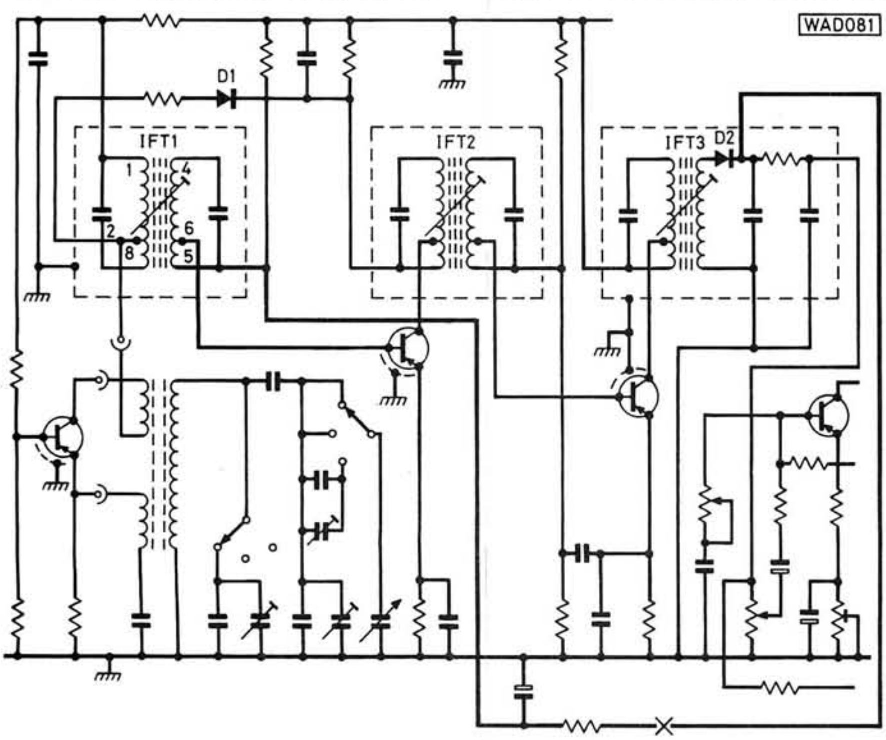


Fig. 1: In this part circuit of a simple receiver the positive a.g.c. voltage is developed at D2 in IFT3 from the i.f. signal and applied to pin 5 of IFT1 and thence, via pin 6, to the base of the first i.f. stage transistor, feeding IFT2. The route is shown by a heavy line. An a.g.c. on-off switch can be inserted at point X

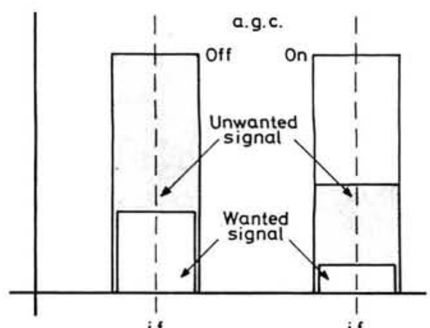


Fig. 2: The action of the a.g.c. voltage can reduce the level of the wanted signal to almost zero

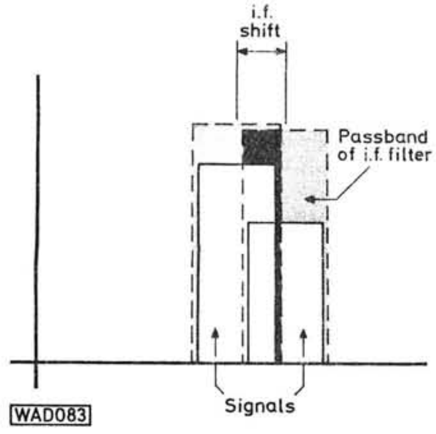


Fig. 3: The "i.f. shift" facility allows the i.f. passband to be moved to accommodate a particular signal, often eliminating an unwanted signal. Unfortunately the filter response "curve" used here is an idealised one

fitted then one can be added which either breaks the a.g.c. line to the i.f. stages or shorts it to earth, depending upon the circuit. The maximum advantages of dispensing with a.g.c. on weak signals come when the receiver has separate r.f. and i.f. gain controls, which, when used carefully, can eliminate a lot of the cross-modulation that occurs between signals, which is generated in the receiver itself, a fact which seems to surprise some listeners.

Remember that the best results are not obtained with everything at maximum. The less r.f./i.f. gain the better for the signal-to-noise ratio, which, after all, is the ultimate target, not absolute signal strength. If you are one of the lucky ones prepared to dive inside your receiver then separating the r.f. gain control from the i.f. one will be the best move you can make towards improved reception, as well as switching the a.g.c. off, of course!

Contest News

Results are to hand of the 12th Cray Valley Radio Society SWL contest held in September. There were 40 entries from all over the world but as far as the UK was concerned our very own **Jim Dunnett** BRS30694, but a G4 by now, was second in the c.w. section, single op. The multi-op section was won by a couple of W5 SWLs. In the 'phone section for single op **John Sutton** BRS35509 came third, **David Whitaker** BRS25429 was fourth, **David Stewart** BRS40293 fifth, **D. Gordon** BRS43752 in GW Sixth, **Paul Crankshaw** BRS48909 in GM made seventh place. A pretty creditable show all round, chaps, and I'm sure that they all benefited from the experience.

DX Doings

Good news from **David Warr** (Weymouth) with his new call G6HRV, but as he will have got his code chitty by the end of November I'm wondering why he bothered about the G6! It only costs yet more money. A KW2000B is in the offing, a very good rig for the baptism on the air. Stuff heard on 21MHz ran to J3AH, SV1LK, VU9RX, 4N5G and 5H3BH, with the FR50B, a.t.u. and long wire. The poor old FR50B got the chop in buying the 2000!

Sticking to 21 and 28MHz in Ramsgate, **Archie McGrath** logged FM7CD, 3V0HA, TU2JL, OY9R, C6AEY and TR8JD on the former, and FY7BC and VP5RAC on 28MHz. This with his Trio R1000, a.t.u. and long wire. Archie has been corresponding with K4NBN who expects to be over here next year, so a meeting is in the offing.

Very glad to get a c.w. log from **Paul Williams** of Whitehaven, Cumbria, who is pleased with his a.t.u., built in an evening for around £10. Sounds a lot to me! He's done it, and that's the main thing, improving reception on the long wire and Realistic DX100L. So, it was 14MHz for C31NP, CT3DJ, EA9KQ, FM7CT (QSL POB 630, Fort de France 97200), FY7YF, J3AJ, JX6RE (QSL LA6RE), VP9JR and 6Y5SG. On the reader-neglected 10MHz band Paul caught KP4CKY, VP8ANT and 9H1CG: all above on c.w.

Andy Durrant in Colchester has been troubled with local QRM via the mains on his AR88 but he did log 4N9YU (YU4FRS in disguise), 7X2LS, DF3NZ/CT2 (ST2??), 4Z6FR and JA1LFR, all on 14MHz. New to our column and to amateur radio **Gordon Carmichael** of Lincoln runs a Realistic DX302 with the almost inevitable long wire and a.t.u. Goodies on 14MHz (20m) included C31YF, CT2ES, EA8ZO, 3A2A and 9G1NO. On 21MHz (15m) FM0GA, S2SI ("Sealand" in the North Sea) of very doubtful legitimacy, VP2VDH, YA7AJH, and 4Y4W.

Much progress in his RAE studies is reported by **Brian Patchett** in Sheffield and being 15 w.p.m.-capable at the moment will go straight for his G4 if he does OK next May. The little listening done on the Grundig Satellit 1400 revealed CE3HUX and CP5CIC on 14MHz and HH7PV, VP8ANT, VP8APK, VP9IB plus 5H3DF on 21MHz. A BC348 limits **Stephen Pearson** in Arundel, W. Sussex, mainly to the 14MHz (20m) band where he found C53BT, VP2MF, VP8MY (POB 121, 15 James Street, Port Stanley), G4BUV/VS6, VP9AD, 6Y5MJ while the only bit of excitement on 1·8MHz was 4U1ITU. All this on s.s.b.

School studies have kept **David Freeborough** (Sandbach, Cheshire) from his Panasonic RF3100 while a go at the RAE will be held over to late next year. Disappointing, but probably very wise. Heard on 14MHz were EK9F, HI8MPA, TI2J, VQ9IB, 4N9WG (YU-land) and 5Z4CH. For David, and possibly others, QTHR simply means that a station's address is in the call book. Unfortunately the term is often used by newly-licensed stations whose QTH won't be in any call book for up to a year. On to 21MHz and HC5ML, HH5CB, KG6RA, TJ1GH, VP5RAC, Z21GW, 5T5TR, 6W8DT and 9Y4PH.

Studying and listening are the life of **Alan Galloway** BRS51330 of Kincaidston, Ayr, with his Heathkit SB303 and inverted-V's, with hopes of taking the March RAE. The 14MHz band came up with 7Q7LZ, VQ9N, VP2LY, VK9XI, 5H3LV and JW7FO, while on 28MHz it was just PZ1DT. **Jim Dunnett** of Prestatyn, Clwyd, could be writing in for the last time as he has now passed his code test and is probably meeting the postman every morning! The FT101 didn't have much trouble bringing in CO2PY, FG7BP, FM7CF, TI2PI and VU9LO all on 28MHz, then CO2GA, FK8CE, HK1QQ on 21MHz, PY0ZZ on Noronha with cards to PY7ZZ, SV0BE/9, 5Y4ITU (via POB 45681, Nairobi), 9J2TS, and on to 18MHz where only catch of note was G4CTQ/ZB2. So to 14MHz and FR7CL, FY7YE, KL7AF, 5B4LY and 9H1DV, and then 10MHz where DL2GG/YV5, JW5VAA, OY7ML and VK3MR were trapped. Sole DX reported on Top Band was ZB2EO on 1848kHz. All these entries were for the c.w. mode.

Dave Coggins up in Knutsford, Cheshire, had fun in the CQ WW contest especially on Top Band where his FRG-7700 + 7700 a.t.u. + delta beam for 28MHz + long wire brought in EA8AK, EA9EU, HZ1AB, K1PBW, RG6G, UK9ADT, VO1DN and 4X4NJ on s.s.b., all on Top Band, I say again, in case you might think it was 14MHz! The 7MHz band, deserted by virtually all readers except Dave, revealed HH2CQ, JH1FFQ, OX3JF, UH8EAA, ZL1BGK and 6W8DY. I know there is a lot of BC QRM there but the DX is there also with a bit of digging down. Delights on 14MHz were T32AF on the Pacific Christmas Island and QSL to WH6AIF, UA0KBO in Chukotka, not too far from KL7-land, VR6TC and ZK1CG on Cook Is. Not finished yet . . . . . on 28MHz were AH0B on Mariana Is, DL9EAJ/3B9 on Rodriguez Is, KH6IBA, HL0B, H44JE, UA0QEP Yakutsk, VS6CX and ZL2BFU. Phew! I'll be glad when he gets his ticket!

John Desmond in Cork, Eire, writes in to say with his FRG-7 and a long wire he logged LX1PD and EA9EU on 1·8MHz plus VP2EC and 6Y5MJ on 7MHz, VQ9VB, C31YF, 9Y4NW, ZB2FA and VP9JR on 14MHz ending with HP1XED, CP1FQ, J3AH, 5T5TO, YB5CE and VS6CT on 28MHz. Everything was copied on s.s.b.

The FRG-7700 and a.t.u. and long wire, what else, have been busy on four bands, starting with 28MHz and JW7FD and 9J2BO, on to 21MHz and FR0FLO, HL1AHZ, TL8KA, 5B8TL and 6W8HL. The 14MHz patch saw PZ5JR, 9Y4QU, HH5CB, N3BB/VP9, PJ2DD, VP2KK, VP5GT, VP8AIB, VQ9EF and 3A2CN, ending with CO6RCP, FP8DF, J88AB, VS6DO, 5W1DQ, 6D5AA in Mexico City, PJ9EE, 6Y5IC and

8P6OR, all on 7MHz. All this, I should mention, from **Viv Doidge** who resides in Callington, Cornwall.

Just meeting the deadline this month is **Jonathan Kempster** BRS45205 of Berkhamsted, Berks, who seems to have enjoyed himself in the CQ WW phone contest where 14MHz produced KA2PFV/SV9, FM7CD, ZS3HL, RG6G, D44BC, VQ9CI, CS4YA, CE2AA, EW6V and ES3E. Victims on 21MHz were FM7CD, YC2BSF, VP9AD, 6W8DY, N1GL/6Y5 and EA8ND passing on to 28MHz and 5Y4DE, HH2CQ, J6LOV, 9Y4VT, SV0CT, 7Q7LW, VP5KP, VP2EC, 4T4O, VP5B, DJ0QT/CT3 and HH2WW.

My own idea of fun in contests these days is trying to see how quickly I can work all continents!

News on ZD9 activity from **Ean Retief** ZS6UD reports the departure of Peter ZD9BW from the island. Cards are handled by Ean but he does not reckon to be able to start replying until January. The good news is that ZD9BX is now active on s.s.b. and ZD9BZ will concentrate on c.w. operation. Thanks, Ean.

The trouble with Keith Anderson's XYL comment is that she is dead right, of course!

Bits and Pieces

A very interesting letter from CE3EYN, **David Calderwood,** no less, residing in Santiago and working as an English language teacher, having been on the air there only since August last. Rig is a Trio TS130SE with a 7MHz dipole and a quad loop on 28MHz. David would like to work the UK and will be glad to QSL listener reports from his QTH at Colegie Redland, Cemina El Alba 11357, Las Condes, Santiago, Chile.

From Preston, Lancs, **Keith Anderson** began radio long before the war when as a young lad he plugged a pair of headphones into a socket he discovered on a wall in a new house, getting the BBC "9 + 20" as he puts it, not realising till later that it was wired radio! Interest lapsed in the 50's until recently and now he is back in the fold with an FRG-7700 and matching a.t.u. with an outside wire. Keith's QSL, reproduced above, sums up a situation we have all come across one time or another!

Club Roundup

Acton, Brentford & Chiswick ARC G3IIU If you have enjoyed the excellent programme of events over the last year you will get along to the AGM on Tuesday Jan 18 at the Chiswick Town Hall, High Road, Chiswick at 7.30 when potential members and visitors will be welcome, as well as regular members, of course. Try W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3 for latest info on club activities.

Addiscombe ARC G4ALE Welcome to the column! Sec is Peter Hart G3SJX, 42 Gravel Hill, Croydon, Surrey, or 01-656 9054, with meetings every Tuesday at 9pm, yes nine pm, at the Woolpack, Gloucester Road, Croydon. A monthly newsletter keeps the members in touch, from which it seems the club enters every contest going from 1·8MHz to 1296MHz!

Amateur Radio Club of Nottingham G3EKW, G6CW and G8IUT Thursdays at 7.30, Sherwood Community Assoc, Woodthorpe House, Mansfield Road, Sherwood, N'ham. Jan 6 is a forum, a talk on QRP work on the 13th, station activity "on the air" Jan 20, plus a talk and lecture on the 27th. The shack is usually active after every meeting with a final break-up around 10.30. Call the sec P. G. Chapman G4IJL on (0602) 623828 or write via the club QTH.

Aylesbury Vale RS AGM on Tuesday Jan 25 at 8pm sharp at Stone Village Hall, Stone, with the prospect of a natter plus coffee afterwards, not to mention a raffle. More on this and club events from sec Mike Marsden G8BQH, Hunters Moon, Buckingham Road, Hardwick, Aylesbury (0296) 641783.

Braintree & District ARS G4JXG G6BRH Changes in the committee bring in new sec M. Jones G6DFZ, 26 Anson Way, Braintree, Essex, but meeting place is the same, namely the B'tree Community Centre, Victoria Street, B'tree, around 7.45 on first and third Mondays, informal and formal respectively. Informative and lively club mag *BARSCOM* is supplemented on non-club Mondays by a net at 8.45pm on S15. In addition to a code class there are code practice tapes for members.

Carlisle & District ARS The White Quay Inn, Durdar, Carlisle, at 7.30 any Monday, says Paul Boyd G8RJA, 13 Stackbraes Road, Longtown, Cumbria.

Cheltenham AR Association G5BK Good news in the form of an almost certain move to new club premises not too far from present one at the Old Bakery, Chester Walk, Clarence Street, Cheltenham, says club mag *CARA News*. It could all have happened by the time you read this so get on to sec John Holt G3GWW on Witcombe 3435 for latest news.

Conwy Valley ARC Last year was an excellent one for the club with membership topping the 100 mark and more than ever getting their tickets, reports hon sec J. N. Wright GW4KGI who, unhappily, had a "long standing engagement with the local hospital" when he wrote. Trust you are back home, safe and well, by now OM. Annual dinner takes place on Jan 6 at the Green Lawns Hotel, Bay View Road, Colwyn Bay, with an excellent cabaret to follow. The club meets at the same place on the second Thursday at 7.45pm. More from GW4KGI at 46 The Dale, Woodlands, Abergele but it may be easier for all concerned to ring Abergele 823674.

Crawley ARC Meetings vary between members' homes and the Trinity Church Hall, Ifield, Crawley. One good idea that has been proposed is for members to bring in and demonstrate their test gear for, say, 15 mins. But David Hill G4IQM, the club sec will be glad to fill in with dates, etc., on Crawley 882641.

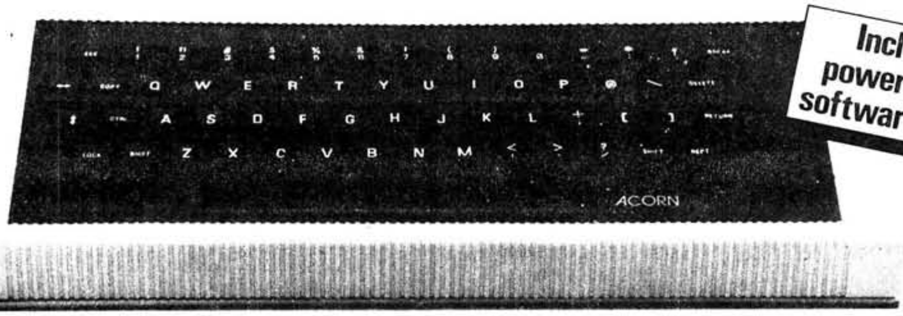
Derby & District ARS Annual club contest on 144MHz (2m), all modes, happens on Jan 30 with transmitting and receiving sections. All meetings at 119 Green Lane, Derby at 7.30 every Wednesday, plus Morse code classes on Tuesdays and Thursdays, same place. Could this be in time for you to go to the New Year junk sale on Jan 5, I ask myself. Anyway, on the 12th talks on the history of the club by Fred G2CVV and he ought to know, he is the club! On to Jan 19 and a computer demo by John Jennings of ICL. Finally, on the 26th Ian Boston explains what contests are all about. If there is anything else you want to know you can have the pleasant task of contacting Jenny Shardlow G4EYM, 19 Portreath Drive, Darley Abbey, Derby, or D'by 556875.

Echelford ARS Second Mondays and last Thursdays at 7.30 in The Hall, St Martin's Court, Kingston Crescent, Ashford, Middx with Sunday net on 1930kHz at ten in the morning, plus 144MHz (2m) net Weds at 8 on 144·575MHz. The club newsletter describes the fun had by G8ALB making and flying a kite to support a long wire. Oh, yes, G4NNS transmits computerised slow Morse on Weds at 7 on 144·625MHz. Sec is Anton Matthews G3VFB, 13a King Street, Twickenham, Middx, also 01-892 2229.

Edgware & District RS G3ASR Jan 9 sees the club joining in the Affiliated Societies contest, followed by the AGM on the 13th. The club building project takes up the evening of the 27th. Note the beginners' evening on Feb 10 which could attract a lot of attention. Very advanced notice of a "Straight Key" evening on 3·5MHz (80m) c.w. on March 31 when iambic, triambic and anything more complicated than a good old-fashioned key will be taboo. So it's the second and fourth Thursdays at 8pm at 145 Orange Hill Road, Burnt Oak, Edgware, Middx about which hon sec Howard Drury G4HMD, 11 Batchworth Lane, Northwood, Middx will tell you more, on Northwood 22776 if you wish. Or drop in on the club net on 1875kHz Monday evenings at ten. The club programme of slow Morse from G3ASR is probably the most comprehensive in the country, on both Top Band and 144MHz.

Volume purchase from Acorn brings massive savings for you!

Now only £99 plus VAT



Includes free power supply and software worth £20

Cash in on our misfortune! Over £50 off an Atom Microcomputer

We recently made a bulk purchase of over 800 Acorn Atoms for sale overseas. The deal fell through! We are now offering those Atoms to you at the price we paid for them.

The Atom normally retails at £174.50 inc. VAT we are offering it to you at a mail order price of only £115 inc. VAT - an incredible saving of £59.50 plus a free power supply and software worth over £20.

The Computer

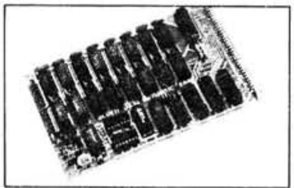
The Atom has 2K of RAM and 8K of ROM but of course this can be boosted enormously.

The computer has a full sized keyboard laid out in a conventional way. To use it just connect the power supply and a cable into the aerial socket of a TV set.

As well as integral sound output and direct cassette and TV interface, a wide range of additional interface boards are available to fit inside the casing. Extra 64K RAM, Colour, Printer, Laboratory, Cassette, 6522, 80x25 VDU, Analogue, Econet etc etc allowing the user to build a very sophisticated application machine. Full details of all accessories, disc pack, software etc are supplied with each machine.

The language used by the ATOM is BASIC, the language used by most personal computers.

The Atom's version is very fast, making it ideal for real time applications.



Expansion Cards

Plotting + Graphics

Word Processing

Real time applications

It has all the normal functions you would expect plus many powerful extensions making it very easy for you to operate and write your own programs.

The Atom is fully guaranteed. There are 80 nationwide authorised service centres. Just clip the coupon below or ring 01-930 1612 with your credit card number. Computer Marketplace Ltd, 20 Orange Street, London WC2H 7ED

To: Computer Marketplace Ltd, 20 Orange Street, London WC2H 7ED

Please send me ____ (qty) Acorn Atoms at £115 including p&p/ins.
Total £ ________
I enclose my cheque.
Please debit my Access/Barclaycard

Block Letters Please

NAME: ________________

ADDRESS: ________________

SIGNATURE: ________________

Please allow 21 days for delivery.

Books for radio amateurs

RSGB Publications

A Guide to Amateur Radio (18th edn)	£5.37
Amateur Radio Awards (2nd edn)	£3.41
Amateur Radio Operating Manual (2nd edn)	£5.03
Amateur Radio Techniques (7th edn)	£6.20
HF Antennas for All Locations	£6.67
Radio Amateurs' Examination Manual (10th edn)	£3.42
Radio Communication Handbook *(paperback 5th edn)*	£11.15
RSGB Amateur Radio Call Book *(latest 1983 edn)*	£5.70
Test Equipment for the Radio Amateur (2nd edn)	£6.07
Television Interference Manual (2nd edn)	£1.95
VHF/UHF Manual (3rd edn)	(out of print)
Logbooks	
Amateur Radio Logbook	£2.45
Mobile Logbook	£1.14
Receiving Station Logbook	£2.72
Wall maps	
Great Circle DX Map	£2.12
IARU QTH Locator Map of Europe	£1.37
QTH Locator Map of Western Europe	£1.37
World Prefix Map *(in full colour)*	£2.23

Other Publications

ABC's of Capacitors (Sams)	£6.71
ABC's of Integrated Circuits (Sams)	£4.79
A Course in Radio Fundamentals (ARRL)	£3.24
Active Filter Cookbook (Sams)	£12.71
All About Cubical Quad Antennas (RPI)	£2.99
Amateur Television Handbook (BATC)	£2.39
Antenna Anthology (ARRL)	£3.32
ARRL Electronics Data Book	£3.60
Beam Antenna Handbook (RPI)	£4.13
Better Short Wave Reception (RPI)	£3.42
Care & Feeding of Power Grid Tubes (Varian)	£2.98
Design of VMOS Circuits (Sams)	£8.50
English-French QSO Instruction	£1.78
FET Principles, Experiments and Projects (Sams)	£8.04
FM & Repeaters for the Radio Amateur (ARRL)	£3.72
Hints and Kinks for the Radio Amateur (ARRL)	£3.13
How to Program and Interface Your 6800 (Sams)	£12.80
How to Troubleshoot and Repair AR Equip. (Sams)	£7.13
IC Converter Cookbook (Sams)	£11.51
Practical Antennas for the Radio Amateur (Scelbi)	£8.10
Radio Frequency Interference (ARRL)	£2.69
RTTY the Easy Way (BARTG)	£1.44
SCRs and Related Thyristor Devices	£7.99
Single Sideband for the Radio Amateur (ARRL)	£3.32
Solid-state Basics (ARRL)	£3.93
Solid-state Design for the Radio Amateur (ARRL)	£5.64
The ARRL Antenna Book *(new 14th edn)*	(out of stock)
The Cheap Video Cookbook (Sams)	£5.47
The 8080A Bugbook (Sams)	£9.59
Troubleshooting with your Oscilloscope	£7.05
TTL Cookbook (Sams)	£8.55
Understanding Amateur Radio (ARRL)	£4.14
World Atlas (RACI)	£1.91
80m DXing (CTI)	£3.12
6809 Microcomputer Programming (Sams)	£10.89
8085A Cookbook (Sams)	£11.34

Prices include postage, packing and VAT where applicable. Postal terms:
cheques/POs with order (not stamps or book tokens).

PLEASE ALLOW UP TO 28 DAYS FOR DELIVERY

The RSGB is the national society representing all UK radio amateurs and membership is open to all interested in the hobby, including listeners. The Society also publishes a complete range of books, log books and maps for the radio amateur. Contact the membership services section for more information about amateur radio, the RSGB and its publications.

Radio Society of Great Britain
Alma House, Cranborne Road,
Potters Bar, Herts EN6 3JN
Telephone Potters Bar 59015

SELECTRONIC SERVICES

THE FINEST ANTENNAS IN THE WORLD ARE NOW AVAILABLE

No hi-fi specifications here, just antennas that are stronger, last longer and work better than any other antenna available today.

HF Antennas
10MHz Broadside, similar to classic bobtail array (10/BDA): gain 5dBd with this wire array at only £41.25. 14MHz Broadside, same specifications as 10/BDA, (14/BDA): £36.25.

4m Quads
4 Ele quad (4/4EQ): gain 7dBd, £58.50; 6 Ele quad (4/6EQ): gain 9dBd, £60.50

2m Quads
4 Ele quad (2/4EQ): gain 7dBd, £45.25; 8 Ele quad (2/8Eq): gain 12dBd, long yagi spacing (12ft boom), £62.50
All quad antennas have glass fibre booms and supports for strength and less corrosion and less effect on performance.

Helix range
70cms, 6 turn (6/70H): gain 12dBd, £42.85; 12 turn (12/70H): gain 16dBd, £46.85. 23cms, 6 turn (6/23H): gain 12dBd, £34.50; 12 turn (12/23H): gain 16dBd, £35.50; 20 turn (20/23H): gain 17dBd, £37.50.
Helix range uses glass fibre booms and comes complete with 'N' plug and socket. All helix antennas have a 50∫ feed impedance suitable for satellites, tropo, FM repeaters and ATV.

Stacked collinear arrays
70cms, 16 Ele (70/SC16): gain 14dBd, £45.20; 20 Ele (70/SC20): gain 16dBd, £49.20. 23cms, 16 Ele (23/SC16): gain 13dBd, £43.50; 20 Ele (23/SC20): gain 14.5dBd, £38.50.
Continuation to be placed after stacked collinear array specifications.

COMMING SOON!
Due to the massive response to our previous advertisements and many pleas for an HF minibeam "at a reasonable price that works and is not a rotatable dummy load on 20m"! We are pleased to say that the research and development of a very high performance minibeam is well advanced. The price will be considerably lower than it's competitors and constructional techniques we use will ensure that they will last for years.
Thanks for the interest you have shown. Any suggestions? Please ring. (As long as they are decent). We hope to visit most rallys and exhibitions during 1983.

OVER 40 NEW ANTENNAS TO COME
The most comprehensive range of anntenas to suit every operator and every climatic condition.
Please enclose a stamped addressed envelope with all enquiries.

For further information contact:

SELECTRONIC SERVICES
Unit BT50/55B, Perry Avenue,
Teesside Industrial Estate, Thornaby,
Stockton-on-Tees, Cleveland TS17 9LN.
Tel: (0642) 760093

TELECOM

6 NEW ST, BARNSLEY, S. YORKS
TEL: 0226 5031

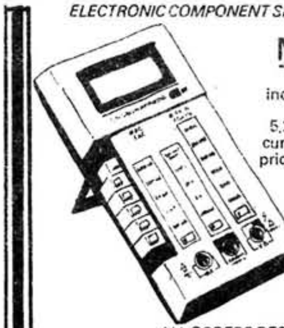
ICOM		FRG7	199.00	**TONO**	
IC740	699.00	FRG7700	329.00	2M-5oW	65.00
IC720A	883.00	FRV7700	72.50	2M-100W (pre-amp)	115.00
IC290E	366.00	FRT7700	37.00	**L.A.R. MODULES**	
IC25E	239.00			VHF OMNI MATCH	29.95
IC2E	159.00			HF-OMNI MATCH	69.95
ICR70	469.00	**MICROWAVE MODULES**		MOBILE OMNI MATCH	19.95
IC4E	199.00			ANTENNA BRIDGE	
YAESU/SOKA		MML/30LS	69.95	SWL OMNI MATCH	31.95
FT102	725.00	MML/50S	85.00		
FT707	569.00	MML/100S	139.95		
FT290R	259.00	MML/100LS			
FT480R	379.00	MM2001	189.00		
TF280FM	159.00	MMC144/28	29.90		
		MMA144V	34.90		

Also Thander Test Equipment, Cush craft J-Beam, Leader Datong, etc.

PROGRESSIVE RADIO

ELECTRONIC COMPONENT SPECIALISTS

MULTIMETER OFFERS



BTC601 3½ digit 0.5" LCD display, low battery indicator, Input impedance 10m/100pf, overload protection on all ranges. Ranges; DC volts, 5,200mv-1000v, AC volts, 5,200mv-750v, AC/DC current 200 micro-2 amp, resistance 200r-20meg. price **£32.00 inclusive of VAT and postage.**

OPTO /LED BARGAINS
TIL32/TIL38 Rx. Tx. 45p a pair. 0.2" L.E.D.'s., red – green – yellow 11p each. Rectangular type, red – green – yellow 12p each. Square type, red – green – yellow 25p. 2 colour L.E.D. 37p. MEL31 photo trans. 40p. MEL11 photo Darlington 32p. 0.4" displays C.C. or C.A. 90p each. 7 segment calculator displays 35p each.

ALL ORDERS DESPATCHED BY RETURN POST.

93 DALE STREET, LIVERPOOL L2 2JD

Great Yarmouth & District ARC Don't forget, the new club QTH is the STC Sports & Social Club, Beevor Road, South Denes, Gt Yarmouth, fortnightly at 7.30, which means Jan 6 and 20th. The club tries to cater for all ages and all interests in the field of electronics. Much more from A. D. Besford G3NHU, 49 Blake Road, Gt Yarmouth, Norfolk.

Guildford & District RS It's Party Night on Friday Jan 14 says club newssheet *The Natter,* "bring something to eat and drink and, of course, your nearest and dearest, and that doesn't mean the new rig you got for Christmas"! Where this rave-up takes place I don't know but sec Helen Mullenger G4OJO will no doubt oblige on Aldershot 20384. Or you can drop in on the club nets, on 144MHz (2m) S20 Sundays at 8pm or the 28MHz (10m) band on 28·535MHz on Monday 8pm.

Jersey ARS GJ3DVC Meets, I know not where, on Fridays from 7.30 to 10.30 and on Sunday mornings from 9.45 to 12.30. Anyone interested in amateur radio is most welcome, says new sec Phil Taylor GJ6BUK, 1 Don Terrace, Don Road, St Helier, Jersey CI.

Mid-Sussex ARS G3ZMS At Marle Place Adult Education Centre, Leylands Road, Burgess Hill, W. Sussex, 7.30 with submarine cables the subject for Jan 13, the AGM coming on the 27th. Note for diary: surplus gear sale Feb 10. Newsy club newsletter *Mid-Sussex Matters* details all the club's activities. Ring Bob Hodge G4MMI on Hurstpierpoint 833559 for more gen.

Norfolk ARC G4ARN G6NRC It's the Crome Centre, Telegraph Lane, East Norwich at 7.45, says Paul Gunther G8XBT of Norwich 610247, on Wednesdays. On Jan 12 it's a visit and talk by RSGB regional rep G3PLF, with G3IOR dispensing info on matters auroral on the 26th. Intermediate Wednesdays are "short" meetings, probably more of a natter than anything else. An early date is the first meeting to discuss HF Field Day, on Feb 9.

North Bristol ARC G4GCT Every Friday at 7 at the Self-Help Enterprise 7, Braemar Crescent, Northville, Bristol, and you can go home at around 9.30pm. The winter programme is about to be announced and who better to tell you of it than Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol 7.

Northern Heights ARS Meets at the Bradford Tavern, Bradshaw, Halifax, on Wednesdays with Geoff Milner G8NWK at 3 Briggs Villas, Queensbury, Bradford, waiting to bring you up to date on meetings. You can also try B'ford 882945.

North Wakefield RC Gathers every Thursday at 7.45 at the Carr Gate Working Men's Club with Jan 6 welcoming G4DXA for a talk on Interference, another outside visit goes to the Wakefield power station on the 13th with yet another, to the Leeds Microcomputer Users Group, on Feb 3. Future plans call for a talk on the RSGB by G4DAX and one on computers in amateur radio. Steve Thompson G6ELC, 3 Harlington Court, Morley, is also on (0532) 536633.

Radio Club of Thanet G2IC Meetings at the Birchington Village Centre at 8pm or get there at 7.30 if you want to take part in the code practice. Every Friday with emphasis on Jan 7 when there is a talk on video tapes, Jan 21 when G3TRX of Racal gives a chat, then the 28th with a visit to the Richborough power station. G4PTE is the newly-elected sec but before he settles in drop a line to Ian Gane G4NEF, the chairman, of 17 Penshurst Road, Ramsgate, Kent, otherwise (0843) 54154.

Radio Society of Harrow Well-produced club mag *QZZ* covers a wide field of member interests, like construction contests, for sale and wanted feature, v.h.f. antenna construction, to club contest activity. If that has whetted your appetite you may like to call at the Harrow Arts Centre, High Road, Harrow Weald on Fridays at around 8. It may be the Roxeth Room or the Belmont Room but I'm sure you'll find it. Latest info on the club on GB2RS or from Chris Friel G4AUF, 17 Clitheroe Avenue, Harrow, Middx. Needless to say, there are also code classes on the go.

South Dorset RS Meets first Tuesdays at 7.30 at the Wyke Regis Army Bridging Camp, Weymouth. Might be too late for the film show on Jan 4 but there will be an interesting meeting on Feb 1. Club sec R. Cridland G3ZGP is on Upwey 2893, or there is Andrew Prior G6HEL at Greenways, Dewlish, Dorchester, Dorset.

Southgate ARC Lectures, demos and other exciting events have already been planned for the coming year, and you can join in by getting along to St Thomas' Church Hall, Prince George Avenue, Oakwood, London N14 on the second Thursday of the month around 7.30, where, need I say it, visitors will be made most welcome. Feature for Jan is G3JWI on interference suppression techniques with a related talk on radio interference and harmonic radiation at the Feb gathering. It's G8EWG, 16 Kent Drive, Cockfosters, Barnet, Herts.

Spalding & District ARS G4DSP Nice to hear from sec Ian Buffham G3TMA, 45 Grange Drive, Spalding, Lincs (Spalding 3845) that the club meets on the second Friday at 7.30 at the White Hart Hotel, Market Place, Spalding. If you really want to know all about the club then jog along to the AGM on Jan 14.

Stevenage & District ARS A reminder that the club's new venue is T. S. Andromeda, Shephall View, Bedwell, Stevenage, first and third Tuesdays at 8. Details of the Jan 4 and 18 meetings from Les Mather G8OKI, 63 Woodhall Lane, Welwyn Garden City, Herts.

Sutton Coldfield RS Special event on Jan 10 is the showing of the BBC's video tape *"Secret Listeners"* at the Central Library at 7.15pm but I'd get there a bit earlier if you want to get a seat. More from sec Derek Turner G8TUR, 10 Jervis Crescent, Sutton Coldfield, or 021-353 2061.

Torbay ARS G3NJA G8NJA Sec Arthur Cooper has had to resign with health problems but the XYL of G6GLP has stepped into the breach and Margaret Rider can be found at 7 Kingston Close, Kingkerswell or try 08047 5130. Meeting place is at Bath Lane, rear of 94 Belgrave Road, Torquay at 7.30 every Friday with main attraction in February being the RSGB's video tape on satellite communication. PRO TARS is Les Mays G2CWR, Atlantis, Clennon Avenue, Paignton, Devon.

Wakefield & District RS It's "alternate Tuesdays" at Holmfield House, Denby Dale Road, Wakefield at 8pm which means Jan 11, Jan 25 for an on-the-air evening, and Feb 8 for a visit to Radio Aire studios for which an early booking would be desirable. As usual it is sec Dick Sterry G4BLT, 1 Wavell Garth, Sandal, Wakefield, W. Yorks, otherwise W'field 255515.

Warrington ARC G4CDA Every Tuesday at 8 at the Grappenhall Youth & Community Centre, Bell House Lane, Grappenhall, W'ton, Cheshire, with *"A mug's guide to satellites"* on Jan 11, a hot pot supper on the 18th (yum, yum) and, if I've got it right, an inter-club contest over the air with a fast scan TV set-up, with the Bury mob. Beat that for ingenuity! If I don't tell you now you'll miss G3LEQ revealing the secrets of the sun, earth and radio on Feb 1. All I can tell you about the sec M. W. Mansfield G6AWD is that it is QTHR.

West Kent ARS At the KEC Adult Education Centre, Monson Road, Tunbridge Wells, Kent, on Jan 7 with a chat on keyers and kindred subjects, and the 24th deals with computing in amateur radio. As for Feb 4 there is an energy conversion competition that night, which conjures up ideas of all sorts of gadgets! Drop a line to Brian Castle G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent or, alternatively (0732) 456708 at the shack, or 01-739 3464 ext 565 in the office.

Wimbledon & District RS Get along to the St John Ambulance HQ, 124 Kingston Road, London SW19 round about 8pm on second or last Friday, or, preferably, both, where you will be most welcome. Attraction on Jan 14 is a natter evening and general ragchew on the club's activities. It get's getter . . . on Jan 28 club sec Geoff Mellett G4MVS demonstrates to members how power measurements should be made in the s.s.b. mode. Could be a very popular lecture! Geoff hangs out at 26 Paget Avenue, Sutton, Surrey, likewise 01-644 8249.

Wirral ARS G3NWR First and third Weds at Minto House School, Birkenhead Road, Meols, at 7.45, reports G4KPY, hon sec at 40 Westbourne Road, West Kirby, Wirral. Planned meetings read as follows:—Jan 5 surplus gear sale, Jan 19 building an a.t.u. by G3CSG, and on Feb 2 the hon sec on switched mode power supplies.

Worcester & District ARC The Jan meeting doesn't follow the usual format as it's on Jan 10, one week late (recovering from the celebrations?) at the Oddfellows Club, New Street, Worcester at 8pm. That on Jan 17 will be held at the Old Pheasant Inn in the same street, also at 8pm. Alasdair Lindsay G4NRD, 11 Durcott Road, Evesham, Worcs will be glad to fill in the gaps in info on Evesham 41508 if you so wish.

I'll finish this month with a brief description of the "home" of the Stratford-upon-Avon & District ARC at the Control Tower, Bearley, which turns out to be on an old airfield outside Stratford, at a useful 107m a.s.l. open in all directions! Antennas run to a 12-element ZL Special for the 144MHz band, 3-element tribander for the h.f. bands plus a 5-element for the 70MHz (4m) band. I am assured that there is space for more if required! How about a few rhombics? New members, get in the queue. It's second and fourth Mondays at 7.30.

That's all folks, sorry if your club hasn't been mentioned but I'd need twice as many pages to get them all in! Don't forget the deadline, the 15th of the month.

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

Loops crop up regularly in this column but this time the subject takes a new turn in a letter from **Brian Russell** of Runcorn who asks "Do you know the historical aspect of the loop?" Brian goes on to say that he has a 1941 Admiralty publication "which goes into loops as direction finding antennas."

Origin of the Loop

The "frame antenna" used in early broadcast receivers, which was really an enlarged antenna tuning coil, was certainly a descendant of the direction finding loop. The latter pre-dates broadcasting, in fact the Marconi Company were offering a DF set, with crossed loops, before World War I. It seems probable that the loop was derived from a pair of vertical antennas spaced half a wavelength apart. The directional effect of such an arrangement was known at the turn of the century. The Bellini-Tosi system started as four verticals. The tops were led to a single mast and eventually opposites were joined to form a pair of crossed triangular loops. I have been unable to trace the final step to the small rotatable DF loop whose size is small and is not related to the wavelength in use. Can anyone help?

While doing research on this item I dug out my copy of *Direction and Position Finding by Wireless* by R. Keen, published in 1922. This book, which was the fore-runner of the well known *Wireless Direction Finding,* contains quite a bit of information that was omitted from its successor. There is a fascinating chapter on aircraft DF with a photograph of an open cockpit and vertical foremast on the aircraft nose, which supported a fore and aft loop. We medium wave DXers are using techniques from the earliest days of radio when we rotate our loop to null out interference.

At the Controls

All modern receivers are fitted with automatic gain control, abbreviated a.g.c. and known at one time as automatic volume control (a.v.c.). AGC is used to counter fading. When the incoming signal is weak, the receiver gain (r.f.) is at a maximum. When the incoming signal is strong the gain is reduced. This is achieved electronically, automatically and quickly. You could do the job yourself if you were adept enough with the r.f. gain control. To some extent the a.g.c. counters the manual adjustment of the r.f. gain we were discussing last time so to get the best out of the r.f. gain control you have to switch off the a.g.c. When using my BRT400 for m.w. DXing I nearly always have the a.g.c. switched off but few modern receivers are fitted with an a.g.c. on/off switch. You will find though a variable attenuator as part of some receivers.

An attenuator is a device, usually a network of resistors, which absorbs electrical energy. The receiver's attenuator is located between the antenna and the receiver's r.f. stage. It can be adjusted to reduce the strength of the incoming signal and it has a similar overall effect to that obtained from the r.f. gain control. The attenuator is essentially an anti-overloading device and the idea is to use as little attenuation as you can get away with.

My DX160 craftily combines attenuator and r.f./i.f. gain adjustment into a single control labelled r.f. gain. A twin

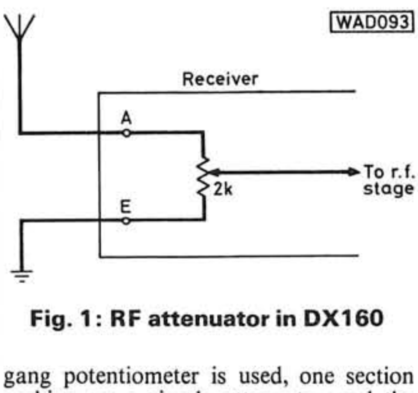


Fig. 1: RF attenuator in DX160

gang potentiometer is used, one section making up a simple attenuator and the other controlling receiver gain in the usual way. The value of the attenuator section of the potentiometer is not critical. If you already have one between 500Ω and 5kΩ in value it is worth making up one for yourself. Fig. 1 shows the arrangement.

Which Direction

Can you define "daylight path and difficult path" asks reader **Richard Hunt** of Tadcaster. The first one is easy. It means simply that the path followed by radio waves when travelling between two places, is in daylight. A difficult path is one that presents problems. It may pass near the magnetic north pole which is in Northern Canada. Radio waves are absorbed here and consequently you are unlikely to log Alaska or Hawaii on the medium waves in the UK. On the short waves a difficult path can sometimes be a long one that is partly in daylight and partly in darkness making it difficult to find a suitable frequency.

Perhaps it is the word "path" that should be defined. I had a letter recently from a reader who assumed, quite reasonably, that radio waves on their journey from the West Coast of North America to the UK travelled overland to the East Coast of the United States before continuing their journey across the Atlantic. The maps in the average atlas would lead one to expect this. If you can get hold of a globe then stretch a piece of thread between San Francisco and London. The thread will mark out the Great Circle path which is the shortest distance between the two places and is the path taken by radio waves as they bounce up and down between the ionosphere and the earth's surface. This path passes over Canada and to the south of Iceland!

You can obtain a Great Circle DX Map, centred on London, from the RSGB, Alma House, Cranborne Road, Potters Bar, Herts, EN6 3JW for £2.12 post paid. You won't recognise Australia and New Zealand on this map but it does have the advantage that a straight line from London to New York, for example, is the G.C. track and if this line is con-

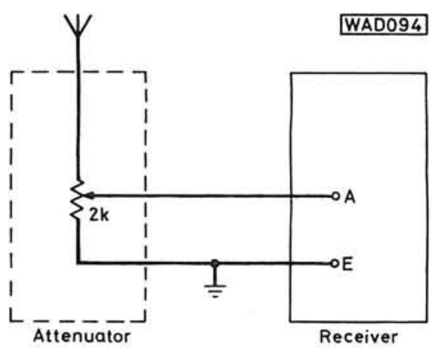
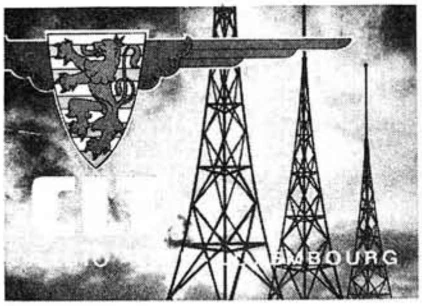


Fig. 2: Adding an external attenuator

tinued to the edge of the map you can read off the bearing. Distance is proportional to the length of the line. If you have a home computer (ZX81) you can load it with the Distance and Bearing Program from the *PW* Radio Programs Cassette, see December 1982 issue. If you know the latitude and longitude of two places then the computer will provide the range and bearing.



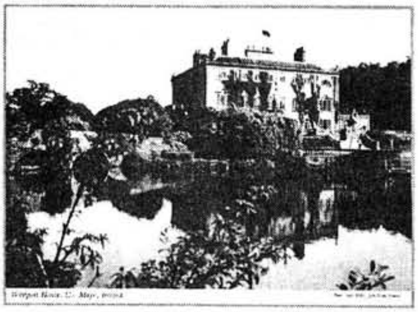
QSL cards from Radio Luxemburg and Radio Warsaw *Adrian Butcher*

It is interesting to examine a G.C. map. Newfoundland, Boston, New York, New Orleans and Southern Mexico are all roughly on the same G.C. track from the UK while the reciprocal passes through Vienna and Istanbul. All these places are in the same direction from the point of view of a medium wave loop antenna which means that it cannot be used to separate stations that lie along this path.

Radio in the UK

This is the title of a 48 page A5 size booklet produced, in English, by Norwegian DXer Bernt Erfjord. It is mainly concerned with local radio stations. A section is devoted to each broadcaster, giving frequencies, including v.h.f. and some programme details. There is a list of possible verie signers, maps showing ILR and BBC local and national transmitters and a list of all medium and longwave transmitters in frequency order. The booklet is available for seven (7) International Reply Coupons or 25 Norwegian Kroner from Bernt Erfjord, N–4480 Kvinesdal, Norway/Norvega.

Next "some Norwegian information" continues Bernt who says that the old transmitter at Stavanger on 1314kHz was closed down during this summer and replaced with a new transmitter complex at Kvitsoy Island, north of Stavanger. Two parallel transmitters of 600kW pump a total of 1·2MW into the air.



QSL card from RTE2 in Dublin

John Dennis Court

QSL card from Dakar in Senegal

DX Heard

If you haven't heard West Africa yet on the medium waves then listen on 765kHz. Radio Dakar in Senegal is a strongish signal on this channel after Sottens in Switzerland signs-off at 2300. This 200kW transmitter carries the national programme in both English and local languages and the station does QSL. The address is BP 1765, Dakar, Senegal.

Newfoundland is the nearest part of Canada to the UK being no farther away than Egypt. It is only the high level of European interference that prevents some of their stations from having regular listeners in this country but some of them do come in well and have been heard at my QTH this winter, after midnight. Listen for CBNA at St Anthony on 600kHz, CBN St John's on 640kHz and CBGY at Bonavista on 750kHz. All are outlets of the CBC (Canadian Broadcasting Corporation) and carry the same programme with the announcement "CBC Radio". There is a news bulletin at 0200 which is equivalent to 1030 local time, followed by the maritime weather forecast for Newfoundland.

The most consistent North American station is the commercially owned CJYQ at St John's whose slogan is "First with the news in Newfoundland". I have heard CJYQ several times before midnight this winter and the station is a good pointer to conditions on this path.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

Reports: as for medium wave DX, but please keep separate.

We are all familiar with domestic broadcasting on the long and medium waves and on v.h.f. Stations occupy the same spot on the dial year in, year out with continuous programming throughout the day and often all night as well. The radio waves travel from the transmitter along the ground to the receiver giving reliable interference-free reception during the day. It is only at night on the medium and long waves that sky wave reception via the ionosphere is possible, which causes the heavy interference familiar to everyone.

Short Wave Broadcasting

The international short wave bands are to be found in the range 5·9MHz to 26·1MHz, a part of the spectrum shared with other users such as shipping, aircraft etc. Broadcasting takes place within bands, which are usually marked by small dashes on the receiver dial. The range of the ground wave is very limited on these bands and you have to live quite close to the transmitting station to pick it up. On the other hand, sky wave reception via the ionosphere occurs during the day as well as night. Worldwide reception is not too difficult provided you choose the appropriate band for the time of day, the season of the year and the particular path that interests you.

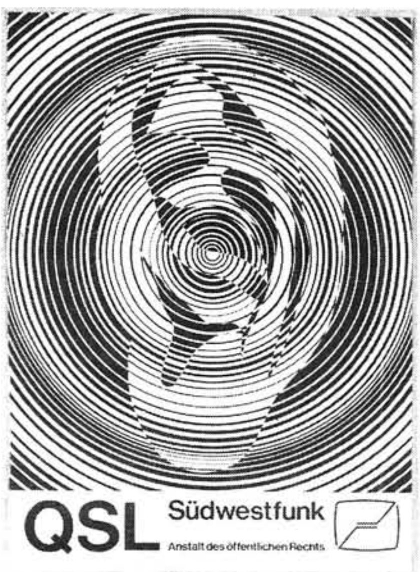
Right away we notice one significant difference between local broadcasting and the short waves. You can leave your domestic radio permanently tuned to your favourite station and all you have to do is to switch on when you want to listen. Not so on the short waves. Even if the station you are looking for is on the air 24 hours a day, reception of it at your location may only be possible for part of the day.

Types of Programme

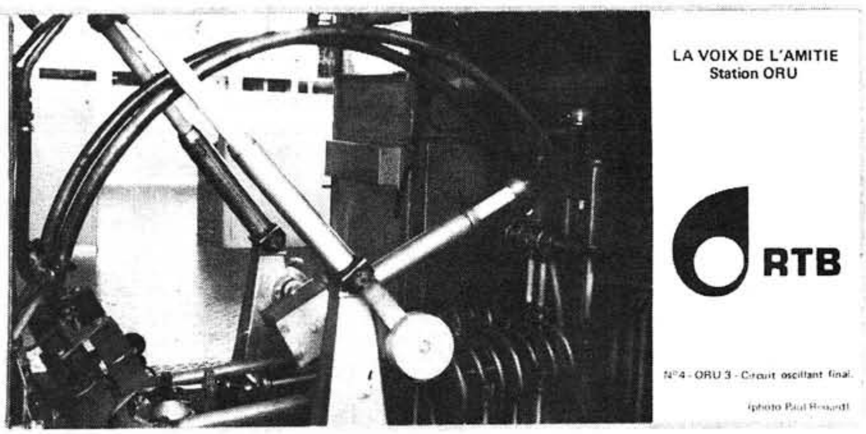
The programmes you hear on the short waves fall roughly into three categories. Those intended for ex-patriots, those intended for foreign audiences, relays of the domestic service. Domestic broadcasting on the short waves does still exist as it is an economic way of covering the area beyond the normal service area of a m.w. transmitter. It is also a useful way of covering large sparsely populated areas.

Since these programmes are intended for semi-local reception they are of more interest to the DXer than the general listener, but there are several that can be picked up easily in the UK. The West German regional stations come in well at my QTH during the daytime. Listen for Berlin/Munich on 6·005MHz, Stuttgart on 6·03MHz, Radio Bremen on 6·19MHz, all in the 6MHz (49m) band and for Sudwestfunk in Baden Baden on 7·265MHz (41m band). These stations relay the domestic service that goes out on the medium waves and they could be of interest to anyone studying the German language.

The Northern Service of the CBC (Canada) from Quebec can be found on 9·625MHz (31m band) during the evening and is often a reasonable signal before midnight. It broadcasts in English, French, Eskimo and Cree Indian. There is also the domestic service of the ABC (Australia) in Perth which sometimes pops up on 9·61MHz during the afternoon, but we are now straying into the World of DX! Next time we will have a look at some programmes in English that are heard easily on the short waves, but in the meantime look around 6MHz, above 7MHz, below 10MHz, below 12MHz, above 15MHz, below 18MHz, above 21MHz and around 26MHz for international broadcasting on the short waves.



A card from Sudwestfunk on 7·265MHz *Richard Hunt*



Radiodiffusion Televisions Belge is on 5·965MHz *Richard Hunt*

Antennas for the SWL

There seems to be some confusion about the best type of antenna to use when listening on the short waves. Some readers who write to me have connected a longwire via an a.t.u. to a portable receiver with disappointing results. Another group have purchased a communications receiver which they use with a metre or so of wire hanging down from the antenna socket. This is not really giving the receiver a chance and again, disappointment follows.

Modern receivers, unlike their predecessors, are extremly sensitive and do not require a large outdoor antenna. A portable is designed to operate with its own antenna and if you take it out in the open, well away from buildings, you will find it quite adequate. The only justification for connecting an additional antenna to such a set is if it is being used in a place where radio waves are weakened—inside a caravan or metal framed building—or somewhere where electrical interference is high.

Modern living means that the average dwelling is surrounded by a haze of electrical intereference. The TV is the worst offender but other equipment such as calculators, dimmers, home computers, fluorescent lighting do their share. An example of the latter cropped up last summer while I was afloat. In order to listen to the midnight shipping forecast on 200kHz I had to rotate the receiver and make use of the directional properties of the internal antenna to null out the cabin light, which was generating an awful din.

Antennas for use with a Portable

If you could detach the receiver's telescopic antenna and install it somewhere outdoors then the problem would be resolved. Siting the receiver near a window can bring an improvement. A car antenna or whip, mounted on the window ledge, pointing outwards is even better. A "short" longwire (more correctly, a random wire antenna) about 5 metres long and running away from the house, is the only external antenna needed. A point easily overlooked is the receiver's own antenna. It should be retracted otherwise it will continue picking up the electrical interference you are trying to get away from.

Antennas for Communications Receivers

These sets do not have their own antenna and most of them have sockets marked Antenna, Earth, A A1 (Balanced Input). You can use a screened lead with this type of set. Join a length of coaxial cable to the Antenna and Earth sockets, the inner going to A and the screen going to E. Lead the coaxial cable away from the set and connect it to the antenna. What sort of antenna? Well the field is open but the "short" longwire mentioned above will give good results. Join the

A pennant from HCJB in Ecuador *Richard Hunt*

WOOD & DOUGLAS

We have moved! Our new manufacturing facility in Berkshire will provide an even better service for our extensive range. Credit card orders can also now be taken, ring for details.

PROJECT	CODE	ASSEMBLED	KIT
70cms EQUIPMENT			
Transceiver Kits and Accessories			
FM Transmitter (0.5W)	70FM05T4	**38.10**	23.10
FM Receiver	70FM05R5	**68.25**	48.25
Synthesiser (2 pcb's)	70SY25B	**84.95**	60.25
Synthesiser Transmit Amp	A-X3U-06F	**27.60**	17.40
Synthesiser Modulator	MOD 1	**8.10**	4.75
Bandpass Filter	BPF 433	**6.10**	3.25
PIN RF Switch	PSI 433	**9.10**	7.75
Converter (2M or 10M I.F.)	70RX2/2	**27.10**	20.10
FM Package 2 (Synthesised)	70PAC2	**163.00**	128.00
TV Products			
Receive Converter (Ch 36)	TVUP2	**26.95**	19.60
Pattern Generator	TVPG1	**39.95**	32.53
TV Modulator	TVM1	**8.10**	5.30
3W Transmitter (boxed)	ATV-1	**87.00**	—
3W Transceiver (boxed)	ATV-2	**119.00**	—
Power Amplifiers (FM/CW Use)			
50mW to 500mW	70FM1	**14.65**	8.85
500mW to 3W	70FM3	**19.65**	13.25
500mW to 10W	70FM10	**30.70**	22.10
3W to 10W	70FM3/10	**19.75**	14.20
10W to 45W	70FM45	**58.75**	45.20
Combined Power Amp/Pre-Amp	70PA/FM10	**48.70**	34.65
Linears			
500mW to 3W	70LIN3/LT	**25.75**	18.60
3W to 10W (Compat. ATV1/2)	70LIN3/10E	**39.10**	28.95
Pre-Amplifiers			
Bipolar Miniature (13dB gain)	70PA2	**7.90**	5.95
MOSFET Miniature (14dB gain)	70PA3	**8.25**	6.80
RF Switched (30W Max)	70PA2/S	**21.10**	14.75
2M EQUIPMENT			
Transceiver Kits and Accessories			
FM Transmitter (1.5W)	144FM2T	**36.40**	22.25
FM Receiver	144FM2R	**64.35**	45.76
Synthesiser (2 pcb's)	144SY25B	**78.25**	59.95
Synth Mult/Amp (1.5W o/p)	SY2T	**26.85**	19.40
Bandpass Filter	BPF 144	**6.10**	3.25
PIN RF Switch	PSI 144	**9.10**	7.75
Synthesised FM Package (1.5W)	144PAC	**138.00**	105.00
Power Amplifiers/Linears			
1.5W to 10W FM (No Changeover)	144FM10A	**18.95**	13.95
1.5W to 10W FM (Auto-Changeover)	144FM10B	**33.35**	25.95
1.5W to 10W SSB/FM (O/P c/o)	144LIN10A	**26.80**	19.87
1.5W to 10W SSB/FM (Auto c/o)	144LIN10B	**35.60**	26.95
Pre-Amplifiers			
Low Noise, Miniature	144PA3	**8.10**	6.95
Low Noise, Improved Performance	144PA4	**10.95**	7.95
Low Noise, RF Switched	144PA4/S	**18.95**	14.40
SYNTHESISER ACCESSORIES			
Display Decoder/Driver	DISP1/2	**22.60**	16.10
GENERAL ACCESSORIES			
Toneburst	TB2	**6.20**	3.85
Piptone	PT3	**6.90**	3.95
Kaytone	PTK3	**6.80**	4.25
Relayed Kaytone	PTK4R	**9.95**	7.75
Regulator	REG1	**6.80**	4.25
Solid State Supply Switch	SSR1	**5.80**	3.60
Microphone Pre-Amplifier	MPA1	**5.40**	2.95
Reflectometer	SWR1	**6.35**	5.35
CW Filter	CWF1	**6.40**	4.75
TVI Filter (Boxed)	HPF1	**5.95**	—
MICROWAVE PROJECTS			
Microwave Drive Source	MD05T	**29.50**	20.40
Bandpass Filter	BPF 384	**5.10**	3.25
4M EQUIPMENT			
FM Transmitter (1.5W)	4FM2T	**34.75**	21.20
FM Receiver	4FM2R	**61.65**	43.15
Pre-Amplifier	4PA4	**10.95**	7.95
Pre-Amplifier, RF Switched	4PA4/S	**18.95**	14.40
6M EQUIPMENT			
Converter (2M)	6RX2	**27.60**	19.95

Enquiries by post should contain a SAE. Please restrict telephone technical enquiries between 6 pm and 9 pm in the evening on either 0256 24611 or 07356 5324. Access and Barclaycard orders can be taken on 07356 5324.

MAIN AGENTS J. Birkett, LINCOLN 0522-20767
Darwen Electronics, LANCS 0254-771497
Amateur Radio Exchange, ACTON 01-992 5765
Wood & Douglas (Scandia) HB, SWEDEN 040-94-89-55

Prices include VAT at the current rate. Please add 75p postage and handling to the total order. ATV-1 and ATV-2 orders should include £2.00 for postage and insurance. Please allow 28 days for delivery if not stock at time of ordering.

Unit 13, Youngs Development
Aldermaston, Reading RG7 4PQ

Technical Training in Radio, Television and Electronics

ICS have helped thousands of ambitious people to move up into higher paid, more secure jobs in the field of electronics—now it can be your turn. Whether you are a newcomer to the field or already working in the industry, ICS can provide you with the specialised training so essential to success.

Personal Tuition and Guaranteed Success

The expert and personal guidance by fully qualified tutors, backed by the ICS guarantee of tuition until successful is the key to our outstanding record in the technical training field. You study at the time and pace that suits you best and in your own home. In the words of one of our many successful students: "Since starting my course, my salary has trebled and I am expecting a further increase when my course is completed".

CITY AND GUILDS CERTIFICATES

Excellent job prospects await those who hold one of these recognised certificates. ICS can coach you for:

Basic Electronic Engineering (C&G/ICS)
Radio Amateurs

CERTIFICATE COURSES

TV & Audio Servicing
TV, Radio and Audio Engineering
Radio & Amplifier Construction
Electronic Engineering*
Computer Electronics*
Industrial Electronics*
Radio Frequency Electronics*
Introduction to Microprocessing*
Electrical Engineering*
Electrical Contracting & Installation

*Qualify for IET Associate Membership

CACC — Approved by CACC
ICS — Div. National Education Corporation
ABCC — Member of ABCC

POST OR PHONE TODAY FOR FREE BOOKLET

Please send me your FREE School of Electronics Prospectus.

Subject of Interest ______________________

Name ______________________

Address ______________________

____

ICS Post to: **Dept D276**
ICS School of Electronics
160 Stewarts Road
London SW8 4UJ

01-622 9911
(All Hours)

cable inner to the antenna but leave the coaxial screen disconnected at the antenna end of the cable. If you are interested in chasing after weak signals, i.e. DXing, then a longwire plus a.t.u. will help pull them in. Remember though, that such an antenna may be satisfactory on the 15MHz band during the late evening when looking for Latin American DX but it may well overload the receiver when you tune across the same band during the daytime.

Screened Locations

Radio waves are weakened when they pass through solid objects such as buildings. The effect is only noticeable to the s.w.l. when metal is involved and can be significant inside a metal framed building. Some flat dwellers may be confronted with the double problem of weak signal plus electrical noise. A window ledge whip should bring a dramatic improvement or you can follow the advice of reader **John Dennis Court** of Birmingham who says "if flat dwellers like myself are restricted by space, throw a longwire out of the window! It pulls in DX." I once knew someone who went the other way and supported a vertical by a met balloon filled with hydrogen but I feel such a solution could lead to other problems.

Events on the Bands

Radio New Zealand is still on the air according to their schedule, a copy of which reached me recently. It covers the period up to 5 March 1983, all times being in UTC (GMT).

Pacific Service. 11·96MHz 0730 to 1115 and 1700 to 2000
15·485MHz 1700 to 2000
17·705MHz 2015 to 1715

Australian and NW Pacific Service.
15·485MHz 2015 to 1115

If you want a QSL (card) enclose four International Reply Coupons with your report. This may well be your last chance as the old 7·5kW transmitters are worn out and no money is available for replacement. The address is PO Box 2092, Wellington, New Zealand.

The BBC weekly programme *Waveguide* can now be heard on the World Service at 0915 on Mondays and 1735 on Wednesdays. The best frequency at my QTH and probably for most of the UK is 5·975MHz in the 6MHz (49m) band.

VHF Bands

by Ron Ham BRS15744

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

Czechoslovakia worked by tropo on 144MHz, a transatlantic QSO on 6m and more DX records on microwaves, what better headlines could a v.h.f. columnist ask for.

Solar

Although the overcast skies have hampered our optical observers, **Ted Waring,** Bristol, counted 28 sunspots on October 23, 38 on the 27th and 14 on November 10. He also saw active areas near the central meridian on October 24, 27 and November 9. Apart from a few small bursts of radio noise at 143MHz on the 26th, 28th and 29th, the sun was quiet for most of October and up to November 10, when I recorded a large burst of noise (Fig. 1) which, true to form, heralded the beginning of a noise storm.

During the morning of November 15, **Cmdr Henry Hatfield,** Sevenoaks, using his spectrohelioscope counted approximately 30 sunspots in a very large chain of spots near the sun's equator just west of central meridian and no doubt was the cause of the noise storm that Henry and I recorded on the 13th, 14th and 15th.

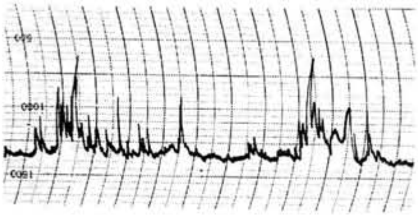


Fig. 1: An isolated 10 minute burst of solar radio noise recorded by the author at 143MHz at midday on Nov 1. Note the peaks at start and finish of the event

The 50MHz (6m) Band

"I have been monitoring 'F2' conditions in Band I and heard a few whispers of c.w. activity from VE on 50MHz recently" writes **Sam Faulkner,** Burton-on-Trent, on November 12. This may well have been meteor "pings" Sam, because at 1345 on November 5, **David Newman** G4GLT, Leicester, heard "pings" of c.w. on 50·100MHz. At 1358 he made out "VE1" and during a longer burst at 1402 he read the complete callsign "VE1YX". Suddenly at 1403 "like a rocket out of the blue I heard VE1YX peaking 579" said David, who, like **Gordon Pheasant** G4BPY, Walsall, called him and although the opening was brief, both David and Gordon were delighted to make this cross-band transatlantic QSO on 50/28MHz. Congratulations to all concerned and as you say David, "The moral of the story is that on 50MHz you just have to keep listening".

At 1315 on October 17, David had a cross-band QSO, 50/28MHz, with ZB2BL and between 1130 and 1348 on the 18th, he heard the South African beacons ZS6DN, ZS6LN and ZS6PW and enjoyed cross-band QSOs with ZS6BT and ZS6LN. "The most interesting point about this opening was that the ZS1STB beacon at Still-Bay was audible from 1145-1222, peaking 579 on 50·010MHz", writes David, who sent me a most impressive tape recording of the auroral signal he recorded from GB3SIX between 0656 and 0716 on September 22 and the fluttering signal of ZS6PW on 50·030MHz during the TEP opening between 1931 and 1957 on October 2.

The 28MHz (10m) Band

"Conditions on the 28MHz band have been excellent" writes **Dave Coggins,**

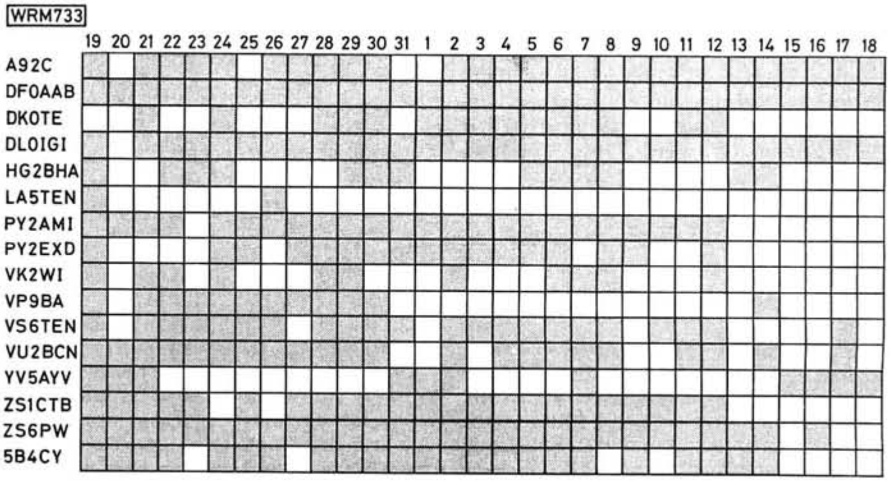


Fig. 2: Distribution of Beacon signals

Knutsford, who, as well as echoing the views of many of us, suggests that the most favourable time to listen for VK/ZL, on the long path, is after the band has closed following an opening to South America. Take note new readers, these are the tricks of the trade. Dave, using a Yaesu FRG-7700M receiver with a FRT-7700 a.t.u. and a 2-element 28MHz Delta quad antenna, logged KP21, K5FTC, NC4L, RA6LXB, VE3UK and WB8BTI on f.m. around 29·500MHz.

I was delighted at 1015 on October 19 to hear a strong signal from ZL3ACP while he was working G3ALI, followed by signals from stations in Austria and Greece and from many parts of the USSR. Like many of my readers, I logged several JAs, VEs, VKs and Ws between October 19 and November 18 and at 1430 on October 28, I heard a very strong signal from a Canadian YL operator, Irene VE3LWZ, when she was working into Austria. In general, signals from stateside were very strong and **Harold Brodribb,** St Leonards-on-Sea, reports hearing Utility stations up to 39MHz on October 16 and 17, 40MHz on October 21 and November 7 and 11 and some 6 harmonics from lower frequency broadcast stations between 29 and 31MHz on October 17. There were strong echoes on the signals of G3NSY when he answered a CQ from YO7DL at 0913 on November 7, G4KJF while he was working a VK around 0910 on the 10th and on several French stations early on the 13th.

28MHz Beacons

Norman Hyde G2AIH, Epsom Downs, uses a Trio TS-130S and a NE/SW dipole on 28MHz and along with the reports from **Susan Beech**, Dollar, Dave Coggins, **George** and **John Coulter** from Dover and Winchester respectively, **Bert Glass** BRS32693, Plymouth, using a FRG-7700 and a.t.u. David Newman and I, the list of beacons heard, (Fig. 2), was compiled. It's good to see this list getting longer and the signals being heard more frequently, which shows the band is really opening up. Most contributors reported hearing a new beacon, LU1UG on 28·245MHz, which, says George Coulter, "According to the call-book, the station belongs to Radio Club of Pampeano". Among other beacons occasionally heard between October 19 and November 18 were Gough Island ZD9GI, New Zealand ZL2MHF and Spain EA6EU.

Tropospheric

The atmospheric pressure, an important factor in v.h.f. propagation, measured at my QTH rose sharply from 29·6in (1002mb) on October 18th to 30·0 (1015) by midday on the 19th. Apart from a drop to 29·7 (1005) on the 22nd, it remained around 30·0 until 2000 on the 26th when it took off, (Fig. 3), reaching 30·3 (1026) at midday on the 27th, peaked at 30·4 (1029) at midnight on the 28th. It then began falling slowly at 0400 on the 29th, giving us a good tropo opening, to 30·2 (1022) at 1600 on the 31st. The pressure remained at this level until 0400 on November 5 when it rapidly fell to 29·2 (988) by 0200 on the 8th and as the foul weather, which accompanied the low pressure, passed over, the pressure then rose slowly to 30·15 (1020) at midday on the 11th only to fall again to around 29·7 on the 14th.

During the lift between October 29 and 31, **Don Hunter** G8YCA, Wimborne, using a Trio 9130 and home-brew 16-element ZL antenna, worked 3 stations in Czechoslovakia on 144MHz (2m) s.s.b. as did **John Cooper** G8NGO, Cowfold, Sussex, who ended up the evening of the 30th with 7 OK/Ps, one of them OK1AFN/P was only running 2 watts, 3 East-Germans and 6 West-Germans. Don also worked into East-Germany bringing his total to 15 countries contacted on 144MHz.

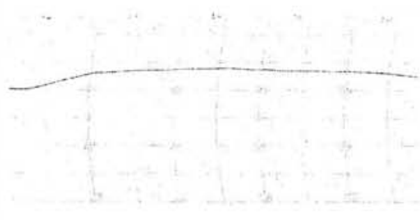


Fig. 3: Atmospheric pressure recorded by the author at the end of October

Back in Sussex, **Ian Shaw** G4MWD, made the most of the event by working DB8KJ, EI2DJ and two first time contacts with OE5XDL and OK1KKH/P, he also heard French stations working into Scandinavia. During this period Ian worked stations in PA0 and Y23 bringing his QTH square total to 106 spread through 22 countries on 144MHz.

While the prevailing high pressure, with frontal systems, moved rapidly through the general south-coast area, **Richard Bird** GU6NBS, Guernsey, began a QSO on 934MHz CB with a station in Torquay at 2300 on November 1 which lasted until around 0200 on the 2nd. During the experiments, Richard went mobile over a 5km course and the signals, received in Torquay, varied between 53 and 59 plus and rapid fading was experienced as the vehicle passed through areas of high buildings. Our Technical Editor, **John Fell** G8MCP, heard the signals from the re-built and re-sited beacon in Cornwall GB3CTC 432·970MHz and the beacon in Crowborough GB3WHA 432·810MHz on the 29th and a very strong signal from the Yorkshire beacon GB3EM 432·910MHz on the 31st. John also proved that conditions on 432MHz (70cm) were good on November 1st when he received a 57 report from **John Brakespear** G8RZP on the Isle of Sheppey, using just 8 watts into a 20 element quad loop Yagi at 12m a.g.l. from his home in Dorset. Up in Cheshire, Dave Coggins logged signals from the 144MHz beacons in Angus GB3ANG on October 17, 18 and November 6 and from Wrotham GB3VHF on October 23, 26, 27 and November 6 and on the 10th, John Cooper worked HW1KAR, a special callsign to commemorate the 60th anniversary of Radio Club Normandie, the oldest radio club in France. The club station at the time was being operated by **Claude Roger** F1FJT. Although 144MHz conditions were flat around 1820 on the 15th, John managed to work two German stations in a local contest and they were both very pleased to add a "G" call to their list of stations worked.

Band II

Ian Anderson, Eastbourne, using an AIWA R22 Tuner and a 6-element rotatable antenna can normally receive v.h.f. broadcast signals from the Boulogne area of France and tells me that a fairly new station, Radio Boulogne Littoral, on 103·7MHz is privately owned and operated by the Boulogne Town Council. "RBL broadcasts 24hrs daily in French, but every Monday evening, starting at 2030GMT, the English service takes over," writes Ian who, as one of RBL's English presenters would like to know how many readers are able to hear this station.

With a change in the weather on October 26, **John Williams,** Cheltenham, heard a broadcast station from Eire come up alongside Severn Sound on 95MHz and on October 29, 31 and November 3, Harold Brodribb received around 16 French broadcast stations in Band II increasing to 29 on November 1 and 22 on the 4th. With his mind very much on the prevailing atmospheric pressure, Harold sent the weather maps from his daily paper covering the period October 27 to November 2, clearly showing the movement into the continent of the high pressure system which gave us the DX.

During the evenings of October 28, 29 and 30, **Simon Hamer,** Presteigne, received signals from the BBC radios Cambridge and Northamptonshire, ILRs Capital, Chiltern Radio and LBC, Opera

Fig. 4: Peter Lincoln in his shack in Aldershot

GAREX (G3ZV1)

RESISTOR KITS a top-selling line for many years. E12 series, 5% carbon film, 10Ω to 1M, 61 values, ratings ¼W or ½W (state which).
Starter pack 5 each value (305 pieces) **£3.10**
Standard pack 10 each value (610 pieces) **£5.55**
Mixed pack, 5 each ¼W + ½W (610 pieces) **£5.55**
Giant pack, 25 each value (1525 pieces) **£13.60**

SR-9 monitor: 2m FM with 144-146MHz full coverage VFO + 11 xtal controlled channels; ideal for fixed,/M,/P use. 12V DC operation **£47.50**

Marine band SR-9, 156-162MHz, same spec. and price.

CRYSTALS FOR NR-56, SR-9, SR-11, HF-12, TM-56B All 2m channels from 0 (145.00) to 33 (145.825) incl. also 144.80, 144.825, 144.85 Raynet at **£2.46** (+**20p** post per order). Over 40 popular marine channels at **£2.85** (+**20p** post).

CRYSTAL FILTER 10.7MHz, 12½KHz spacing, ITT 901C **£6.90**

CRYSTAL FILTER 25KHz spacing type 914B or 909B **£6.90**

PYE RADIOTELEPHONE SPARES (sae full list). Ex. equip., fully guaranteed. **CAMBRIDGE AM10** 10.7MHz I.F. **£3.65.** 2nd mixer **£3.** 455KHz block filter 12½KHz **£9.40.** Ditto 25KHz **£3.** 455KHz AM I.F. **£4.95.** Audio bd. **£1.95**

WESTMINSTER W15/W30 AM RX RF 68-88MHz *or* 148/174MHz **£6.95.** 10.7MHz IF (inc. 12½KHz xtal filter) **£8.25.** 2nd Osc **£2.10.** 455KHz IF **£5.65.** 455KHz block filter (12½KHz) **£7.35.** Squelch **£1.45.** QQ206-40a (quick-heat) RF tested **£11.95.** Aerial relays **£1.50**

PYE SPARES ARE OUR SPECIALITY – COMPLETE UNITS ARE ALSO AVAILABLE

GAREX FM DETECTOR & squelch conversion for Pye R/T equipment. Ready assembled, full instructions. Tailor-made, easy-fit design, replaces existing squelch board, with minimum of modifications. For AM Cambridge **£6.30;** for Vanguard AM25B (Valve RX) **£6.10;** for Transistor Vanguard AM25T **£6.95**

MAIN DISTRIBUTOR OF REVCO AERIALS & SPECIAL PRODUCTS

(trade enquiries welcome).
PRICES INCLUDE UK POST & PACKING & 15% VAT.

SX200-N
THE ULTIMATE SCANNER

- ★ MICROPROCESSOR CONTROLLED 32,000 CHANNELS
- ★ AM & FM ALL BANDS
- ★ WIDER COVERAGE: 26-58, 58-88, 108-180, 380-514MHz; includes 10m, 4m, 2m, & 70cm Amateur bands.
- ★ 5kHz & 12½kHz FREQUENCY INCREMENTS
- ★ 16 MEMORY CHANNELS WITH DIRECT ACCESS
- ★ SPECIALLY DESIGNED FOR EUROPEAN MARKET
- ★ 2 SPEED SCAN SCAN DELAY CONTROL
- ★ 2 SPEED SEARCH UP AND DOWN
- ★ SEARCH BETWEEN PRESET LIMITS UP AND DOWN
- ★ 3 SQUELCH MODES inc. CARRIER & AUDIO
- ★ RELAY OUTPUT FOR Aux. CONTROL
- ★ INTERNAL SPEAKER, ALSO EXTERNAL SPEAKER & TAPE OUTPUTS
- ★ LARGE GREEN DIGITRON DISPLAY BRIGHT/DIM
- ★ AM-PM CLOCK DISPLAY
- ★ 12V DC, 230V AC OPERATION
- ★ FACTORY-BACKED SPARES & SERVICE, 12 MONTH WARRANTY & THE ALL-IMPORTANT PRE-DELIVERY CHECK BY GAREX, THE MAIN SERVICE & SALES AGENTS.

£264.50 INC. VAT Delivered

•NEW• **★ REVCONE ★** •NEW•

A new top quality 16-element, all British made, VHF/UHF broadband fixed station aerial from Revco. Ideally suited to SX200 and other VHF/UHF Receivers. **PRICE £24.95 inc**

Access

GAREX ELECTRONICS
7 NORVIC ROAD, MARSWORTH, TRING, HERTS HP23 4LS.
Phone 0296 668684. Callers by appointment only.

Goods normally despatched by return

BARCLAYCARD VISA

ZX81 – RTTY

A COMPLETE TRANSMIT/RECEIVE RTTY PACKAGE FOR THE ZX.81 – 5 MEMORY STORES, AUTO-RUN, AUTO CARRIAGE RETURN AND LINE FEED, FULLY DOCUMENTED. SEND FOR DETAILS OF THIS AND OTHER AMATEUR RADIO SOFTWARE FROM

SCARAB SYSTEMS

PURCHASERS AND DISTRIBUTORS OF SOFTWARE

141 Nelson Road, Gillingham, Kent ME7 4LT.
Medway (0634) 575778

ANTENNAS TONNA (F9FT)

50MHz	
5 element†	£31.74(a)
144MHz	
4 element	£13.01(a)
9 element fixed	£15.44(a)
9 element portable	£17.46(a)
9 element crossed†	£28.52(a)
13 element portable†	£27.21(a)
NEW 17 element fixed	£35.19(a)
435MHz	
19 element	£18.14(a)
19 element crossed†	£30.05(a)
21 element 432MHz	£26.00(a)
21 element ATV	£26.00(a)
144/435MHz	
Oscar Special	
9 & 19 element†	£30.05(a)

YOUR NUMBER ONE CHOICE FOR 6m, 2m, 70, 24 & 23cm ANTENNAS

1250MHz OR 1296MHz
23 element† **£25.90(b)**
4 × 23 ele antennas – power splitter – stacking frame **£140.00(a)**

Telescopic Portable Masts
4 × 1m **£15.96(a)** 3 × 2m **£19.15(a)** 4 × 2m **£28.75(a)**

ANDREW HELIAX LDF4-50 COAXIAL CABLE
Attenuation per 100ft. 144MHz-0.8dB 435MHz-1.6dB. 1296MHz-2.9dB. **£3.20 per metre (a).** 'N' Type connectors for LDF4-50 male or female **£10.35.**

MICROWAVE MODULES – ROTATORS – COAXIAL CABLES ETC.
POWER SPLITTERS AVAILABLE FOR 2 OR 4 ANTENNAS

†Denotes 50Ω ONLY – all others 50Ω OR 75Ω impedance

PLEASE ADD CARRIAGE AS SHOWN (a) £4.00. (b) £1.80. ALL PRICES INCLUDE VAT AT 15%

Terms: Cash with order, ACCESS – VISA – telephone your card number.

FOR FULL SPECIFICATION OF OUR RANGE SEND 30p FOR CATALOGUE

Callers welcome, but by telephone appointment only please. Goods by return.

RANDAM ELECTRONICS (P)
12 Conduit Road, Abingdon, Oxon OX14 1DB. Tel: (0235) 23080 (24 hours)

AT LAST!! – A REALLY FINE RECEIVER FROM ICOM

SSB, CW, AM, RTTY AND FM WITH SUPERB PERFORMANCE

ICR70

PRICE £469

– Call or write for more details.

ICOM **THANET ELECTRONICS LTD.**
143 RECULVER ROAD, HERNE BAY, KENT.
Tel: 02273 63859 Telex: 965179

from BFBS Bielefeld, a variety of programmes from Belgium BRT-11 Egem and RTBF-1 Leglise, TDF Cultor and TDF Musique from France and from Germany NDR-2 Aurich and Hamburg and SDR-111 Heildelberg.

"The tropospheric opening on October 29 and 30 was amazing . . . about the most intense opening I've known" writes **Ian Kelly** from Reading who, like Harold and Simon, received many strong stations from France between 88 and 104MHz in addition to about 20 German stations, "of which a good number were in strong stereo" said Ian, adding "My best log was Radio Luxembourg, which gave me good reception around 0200 on the 30th on 92·5MHz. The transmission was only in mono, but perfect". Well done Ian, another goody in the log. From Dollar in Scotland **Alan Beech** reports hearing Radio Merseyside on November 10.

Microwaves

During the good conditions on October 30, "G3AUS in Devon worked an OK station on 1296MHz (23cm) at 1576km, a new DX record" writes **John Tye** G4BYV, Dereham, Norfolk, who himself worked OK1AIY/P on 2·3GHz (13cm) at 1027km. PA2DOL worked over 500km on 3·3GHz (9cm) establishing yet another DX record. Congratulations to all concerned, we at *PW* are always pleased to hear about DX records, especially on microwaves, so what about it lads and lasses, drop me a line.

RTTY

The best RTTY DX during October for **Peter Lincoln** BRS 42979, Aldershot, (Fig. 4), was CE3JK, FY7BC, 5N22BSH and the Jamboree-on-the-Air station XT2AW/JAM. Among the other countries copied were HW6, OH, W, YU, Y2 and 4N7. Between October 11 and November 9, **Norman Jennings,** Rye, logged RTTY signals from most European countries on 14MHz (20m) VE, VP and plenty of Ws on 21MHz (15m) and a DJ and several Ws on 28MHz (10m).

Among the interesting two-way QSOs I copied were, a local contact between 2 DLs around 0830 on October 24, I1KUE and DJ4ET at 0929 on November 7, DF9KD and ZB2HL at 0914 on the 10th and at 1415 on the 7th, I logged N8ES in Ohio calling CQ DARC contest on 28MHz. There appeared to be plenty of activity for the RTTY enthusiasts between October 19 and November 17 because, even with the limited time I spend on the bands I managed to copy signals from 16 countries, DJ, EA, F, GI, GM, HB0, HB9, IT9, KP4, LA, OE, OK, OZ, SM, YU and ZB2 on 14MHz, 4, EA, IT9 OH and SM on 21MHz and 7, CN, HG, I, LZ, OH, W and 5B4 on 28MHz.

Ted Double G8CDW, contests and awards manager of the British Amateur Teleprinter Group, reminds me that the BARTG Spring VHF/UHF RTTY Contest will take place between 1800GMT on April 9 and 1200GMT on the 10th, on the 144, 432 and 1296MHz bands. All details from Ted, QTHR. I see that some of my readers were among the 23 entries in the single operator and the 9 in the multi-operator sections of the Autumn 144MHz RTTY Contest and I congratulate **Colin Desborough** G3NNG and **Jonathan Perkins** G4IVV/A, the section winners and **John Neal** G4NQC and the Bournemouth Radio Society, the runners up respectively. During the event QSOs ranged from Belgium to Scotland and from Germany to Northern Ireland.

TV

by Ron Ham BRS15744

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

"I am very interested in becoming active on the TVDX scene and also interested in Amateur TV", writes **Jim Byrne** from Dublin, whose letter is typical of many which periodically appear in my postbag. As far as ATV is concerned, I recommend that you first join your local amateur radio club and get to know the television buffs and believe me, you will learn far more from them in a short while than you can by scratching around on your own. Whereas activity in the ATV world is being created all the time, DXTV requires a given amount of patience because the enthusiast must wait for an atmospheric disturbance, such as sporadic-E or a tropospheric opening, before receiving some of the juicy pictures that are published in my column.

The majority of the domestic TV channels are shared by international agreement and due to the normal limited range of a TV transmitter, many signals are transmitted on the same or similar channels without interference. The system works fine until an atmospheric disturbance occurs, and for a while the range of a multitude of TV transmitters is increased from about 80 to more than 2400 km and of course, creates what's commonly known as co-channel or adjacent channel interference, Fig. 1.

In general, television signals in Band I, approximately 40–70MHz, are influenced by sporadic-E which, varying in intensity, occurs on most days between late April and mid-August and signals transmitted in Band III, approximately 175–225MHz, and the u.h.f. bands are affected by disturbances in the troposphere which can occur at any time when the atmospheric pressure is high and the prevailing weather is fine and clear. The YL announcer and the speaker in Figs. 2 and 3 were received by the author on Ch. R1, 49·75MHz from possibly Poland or the USSR during the 1982 sporadic-E season. The YL presenter, (Fig. 4), was received in colour, by the author, from Germany on Ch. E10 210·25MHz during a tropo opening in September and the two German stations, Figs. 5 and 6, were received on Chs. 45 and 54 respectively by **Nicholas Wythe,** Folkestone, during a tropo opening in July.

When selecting a receiver for DXTV make sure that it has two TV tuners, one for v.h.f. covering Ch. E2–4 and E5–12 and the other for u.h.f. Chs. 21–69. Suitable sets are usually small screen portables and are made by such firms as Hitachi, JVC, National Panasonic, Plustron, Sanyo, Sony and no doubt others, which I am always pleased to hear about.

SSTV

Peter Lincoln BRS 42979, Aldershot, received slow scan television pictures from F3HD Fig. 7, K4BZY Fig. 8 and OH2BTX Fig. 9 with a Wraase SC–140 SSTV converter and a Hitachi 4·5in portable receiver, both seen on the right of the operater's bench in Fig. 10. Peter also received pictures from stations in Finland, France, Germany and Spain and his best DX during October was LU5NA.

Amateur TV

Congratulations to **Roy Humphreys** G6AIW, Worthing, on winning the BATC Summer Cumulative ATV contest. Roy used his TV gear on each of 5 sessions at Chanctonbury Ring, a high spot on the Sussex Downs, and exchanged mono and colour pictures with stations as far apart as F3YX near Paris and G8VBC in Derby.

Our Technical Editor, **John Fell** G8MCP is now active on 432MHz with a Wood and Douglas ATV-2 transmitter fed by a monochrome camera and a Sinclair ZX Spectrum computer for colour transmissions and fellow members of the Flight Refuelling Amateur Radio Society, **Judith Richardson** G6JGR and **Mervyn Staton** G4BGT, from Corfe Mullen, also have a Wood and Douglas ATV-2 plus 10W p.a. coupled to a 48-element multi-beam antenna and use a Hitachi C750 colour camera and a 6500 video recorder for film making. Judith and Mervyn have plans to operate ATV equipment on 1296MHz, and are looking for skeds, on 432MHz, with stations to the west of Corfe Mullen. Anyone interested, they are both QTHR.

Roy Humphreys and fellow members of the Worthing and District Video Repeater Group are prepared to give talks on the subject, in aid of their funds, so any clubs who are interested should contact Roy at Worthing on 0903 67764.

Band I

As a result of leaving the television gear ticking over whenever I am working in the shack I have seen frequent bursts of signal on Chs. E2 46·25MHz and R1, long enough to identify, the test cards from Austria ORF-FSI, Czechoslovakia RSKH and Poland and such programmes as cartoons and music and, at 0845 on October 24, the caption "Fr" appeared. Any ideas?

Around 1220 on the 31st, **Harold Brodribb,** St Leonards-on-Sea, watched pictures of golf during a sports programme from Spain on Ch. E2 and, as the camera zoomed on a sign he saw the word "7 pasa" and while using his v.h.f. communications receiver, at 1110 on November 3 he heard many short lived bursts of synchronising pulses on Ch. R1 which as Harold presumes were most likely coming from meteor trail reflection.

Dave Cawser G6NBY, Burton-on-Trent, has shown that it is well worth keeping an eye on Band I outside the sporadic-E season, because at 0929 on October 24 he saw a Russian station identification, with a YL announcer and a clock showing 1229, on Ch. R1. Around 1045 on the 31st, he watched dancing from TVE Spain on Chs. E2 and 3 and at 1150 a weather forecast from RAI Italy on Ch. 1a 53·75MHz. Both Dave and I saw a film about wild birds with their young during a mild sporadic-E disturbance around 0930 on November 14, which seemed to peak around Chs. E2 and R1.

Tropospheric

Around 1500 on October 29, **Adrian Butcher,** Washington, Sussex, using an Ultra 6808 and outside Yagi antenna

Fig. 1: German caption received by the author on Ch. E10. Note the diagonal lines of co-channel interference

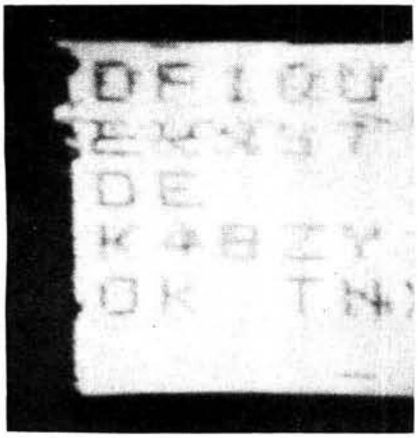
Fig. 2: Unidentified signal, received by the author via sporadic-E on Ch. R1

Fig. 3: Unidentified signal received by the author on Ch. R1

Fig. 4: ZDF programme presenter received by the author on Ch. E10

Fig. 5: UHF picture received by Nicholas Wythe. Note the lines of co-channel interference

Fig. 6: UHF picture received by Nicholas Wythe



Figs. 7, 8 & 9: Slow scan television picture logged by Peter Lincoln

received a strong test card from Belgium BRT TV2 Wavre on Ch. 25 and at 1550 I received BRT TV1 from Wavre on the much lower frequency of Ch. E10. This heralded good DX conditions for the following few days.

At 1930 a news programme came up on Ch. E10 with a YL presenter and reports about a European conference by Renate Butow and the Spanish General Election by Wolf Hanke, followed at 1915 by the weather charts and forecast and at 2225 the German ARD caption. The following morning my Band III beam was still pointing east and at 0804, using a Plustron TVRC7, I received the Dutch test card PTT NED-1 on Ch. E4, pictures of food and wine being prepared on Ch. E5, and colour test cards, from the W. German stations "hr 1 m" on Ch. E7, NDR1 on Ch. E10 and WDR1 on E11. At 1445 there was a war film in black and white, from the E. German station DDR on Ch. E6 followed by a YL announcer and a programme about dahlias, while concurrently, on Ch. E10, was a variety programme in full colour. The ARD clock appeared at 1900 and strong pictures continued on Chs. E6 and E10 for most of the evening.

"During the evening of October 30 BBC television announced that viewers

Fig. 10: Peter Lincoln's shack showing SSTV gear on the right of the bench

may experience interference to their programmes as Bands III, IV and V become disturbed" writes **Sam Faulkner,** Burton-on-Trent, who received a very strong IBA Ch. 4 test card from Sandy Heath on Ch. 21, the programme *Heute* and *Das Aktuelle Sport Studio,* from ZDF on Chs. 34, 35, 37 and 39 and from "Hessischer Rundfunk" on Ch. 52. Also watching u.h.f. was **Simon Hamer** in Presteigne who received France TDF on Chs. 27, 35 and 45. "An ideal birthday present" said Simon who also received pictures from Belgium on Ch. E8 and Germany on Ch. E10.

"Very spectacular" thought Sam as he logged a test card from Denmark on Ch. E5, football from ARD on several Band III channels, news from DDR-1 on Ch. E5 and 12 and his best DX was Czechoslovakia CST, on Ch. R10, who were showing a "Your Letters" type programme which Sam had previously seen on the Band I channels called NAD, DOPISY, DIVAKU CST. It is worth noting that while Sam received TV pictures from CST on R10, 207·25MHz, several radio amateurs in the UK were working into Czechoslovakia on the 144MHz band. "The best results I've ever had from our set, four countries, all in one afternoon, including good colour pictures from Germany," writes **Ian Kelly,** Reading, who logged 3 editions of ZDF on Chs. E32, 34 and 35 and saw *Charlie Brown, Heute, The Flintstones* and adverts for German toys, in addition to pictures from Belgium and Holland and many negative pictures from stations in France.

swap spot

Have Sony music system model HMK77 and two Sony speakers model SS2030. Would exchange for general coverage amateur transceiver with built-in power supply or separate. D. Jenkins, 40 Fraser St., Bedminster, Bristol BS3 4LZ. *P813*

Have nearly complete set of *Practical Electronics* from onset to late seventies. Would exchange for general coverage receiver, age and condition immaterial, even one needing attention—for a keen s.w.l. Williams, 40 Salem Street South, Hendon, Sunderdand. Tel: 0783 653097. *P822*

Have photographic colour processing equipment including Durst Enlarger, Melico analyser, timer, drum, filters etc., plus cine equipment. Would exchange for a 144MHz transceiver, h.f. receiver CB transceiver w.h.y. Richard, Okehampton 0837 2484 (Devon). *P829*

Have 1956 Ekco TMB272 9in radio TV (portable), works but needs mains lead. Would exchange for short wave a.t.u. or two 3Ω speakers in cabinets or multimeter. Tel: Blagdon Hill (Somerset) 554. *P840*

Have Kodak instant camera with accessories, also have TV DX converter or 144MHz linear amplifier for IC-2E. A. Dunham, 5 King St., Wimblington, March, Cambs PE15 0QF. Tel: 740660. *P842*

Have 1969 Nikon F camera with photomic head 50 × 1·4, 28 × 3·5 Nikon lenses, 200 × 3·5 Vivitar. Would exchange for 144MHz multimode or other 144MHz equipment considered. Tel: Southport 0704 35775. *P860*

Have Tektronix 5020A double beam oscilloscope with manual, and probes, in good working order. Would exchange for transceiver, receiver or w.h.y. W. Craig, 30 Titania St., Cregagh, Belfast BT6 8NT. *P867*

Have Realistic PRO2001 f.m. scanner, 30-50MHz, 68-88MHz, 144-174MHz and 430-512MHz. Would exchange for a Plustron TVR5D TV. E. Eyre, 4 Park Road, Hoddesdon, Herts. Tel: 65165. *P868*

Have 88 receiver, 8-track player, computer panels and a 24-hour timer switch. Will exchange the lot for tuner unit 30-80MHz. Tel: Kennoway 350993. *P869*

Have Bearcat 220FB scanner, boxed with manual. Would exchange for Trio R-1000 or similar type general coverage receiver. Cash adjustment if necessary. I. Baggett, 59 Leigham Vale Road, Bournemouth BH6 3LR. Tel: Bournemouth 420666. *P890*

Have SLR camera Olympus OM1, Zuiko 1·5 50mm lens with case, B/W Zenith 5 portable enlarger with timer, developing tank, dishes and Paterson paper exposure meter. Would exchange for used Microwave Modules MM200/1 RTTY to TV converter. Tel: evenings only, Claude 01-431 2919. *P891*

Have Sommerkamp TS788DX. Would exchange for Reftec 934MHz transceiver and antenna. Tel: 01-987 2296. *P898*

Have Ekco vintage receiver model No. 25, perfect working order. Would exchange for R208 or WS19 communications receiver—operational or otherwise, or w.h.y. P.H. Spencer James, 105 St. Andrews Road, Yeovil, Somerset BA20 2DF. *P901*

Have DX302 general coverage receiver, 18 months old, digital readout, quartz locked circuit, 6 tunable pre-selectors, l.e.d. band indicators, b.f.o., u.s.b. and l.s.b. with built-in Morse practice. Would exchange for current model 144MHz mobile multimode transceiver. J. Docherty, 12 Mallaig Road, Glasgow G51 4NE. Tel: 041-440 0223. *P911*

MODS

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

Roger Hall G8TNT(Sam)

No. 19

More mods for the FT-290R this month

SSB Auto Pip-Tone

Tom's second mod is for automatic pip-tone on s.s.b. using the existing tone generator. It involves a fair amount of work but it should not prove too difficult for most people. Having gained access to the Regulator Unit, the first step is to open circuit the TC SW line on the print at Pin 10 of the connector. Either cut the print or remove the connection. Then open circuit the f.m. 6·8V supply at 12 and 13 and replace it with a permanent 6·8V supply which is available at Pin 5 using a short wire link. Now move to the component side of the board and note that the tone input is fed to the f.m. demodulator direct. This tone feed-point must be altered to accommodate s.s.b. operation. Disconnect the two green tone-feed wires from their pillars near Q2004 and connect them to a potential divider of 12kΩ and 100Ω to earth built across the microphone input pillars nearby, Fig. 7. Now the CALL button will activate the tone generator but not the transmitter, and the tone will be audible in the microphone.

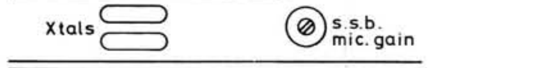


Fig. 7

The next stage starts by removing the battery housing and the bottom cover. Then connect a 2000μF capacitor from the coil of RLO1, junction Q2011 collector to earth via the NOISE BLANKER switch, which should have had its original wires removed and been wired permanently on so that this switch is available for turning the pip-tone on and off. This capacitor provides a delay on the TX/RX relay which gives us the pip window at the end of the transmission. As it is such a large component, it may be necessary to house it in the battery compartment and run a wire round to the main board. Next make up the AND gate shown in Fig. 8 using any *npn* silicon BC147-107 type transistors and connect it to the points indicated. Install it straight on the back of the p.c.b. as flat as possible. Tom has put his near to the TX/RX relay as the TX s.s.b. 6·8V and p.t.t. line are nearby, but he has had to run a long piece of wire to the Regulator board. This mod is now complete and it works because when the p.t.t. is pressed, Tr1 is off and Tr2 is on. When the p.t.t. is released, approximately 4V turns on Tr1 and Tr2 is still off because the 2000μF capacitor is holding the relay in the transmit mode, thus supplying Tr2 with bias. Therefore the T. Call line at Tr2 collector is taken towards earth, initiating tone until the capacitor discharges through RLO1 and the RX mode is established. Once on receive, Tr2 loses its bias and its collector rises causing the tone to cease. Even on receive, there is no tone in the microphone unless the CALL button is pressed. The pip-tone is automatically disabled when the f.m. mode is selected because there is no longer the s.s.b. TX 6·8V on Tr2. The potential divider across the microphone is essential as the level of tone is very high.

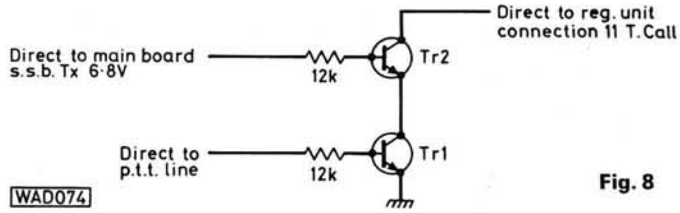


Fig. 8

3SK88

This is the first anti-mod that I have ever published and it will be a disappointment to all of you who are reading this page in the hope of finding out how to install a 3SK88 in the front end of your rig. Instead I am going to suggest that you do not carry out this mod. There was a time when dealers couldn't sell an FT-290R unless they had installed this device, but now most prospective customers are asking for unmodified rigs. The general consensus of opinion among the engineers that I have spoken to, and who work in the dealers' workshops, is that this mod not only does not work, it also degrades the performance of the rig. One of the problems seems to be the 3SK51 (Q1002) mixer which is an average performer but not up to handling the output from a 3SK88 and so it tends to overload. I have also been told of a.g.c. problems with this mod, but the most obvious symptom is nearly always cross-modulation.

Those engineers who have been interested enough to check out this mod on their test equipment have told me that there is a marginal improvement under controlled conditions but out in the real world where there are strong signals nearby, an outboard switchable pre-amplifier with a high *Q* would have more selectivity and less cross-mod and would be far more versatile. The standard FT-290 is very good when it comes to cross-modulation and it is logical to assume that it is as easy to buy a 3SK88 in Japan as it is in this country and so if the designers of this rig have decided not to use one, they probably had a very good reason. Two dealers have even told of stability problems on transmit which cleared up as soon as this device was removed, but neither of them could explain the cause. In his letter Tom G8HUH, said that he carried out the 3SK88 mod and the results were disappointing, but he managed to improve the performance by grounding the source, thereby removing the d.c. feedback to Gate 1. He also commented on the increased cross-modulation that his rig now suffers from. Most of the engineers who work on these rigs have said that the easiest, and probably the best way to improve the performance of the front end is to re-tune them so that they are peaked on 145MHz.

Note: *In the Squelch mod last month, T1007 is a transformer, not a transistor.*

EAST LONDON HAM STORE

H. LEXTON LIMITED

191 FRANCIS ROAD LEYTON E.10
TEL 01-558 0854 TELEX 8953609 LEXTON G

DRESSLER AMPLIFIERS

These are high power 240V linears using 4C x 150 or 4C x 250 or 4C x 350 Eimac Tubes NOT using the grounded Grid system. Fully protected, no thermal damage to PA finals possible.

DRESSLER AMPLIFIERS

D70 70cm 200wfm 400 PEP	£495.00
D200c 2mtr 125wfm 200w PEP	£285.00
D200 2mtr 300wfm 600w PEP	£495.00
D200S 2mtr 400wfm 1KW PEP	£600.00

GASFET DRESSLER PRE-AMPS

VV2	
VV2GAAS 150W	£40.00
VV200GAAS 750W	£69.00
VV2000GAAS 1KW	£79.00
VV2RPS S0259	Non switching £22.00
VV2RPS N Type	£24.00
VV7RPS S0259	£22.00
VV7RPS N Type	£24.00

Powered by the linear or with separate interface.
0.7 - 0.9dB signal to noise
0.2dB insertion loss

3SK97 GASFET Available separately £4.50

GASFET MASTHEAD PREAMPS

ICOM

IC740 HF 100W	£699
IC720RHF 100W G/C	£899
IC730 HF 100W	£586.00
IC2KL Linear	£829.00
IC2KLPS P.S.U	£211.00
PS15 P.S.U.	£ 99.00
PS20 P.S.U	£130.00
AT500 A.T.U	£299.00
RX70 Receiver	£469.00
PS15 P.S.U	£99.00

ICOM

IC2E 2mtr fm portable	£159.00
IC4E 70cm fm portable	£ 99.00
IC25G 2mtr 25w fm	£235.00
IC290 2mtr 10w fm/ssb	£366.00
IC251 2mtr 10w fmkw/ssb/base	£495.00
IC451 70cm 10w fmkw/ssb/base	£630.00
IC490 70cm fm/ssb mobile	£445.00
ICSP3 Speaker	£ 29.00
ICSM5 Mic	£ 29.00

ICOM

Accessories	
ICLC/1/2/3 case	£ 4.25
ICWM9 SP/Mic	£ 12.00
ICBP2 6V pack	£ 29.50
ICBP3 9V pack	£ 20.00
ICBP4 empty pack	£ 6.95
ICBP5 12V pack	£ 39.50
ICCP1 charging lead	£ 3.75
ICDC1 12V car pack	£ 9.75
LC8 leather case	£ 18.98
BC30 Base Charger	£ 45.60

TRIO/KENWOOD

TS930 General Coverage RX/TX	£995.00
TS830 100W HF	£650.00
TS530 100W HF	£475.00
TS130 100W HF	£495.00
TS130 25W 2mtr FM/SSB	£390.00
TS7850 40W 2mtr FM	£300.00
TS7800 25W 2mtr FM	£245.60
TR2500 2mtr Portable	£200.00
TR7730 2mtr FM	£245.00
AT230	£110.00
SP230	£ 34.00
DM801 GDO	£ 60.00
R600 Receiver AM/SSB	£190.00

YAESU

FT-one gen. coverage TX/RX	£1295.00
FT102 150W 10mtr-160mtr	£690.00
FT707 100W 5-10mtr	P.O.A.
FP707 20A P.S.U.	P.O.A.
FC707 A.T.V.	P.O.A.
FT107M 9 band 100W	P.O.A.
FP107 P.S.U.	P.O.A.
FT101ZD 160-10mtr	
FT9020M 160-10mtr AM/FM	P.O.A.
SP901 Speaker	£ 30.00
FC902 A.T.U	£135.00
FL2100Z 1.2KW PEP linear	£425.00
FC102 Speaker	P.O.A.
FC102 A.T.U	P.O.A.
FV102 V.F.O.	P.O.A.

Morse Readers

MBA electronic morse/RTTY reader	£170.00
Microdot/morse/RTTY printer/ VDU/Key Board all one peice	£650.00

YAESU

FT290R with mods FM/SSB	£245.00
FT480R 2mtr mobile FM/SSB	£365.00
FT780R 70cm 7.6swift Shift	£400.00
FT780R 70cm 1.6 swift Shift	£440.00
FT208 2mtr portable FM	£195.00
FT708 70cm portable FM	£205.00
FT230 2mtr FM mobile	£220.00
FRG7700 receiver AM/FM/SSB	£295.00
FRG7700 memory	£ 80.00
FRV7700A 118-150	£ 60.00
FRV7700B 50-60/118-150	£ 75.00
FRV7700C 140-170	£ 65.00
FRV7700D 70-80/118-150	£ 72.00
FRT7700 Aerial Tuner	£ 37.00
FRA7700 Active Antenna	£ 36.00
FF5 Filter	£ 9.95
MMB11 FT290 Car Mount	£ 22.00
NC11C Charger	£ 8.00
NC8 Base Charger	
FT208/208 108	£ 44.00

MORSE READERS

+ Tasco Telereader CW/RTTY	£250

DIAWA

RM940 Mic Infrared	£ 45.00
CN620A 1KW SWR	£ 52.81
CN1001 Auto A.T.U.	£156.00
CN2002 2KW Auto A.T.U.	£228.00
CN518 2.5KW A.T.U.	£175.00
AF406 Active Filter	
AF606 P.L.L. Active Filter	£ 56.00
DR7500X	£95.00
DR7500R	£100.00
DR7600X	£135.00
DR7500R	£145.00

DATONG

D70 Morse Tutor	£ 56.35
PC1 Gen. cov converter	£137.00
FL1 Agile filter	£ 79.35
FL2 Active filter	£ 89.70
FL3 Agile filter & notch	£129.37
ASP Auto clipper	£ 82.80
D75 Manual clipper	£ 56.35
RFC Speach clipper	£ 29.90
AD270 Indoor active ant	£ 47.15
AD370 Outdoor active ant	£ 64.40
RFA Wide band AMP	£ 33.92

WELTZ

SP200 1.8-160MMZ 20-200-1KW	£ 59.00
SP300 1.8-500MMZ 20-200-1KW	£ 79.00
SP400 130-500MMZ 5-20-150	£ 59.00
SP250 1.6-60MMZ 20-200-2K	£ 43.00
SP15 1.08-160MMZ 5-20-200	£ 29.95
CT150 150/400W Dummy Load	£ 31.00
AC38 3.5. 30MMZ A.T.U	£ 59.00
SP10X 108-150MMZ 20-20n	£ 19.95

DURING DECEMBER OUR PREMISES WILL BE OPEN SUNDAY FROM 10-3

MORSE KEYS

Morse keys Swedish brass key	£49.00
Himound HK706	£ 11.00
Himound MK706	£ 20.00
Himound HK7022	£ 22.50
Kenpro squeeze key 100 electronic key	£ 57.00
Dawa DK210 Electronic keyer	£41.00

POWER SUPPLIES

The Lexton

7ampMax 12amp	£ 49.95
20ampMax 22amp	£ 79.95

Fully protected against overvolts, over current S/C protected & RF protected

Trade enquiries invited and own name can be provided

SONY

ICF2001 receiver	£140.00

Microwave modules

MML 144/30 1-3w drive	£ 9.95
MML 144/100 L.S. 1-3w drive	£159.95
MML 144/100 S10Wdrive	£139.95
MMC 435/600 ATV converter	£ 27.90
MM2001 RTTY receiver	£189.00
MM4000 RTTY tranceiver	£269.00
MM1000KB key board + transceiver	£299.00
MMT28/144	£109.95
MMD050 frequency counter	£ 75.00

+ ALL MODELS STOCKED

TONO

2M - 50W Linear amp. 1-3Win	£ 62
2M - 70W Linear amp. 10Win	£ 90
2M - 100W Linear amp. 10Win	£115
θ 500 - CW/RTTY Terminal -	£299.00

SCANNING RECEIVER

Scanning Receiver SX200N	£249.00

ROTATORS

Kenpro KR 250	£ 44.95
Hirshmann HR 250	£ 50.00
Kenpro KR400RC	£100.00
Kenpro elevation rotator	£85.00

TONNA

144 4ELE £12.00 432/440 21 ELE	£19.00
144 9ELE £16.00 432/435 21 ELE A.T.V.	£27.00
144 9ELE crossed 30.0 144/435 9 19ELE	£31.00
144 9ELE portable 30.0144 19ELEX	£30.00
144 16ELE £33.00 1296 23ELE	£27.00
144 13ELE portable £29.00 Phasing Harnes	
430/440 19ELE crossed telescopic masts	
435 19ELE	£19.00

TET

HB33T	£189.00
HB34T	£202.00
HB35T	P.O.A.
HB35C	P.O.A.
SQ22144	£ 55.00
SQ22OX144X4	£ 90.00
SQ007 70cm	P.O.A.

See the new standard C5800 Multimode 25W SSB/FM/CW 2Mtr £359.00

JAYBEAM

TB3 HF 3 band	£181.70
VR3 band vertical	£ 46.00
C52M colinear	£ 47.72
5Y2M 5ELEYAGI	£ 12.00
8Y2M 8ELEYAGI	£ 15.50
10Y2M10ELEYAGI	£ 33.00
PBM1010EPARABEAM	£39.50
PBM1414EPARABEAM	£48.00
5XY2M	£24.70
8XY2M	£31.00
10XY2M	£40.80
Q4/2M	£25.80
Q6/2M	£33.90
Q8/2M	£39.00
MBM548/70cm	£31.00
MBM88/70cm	£42.50
8XY 70cm	£36.80
12XY 70cm	£46.00

HOXIN

GP5 2mtr colinear 6.4DB	£33.00
DX1 discone TX-TX	£34.00
HF5DX 80-40-20-15-10 mtr Vertical	£84.00

ALL ACCESSORIES AVAILABLE – PLUGS SKTS CO-AX 2MTR COLINEAR £31.50, 70CM COLINEAR £31.50

Access

PRICES INCLUDE VAT AT THE PRESENT RATE OF 15%
OPEN MON–FRIDAY 9:00–5.30. SATURDAY 10:00–3:00. INSTANT HP FACILITY AVAILABLE
EASY ACCESS M2–M11–M1 NORTH CIRCULAR ROAD–EASY PARKING

BARCLAYCARD VISA

BI-PAK BARGAINS

5T21 **SCREWDRIVER SET**
6 precision screwdrivers in hinged plastic case. Sizes — 0.8, 1.4, 2, 2.4, 2.9 and 3.8mm **£1.75**

5T31 **NUT DRIVER SET**
5 precision nut drivers in hinged plastic case. With turning rod. Sizes — 3, 3.5, 4, 4.5 and 5mm **£1.75**

5T41 **TOOL SET**
5 precision instruments in hinged plastic case. Crosspoint (Phillips) screwdrivers — H 0 and H 1 Hex key wrenches — 1.5, 2 and 2.5mm **£1.75**

5T51 **WRENCH SET**
5 precision wrenches in hinged plastic case. Sizes — 4, 4.5, 5, 5.5 and 6mm **£1.75**

BUY ALL FOUR SETS 5T21-5T51 and get HEX KEY SET **FREE**

HEX KEY SET ON RING
Sizes 1.5, 2, 2.5, 3, 4, 5, 5.5 and 6mm
Made of hardened steel
HX/1 **£1.25**

"IRRESISTABLE RESISTOR BARGAINS"

Pak No.	Qty.*	Description	Price
SX10	400	Mixed "All Type" Resistors	£1
SX11	400	Pre-formed ¼-½ watt Carbon Resistors	£1
SX12	200	⅛ watt Carbon Resistors	£1
SX13	200	¼ watt Carbon Resistors	£1
SX14	150	½ watt Resistors 22 ohm-2m2 Mixed	£1
SX15	100	1 and 2 watt Resistors 22 ohm-2m2 Mixed	£1

Paks SX12-15 contain a range of Carbon Film Resistors of assorted values from 22 ohms to 2.2 meg. Save pounds on these resistor paks and have a full range to cover your projects.
*Quantities approximate, count by weight

"CAPABLE CAPACITOR PAKS"

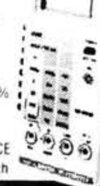
Pak No.	Qty.*	Description	Price
SX16	250	Capacitors Mixed Types	£1
SX17	200	Ceramic Capacitors Miniature Mixed	£1
SX18	100	Mixed Ceramics 1pf-56pf	£1
SX19	100	Mixed Ceramics 68pf-0.5mf	£1
SX20	100	Assorted Polyester/Polystyrene Capacitors	£1
SX21	60	Mixed C280 type capacitors metal foil	£1
SX22	100	Electrolytics, all sorts	£1
SX23	50	Quality Electrolytics 50-1000mf	£1
SX24	20	Tantalum Beads, mixed	£1

*Quantities approximate, count by weight.

BRAND NEW LCD DISPLAY MULTITESTER.

RE 188m
LCD 10 MEGOHM INPUT IMPEDANCE
*3½ digit *16 ranges plus hFE test facility for PNP and NPN transistors *Auto zero, auto polarity *Single-handed, pushbutton operation *Over range indication *12.5mm (½-inch) large LCD readout *Diode check *Fust circuit protection *Test leads, battery and instructions included

Max indication	1999 or — 1999
Polarity indication	Negative only. Positive readings appear without + sign
Input impedance	10 Megohms
Zero adjust	Automatic
Sampling time	250 milliseconds
Temperature range	— 5°C to 50°C
Power Supply	1 x PP3 or equivalent 9V battery
Consumption	20mW
Size	155 x 88 x 31mm



RANGES
DC Voltage 0-200mV
0-2-20-200-1000V Acc 0.8%
AC Voltage 0-200-1000V
Acc 1.2% DC Current 0-200uA
0-2-20-200mA 0-10 A Acc 1.2%
Resistance 0-2-20-200K ohms
0-2 Megohms Acc 1%
BI-PAK VERY LOWEST POSS PRICE **£35.00** each

GUARANTEED TO SAVE YOU MONEY

SX27A 60 Assorted Polystyrene Bead Capacitors Type 9500 Series PPD **£1.00**
SX28A 50 Assorted Silver Mica Caps 5.6pF-150pF **£1.00**
SX29A 50 Assorted Silver Mica Caps 180pF-4700pF **£1.00**
SX30A 50 High Voltage Disc Ceramics 750V min up to 8KV. Assorted useful values **£1.00**
SX31A 50 Wirewound 9 watt (arg) Resistors. Assorted values 1 ohm-12K **£1.00**

AUTO SCREWDRIVER/DRILL

Automatic spiral ratchet. Complete with 2 screwdriver blades, 5 & 65mm. 1 screwdriver cross point No. 1 & three drills — 2, 2.8 and 3.65mm — A MUST FOR ALL HOBBY-BUILDERS & CONSTRUCTORS. Order No. ASD/1 **£3.50 each.**

BARGAINS

SX91	20 x Large .2" RED LED	£1
SX42	20 small .125 Red LED's	£1
SX43	10 Rectangular Green LED's .2	£1
SX46	30 Assorted Zener Diodes 250mw-2 watt mixed voltages, all coded. New	£1
SX47	4 Black Instrument Knobs—winged with pointer ¼" Standard screw. Fit size 29 x 20mm	50p
SX49	20 Assorted Slider Knobs. Black/Chrome, etc	£1
SX80	12 Neons and Filament Lamps. Low voltage and mains — various types and colours — some panel mounting	£1

SIREN ALARM MODULE

American Police type screamer powered from any 12 volt supply into 4 or 8 ohm speaker. Ideal for car burglar alarm, freezer breakdown and other security purposes. 5 watt, 12v max.

£3.85
Order No. BP124.

The Third and Fourth Hand...

.... you always need but have never got "until now". This helpful unit with Rod mounted horizontally on Heavy Base. Crocodile clips attached to rod ends. Six ball & socket joints give infinite variation and positions through 360° also available attached to Rod a 2½ diam magnifier giving 2.5 x magnification. Helping hand unit available with or without magnifier. Our Price with magnifier as illustrated ORDER NO. T402 **£5.50**
Without magnifier ORDER NO. T400 **£4.75**

SX52 6 Black Heatsink will fit TO 3 and TO 220. Ready drilled. Half price value £1

SX53 1 Power finned Heatsink. This heatsink gives the greatest possible heat dissipation in the smallest space owing to its unique staggered fin design, pre drilled TO 3 Size 45mm square x 20mm high **40p**

SX54 TO-66 size 35mm x 30mm x 12mm **35p**

SX55 1 Heat Efficiency Power Finned Heatsink 90mm x 80mm x 35mm High. Drilled to take up to 4 x TO 3 devices £1.50 each

SINGLE SIDED FIBREGLASS BOARD

Order No.	Pieces	Size	Sq.Ins.	Price
FB1	4	9 x 2¾"	100	£1.50
FB2	3	11 x 3"	100	£1.50
FB3	4	13 x 3"	156	£2.00

DOUBLE SIDED FIBREGLASS BOARD

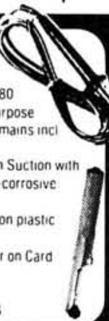
Order No.	Pieces	Size	Sq.Ins.	Price
FB4	2	14 x 4"	110	£2.00

SILICON POWER TRANSISTORS — T03

NPN like 2N3055 — but not full spec
100 watts 50V min.
10 for £1.50 — Very Good Value
100s of uses — no duds
Order No. SX90

BI-PAK SOLDER-DESOLDER KIT

Kit comprises ORDER NO. SX80
1 High Quality 40 watt General Purpose Lightweight Soldering Iron 240v mains incl 3/16" (4.7mm) bit
1 Quality Desoldering pump. High Suction with automatic ejection. Knurled, anti-corrosive casing and teflon nozzle
1.5 metres of De-soldering braid on plastic dispenser
2 yds (1.83m) Resin Cored Solder on Card
1 Heat Shunt tool tweezer Type
Total Retail Value over **£12.00**
OUR SPECIAL KIT PRICE **£8.95**



BI-PAK PCB ETCHANT AND DRILL KIT

Complete PCB Kit comprises
1 Expo Mini Drill 10,000RPM 12v DC incl 3 collets & 1 x 1mm Twist bit
1 Sheet PCB Transfers 210mm x 150mm
1 Etch Resist Pen
1 ½lb pack FERRIC CHLORIDE crystals
3 sheets copper clad board
2 sheets Fibreglass copper clad board
Full instructions for making your own PCB boards
Retail Value over **£15.00**
OUR BI-PAK SPECIAL KIT PRICE **£9.75**
ORDER NO. SX81

PROGRAMMABLE UNIJUNCTION TRANSISTOR

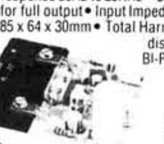
"PUT" case T0106 plastic MEU22 Similar to 2N6027/6028 PNPN Silicon.

Price:	1-9	10-49	50-99	100+	Normal Retail
Each:	20p	18p	15p	13p	Price £0.35 each

SX33A	6 small (min.) SDST/SPDT Toggle Switches 240v 5amp	£1.00
SX35A	Rocker Switches 250V 2A	£1.00
SX32A	12 Assorted Jack & Phono plugs, sockets and adaptors, 2.5m, 3.5mm and standard sizes	£1.00
SX71	50 "C108 "Fallouts" Manufacturers out of spec on volts or gain You test.	£1.00
SX72	A mixed bundle of Copper clad Board Fibre glass and paper. Single and double sided. A fantastic bargain	£1.00

5 watt (RMS) Audio Amp

High Quality audio amplifier Module. Ideal for use in record players, tape recorders, stereo amps and cassette players, etc. Full data and back-up diagrams with each module.
Specification
• Max Power Supply 30v • Power Output 5 watts RMS • Load Impedance 8-16 ohms • Frequency response 50Hz to 25KHz—3db • Sensitivity 70mv for full output • Input Impedance 50k ohms • Size 85 x 64 x 30mm • Total Harmonic distortion less than ·5%
BI-PAK'S give away price



£2.25
You could not Build one for this price.

TECASBOTY

The Electronic Components and Semiconductor Bargain of the Year. A host of Electronic components including potentiometers — rotary and slider, presets — horizontal and vertical. Resistors of mixed values 22ohms to 2M2 — 1/8 to 2 Watt. A comprehensive range of capacitors including electrolytic and polyester types plus disc ceramics etcetera. Audio plugs and sockets of various types plus switches, fuses, heatsinks, wire, nuts/bolts, gromets, cable clips and tyes, knobs and P.C. Board. Then add to that 100 Semiconductors to include transistors, diodes, SCR's opto's, all of which are current everyday usable devices. In all a Fantastic Parcel. No rubbish all identifiable and valued in current catalogues at well over £25.00. Our Fight Against Inflation Price — Beat the Budget — Down with Depression **JUST £6.50.**

SX38	100 Silicon NPN Transistors—all perfect Coded mixed types with data and eqvt sheet. No rejects. Real value.	£3.00
SX39	100 Silicon PNP Transistors—all perfect. Coded mixed types with data and eqvt. sheet. No rejects. Fantastic value.	£3.00

2N3055 The best known Power Transistors in the World — 2N3055 NPN 115w.
Our BI-PAK Special Offer Price:

10 off	50 off	100 off
£3.50	£16.00	£30.00

BD312 COMPLIMENTARY PNP POWER TRANSISTORS: TO 2N3055.
Equivalent MJ2955 — BD312 — T03
SPECIAL PRICE £0.70 each
10 off £6.50

MORE BARGAINS!

SX51	60 metres PVC covered Hook-up wire single and stranded. Mixed colours.	£1
SX58	25 Assorted TTL Gates 7400 Series. 7401-7460	£1
SX59	10 Assorted flip Flops and MSI TTL	£1
SX60	20 Assorted Slider Potentiometers	£1
SX62	40 Assorted Pre-Sets Hor/Vert etc.	£1
SX79	10 Reed Switches — glass type 3 Micro Switches — with lever	£1

BI-PAK

Send your orders to Dept. PW2 BI-PAK PO BOX 6 WARE HERTS.
SHOP AT 3 BALDOCK ST. WARE HERTS
TERMS: CASH WITH ORDER. SAME DAY DESPATCH. ACCESS, BARCLAYCARD ALSO ACCEPTED. TEL (0920) 3182. GIRO 388 7006
ADD 15% VAT AND 75p PER ORDER POSTAGE AND PACKING

Use your credit card. Ring us on Ware 3182 NOW and get your order even faster. Goods normally sent 2nd Class Mail.
Remember you must add VAT at 15% to your order.
Total Postage add 75p per Total order.

TOROIDALS

The toroidal transformer is now accepted as the standard in industry, overtaking the obsolete laminated type. Industry has been quick to recognise the advantages toroidals offer in size, weight, lower radiated field and, thanks to I.L.P., PRICE.

Our large standard range is complemented by our SPECIAL DESIGN section which can offer a prototype service within 7 DAYS together with a short lead time on quantity orders which can be programmed to your requirements with no price penalty.

★ **294 TYPES TO CHOOSE FROM!**

★ **ORDERS DESPATCHED WITHIN 7 DAYS OF RECEIPT FOR SINGLE OR SMALL QUANTITY ORDERS**

★ **5 YEAR NO QUIBBLE GUARANTEE**

TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
30 VA	1x010	6+6	2.50	
70×30mm	1x011	9+9	1.66	**£5.12**
0.45Kg	1x012	12+12	1.25	+p/p £1.04
Regulation	1x013	15+15	1.00	+VAT £0.92
18%	1x014	18+18	0.83	TOTAL £7.08
	1x015	22+22	0.68	
	1x016	25+25	0.60	
	1x017	30+30	0.50	
50 VA	2x010	6+6	4.16	
80×35mm	2x011	9+9	2.77	
0.9Kg	2x012	12+12	2.08	
Regulation	2x013	15+15	1.66	**£5.70**
13%	2x014	18+18	1.38	+p/p £1.30
	2x015	22+22	1.13	+VAT £1.05
	2x016	25+25	1.00	TOTAL £8.05
	2x017	30+30	0.83	
	2x028	110	0.45	
	2x029	220	0.22	
	2x030	240	0.20	
80 VA	3x010	6+6	6.64	
90×30mm	3x011	9+9	4.44	
1Kg	3x012	12+12	3.33	
Regulation	3x013	15+15	2.66	**£6.08**
12%	3x014	18+18	2.22	+p/p £1.67
	3x015	22+22	1.81	+VAT £1.16
	3x016	25+25	1.60	TOTAL £8.91
	3x017	30+30	1.33	
	3x028	110	0.72	
	3x029	220	0.36	
	3x030	240	0.33	
120 VA	4x010	6+6	10.00	
90×40mm	4x011	9+9	6.66	
1.2Kg	4x012	12+12	5.00	
Regulation	4x013	15+15	4.00	**£6.90**
11%	4x014	18+18	3.33	
	4x015	22+22	2.72	+p/p £1.67
	4x016	25+25	2.40	+VAT £1.29
	4x017	30+30	2.00	TOTAL £9.86
	4x018	35+35	1.71	
	4x028	110	1.09	
	4x029	220	0.54	
	4x030	240	0.50	
160 VA	5x011	9+9	8.89	
110×40mm	5x012	12+12	6.66	
1.8Kg	5x013	15+15	5.33	
Regulation	5x014	18+18	4.44	**£7.91**
8%	5x015	22+22	3.63	+p/p £1.67
	5x016	25+25	3.20	+VAT £1.44
	5x017	30+30	2.66	TOTAL £11.02
	5x018	35+35	2.28	
	5x026	40+40	2.00	
	5x028	110	1.45	
	5x029	220	0.72	
	5x030	240	0.66	

TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
225 VA	6x012	12+12	9.38	
110×45mm	6x013	15+15	7.50	
2.2Kg	6x014	18+18	6.25	
Regulation	6x015	22+22	5.11	**£9.20**
7%	6x016	25+25	4.50	+p/p £2.00
	6x017	30+30	3.75	+VAT £1.68
	6x018	35+35	3.21	TOTAL £12.88
	6x026	40+40	2.81	
	6x025	45+45	2.50	
	6x033	50+50	2.25	
	6x028	110	2.04	
	6x029	220	1.02	
	6x030	240	0.93	
300 VA	7x013	15+15	10.00	
110×50mm	7x014	18+18	8.33	
2.6Kg	7x015	22+22	6.82	**£10.17**
Regulation	7x016	25+25	6.00	+p/p £2.00
6%	7x017	30+30	5.00	+VAT £1.83
	7x018	35+35	4.28	TOTAL £14.00
	7x026	40+40	3.75	
	7x025	45+45	3.33	
	7x033	50+50	3.00	
	7x028	110	2.72	
	7x029	220	1.36	
	7x030	240	1.25	
500 VA	8x016	25+25	10.00	
140×60mm	8x017	30+30	8.33	**£13.53**
4Kg	8x018	35+35	7.14	+p/p £2.35
Regulation	8x026	40+40	6.25	+VAT £2.38
4%	8x025	45+45	5.55	TOTAL £18.26
	8x033	50+50	5.00	
	8x042	55+55	4.54	
	8x028	110	4.54	
	8x029	220	2.27	
	8x030	240	2.08	
625 VA	9x017	30+30	10.41	
140×75mm	9x018	35+35	8.92	**£16.13**
5Kg	9x026	40+40	7.81	+p/p £2.50
Regulation	9x025	45+45	6.94	+VAT £2.79
4%	9x033	50+50	6.25	TOTAL £21.42
	9x042	55+55	5.68	
	9x028	110	5.68	
	9x029	220	2.84	
	9x030	240	2.60	

IMPORTANT: Regulation – All voltages quoted are FULL LOAD. Please add regulation figure to secondary voltage to obtain off load voltage.

The benefits of ILP toroidal transformers

ILP toroidal transformers are only half the weight and height of their laminated equivalents, and are available with 110V, 220V or 240V primaries coded as follows:

For 110V primary insert "0" in place of "X" in type number.

For 220V primary (Europe) insert "1" in place of "X" in type number.

For 240V primary (UK) insert "2" in place of "X" in type number.

How to order Freepost:

Use this coupon, or a separate sheet of paper, to order these products, or any products from other ILP Electronics advertisements. No stamp is needed if you address to Freepost. Cheques and postal orders must be crossed and payable to ILP Electronics Ltd. Access and Barclaycard welcome. All UK orders sent within 7 days of receipt of order for single and small quantity orders.

Also available at Electrovalue, Maplin and Technomatic.

ILP Electronics Ltd.
Freepost 3, Graham Bell House, Roper Close, Canterbury CT2 7EP.

Please send ____________________

Total purchase price ____________________

I enclose Cheque ☐ Postal Orders ☐ Int. Money Order ☐

Debit my Access/Barclaycard No. ____________________

Name ____________________

Address ____________________

Signature ____________________

PW/2/83

Post to: ILP Electronics Ltd, Freepost, 3 Graham Bell House, Roper Close, Canterbury CT2 7EP, Kent, England.
Telephone Sales (0227) 54778: Technical (0227) 64723. Telex 965780

ILP TRANSFORMERS (a division of ILP Electronics Ltd)

COMMUNICATION CENTRE OF THE NORTH

The largest range of communications equipment available in the North. Full range of receivers, transceivers, antennas, power supplies, meters. Ali tubing – wall brackets etc.

We are the only official TRIO stockists in the North West. Full range of equipment on display. Guaranteed after sales service.

We can offer a full range of receiver from the SR9 2m **£46.00** to the Drake R7 at **£989** and the NRD515 at **£985.00** + Antenna Tuning Units – Audio Filters – Indoor and Outdoor Antennas – Cable – Plugs etc.

RECEIVERS

TRIO R2000 Solid State Receiver due shortly. **TRIO R600** Solid State Receiver 150KHz to 30MHz **£235.00. Yaesu FRG7** Solid State Receiver **£199.00. Yaesu FRG7700** Solid State Receiver **£329.00.**

For the caller a wide range of Aluminium Tubing, Clamps, etc. at competitive prices, i.e. 12′ × 2″ Ali Tubing **£9.00.**
+ VHF – Aircraft Band Converters and Receivers.

Part Exchanges welcome. Second hand lists daily.
Send S.A.E. for details of any equipment.
HP terms. Access/Barclaycard facilities.
Open 6 days a week. 24 Hour Mail Order Service.

Phone 0942-676790.

STEPHENS JAMES LTD.
47 WARRINGTON ROAD,
LEIGH, LANCS. WN7 3EA.

Made in U.S.A. **Explore a new world of short wave listening pleasure with the:–**

A.E.A. MBA-RO
MORSE/RTTY/
ASCII READER

- SIMPLE CONNECTION TO YOUR RECEIVER VIA SPEAKER OUTPUT.
- 32 CHARACTER FLUORESCENT DISPLAY (NO SEPARATE TV DISPLAY NEEDED).
- AUTOMATIC TRACKING AND DISPLAY OF MORSE SPEEDS TO 99 W.P.M.
- WIDE AND NARROW RTTY SHIFTS.
- 12V D.C. POWER INPUT.
- WELL PROVEN DESIGN – MANY THOUSANDS IN USE.

PRICE **£175** inc. (P&P & ins £2.50)

A.E.A. ADVANCED MORSE KEYERS

Microprocessor controlled – multiple message memories – beacon mode for VHF use – automatic contest serial number generation – programmable speeds – random character training program – SIMPLY THE WORLDS BEST!!

Prices as follows:

KT-2 Keyer/Trainer **£89.00** inc.
CK-2 "Contester" Memory Keyer **£99.00** inc.
MM-2 Morsematic Keyer **£119.00** inc.
(Post and packing £2)

The MM-2 includes all features listed. The KT-2 and CK-2 include subsets.

I.C.S. ELECTRONICS LTD
P.O. Box 2
Arundel, West Sussex BN18 0NX
Tel: 024 365 590
Please allow 7 days for Delivery

MODULAR ELECTRONICS

95 HIGH STREET SELSEY, Nr CHICHESTER, SUSSEX. TEL: SELSEY (0243) 602916

DISTRIBUTOR FOR SOLID STATE MICROWAVE (THOMPSON-CSF) RF PRODUCTS G8COS

Type	P/out	Gain	Volts	Freq.	Price
2N3866	1w	10dB	28	175MHz	£1.01
2N4427	1w	10dB	12	175MHz	£1.22
2N3553	2.5w	9dB	28	175MHz	£1.34
2N5913	2w	7dB	12	470MHz	£1.95
SD1127	4w	12dB	12	175MHz	£2.75
2N6080	4w	12dB	12	175MHz	£5.97
SD1143	10w	10dB	12	175MHz	£7.75
2N6081	15w	6.3dB	12	175MHz	£8.86
2N6082	25w	5.7dB	12	175MHz	£9.49
2N6084	40w	4.5dB	12	175MHz	£13.80
SD1428	45w	6.5dB	12	175MHz	£17.55
SD1416	70w	6.7dB	12	175MHz	£28.75
SD1477	100w	6.0dB+	12	175MHz	£31.50
2N5590	10w	5.2dB	13.6	175MHz	£7.10
2N5591	25w	4.4dB	13.6	175MHz	£9.15
2N5944	2w	9dB	12	470MHz	£7.47
2N5945	4w	8dB	12	470MHz	£9.65
SD1135	5w	7.5dB	12	470MHz	£8.99
SD1136	10w	6dB	12	470MHz	£9.50
2N5946	10w	6dB	12	470MHz	£12.02
SD1088	25w	6.8dB	12	470MHz	£21.50
SD1089	40w	4.3dB	12	470MHz	£31.25
SD1434	50w	6.0dB	12	470MHz	£28.33

Ex Equip 2N5070 2-30MHz 25wPEP	£2.88
2N5645 Mot. 12v 470MHz 4W out.	£4.50
2N5914 RCA 12v 470MHz 2w 7dB	£4.60
218BLY Mul Studless BLY38 2w 470MHz	£3.45
61387 RCA Studless Sim C1-12 CTC	£3.45

Free data sheets with all purchases which include typical circuits etc.

LOW NOISE SMALL SIGNAL SEMICONDUCTORS.

BFR90 Mul. T Pack. 2.5dB N/F 1GHz	£2.82
BFR91 Mul. T Pack. 2.5dB N/F 1.2GHz	£3.45
BFR34a T Pack. 4dB N/F GHz	£2.25
BFT66 Low Intermod. T072	£2.59
SD306 "D" MOS MOSFET	£2.60
40673 RCA MOSFET	£0.92
BF900 UHF MOSFET Equiv 3SK88	£1.30

UNELCO Cased RF Mica Caps. Following PFs 10/20/30/40/50/60/70/80pF **£1.61**; 100/150/180/250pF **£1.73**; 1000pF **£1.84**.

PTFE Sheet 0.25mm 300mm Square	£2.30
H.P. 5082-2800 Hot Car. Diodes.	£1.12
H.P. 5082-2835 Hot Car. Diodes.	£0.98

Motorola MC12013L + 10 Prescaler I.C. with full data/instructions **£11.50**
BB103 Varicap Diodes **£0.50**
TIP33 **£0.58**; 2N918 **£0.50**; BF180 **£0.50**; BF115 **£0.50**; 2N5179 **£0.82**; BFY90 **£1.15**; ST2110-BSX20/2N2369a **£0.30**.

TRIMMERS
Tetfer PTFE 1-10pF **44p.** DAU PTFE Film 1 to 9pF or 1.5-18pF **34p.** Surplus 2.5-25pF **22p.**
SPRAGUE (Grade 1) Mica Trimmers (500v) for R.F. Amps. 2.5-7pF **81p.** 4-20pF **86p.** 7-40pF **86p.** 16-100pF **98p.** 25-150pF **£1.09.** 40-200pF **£1.15.**
HEATSINKS single sided ideal for RF amps. Redpoint 6M1 2.6 deg/w **£2.20**

FINISHED MADE UP AND TESTED EQUIPMENT
PA2 Preamplifier for 2 meters, using the latest UHF stripline MOSFET the BF900. 1½" square for fitting in the rig. 50Ω in/out imp. Only **£8.05** with instructions.
PAU2 432MHz Preamp. stripline using the BFR34a 14dB gain N/F < 2dB **£8.63.**

LINEAR AMPLIFIER MODULES for 144MHz without Ch/Over. Size 55×93mm with thermal interface. 50Ω.

PM2-10 0.4w in 10w out. 13.8v	£19.75
PM2-15 1.5w in 15w out. 13.8v	£21.75
PM2-25 4w in 25w out. 13.8v	£22.95

CPM LINEAR AMPS with full RF Changeover. Size 82×102mm. Preamp can be fitted in RX path. Spec. as for PM Series. Specify CPM type and add **£7.00** to PM series prices.

PRESCALER BOARD ÷ 10 Size 55×93mm with input amplifier (2×BFR34a) sens. 40mV 432mc uses MOT MC12012I I/C. 500MHz typ 600MHz. Only **£23.00.** 5v neg E supply.

Allow 7 days for delivery.
Barclaycard or Access on orders above £10.
POST and PACKING ADD 50p TO ALL ORDERS.
Orders sent 1st Class Post where weight permits.
SAME DAY DISPATCH ON ALL IN STOCK ITEMS.
Minimum invoiced order to approved customers £15.00.
ALL PRICES NOW INCLUDE VAT AT 15%.

VALVES

A1065	1.40	1A3	0.85	6AV6	0.85	6LD20	0.70	19AQ5	0.85
A2293	8.80	1L4	0.50	6AX4GT	1.30	6KG6A	2.70	19G3	11.50
QQV03-25A	36.50	1R5	0.60	6AX5GT	1.30	6Q7G	1.30	19G6	8.50
QQV06/40A	16.10	1S4	0.45	6BA6	0.55	6SA7	1.00	19H5	39.55
QV03-12	4.20	1S5	0.45	6BE6	0.60	6SG7	1.15	20D1	0.80
SP61	1.80	1T4	0.45	6BG6G	1.60	6SJ7	1.05	20F2	0.85
TT21	23.00	1U4	0.80	6BJ6	1.30	6SK7	0.95	20E1	1.30
TT22	18.50	1X2B	1.40	6BQ7A	0.85	6SL7GT	0.85	20P1	0.65
U25	1.15	2D21	1.10	6BR7	4.80	6SN7GT	0.80	20P3	0.75
U26	1.15		1.85*	6BW6	6.20	6SR7	1.10	20P4	1.25
U27	1.15	2K25	16.95	6BW7	1.80	6SQ7	0.95	20P5	1.35
U191	0.85		24.50*	6C4	0.50	6V6G	1.50	25L6GT	0.95
U281	0.70	2X2	1.15	6C6	0.55	6V6GT	0.95	25Z4G	0.75
U301	0.65	3A4	0.70	6CH6	8.20	6X4	0.95	30C15	0.50
U600	11.50	3AT2	2.40	6CL6	2.75	6X4WA	2.10	30C17	0.50
U801	0.90	3D6	0.50	6CW4	8.50	6X5GT	0.65	30C18	2.45
UBC41	1.20	3D22	23.00	6CX8	3.80	6Y6G	0.90	30F5	1.15
UABC80	0.75	3E29	19.00	6D6	0.70	6Z4	0.70	30FL2	1.40
UAF42	1.20	3S4	0.60	6F6	1.60	7B7	1.75	30FL12	1.25
UBF80	0.70	4B32	18.25	6F6GB	1.10	8BN8	2.95	30FL14	2.15
UBF89	0.70	5B/254M	16.90	6F7	2.80	9D2	0.70	30L15	1.10
UCC84	0.85	5B/255M	14.50	6CY5	1.15	9D6	2.90	30L17	1.10
UCC85	0.70	5B/258M	12.50	6F8G	0.85	10C2	0.85	30P12	1.15
UCF80	1.30	5C22	29.90	6F12	1.50	10F18	0.70	30PL13	1.25
UCH42	1.65	5R4GY	1.20	6F14	1.15	10P13	1.50	30PL14	2.45
UCH81	0.75	5U4G	0.75	6F15	1.30	11E2	19.50	35L6GT	1.40
UCL82	0.95	5V4G	0.75	6F17	3.20	12A6	0.70	35W4	0.80
UF41	1.35	5Y3GT	0.95	6F23	0.75	12AT6	0.70	35Z4GT	0.80
UF80	0.95	5Z3	1.50	6F24	1.75	12AT7	0.65	50C5	1.15
UF85	0.95	5Z4G	0.75	6F33	10.50	12AU7	0.60	50CD6G	1.35
UL84	0.95	5Z4GT	1.05	6FH8	4.20	12AV6	0.95	75B1	1.25
UM80	0.90	6/30L2	0.90	6GA8	1.95	12AX7	0.65	75C1	1.70
UM84	0.70	6AB7	0.70	6GH8A	0.95	12BA6	0.90	76	0.95
UY82	0.70	6AC7	1.15	6H6	1.60	12BE6	1.25	78	0.95
UY85	0.85	6AG5	0.60	6J4	1.35	12BH7	1.95	80	1.70
VR105/30	1.25	6AH6	1.15	6J4WA	2.00	12BY7A	2.30	85A2	1.40
VR150/30	1.35	6AK5	0.65	6J5	2.30	12C8	0.65		2.55*
X66	0.95	6AK8	0.60	6J5GT	0.90	12E1	18.95	807	1.25
X61M	1.70	6AL5	0.60	6J6	0.65	12J5GT	0.55		1.90*
XR1-6400A	125.00	6AL5W	0.85	6J6W	0.90	12K7GT	0.70	813	19.32
Z759	19.00	6AM5	4.20	6JE6C	2.95	12K8GT	0.80		88.50*
Z749	0.75	6AM6	1.50	6JS6C	2.95	12Q7GT	0.60	829B	14.00
Z800U	3.45	6ANBA	2.50	6JU6	5.85	12SC7	0.65	832A	8.90
Z801U	3.75	6AQ4	3.40	6K7	0.80	12SH7	0.65	866A	3.80
Z803U	16.00	6AQ5	1.00	6KD6	4.50	12SJ7	0.70	866E	6.25
Z900T	2.45	6AQ5W	1.80	6L6M	2.80	12SQ7	1.45	931A	13.80
		6AS6	1.15	6L6G	2.50	12SQ7GT	0.85	954	0.60
		6AT6	0.90	6L6GC	2.65	12Y4	0.70	955	1.20
		6AU6	0.60	6L6GT	1.25	13D3	0.70	956	0.60
				6L7G	0.65	13D5	0.90	957	1.05
				6L18	0.70	13D6	0.80	1625	1.80
				6LQ6	2.95	14S7	1.15	1629	1.85

*SPECIAL QUALITY

VALVES and transistors

Telephone enquiries for valves, transistors, etc: retail 749 3934, trade and export 743 0899.

COLOMOR 907/3530 London
(ELECTRONICS) LTD.
170 Goldhawk Rd., London W.12

POSTAGE: £1-£3 45p; £3-£5 55p; £5-£10 60p; £10-£15 75p; £15-£20 90p; over £20 free.

PRICES MAY VARY **Delivery by return of post.**

Tel. 01-749 3934
Open Monday to Friday 9-1 pm, 2.00-5.30 pm.

3 × £1 DISCOUNT VOUCHERS

ambit's new autumn/winter catalogue is OUT NOW!

128 PAGES

70p

at all good newsagents or direct

ALL THE 'USUAL' BITS (Rs, Cs, Tr's, ICs etc) + ALL THE TRICKY BITS

- TOKO COILS, INDUCTORS, LC FILTERS
- PCM FILTERS, VHF/UHF HELICAL FILTERS
- UNELCO CAPACITORS
- PCI INTELLIGENT LCD MODULES
- TOKO SWITCHES : F SERIES/R7000 SERIES
- ALPS POTENTIOMETERS AND KEYSWITCHES
- TOYO-TSUSHO COAX RELAYS FOR TX/RX
- CRYSTAL FILTERS, CERAMIC FILTERS
- WELLER SOLDERING IRONS
- COOPER TOOLS
- TEST EQUIPMENT
- BOOKS, MANUFACTURERS' HANDBOOKS
- HARDWARE, CASES, PANELWARE, ETC.
- MODULES, R&EW KITS
- RF POWER DEVICES

ORDERS SUBMITTED USING STOCKCODES DESPATCHED WITHIN 8 WORKING HOURS

- PHONE ORDER SERVICE — (NO MACHINES!)

PLEASE NOTE OUR NEW PHONE SYSTEM AUTOMATICALLY STACKS CALLS IN ORDER OF ARRIVAL SO PLEASE WAIT IF NOT ANSWERED IMMEDIATELY

8 AM — 7 PM MON — SAT
0277 230909

- COMPUTER ORDER SERVICE — 'REWTEL'

6 PM — 9 AM 300 BAUD/RS232
(IT MAY BE 24 HRS BY THE TIME YOU READ THIS)
0277 230959

ambit INTERNATIONAL

200, NORTH SERVICE ROAD
BRENTWOOD, ESSEX
CM14 4SG
Telephone : (0277) 230909
Telex: 995194 AMBIT G

MASTER ELECTRONICS NOW!

The PRACTICAL way!

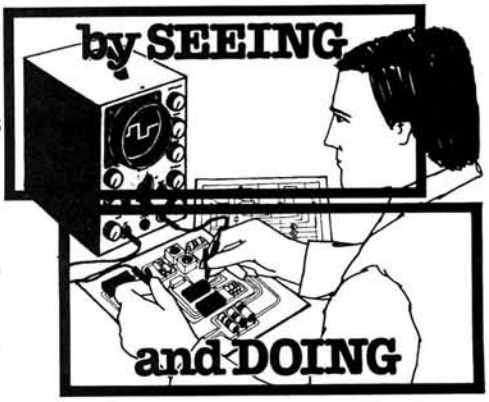
This new style course will enable anyone to have a real understanding of electronics by a modern, practical and visual method. No previous knowledge is required, no maths, and an absolute minimum of theory.

You learn the practical way in easy steps mastering all the essentials of your hobby or to start or further a career in electronics or as a self-employed servicing engineer.

All the training can be carried out in the comfort of your own home and at your own pace. A tutor is available to whom you can write personally at any time, for advice or help during your work. A Certificate is given at the end of every course.

You will do the following:

- Build a modern oscilloscope
- Recognise and handle current electronic components
- Read, draw and understand circuit diagrams
- Carry out 40 experiments on basic electronic circuits used in modern equipment
- Build and use digital electronic circuits and current solid state 'chips'
- Learn how to test and service every type of electronic device used in industry and commerce today. Servicing of radio, T.V., Hi-Fi and microprocessor/computer equipment.



New Job? New Career? New Hobby? Get into **Electronics** Now!

FREE! COLOUR BROCHURE

Please send your brochure without any obligation to

NAME

ADDRESS

BLOCK CAPS PLEASE

I am interested in:

PW/2/83

- COURSE IN ELECTRONICS as described above
- RADIO AMATEUR LICENCE
- MICROPROCESSORS
- LOGIC COURSE

OTHER SUBJECTS

POST NOW TO:

British National Radio & Electronics School Reading, Berks. RG1 BR

T. POWELL 311 EDGWARE ROAD, LONDON W.2

SPECIAL OPENING OFFER – A negative ion generator kit

This kit will saturate your home or office with millions of refreshing ions. Without fans or any moving parts it will put our a pleasant breeze. A pure flow of ions pours out like water from a fountain. The result is that the air feels pure, crisp and wonderfully refreshing.

As a special opening offer we are selling the kit, complete with case for **ONLY £18.**

We also stock PW kits including:–

Amateur TV UP Converter	ZW22		£14.50
Morse Practice Oscillator	ZW16	Jan '82	£8.25
R.F. Noise Bridge	ZW15	Jan '82	£22.50
Beginners Short-wave Receiver (Components only)	ZW11	Sept '81	£13.50
Active Receiving Antenna	ZW10	March '81	£9.00
Beginners 2 metre Converter	ZW6	Sept '80	£15.00
AF Speech Processor	ZW14	Jan '80	£18.50

All prices include post & 15% VAT

Reprints of articles 40p extra (+SAE if no kit required)

Barclaycard/Access welcome.

Please allow 14 days for delivery.

We have many millions of components in stock – personal callers are very welcome at our new shop at

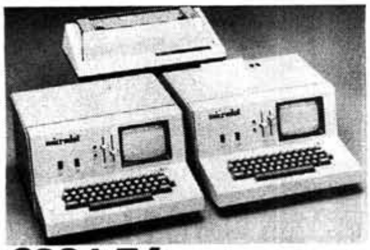
311 EDGWARE ROAD, LONDON W2. 01-723 9246

PLEASE MENTION

PRACTICAL WIRELESS

WHEN REPLYING TO ADVERTISEMENTS

THE **microdot**



CW/RTTY COMMUNICATIONS TERMINAL

STANDARD FEATURES INCLUDE

- ★ Integral high resolution video monitor
- ★ Professional keyboard with many special functions
- ★ Real-time clock (constantly displayed)
- ★ Transmit and receive both CW (morse) and RTTY (teleprinter)
- ★ Users callsign programmed in
- ★ Receive CW speed tracking and display
- ★ Self checking facility
- ★ Char. by char. or 'page' transmission modes
- ★ Stylish two tone metal cabinet

OTHER OPTIONAL FEATURES

- ★ Printer interface board (Centronics compatible)
- ★ On-board 40 column printer (12V)
- ★ External 80 column printer (SEIKOSHA GP100A)

£381.74 inc. carriage
(Standard unit cost – VAT not included)

We welcome Access

Forget all those messy wires, the MICRODOT now offers a totally integrated communications system. Write for full details to . . .

POLEMARK Ltd. Lower Gower Road, Royston, Herts. SG8 5EA. Tel. Royston (0763) 47874

MICROWAVE MODULES LTD

FOUR OF THE BEST!

MTV435

435MHz ATV 20 WATT TRANSMITTER

★ 20 WATTS PSP OUTPUT POWER
★ BUILT-IN TEST GENERATOR
★ TWO VIDEO INPUTS
★ AERIAL CHANGEOVER FOR RX CONVERTER
★TWOCHANNELUSINGPLUGINCRYSTALS

This high performance ATV transmitter consists of a two channel exciter, video modulator and a two stage 20 watt linear amplifier. The unit will accept both colour and monochrome signals, and a sync-pulse clamp is incorporated to ensure maximum output. An internal pin diode aerial changeover switch allows connection of the aerial to a suitable receive converter when in the receive mode. **(The MRC435/600 is ideal for this application, and has an output on channel 35 – £27.90 inc. VAT, p&p £1).**

Full transmit/receive switching is included together with an internal wave form test generator. The unit is housed in a highly durable block diecast case and all circuitry is constructed on high quality glass-fibre printed circuit board. The two stage linear amplifier is housed in a separate internal compartment, thus ensuring excellent stability.

£149 inc VAT (p&p £2.50)

MM4001KB

FEATURES: RTTY TRANSCEIVER

★ Complete Transceive Data Communication System using the Latest State of the Art Microprocessor
★ Wide Range of Popular RTTY & ASCII Speeds
★ 170, 425, 850 AND 1200 Hz Shifts Available on both RX and TX
★ Four Separate Message Stores
★ Compatible with a Standard Parallel ASCII Keyboard and Printer
★ Stored Test Functions
★ Auto CQ Call Facility
★ Automatic Carriage Return/Line Feed
★ Automatic Letter and Figure Shift
★ Upper & Lower Case Display for ASCII

Modes of operation

: Murray Coded RTTY - 45.5, 50, 75, 100 baud. Amateur Standard ASCII 110, 300, 600, 1200 baud. In each of these modes the receive converter will accept FSK and AFSK signals.

This MM4001KB unit, when simply connected to any HF or VHF transceiver, a standard TV set, and the supplied keyboard, provides a complete data communication capability at a cost of less than half of any similar system. The MM4001 ICB contains a terminal unit, a microprocessor controlled TV interface and the necessary transmit tone generators to enable transmission and reception of RTTY and ASCII, with the minimum of ancillary equipment.

£299 inc VAT (p&p £4.00)

MML144/50-S

144MHz 50 WATT LINEAR POWER AMPLIFIER

A TRULY COST EFFECTIVE PRODUCT!
— REAL VALUE FOR MONEY!

This new product represents one of the best combinations of high power at a realistic cost, whilst still not requiring a huge power supply.

FEATURES:

★ 50 WATTS OUTPUT POWER FOR 10 WATTS IN
★ LINEAR ALL MODE OPERATION
★ STRAIGHT THROUGH MODE AT THE FLICK OF A SWITCH
★ ULTRA LOW NOISE RECEIVE PREAMP – 35K88 – SWITCH SELECTABLE
★ RF VOX (WITH MANUAL OVERRIDE)
★ LED STATUS LIGHTS

£85 inc VAT (p&p £2.50)

MML432/30-L

432MHz 30 WATT LINEAR POWER AMPLIFIER

Following the success of the ever popular MML144/30-LS, comes a 70cm equivalent.

Designed to complement the many 1 or 3 watt hand held transceivers, this new product will provide an output power of 30 watts. (An internal attenuator controlled by a front panel switch allows the input sensitivity to be selected between 1/3 watts.) An RF VOX circuit is provided to allow automatic changeover and switched delay times for SSB or FM can be selected on the front panel. A low noise receive preamp is included to provide an increased receiver sensitivity.

FEATURES:

★ 30 WATTS OUTPUT POWER
★ SUITABLE FOR 1 OR 3 WATT TRANSCEIVERS
★ ULTRA LOW-NOISE RECEIVE PREAMPLIFIER
★ RF VOX (WITH MANUAL OVERRIDE)
★ LINEAR ALL MODE OPERATION
★ LED STATUS LIGHTS
★ SUPPLIED WITH ALL CONNECTORS

£99 inc VAT (p&p £3.00)

ALL MICROWAVE MODULES PRODUCTS ARE FULLY GUARANTEED FOR 12 MONTHS (INCLUDING PA TRANSISTORS)

WELCOME

MICROWAVE MODULES
BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011 Telex: 628608 MICRO G
CALLERS ARE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY TO FRIDAY
9–12.30, 1–5.00

AUTHORISED ICOM DEALER

YOUR OFFICIAL SOMMERKAMP IMPORTER

FDK

WELZ BRIDGES IN STOCK

LOOK SPECIAL PRICES

HF | VHF

FT902DM	FT307	FT480R	FT290R	FT207R
2 year warranty All options fitted RRP £959 **P.O.A.**	Similar to FT107 but with all options RRP £1050 **P.O.A.**	Mobile base 2 metre multimode RRP £379 **£349**	Mobile/portable improved front end with free charger **£239**	Hand portable complete. All for **£169**

2m AMPLIFIERS

FL 2050	(100W)	£125
FL 2010	(10W) Specially for use with FT290	£65

STOP PRESS

4dB colinear, only £17.50

We stock genuine Sommerkamp quality accessories

NT30 12V3A regulated P/S **£23. NT60** 12V3A regulated P/S **£30. YS2000** SWR bridge & power meter, reads 200W output from **YS2000** SWR bridge & power meter 1.8-150MHz **£54.**

RECEIVERS

FRG 7700 (With memories fitted)	£389
FRG 7	£199
SX200N	£259
Bearcat 220FB. SPECIAL OFFER	£199

FT102 ALL OPTIONS £779

VHF EQUIPMENT

FT 290R	2m all mode portable transceiver (inc charger).	£239
FT 480R	2m all mode mobile/base station	£369
FT 780	70cms version	£439
Sommerkamp SC 1 base station console for 480 & 780		£125
FT 208RE	2m Hand portable transceiver	£209
FT 708RE	70cms version of above	£219
FT207	SPECIAL OFFER	£159
FT 230R	**NEW** 25W 2m FM mobile	£229
TS 280	**NEW VERSION** 144-148 12½/25 kHz. Reverse repeater, 50 Watts output	£229
FT 725	FM mobile. SPECIAL OFFER	£199

ICOM

IC BC30	230V AC Base Charger and Hod	£39.00	IC720A	HF Transceiver & Gen. Cov. Receiver	£883.00
IC BC25	230V AC Trickle Charger	£4.25	PS15	Power Supply for 720A	£99.00
IC CP1	Car Charging Lead	£3.20	IC251E	2M Multimode Base Station	£499.00
IC BP2	6V Nicad Pack for IC2E	£22.00	IC25E	2M Synthesised Compact 25W Mobile	£259.00
IC BP3	9V Nicad Pack for IC2E	£17.70	IC290E	2M Multimode Mobile	£366.00
IC BP4	Empty Case for 6×AA Nicads	£5.80	IC2E	2M FM Synthesised Handheld	£169.00
IC BP5	11.5V Nicad Pack for IC2E	£30.50	IC L1/2/3	Soft Cases	£3.50
IC DC1	12V Adaptor Pack for IC2E	£8.40	IC HM9	Speaker/Microphone	£12.00
IC ML1	10W Booster	£49.00			
IC730	HF Mobile Transceiver 8 Band	£586.00			

HF EQUIPMENT

FT 7B & YC 7B		£459
FP 12	(Matching p.s.u.)	£85
FT 767	(=FT 707) mobile HF, with scanning mic and CW filter	£629
FT 277ZD	(=FT101ZD) Sommerkamp unit with **everything** fitted (AM or FM, you choose)	£679
FT 1	The ultimate in HF transceivers. Supplied with **all** extras fitted	P.O.A.
FL 277ZD	HF Amplifier 2kW	£439
External speakers, VFOs etc are all available		P.O.A.

FT790 SOON IN STOCK **FT90R 70cms P.O.A.**

We also carry a range of products from other manufacturers such as JAYBEAM, MICROWAVE MODULES, L.A.R., DATONG, CUSHCRAFT etc.

A selection of marine and commercial equipment is also available.

ALL PRICES MAY CHANGE OWING TO CURRENCY EXCHANGE FLUCTUATIONS.
All prices include VAT. HP terms available. Part Exchange. Access and Barclaycard welcome.
Goods normally despatched by return of post.

41 Sutton Road, Wigan Road, Bolton. G4GHE 800 yds from Junc. 5 M61. Easy Parking. Tel: (0204) 652233

GEMINI COMMUNICATIONS

9.30-5.30 Mon-Sat. Closed Wed. p.m.

When replying to Classified Advertisements please ensure:

(A) That you have clearly stated your requirements.
(B) That you have enclosed the right remittance.
(C) That your name and address is written in block capitals, and
(D) That your letter is correctly addressed to the advertiser.

This will assist advertisers in processing and despatching orders with the minimum of delay.

Receivers and Components

VALVES, RADIO, TV. Industrial transmitting, despatched to all parts of the world by post, 6000 parts in stock. Quotation S.A.E. Cox Radio (Sussex) Ltd., The Parade, East Wittering, Sussex. 2023 (024 366).

MAIDSTONE has its own Component Shop. Thyronics Control Systems, 8 Sandling Road, Maidstone. 675354.

BOURNEMOUTH/BOSCOMBE. Electronic components specialists for 33 years. Forresters (National Radio Supplies) late Holdenhurst Road. Now at 36, Ashley Road, Boscombe. Tel. 302204. Closed Weds.

BRAND NEW COMPONENTS BY RETURN

HIGH STABILITY MINIATURE FILM RESISTORS 5%
¼W E24 Series 0.51R-10MO. (Except 7M5)—**1p.**
0.125W E12 Series 1OR to 1M8—**2p.** 0.5W E12 Series 1RO to 10MO.—**1½p.** 1.0W E12 Series 1OR to 10MO—**3p.**
¼W Metal Film E12 series 10R to 1MO 5%—**2p.** 1%—**3p.**

CAPACITORS.
SUBMINIATURE Ceramic E12 100V 2% 1.8pf to 47pf.—**3p**
2% 56pf. to 330pf.—**4p.** 10% 390pf. to 4700pf.—**4p**
Plate Ceramic 50V Wkg. Vertical Mounting.
E12 22pf. to 1000pf. & E6 1K5pf. to 47Kpf.—**2p**
Miniature Polyester 250V Wkg. Vertical Mounting.
.01, .015, .022, .033, .047 & 068 mfds.—**4p**
0.1—**5p.** 0.15 & 0.22—**6p.** 0.33 & 0.47—**8p**
0.68—**11p.** 1.0—**15p.** 1.5—**20p.** 2.2—**22p**

ELECTROLYTIC. Wire Ended (Mfds/Volts).

0.47/50	5p	22/25	6p	100/25	7p	470/25	11p
1.0/50	5p	22/50	6p	100/50	8p	470/40	18p
2.2/50	5p	47/16	6p	220/16	8p	1000/15	15p
4.7/50	5p	47/25	6p	220/25	8p	1000/25	25p
10/50	5p	47/50	6p	220/50	10p	1000/40	35p
22/16	6p	100/16	7p	470/16	11p	2200/16	20p

TANTALUM BEAD SUBMINIATURE ELECTROLYTICS.
0.1, 0.22, 0.47, 1.0, 2.2 ≠ 35V & 4.7 ≠ 6.3V—**14p**
4.7/16V & 25V—**15p.** 10/16 & 22/6—**20p.** 10/25—**29p**
10/35V, 22/16V, 47/6.3V, 68/3V & 100/3V—**30p**
15/25, 22/25, 47/10—**35p.** 47/16—**80p.** 220/16—**£1.20**
Polystyrene 63V Wkg. E12 Series Long Axial Wires.
10 pf. to 820 pf.—**3p.** 1000 pf. to 10,000pf.—**4p**

TRANSISTORS.

BC107/8/9	12p	BC182L	8p	BF197	10p
BC147/8/9	10p	BC184L	8p	BFY50/51/52	18p
BC157/8/9	10p	BC212L	8p	BFX88	25p
BC547C/8C/9C	7p	BCY70	15p	2N2926	7p
BC557C/8C/9C	7p	BF195	10p	2N3055	50p

8 Pin D.I.L. i.c's 741 Op/amp.—**18p.** 555 Timer—**24p**
Holders 8 Pin—**9p.** 14 Pin—**12p.** 16 Pin—**14p.** 18 Pin—**16p.** 24 Pin—**22p.** 28 Pin—**25p.** 40 Pin—**30p.**

DIODES (p.i.v./amps).

75/25mA	1N4148	2p	1250/1A	BY127	10p
100/1A	1N4002	4p	400/3A	1N5404	14p
800/1A	1N4006	6p	60/1.5A	S1M1	5p
1000/1A	1N4007	7p	30/150mA	AAY32	12p

ZENER DIODES.
E24 Series 3V3 to 33V 400mW—**8p.** 1W—**14p**
L.E.D.'s 3 mm. & 5 mm. Red—**10p.** Green, Yellow—**14p**
Grommets for 3 mm.—**1¼p.** Holders for 5 mm.—**2p**
FUSES. 20mm. Glass. 100mA to 5A. Q.B.—**5p.** A/S—**8p.**
VOLTAGE REGULATORS+. 5V, 8V, 12V, 15V 100mA.—**35p**
5V, 8V, 12V, 15V, 18V & 24V. 1A—**55p**
PRESET POTENTIOMETERS
50mW & ¼W 100R to 1MO—**7p.**
PAIRS BATTERY SNAPS PP3—**6p.** PP9—**12p.**

THE C. R. SUPPLY CO.
127, Chesterfield Road, Sheffield S8 0RN.
V.A.T. Inclusive Prices, Postage 15p
(FREE over £5.00)

SMALL ADS

The prepaid rate for classified advertisements is 34 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £11.20 per single column centimetre (minimum 2·5 cms). All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Room 2612, IPC Magazines Limited, King's Reach Tower, Stamford St., London, SE1 9LS. (Telephone 01-261 5846).

NOTICE TO READERS

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

BIG BARGAIN BOX

Our Big Bargain Box contains over a thousand components – resistors, capacitors, pots, switches, diodes, transistors, panels, bits and pieces, odds and ends. All useful stuff – would cost many times the price we are asking if bought separately. Approx. weight 4lbs. ONLY £5.00 inc. post – you're bound to come back for another!!!

ESP 147B, FOUNDRY LANE,
SOUTHAMPTON, SO1 3LS.

Lots of surplus bargains on our latest list – send an SAE for your copy now.

RADIO CANADA, Radio Peking, Voice of America, Radio Moscow. A Vega 308 (short, medium, F.M.). Pulls these and dozens more, daily. £19.99 inclusive. Corrigan Radiowatch, Building 109, Prestwick Airport, KA9 2RT.

VHS CONVERTORS. 2M, 4M, airband, marine. Mosfet RF stage 10.7MHz IF. Feed SW receiver or IF strip. Mechanically tuned, 6:1 reduction. £9 each inc pp. SAE data, lists. H. Cocks, Cripps Corner, Roberts Bridge, Sussex. Tel: 058083 317.

GOVERNMENT SURPLUS components 8 equipment. Send SAE for list. A.F.R. Electronics, School Lane, Moulton, Northampton.

NEW SURPLUS RELEASE

Ex GOVT. LEAD ACID ACCUMULATORS. Brand new 10V. 5Ah. Famous manufacture. Easily tapped in 2v stages. Size only 7" × 5" × 2". Ideal for emergency lighting and power supplies. Burglar alarms etc. Must have cost Govt. over £20 each. Our price **£5.50** each, carriage £2.50. 2 for **£10,** carriage £3.50. 4 for **£18,** carriage £6. 8 for **£32,** carriage £10. All despatched unfilled. Robust wooden tray with carrying handles. Holds 8 accumulators **£5.**

CORDLESS INDUCTIVE LOOP HEADPHONES. Self powered. Input via loop or external min. BNC socket. Contains transistorised high gain amplifier. Operates from internal batteries. Noise excluding muffs. Switch on when placed on head. Special offer whilst stocks last. **£6,** p.p. £2. 2 pairs for **£12** post free.

LIGHTWEIGHT HEADSETS. (Govt. Release). Brand new. 600 ohms impedance. A bargain at **£3.50,** p.p. £1. 2 pairs for **£7** post free.

RIDICULOUS RESISTOR SALE. Brand new ¼ watt carbon film resistors. 5% tol. High quality resistors made to exacting specifications by automatic machines. E12 range. 1RO to 10M. In lots of 1000 (25 per value). Only **£8** per 1000. Lots of 5000 for **£35.** 1 RO to 10M. 1000 PCB type resistors **£2.50.** Bulk purchase enables us to offer 1000 mixed pre formed carbon film resistors. 5% tol. For PCB mounting. Huge range of preferred values. **£2.50** per 1000. 4000 for **£8,** postage 15p in £1.

GENUINE AFV TANK HEADSETS AND MIKE £3.50 per pair, p.p. £1. 2 pairs **£7** post free. All headphones fitted with Ex ministry plug. Standard jack plugs available **25p** each. 2 for **40p.** Headphone extension sockets available at **25p** each, 2 for **40p.** Impedance of first two items 600 ohms. All headphones in good condition.

THE GOVT. SURPLUS WIRELESS EQUIPMENT HANDBOOK. This useful handbook gives detailed information and circuit diagrams for British and American Government Surplus Receivers, Transmitters and Test Equipment etc. Also contained are some suggested modification details and improvements for Surplus equipment. Incorporated in this revised edition is a Surplus/Commercial cross referenced valve and transistor guide. Latest revised facsimile edition. Limited number of copies of this invaluable book which is now a standard reference work in this field. **Only £7.50,** p.p. £1.50. No V.A.T. on books.

New release of **MODERN DYNAMIC MOVING COIL MICROPHONES.** 200 ohms impedance. Switch incorporated. Mostly with lead and DIN plug. Used but nice condition. 3 designs of case housing. Price one mike our choice **£2** plus 50p p.p. Bargain offer all 3 mikes **£4.50,** p.p. £1.

GENUINE EX-GOVT COLLAPSIBLE AERIALS. A fully adjustable highly efficient whip aerial in 5 sections. Length 1½ metres. Closed 300 m/m. Copper plated sections. As used on Ex Govt. Manpacks. Brand new in makers boxes. **£2.50** each, p.p. 75p. 2 for **£5** post free.

HAVE YOU SEEN THE GREEN CAT. 1000s of new components, radio, electronic, audio at unbelievably low prices. Send 50p and receive catalogue and FREE RECORD SPEED INDICATOR. Try a JUMBO PACK. Contains transistors, resistors, caps, pots, switches, radio and electronic devices. **Over £50 worth for £11.** Carriage and packing £2.50. MINI JUMBO PACK **(£20 worth) for £5,** p.p. £1.50. PLEASE ADD 15% V.A.T. to all orders including carriage and p.p.

MYERS ELECTRONICS Dept. PW,
12/14 Harper Street, Leeds LS2 7EA. Leeds 452045.
New retail premises at above address (opposite Corals). Callers welcome 9 to 5 Mon. to Sat. Sunday 10 till 3pm. Govt. surplus items always in stock.

CRYSTALS Brand new high-precision. You benefit from very large stocks held for industrial supplies. All normal freq standards, baud rates, MPU, and all magazine projects inc: HC33/U: 1·0, **£3·75.** 2·5625 MHz, **£3·50.** HC18/U: 4·0, 5·0, 6·0, 7·0, 8·0, 9·0, 10·0, 10·7, 12·0, 15·0, 16·0, 18·0, 20·0, 38·6667 MHz, **£3·35.** Selected freqs stocked in Glider, Marine and 27 MHz bands. Any freq made to order in 8 weeks from **£4.50,** 2-3 week service available.
CB Beat "Bleed-Over" with our special 10.695 MHz, 7 kHz BW. HC 18/U Filters **£4.00** each. Quantity discounts. Many crystals stocked for CB conversions.
Prices inc. VAT and UK post. SAE lists.

P. R. GOLLEDGE ELECTRONICS
G3EDW, Merriott, Somerset, TA16 5NS.
Tel: 0460 73718

Surplus to our Industrial Usage.

POTENTIOMETERS
SPINDLE & PRESET

100 mix £5.75 inc. VAT, P & P.

C.W.O. – cheque, P.O. or Access.

BLORE-BARTON LIMITED
Reedham House,
Burnham, Bucks.

Aerials

AERIAL WIRE 14G hand drawn copper 13p/m. 50ft drawn copper £5 per 100' coil. Aluminium 1.6mm dia., 13p/m. Postage up to 20m, £1.40. Over 20m, £2. Add VAT to total. WESTERN ELECTRONICS (UK) LTD, Dept PW, Fairfield Estate, Louth, Lincs. LN11 0JH.

COPPER AERIAL WIRE 14swg hard drawn 70' £5.50, 140' £8.90 inc. VAT. Postage £1.75. T.M.P. ELECTRONIC SUPPLIES, Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd, North Wales.

AERIAL WIRE 16swg (14awg) hard drawn copper 50 metres £5.90 incl. postage. S. M. Tatham, 1 Orchard Way, Fontwell, Arundel, W. Sussex.

AERIAL BOOSTERS. Improve UHF/VHF Television, VHF Radio Reception. Price from £7. SAE leaflets. Electronic Mailorder Ltd, Ramsbottom, Lancashire, BL0 9AGW.

G2DYM ANTI-INTERFERENCE
ANTI-TVI TRAP DIPOLES
TX & S.W.L. MODELS OR KITS

Data Sheets Large SAE. Aerial Guide 50p. Indoor and Invisible Aerials **£3.50.**
Callers welcome **Tel: 03986-215**

G2DYM, Uplowman, Tiverton, Devon.

Services

SHEET METAL WORK, fine or general front panels chassis, covers, boxes, prototypes. 1 off or batch work, fast turnround. 01-449 2695. M. Gear Ltd., 179a Victoria Road, New Barnet, Herts.

Software

RTTY ON BBC MICRO. Program cassette £7.50. SAE Details and Software list. Terminal units also available. R. Sterry, 1 Wavell Garth, Sandal, Wakefield, W. Yorkshire.

Books and Publications

AIRCRAFT COMMUNICATIONS HANDBOOK (UK/Europe) including spot MF, HF, VHF, UHF, frequencies, Military & Civil Airports, Air Traffic Control Centres, Long Range Stations, Meteorological Broadcasts, Broadcast Times, Navigation Beacons, Co-ordinates, Callsigns, Maps, etc £7.50, P/P £1. PLH ELECTRONICS, 97 Broadway, Frome, Somerset, BA11 3HD.

ELECTRONICS BOOKS. International publishers. Lowest rates. Ask list. Business Promotion, 376 Lajpatrai Market, Delhi, India.

LIST SECONDHAND BOOKS for sale 100 Nos Wireless/TV/Telegraphy etc. SAE please, Gosing Books, 19 Moorside Road, West Moors, Dorset.

POPULAR FREQUENCY CHECKLIST (Europe & U.K; medium & long wave) with unique map for bearings anywhere. £1 postpaid or 7 IRC. – DIAL-SEARCH, 9 Thurrock Close, Eastbourne, BN20 9NF.

"WORLD RADIO TV HANDBOOK" 1983, write for price and publication date. Pointsea, 25 Westgate, North Berwick, East Lothian.

Personal

START YOUR OWN profitable home-based import/export business today. Free introductory offer. Worldwide Business Opportunities, Dept. B11, 151 Harefields, Oxford.

Wanted

ELECTRONIC COMPONENTS PURCHASED. All types considered – Must be new. Send detailed list – Offer by return – WALTONS, 55A Worcester Street, Wolverhampton.

Veteran & Vintage

VINTAGE RADIO'S. Over 200 always in stock from 1920s to 1950s. Including T/V Service Sheets etc. Radio Vintage, 250 Seabrook Road, Seabrook, Nr Hythe, Kent, CT21 5RQ. Phone Anytime 0303-30693. (Late Clock Shop, Folkestone.)

For Sale

YAESU 7700M RECEIVER (12 memories), plus matching ATU. Mint condition. £345 o.n.o. Buyer collects. Tel. Newbury 46679.

DIY QSL CARDS. Just add your own callsign, etc. Also SWL design 50 for £1.70. 100 for £3.00 inc. P&P. SAE for samples. LAM ELECTRONICS (PW) 47 Golden Miller Road, Cheltenham, Glos. Tel: 0242 43891 (24hr).

LIST-A-RIG. A service offered by G3RCQ Electronics to introduce buyers and sellers of used amateur equipment. Buying? its free, just send an S.A.E; Selling/Wanted? send S.A.E for details on how to join the fast growing list. List-A-Rig is sent and updated daily. No waiting no deadlines. List-A-Rig (PW) 65, Cecil Avenue, Hornchurch, Essex, RM11 2NA.

JULIAN G6HHI

CALL SIGN LAPEL BADGES PROFESSIONALLY ENGRAVED AND BY RETURN OF POST

£1.50. State Name and Callsign.

AYLMER KELLY-P
2 PICKWICK ROAD,
CORSHAM, WILTS. SN13 9BJ

24 VOLTS NI-CAD BATTERY (new) contains 20 .5A/H cells. £8. Tel. Leeds 496048 after 7.00pm.

RARE AUDIO AMP IC's Matsushita AN7140 small quantity. Only £5.00 each. Tel. 073 56 6087. Private.

YAESU FT101ZD (AM) MIC £400 o.n.o. Y0901 Monitorscope. Offers. Steve 66ICN, Ware 68555 evenings.

LLOYTRON 12 BAND RECEIVER. Mains/battery. Boxed as new £85. Redditch 23921.

MORSE CODE CASSETTES. C90 8-13 wpm in groups of five. Plain language, 3 minutes sections, numbers, exam pieces etc, with readback! Inclusive price £3.20. S. M. Spain (Bromsgrove) Ltd, 2 New Road, Bromsgrove, Worcs. Phone 72460.

AMATEUR EQUIPMENT bought and sold. Cash waiting. Contact G3RCQ Hornchurch 55733 evenings.

BADGES PROFESSIONALLY ENGRAVED! Call signs, CB, clubs, management, sales teams, shops etc. SAE for details, or £1.25 with your Call Sign etc. Rugeley Electronics, 30 Upper-Brook St., Rugeley, Staffs.

HAMEG HM412-4 OSCILLOSCOPE with case, probes, nearly new, £325 o.n.o. Phone Whitchurch (Shropshire) 3041.

SONY ICF 2001 RECEIVER with accessories as new £95. Tel. Dartford 76327 evenings.

SMALL REED SWITCHES 10p. Magnets 17p. Small DC Solenoids 35p. Postage 25p. Grimsby Electronics, Lambert Road, Grimsby, S. Humberside. Hundreds Bargains at shop. SAE List.

Miscellaneous

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys stock. Special sizes to order. Call Earth Stations, 01-228 7876. 22 Howie Street, London SW11 4AR.

SUPERB INSTRUMENT CASES by Bazelli, manufactured from PVC. Faced steel. Hundreds of people and industrial users are choosing the cases they require from our vast range. Competitive prices start at a low £1.05. Chassis punching facilities at very competitive prices. 400 models to choose from. Suppliers only to Industry and the Trade. BAZELLI, (Dept. No. 25) St. Wilfrid's Lane, Halton, Lancaster LA1 6LT.

ALUMINIUM TUBES/RODS for masts/aerials. Nerva Metals, Wembley, Middlesex. Tel. 01-904 4647.

BURGLAR ALARM EQUIPMENT. Ring Bradford (0274) 308920 for our catalogue or call at our large showrooms opposite Odsal Stadium.

MORSE CODE CASSETTES
LANGUAGE CASSETTES

Cassette A: 1-12 w.p.m. for amateur radio examination.
Cassette B: 12-25 w.p.m. for professional examination preparation. Each cassetten is type C90.
Price each Cassette (including booklets) **£4.75**
Rayles 'Speekeezy' Spanish, German, French or Italian **£4.95 each.**
Price includes postage etc. UK only.
MH ELECTRONICS (Dept PW),
12 Longshore Way, Milton,
Portsmouth PO4 8LS.

THE SCIENTIFIC WIRE COMPANY
PO Box 30, London E.4. Telephone 01-531 1568

SWG	1 lb	8 oz	4 oz	2 oz
ENAMELLED COPPER WIRE				
8 to 34	3 30	1.90	1.00	0.80
35 to 39	3.52	2.10	1.15	0.85
40 to 43	4.87	2.65	2.05	1.46
44 to 47	8.37	5.32	3.19	2.50
48 to 49	15.96	9.58	6.38	3.69
SILVER PLATED COPPER WIRE				
14 to 30	7.09	4.20	2.43	1.72
TINNED COPPER WIRE				
14 to 30	3.97	2.41	1.39	0.94
FLUXCOR SOLDER				
	5.75	3.16	1.73	0.96

Prices include P&P and VAT.
Orders under £2 add 20p.
SAE for list of Copper/Resistance Wire.
Dealer enquiries welcome.

PRACTICAL WIRELESS PCB's 1.5mm G.F.

May 82	FM Mains Intercom WR149	**£2.36**
June 82	Audio amp WR150	**£1.43**
July 82	Morse Show WR125	**£6.56**
Aug 82	Freq Synth WR145-8	**Set of 4 £8.44**
Sep 82	Audio level meter WR139	**£1.98**
Oct 82	Cranbourne freq counter WR 154-5	**Set £11.95**
Nov 82	Cranbourne ovened OSC WR159	**£2.39**
	Repeater time out alarm WR156	**£1.85**

Postage for the UK Add 35p postage and packing to complete order. Europe 70p. Overseas please remit accordingly.
Cash with order please.

PROTO.DESIGN
14 Downham Road, Ramsden Heath,
Billericay, Essex CM11 1PU. Telephone 0268-710722

Service Sheets

TECHNICAL INFORMATION SERVICE

SERVICE SHEETS: full size by return – radio, mono etc. £2 + large sae. CTVs & Music Centres from £3.

SERVICE MANUALS: sole suppliers most obsolete equipment. Everything stocked to latest releases. Fantastic stocks CTVs/videos. E.g. A823 £6.50; Autovox (early) £6.50.

TV AND VIDEO: unique repair manuals and collections of circuits – L.s.a.e. for price lists.

Quotations/free 50p magazine/pricelists/etc., for large s.a.e.

£2 plus 8" × 10" s.a.e. for service sheet and manual catalogues with £4 vouchers.

PHONE 0698 883334 FOR FAST QUOTES – Open 4-6 daily, 11-1 weekends

T.I.S., 76 CHURCH ST., LARKHALL, LANARKSHIRE ML9 1HE.

30,000 SERVICE SHEETS IN STOCK
COLOUR MANUALS ALSO AVAILABLE

TV Monos, Radios **£2.00.** Tuners **£2.00.** Tape Recorders, Record Players **£2.00.** Transistors from **£2.00.** Car Radio **£3.00** +SAE. Stereograms & Music Centres **£2.00.** Radiograms **£2.00.** Also Colour Available. State if circuit will do if sheets are not in stock. All TV Sheets are full length 24 × 12 not in Bits & Pieces. All other Data full lengths. All Sheets **£2.00** except colour. S.A.E. please. Old Valve Radio's **£3** + SAE 9 × 3.

C. CARANNA,
71 Beaufort Park, London NW11 6BX.
01-458 4882 (Mail Order).

BELL'S TELEVISION SERVICES for service sheets on Radio, TV, etc., £1.25 plus SAE. Colour TV Service Manuals on request. SAE with enquiries to B.T.S., 190 Kings Road, Harrogate, N. Yorkshire. Tel (0423) 55885.

Courses

CONQUER THE CHIP . . . Master modern electronics the PRACTICAL way by SEEING and DOING in your own home. Write for your free colour brochure now to British National Radio & Electronics School, Dept. C1, Reading, Berks. RG1 1BR.

Educational

COURSES – RADIO AMATEURS EXAMINATION. City & Guilds. Pass this important examination and obtain your licence, with any RRC Home Study Course. For details of this and other courses (GCE, professional examinations, etc.) write or phone – THE RAPID RESULTS COLLEGE, Dept JX6, Tuition House, London SW19 4DS. Tel: 01-947 7272 (9am-5pm) or use our 24 hr Recordacall Service: 01-946 1102 quoting Dept. JX6.

INDEX TO ADVERTISERS

H.A.C SHORT-WAVE KITS

WORLD-WIDE RECEPTION

TRIPLE-T

TRANSISTOR RECEIVER

for use with headphones
or small speaker.

Construct your own
SHORTWAVE RECEIVER

for only

£26.50

for the complete kit

All orders despatched within 7 days. Send stamped and addressed envelope now for free descriptive catalogue of kits and accessories.

SORRY, NO CATALOGUES WITHOUT S.A.E.

"H.A.C." SHORT-WAVE PRODUCTS

**P.O. Box No. 16, 10 Windmill Lane
Lewes Road, East Grinstead, West
Sussex RH19 3SZ.**

It's easy to complain about advertisements.

Every week, millions of advertisements appear in the press, on posters or in the cinema.

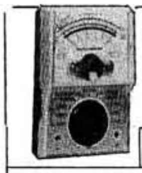
Most of them comply with the rules contained in the British Code of Advertising Practice and are legal, decent, honest and truthful.

But if you find one that, in your opinion, is wrong in some way, please write to us at the address below.

We'd like you to help us keep advertising up to standard.

The Advertising Standards Authority.

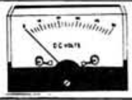
A.S.A. Ltd., Brook House, Torrington Place, London WC1E 7HN.



£6.50 post 50p L MINI-MULTI TESTER
Deluxe pocket size precision moving coil instrument. Impedance + Capacity – 4000 o.p.v. Battery included. 11 instant ranges measure: DC volts 5, 25, 250, 500. AC volts 10, 50, 500, 1000. DC amps 0-250μa; 0-250ma. Continuity and resistance 0 to 600K ohms.

De-Luxe Range Doubler Model, 50,000 o.p.v. £18.50. 7×5×2in. Post £1

NEW PANEL METERS £4.50
50μa, 100μa, 500μa, 1ma, 5ma, 50ma, 100ma, 25 volt.
VU Meter, 500ma, 1 amp, 2 amp.
Facia 2¼ × 2 × 1¼in. Post 50p.
Stereo VU 3¼ × 1⅝ × 1in. £3.



FAMOUS LOUDSPEAKERS

Post £2 each

Make	Model	Size	Watts	Ohms	Price
Goodmans	Tweeter	3½in	25	8	£4.00
Wharfdale	Tweeter	3½in	30	8	£7.50
Seas	Tweeter	4in	50	8	£9.50
Audax	Tweeter	4in	30	8	£6.50
Audax	Mid-Range	4in	50	8	£7.50
Seas	Mid-Range	4½in	100	8	£12.50
Seas	Mid-Range	5in	80	8	£12.00
Goodmans	Woofer	8in	25	4 or 8	£6.50
Wharfdale	Woofer	8in	30	8	£9.50
Audax	Woofer	8in	40	8	£14.00
Audax	Woofer	8in	40	8	£14.00
Audax	Woofer	10in	50	8	£16.00
Goodmans	8HB	8in	60	8	£12.50
Rigonda	Full-Range	10in	15	8	£5.00
Baker Hi-Fi	Deluxe	12in	15	8	£14.00
Baker Hi-Fi	Major	12in	30	4/8/16	£14.00
Baker Hi-Fi	Superb	12in	30	8/16	£24.00
Baker P.A.	Group 45	12in	45	4/8/16	£14.00
Baker Hi-Fi	Auditorium	12in	45	8/16	£22.00
Baker Hi-Fi	Auditorium	15in	60	8/16	£34.00
Baker P.A.	Group 75	12in	75	4/8/16	£18.00
Goodmans	GR (Group)	12in	90	8/16	£27.50
Baker P.A.	Group 100	12in	100	8/16	£24.00
Baker P.A.	Disco 100	12in	100	8/16	£24.00
Baker P.A.	Group 100	15in	100	8/16	£32.00
Baker P.A.	Disco 100	15in	100	8/16	£32.00
Goodmans	HPD (Disco)	12in	120	8	£29.50
EMI	450	13×8in	10	3/8	£8.00
EMI	Bass	13×8in	20	15	£12.50
Goodmans	HP (Bass)	18in	230	8	£80.00

BATTERY ELIMINATOR MAINS to 9 VOLT DC

Stabilised output, 9 volt 400 m.a. UK made with terminals. Overload cut out. 5 × 3¼ × 2½in. Transformer Rectifier Unit. Suitable Radios. Cassettes. **£4.50.**, Post 50p.

R.C.S. LOUDSPEAKER BARGAINS

3 ohm, 5 in. 7×4in. **£2.50;** 8×5in. 6½in. **£3;** 8in. **£4.50;** 10in. **£5**
8 ohm, 2in. 2½in. **£2.00;** 3in. 5in. 5×3in. 7×4in. **£2.50.**
6½in. 8×5in. **£3;** 8in. **£4.50;** 10in. **£5;** 12in. **£6.**
15 ohm, 3in. 5×3in. 6×4in. 7×4in. 5in. **£2.50;** 6½in. **£5.**
25 ohm, 3in. 5×3in. 7×4in. **£2.50;** 120 ohm, 3½in. dia. **£1.50.**

LOW VOLTAGE ELECTROLYTICS

1, 2, 4, 5, 8, 16, 25, 30, 50, 100, 200mF 15V **10p.**
500mF 12V **15p;** 25V **20p;** 50V **30p;**
1000mF 12V **20p;** 25V **35p;** 50V **50p;** 1200mF/76V **80p.**
2000mF 6V **25p;** 25V **42p;** 40V **60p;** 2000mF/100V **£1.20.**
2200mF63V **90p;** 2500mF 50V **70p;** 3000mF 25V **50p;** 50V **65p.**
3300mF 63V **£1·20;** 4700mF 63V **£1·20;** 2700mF/76V **£1.**
4700mF 30V **85p;** 1000mF 100V **£1.**

HIGH VOLTAGE ELECTROLYTICS

8/450V	**45p**	8+8/450V	**75p**	50+50/300V	**50p**
16/350V	**45p**	8+16/450V	**75p**	32+32+32/325V	**75p**
32/350V	**75p**	20+20/450V	**75p**	100+100/275V	**65p**
50/350V	**80p**	32+32/350V	**85p**	150+200/275V	**70p**
50/450V	**95p**	32+32/500V	**£1.80**	220/450V	**95p**

TRIMMERS 30pF, 50pF, **10p.** 100pF, 150pF, **15p.** 500pF **30p.**
CONDENSERS VARIOUS, 1pF to 0·01mF 350V, **5p.**
400V-0·001 to 0·05 **5p;** 0·1 **15p;** 0·25 **25p;** 0·47 **35p.**
1000V 0·1mF **25p;** 0·22mF **30p;** 0·47mF **60p;** 1750V 0·22mF **50p.**
WAFER SWITCHES. 1 pole 12W, 2 pole 6W, 3 pole 4W, 4 pole 3W, 2 pole 2W, 4 pole 2W **60p** ea.
TWIN GANGS 120pF **£1;** 500+200pF **£1.**
SINGLE SOLID DIELECTRIC 100pF, 500pF **£1.50.**
GEARED TWIN GANGS 25pF **95p;** 365+365+25+25pF **£1.**
SLOW MOTION DRIVE 6:1 **90p. REVERSE VERNIER 60p.**
VERNIER DIALS 36mm **£2.25** 50mm **£2.75**
SPINDLE EXTENDERS 85p. COUPLERS 65p.
NEON PANEL INDICATORS 250V. Red 1¼ · ⅜ **45p.**
RESISTORS. 10Ω to 10M. ½W. 1W. **2p,** 2W, **10p.**
HIGH STABILITY. ½W 2% 10 ohms to 1 meg., **8p.**
LOW OHM 1 watt ·470 ohm to 3·9ohm **10p.**
WIRE-WOUND 10 ohm to 10K 5 watt, 10 watt, **20p.**
BLANK ALUMINIUM CHASSIS. 6 × 4–**£1.45;** 8 × 6–**£1.80** 10 × 7–**£2.30;** 12 × 8–**£2.60;** 14 × 9–**£3.00;** 16 × 6–**£2.90;** 16 × 10–**£3.20.** *All 2½in. 18 swg.* **ANGLE ALI.** 6×¾×¾in. **30p.**
ALUMINIUM PANELS,–18 swg. 6 × 4–**45p;** 8 × 6–**75p;** 14 × 3–**75p;** 10 × 7–**95p;** 12 × 8–**£1.10;** 12 × 5–**75;** 16 × 6–**£1.10;** 14 × 9–**£1.45;** 12 × 12–**£1.50;** 16 × 10–**£1.75.**
PLASTIC box with aluminium facia 6¼ × 3¾ × 2in. **£1.50.**
ALUMINIUM BOXES WITH LIDS 3×2×1 **£1.** 4×2½×2 **£1.** 4×4×2½ **£1.35.** 6×4×2 **£1.60.** 7×5×3 **£2.40.** 8×6×3 **£2.50.** 10×7×2½ **£3.** 12×5×3 **£2.75.** 12×8×3 **£3.60**
BRIDGE RECTIFIER 200V PIV ½ amp **50p.** 2 amp **£1·00.** 4 amp **£1.50.** 8 amp **£2.50. DIODES** 1a, **10p;** 3a, **30p.**
TOGGLE SWITCHES SP **40p.** DPST **50p.** DPDT **60p.**
MINIATURE TOGGLES SP, **40p;** DPDT, **60p.**

MAINS TRANSFORMERS

		Post			Post
5-8-10-16V, ½A	**£2.50**	80p	24V 2½A Twice	**£8.00**	£2
6V ½A	**£2.00**	£1	20V 1A	**£3.00**	£1
6-0-6V, 1½A	**£3.50**	£1	20-0-20V 1A	**£3.50**	£1
9V 250ma	**£1.50**	80p	20/40/60V 1A	**£4.00**	£2
9V 3A	**£3.50**	£1	25-0-25V 2A	**£4.50**	£2
9-0-9V 50ma	**£1.50**	80p	28V 1A Twice	**£5.00**	£2
10-0-10V 2A	**£3.00**	£1	30V 1½A	**£3.50**	£1
10-30-40V 2A	**£3.50**	£1	30V 5A and		
12V 100ma	**£2.00**	80p	17-0-17V 2A	**£4.50**	£2
12V 3A	**£3.50**	£1	35V 2A	**£4.00**	£1
12-0-12V, 2A	**£3.50**	£1	34-29-0-29-34V 6A	**£12.00**	£2
15-0-15V 2A	**£3.75**	£1	0-12-27V 2A	**£3.50**	£1

RADIO COMPONENT SPECIALISTS

Dept. 2, 337, WHITEHORSE ROAD, CROYDON, SURREY, U.K. TEL: 01-684 1665

Post 50p Minimum. Callers Welcome. Closed Wed. Same day despatch. Access-Barclay-Visa. Lists 31p.

Published approximately on the 15th of each month by IPC Magazines Ltd., Westover House, West Quay Road, Poole, Dorset BH15 1JG. Printed in England by Chapel River Press, Andover, Hants. Sole Agents for Australia and New Zealand – Gordon & Gotch (A/sia) Ltd.; South Africa – Central News Agency Ltd.
Subscriptions INLAND and OVERSEAS £13·00 payable to IPC Services, Oakfield House, Perrymount Road, Haywards Heath, Sussex.

THE NEW MAPLIN CATALOGUE FOR 1983

BRINGS YOU RIGHT UP-TO-DATE IN ELECTRONICS & COMPUTING

ON SALE IN ALL BRANCHES OF WHSMITH FROM 18th NOVEMBER 1982
PRICE £1.25

Nearly 400 pages of all the most useful components and a whole big new section devoted to home computers and personal software. As always the catalogue keeps you up-to-date with the latest technology — even our ordinary miniature resistors are now superb quality 1% tolerance metal film, yet they're still only 2p each. As well as our usual quality products at low prices, now we're offering quantity discounts too. So pick up a copy of our catalogue now — it's the biggest *and* the best!

Send now for an application form — then buy it with MAPCARD. MAPCARD gives you real spending power — up to 24 times your monthly payments, instantly.

Post this coupon now for your copy of our 1983 catalogue, price £1.25 + 25p p&p. If you live outside the UK send £1.90 or 10 International Reply Coupons. I enclose £1.50.

Name ....

Address ....

....

....

PW 2/83

MAPLIN
ELECTRONIC SUPPLIES LTD
P.O. Box 3, Rayleigh, Essex SS6 8LR.
Telephone: Southend (0702) 552911/554155

Shops at:
159-161 King Street, Hammersmith, London W6 Tel: (01) 748 0926
Lynton Square, Perry Barr, Birmingham. Telephone: (021) 356 7292
284 London Road, Westcliff-on-Sea, Essex. Tel: (0702) 554000
All shops closed Mondays