FOR THE RADIO ENTHUSIAST . . .

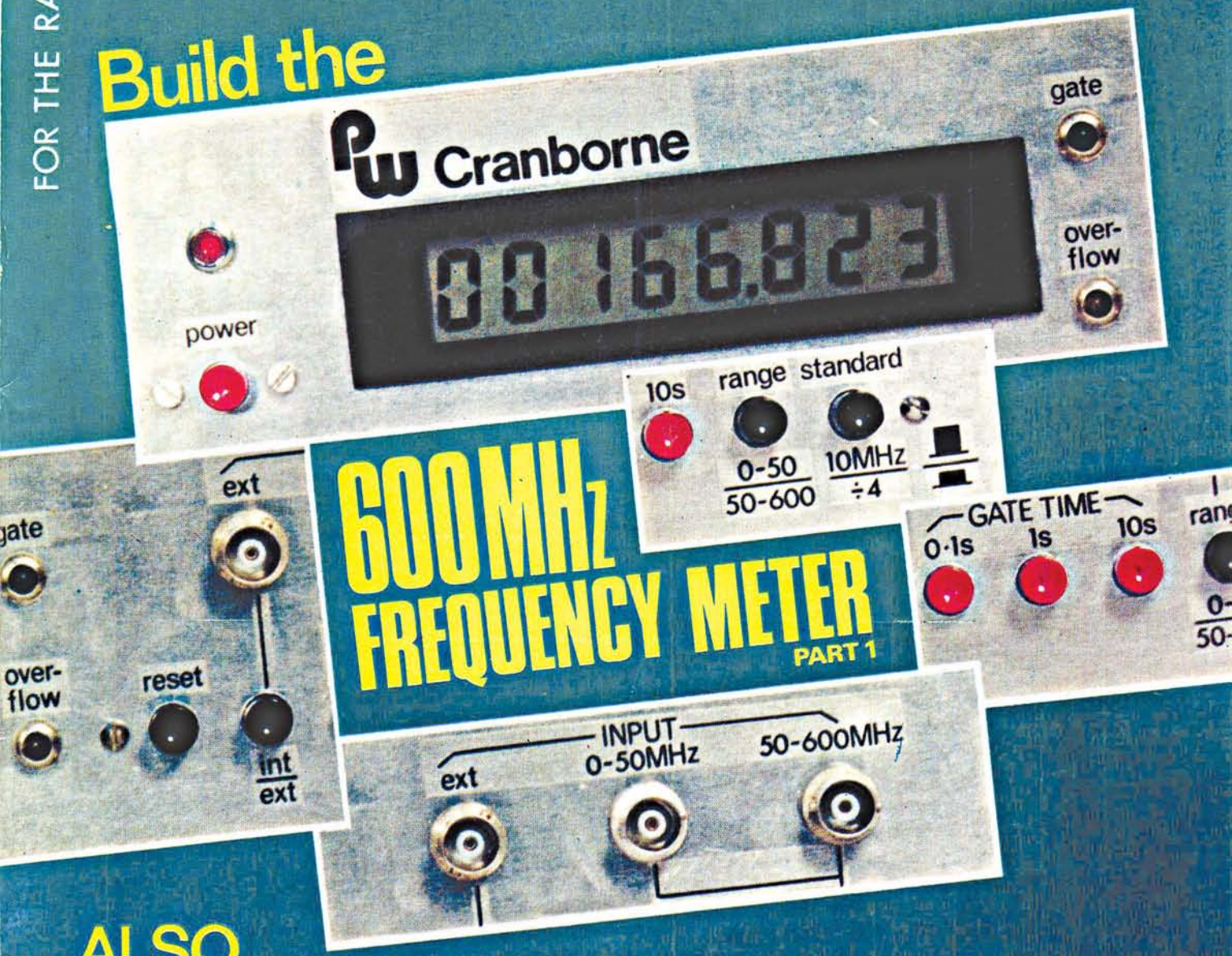
Practical Wireless

SEPTEMBER 1982

Australia $1.35
New Zealand $1.60
Malaysia $4.95
IR £1.29 (inc. VAT)

85p

Build the



600MHz FREQUENCY METER PART 1

ALSO

144MHz RING-BASE ANTENNA

CB OPERATING IMPRESSIONS

MAIL ORDER

THE EASY WAY – THE BREDHURST WAY

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

YAESU

		£	Carr.
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)
FT102S	160-10m 9 Band Transceiver: About	700.00	(—)
FT707	8 Band Transceiver 200W Pep	569.00	(—)
FT707S	8 Band Transceiver 20W pep	485.00	(—)
FP707	Matching Power Supply	125.00	(5.00)
FTV707R(2)	Transverter – 2M	198.00	(—)
FV707DM	Digital V.F.O.	186.00	(—)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MR7	Metal Rack for FT707	15.70	(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	(—)
FP80	Matching 230V AC Power Supply	63.00	(1.50)
FT290R	2M Portable Synthesised Multimode	249.00	(—)
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	10.00	(0.75)
YH77	Lightweight Headphones 8 ohm	10.00	(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)
YM34	As 148 but 8 Pin Plug	21.45	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)

FDK VHF/UHF EQUIPMENT

Multi 700EX	2M FM Synthesised 25W Mobile	199.00	(—)
Multi 750E	2M Multimode Mobile	289.00	(—)
Expander	70cm Transverter for M750E	199.00	(—)

STANDARD VHF/UHF

C78	70cm FM Portable	219.00	(—)
CPB78	10W Matching Linear	67.50	(1.50)
C58	2M Multimode Portable	239.00	(—)
CPB58	25W Matching Linear	79.50	(1.50)
CM8	Mobile Bracket	19.95	(1.00)
CL8	Soft Carrying Case	6.95	(0.75)
C12/230	Charger	7.59	(0.75)

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 (—)

WELZ SP15M £29.00

SWR – POWER METER

Model 110	H.F/2M Calibrated Power Reading	11.50	(0.50)
SWR25	H.F/2M Twin Meter	11.50	(0.50)
UH74	2M/70	14.30	(0.50)
WELZ SP15M	H.F/2M 200W	29.00	(0.75)
SP 45M	2M/70cm 100W	45.00	(0.75)
WELZ SP200	H.F/2M	59.00	(1.00)
WELZ SP300	H.F/2M/70	79.00	(1.00)
WELZ SP400	2M/70	59.00	(1.00)
DAIWA SW110A	H.F/2M	35.00	(—)
DAIWA CN620A	H.F/2M Cross Pointers	52.80	(—)
DAIWA CN630	2M/70 Cross Pointers	71.00	(—)

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)
WELZ CT300	1000W MAX 250MHz	42.95	(1.00)

TS 930S £1078

Amateur band transceiver/General coverage receiver

TRIO

TS930S	New Transceiver	1078.00	(—)
TS830S	160-10m Transceiver 9 Bands	694.00	(—)
VFO230	Digital V.F.O. with Memories	215.00	(2.00)
AT230	All Band ATU/Power Meter	119.00	(2.00)
SP230	External Speaker Unit	34.96	(1.50)
DFC 230	Dig. Frequency Remote Controller	179.00	(1.50)
YK88C	500Hz CW Filter	29.60	(0.50)
YK88CN	270Hz CW Filter	32.66	(0.50)
TS530S	160-10m Transceiver	534.00	(—)
TS130S	8 Band 200W Pep Transceiver	525.00	(—)
TS130V	8 Band 20W Pep Transceiver	445.00	(—)
VFO120	External V.F.O.	85.00	(1.50)
TL120	200W Pep Linear for TS120V	144.00	(1.50)
MB100	Mobile Mount for TS130/120	17.00	(1.50)
SP120	Base Station External Speaker	23.00	(1.50)
AT130	100W Antenna Tuner	79.00	(1.50)
PS20	AC Power Supply – TS130V	49.45	(2.50)
PS30	AC Power Supply – TS130S	88.50	(5.00)
MA5	5 Band Mobile Aerial System	86.00	(5.00)
MC50	Dual Impeadance Desk Microphone	25.76	(1.50)
MC35S	Fist Microphone 50K ohm IMP	13.80	(0.75)
MC30S	Fist Microphone 500 ohm IMP	13.80	(0.75)
LF30A	HF Low Pass Filter 1kW	17.90	(1.00)
TR9130	2M Synthesised Multimode	395.00	(—)
BO9	Base Plinth for TR9000	34.90	(1.50)
TR7800	2M Synthesised FM Mobile 25W	257.00	(—)
TR7730	2M Synthesised FM Compact Mobile 25W	247.00	(—)
TR2300	2M Synthesised FM Portable	166.00	(—)
VB2300	10W Amplifier for TR2300	58.00	(1.50)
MB2	Mobile Mount for TR2300	17.71	(1.50)
RA1	Flexible Rubber Antenna for TR2300	6.90	(0.50)
TR2500	2M FM Synthesised Handheld	207.00	(—)
ST2	Base Stand	46.00	(1.50)
SC4	Soft Case	12.00	(0.50)
MS1	Mobile Stand	28.20	(1.00)
SMC25	Speaker Mike	14.49	(1.00)
PB25	Spare Battery Pack	22.30	(1.00)
TR8400	70cm FM Synthesised Mobile Transceiver	299.00	(—)
PS10	Base Station Power Supply for 800	64.00	(2.00)
TR9500	70cm Synthesised Multimode	449.00	(—)
R1000	Synthesised 200KHz-30MHz Receiver	297.00	(—)
R600	Gen. Cov. Receiver	£235.00	(—)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	58.80	(1.50)
HS5	Deluxe Headphones	21.85	(1.00)
HS4	Economy Headphones	10.35	(1.00)
SP40	Mobile External Speaker	12.40	(1.00)

ICOM

IC740	HF Mobile Transceiver 8 Band	599.00	(—)
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 Synthesised Compact 25W Mobile	219.00	(—)
IC290E	2M Multimode Mobile	366.00	(—)
IC2E	2M FM Synthesised Handheld	159.00	(—)
IC L1/2/3	Soft Cases	3.50	(0.50)
IC HM9	Speaker/Microphone	12.00	(1.00)
IC BC30	230V AC Base Charger and Hod	39.00	(1.50)
IC BC25	230V AC Trickle Charger	4.25	(0.75)
IC CP1	Car Charging Lead	3.20	(0.50)
IC BP2	6V Nicad Pack for IC2E	22.00	(1.00)
IC BP3	9V Nicad Pack for IC2E	17.70	(1.00)
IC BP4	Empty Case for 6×AA Nicads	5.80	(0.75)
IC BP5	11.5V Nicad Pack for IC2E	30.50	(1.00)
IC DC1	12V Adaptor Pack for IC2E	8.40	(0.75)
IC ML1	10W Booster	49.00	(1.00)

TV INTERFERENCE AIDS

Ferrite Rings 1½" dia. per pair	0.80	(0.20)
Toroid Filter TV Down Lead	2.50	(0.50)
Low Pass Filter LP30 100W	3.95	(0.50)
Trio Low Pass Filter LF30A 1kW	17.90	(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	1.00	(0.30)
Ceramic 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.

MICROWAVE MODULES

MMT144/28	2M Transverter for HF Rig	99.00	(—)
MMT432/28S	70cm Transverter for HF Rig	149.00	(—)
MMT432/144R	70cm Transverter for 2M Rig	184.00	(—)
MMT70/28	4M Transverter for HF Rig	115.00	(—)
MMT70/144	4M Transverter for 2M Rig	115.00	(—)
MMT1296/144	23cm Transverter for 2M Rig	184.00	(—)
MML144/30LS	2M 30W Linear Amp (3W I/P)	65.00	(—)
MML144/40	2M 40W Linear Amp (10W I/P)	77.00	(—)
MML144/100S	2M 100W Linear Amp (10W I/P)	129.00	(—)
MML144/100LS	2M 100W Linear Amp (3W I/P)	145.00	(—)
MML432/20	70cm 20W Linear Amp (3W I/P)	77.00	(—)
MML432/50	70cm/50W Linear Amp	119.00	(—)
MML432/100	70cm 10/100W Linear Amp	228.64	(—)
MM2001	RTTY to TV Converter	169.00	(—)
MM4001	RTTY Transceiver	269.00	(—)
MMC50/28	6M Converter to HF Rig	27.90	(—)
MMC70/28	4M Converter to HF Rig	27.90	(—)
MMC144/28	2M Converter to HF Rig	27.90	(—)
MMC432/28S	70cm Converter to HF Rig	34.90	(—)
MMC432/144S	70cm Converter to 2M Rig	34.90	(—)
MMC435/600	70cm ATV Converter	27.90	(—)
MTV435	70cm 20 watt TV Transmitters	149.00	(—)
MMK1296/144	23cm Converter to 2M Rig	59.80	(—)
MMD050/500	500MHz Dig. Frequency Meter	69.00	(—)
MMD600P	600MHz Prescaler	23.00	(—)
MMDP1	Frequency Counter Probe	11.50	(—)
MMA28	10M Preamp	14.95	(—)
MMA144V	2M RF Switched Preamp	34.90	(—)
MMF144	2M Band Pass Filter	9.90	(—)
MMF432	70cm Band Pass Filter	9.90	(—)
MMS1	The Morse Talker	115.00	(—)

DATONG PRODUCTS

PC1	Gen. Coverage Converter HF on 2M Rig	120.75	(—)
VLF	Very Low Frequency Converter	25.30	(—)
FL1	Frequency Agile Audio Filter	67.85	(—)
FL2	Multi-mode Audio Filter	89.70	(—)
ASP/B	Auto RF Speech Clipper (Trio Plug)	79.35	(—)
ASP/A	Auto RF Speech Clippers (Yaesu Plug)	79.35	(—)
D75	Manually controlled RF Speech Clipper	56.35	(—)
RFC/M	RF Speech Clipper Module	26.45	(—)
D70	Morse Tutor	49.45	(—)
AD270	Indoor Active Dipole Antenna	37.95	(—)
AD370	Outdoor Active Dipole Antenna	51.75	(—)
MPU1	Mains Power Unit	6.90	(—)
MK	Keyboard Morse Sender	129.00	(—)
RFA	Broadband Preamplifier	29.32	(—)
Codecall	Selective Calling Device (link prog) (switch prog)	27.60 29.32	(—) (—)

D70 MORSE TUTOR £49.45

MORSE EQUIPMENT

MK704	Squeeze Paddle	10.50	(0.75)
HK707	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	74.00	(—)

ROTATORS

KR250	Kenpro Lightweight 1-1½" mast	44.95	(2.00)
Hirschman	RO250 VHF Rotor	49.95	(2.00)
9502B	Colorotor (Med. VHF)	49.95	(2.00)
KR400RC	Kenpro – inc lower clamps	99.95	(2.50)
KR600RC	Kenpro – inc lower clamps	139.95	(3.00)

DESK MICROPHONES

SHURE 444D Dual Impeadance	33.00	(1.50)
SHURE 526T Mk II Power Microphone	46.00	(1.50)
ADONIS AM 303 Preamp Mic. Wide Imp.	29.00	(—)
ADONIS AM 503 Compression Mic.	39.00	(—)
ADONIS AM 802 Compression Mic+Meter 3 O/P	59.00	(—)

MOBILE SAFETY MICROPHONES

ADONIS AM 202S Clip-on	22.95	(—)
ADONIS AM 202F Swan Neck +Up/Down Buttons	30.00	(—)
ADONIS AM 202H Head Band+Up/Down Buttons	30.95	(—)

MOBILE ANTENNAE

2M 5/8 PL 259 Base	8.50	(1.75)
2M 7/8 PL 259 Base	13.00	(1.75)
CA Cable Assy	3.50	(Min)
GC Gutter CLip (requires CA)	3.50	(carr.)
BM Boot Mount (requires CA)	4.00	(0.75)

TEST EQUIPMENT

Drae VHF Wavemeter	130-450MHz	24.95	(—)
FXI Wavemeter	250MHz MAX	33.00	(0.75)
DM81	Trio Dip Meter	60.00	(0.75)
MMD50/500	Dig. Frequency meter (500MHz)	69.00	(—)

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.)	6.50	(0.50)

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)

Buy it with Access

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

All prices correct at time of going to press.

BREDHURST ELECTRONICS

HIGH STREET, HANDCROSS, WEST SUSSEX. TEL. 0444 400786

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

E.&O.E.

BARCLAYCARD VISA

Goods normally despatched within 24 hrs.

Practical Wireless

SEPTEMBER 1982 VOL. 58 NO. 9 ISSUE 906

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

Peter Metalli
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

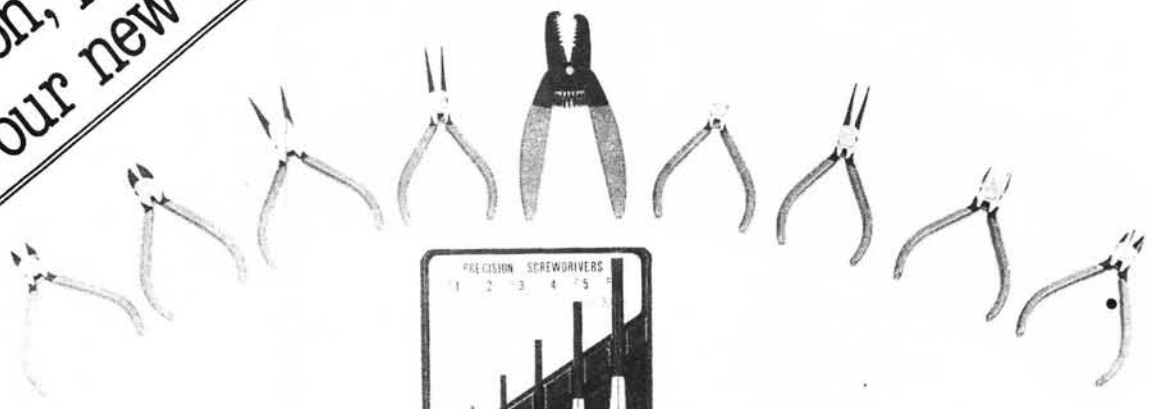
Dave Kerindi
Make-up & Copy
✆ 01-261 6570

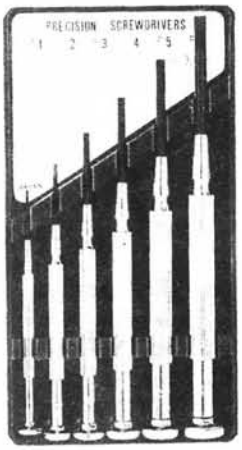
contents

you all know about our shop in London, please telephone about our new shop in Glasgow.

a new range of tools

For many of you who build your own pieces of equipment there has always been a shortage of good small tools. There have always been the very expensive tools which can only be owned and used by the wealthy amongst us and there are also those cheap but extremely nasty tools which we all avoid like the plague. So now after much searching we have come up with a good quality set of tools at a realistic price which all of us can afford. The Pliers and Cutters are available at £4.50 each which includes VAT. Carriage is 75p, if you are considering more than one item then please ring us to find out the correct amount of postage. The pliers are available in the following types, side cutting, long nose, diagonal cutting 100mm, diagonal cutting 115mm, plastic cutting, round nose, flat nose and bent nose. Also available is a wire stripper at the same price.





To compliment the range of Pliers we have 4 Screwdriver Packs, each priced at £1.98. The sets are, 6 piece screwdriver, 5 piece hex key and phillips screwdriver, 5 piece nut driver and a 6 piece assorted screwdriver. Postage on the screwdriver kit is 75p. We also have a 21 piece tool set which contains precision wrenches, phillips screwdrivers, hex key wrenches, nut drivers and of course screwdrivers. This item costs £7.95 INC VAT. Carriage being – £1.50.

AF606K

DAIWA ALL MODE ACTIVE FILTER £56.50 Carr. £5.00

From Daiwa yet another aid to operating. In addition to the notch, SSB and CW filters, the AF606K is equipped with a PLL tone decoder; when the tone frequency of the CW signal and the free running frequency of the PLL tone decoder are the same a locked signal is generated. This locked signal keys an audio oscillator which then reproduces the received CW signal. However, there is a tremendous difference between the produced signal and the received one – no noise and, of course, no fading. ANOTHER PIECE OF EQUIPMENT TO ENHANCE YOUR LISTENING.

HK 702

MORSE KEY £24.50 Carr. £1.50

With so many electronic keys and keyers on the market, it's hard to describe one that is better than the rest. Inevitably it is a matter of "feel", and the feel of the New Daiwa DK210 is superb. Being Daiwa, the quality of design and construction has to be of the best, but it's in use that the DK210 is so impressive. Designed to be used with an external paddle, to give greater personal choice, the DK210 is otherwise self contained, even to being battery powered (PP3) It offers a speed range of 10 to 50 w.p.m., built in sidetone, facilities for semi auto, or fully auto keying, and a tune position for adjusting your transmitter, but the outstanding feature is the adjustable "weight" control. This control gives an amazing improvement in the character of the sending, and completely removes that mechanical sounding "electronic morse" characteristic. Those experienced CW users who have tried out the DK210, have all said how good it sounds – and have usually purchased one. So will you if you try it out.
DK210 from DAIWA – A truly nicer Keyer.

DK 210

DAIWA ELECTRONIC KEYER £42.00 less paddle Carr. £5.00

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

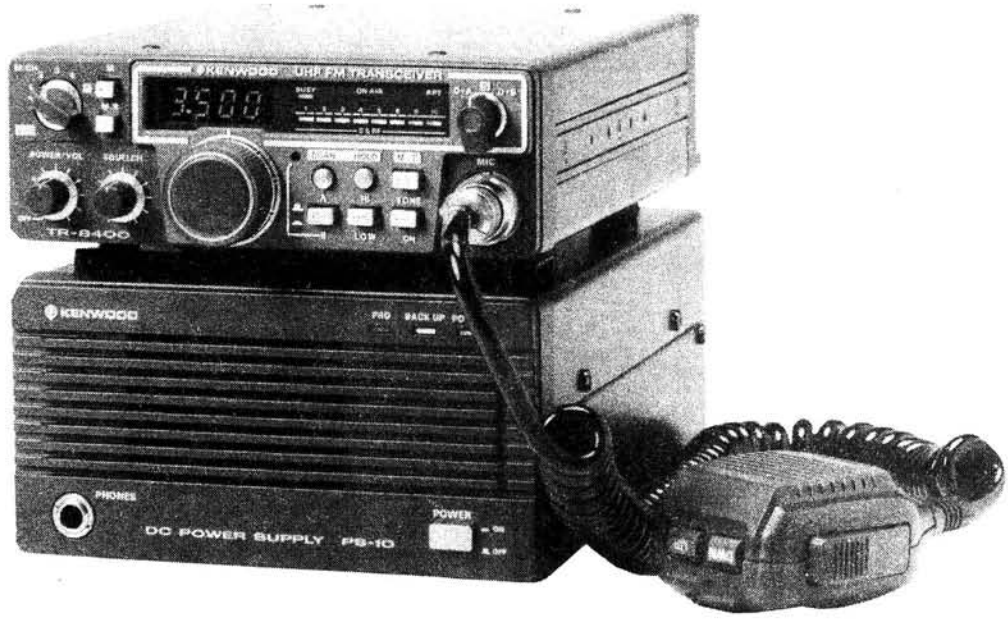
THE DIRECTORS AND STAFF

OF

LOWE ELECTRONICS

have pleasure in inviting you to their open day

SATURDAY 14th AUGUST 1982



with each new TR8400

a free PS10

I appreciate that not everyone has the wherewithall to buy a TS780 at £748.00, not everyone requires 70 cm and 2 metres in one rig.
However, 70 cm is a growing band and there are many easy to use repeaters up and down the country and, of course, SU8 and SU20 are popular Simplex channels: many more amateurs are finding out the pleasures to be had on the less crowded 70 cm band. To those of you who already own a 2 metre mobile rig which you don't want to trade in or part with, then why not consider a TR8400. At its new reduced price of £299.00 the TR8400 is, without a doubt, a good buy. Now, however, we are giving away, free of charge, with each new TR8400 bought, a matching power supply – the PS10. Not only a power supply but a high quality speaker also. The PS10 has the necessary connections for memory back up. Switch off the power supply and rig but leave AC power on to the PS10 and the backup indicating led remains lit and the memory frequencies are retained.
So for those mobile moments, or sat atop the free matching PS10 power supply in the comfort of your own shack, then, for 70 cm FM, the TR8400 is the rig for you.

TR8400 **£299.00 inc VAT**

Carriage £5.00

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

SMC UK DISTRIBUTORS FOR YAESU, KDK, HANSEN, KLM,

CONNECTORS COAXIAL

BNC PLUG 50 OHMS

UG88	Standard type 5.5mm	£0.78	0.50
UG959	Large type 11.2mm	£3.22	0.50

BNC SOCKET 50 OHMS

UG290	Standard, 4 hole type	£0.78	0.50
UG1094	Nut fixing type	£0.76	0.50
UG89	Free, cable-end, 5.5mm	£0.94	0.50

BNC COUPLER 50 OHMS

UG914	Back to back female	£1.07	0.50
UG491	Back to back male	£1.66	0.50
UG274	'T' 2 female 1 male	£2.23	0.50
SMC3FBNC	'T' 3 female	£2.02	0.50
UG306	Elbow. Male – Female	£1.86	0.50

BNC INTERSERIES ADAPTOR 50 OHMS

UG255	BNC plug – UHF socket	£1.76	0.50
UG273	BNC socket – UHF plug	£1.76	0.50
UG201	BNC socket – N plug	£3.28	0.50
UG349	BNC plug – N socket	£3.16	0.50
NF/BNCF	BNC socket – N socket	£2.59	0.50

BNC CABLES 50 OHMS

BNC18BNC	1.5' RG58 BNC ends	£2.55	0.50
BNC36BNC	3.0' RG58 BNC ends	£2.65	0.50
BNC36CROC	3.0' RG58 BNC/clips	£2.50	0.50

UHF PLUG

PL259	Standard type 11.2mm	£0.55	0.50
PL259P	Push on type 11.2mm	£0.79	0.50
UG175	Reducer 5.0mm	£0.14	0.50
UG176	Reducer 5.6mm	£0.14	0.50
PL259R	Reduced type 5.0mm	£0.67	0.50
PL259A	De-luxe type 11.2mm	£1.50	0.50
PL259B	De-luxe type 5.0mm	£1.13	0.50
PL259SL	'Solderless' 11.2mm	£0.63	0.50
PL259SS	'Solderless' 5.0mm	£0.63	0.50
PL259E	Angle type 5.0mm	£0.95	0.50
PL259M	Metric type standard	£0.75	0.50
PL259PM	Panel mount 4 hole	£1.07	0.50

UHF SOCKET

S0239F	Standard 4 hole fix	£0.48	0.50
S0239F31000	4 hole PTFE Au plate	£0.97	0.50
S0239T	2 hole fixing type	£0.48	0.50
S0239NI	Nut fixing inside type	£0.59	0.50
S0239NO	Nut fixing outside type	£0.59	0.50
S0239E	Free angle type 5.0mm	£1.01	0.50
	Free cable end 5.0mm	£2.22	0.50
MX913/C	Dust Cap c/w chain	£0.46	0.50
MX913/M	Dust Cap metric type	£0.46	0.50

UHF COUPLER

PL258	Back to back female	£0.91	0.50
PL274	Back to back chassis	£1.07	0.50
SMCPL/PL	Back to back male	£1.38	0.50
M359	Elbow male – female	£1.07	0.50
M358	'T' 2 female 1 male	£1.38	0.50
M358AF	'T' 3 female	£1.70	0.50
M458	'X' 3 female 1 male	£2.13	0.50

UHF INTERSERIES ADAPTORS

UG255	UHF socket – BNC plug	£1.76	0.50
UG273	UHF plug – BNC socket	£1.76	0.50
S0/25	UHF socket – 2.5mm jack	£0.79	0.50
S0/35	UHF socket – 3.5mm jack	£0.79	0.50
S0/NF	UHF socket – N socket	£1.96	0.50
UG146	UHF socket – N plug	£2.25	0.50
UG83	UHF plug – N socket	£1.96	0.50

UHF CABLES

PL36PL	3.0' RG58 PL259 ends	£1.85	0.50

N PLUG 50 OHMS

UG536	Small type 5.5mm	£2.82	0.50
UG21	Standard type 11.2mm	£1.55	0.50

N SOCKET 50 OHMS

UG58	Standard 4 hole fix	£0.94	0.50
UG1052	Free cable end 5.5mm	£2.86	0.50
UG23	Free cable end 11mm	£1.70	0.50
MX913/C	Dust cap c/w chain	£0.46	0.50

N ADAPTORS

UG107	'T' 2 female 1 male	£3.74	0.50
UG28	'T' 3 female	£3.16	0.50
UG57	Double male adaptor	£2.70	0.50
UG29	Double female adaptor	£2.13	0.50
UG27	Elbow male – female	£2.24	0.50

N INTERSERIES ADAPTORS

UG201	N plug – BNC socket	£3.28	0.50
UG349	N socket – BNC plug	£3.16	0.50
NF/BNCF	N socket – BNC socket	£2.59	0.50
UG146	N plug – UHF socket	£2.25	0.50
UG83	N socket – UHF plug	£1.96	0.50
S0/NF	N socket – UHF socket	£1.96	0.50

ANTENNAS HF FIXED

HY GAIN

12AVQ	Vertical 10-15-20M		14.0'H		£43.13	2.20
14AVQ/WB	Vertical 10-15-20-40M		18.0'H		£63.83	2.20
18AVT/WB	Vertical 10-15-20-40-80M		25.0'H		£90.85	2.20
14RMQ	Roof mount kit for above				£30.48	2.20
18V	Vertical 10-15-20-40-80M, tapped		19.0'H		£31.97	2.20
103BA	3 Ele Yagi 10 metres	17.0'LE	8.0'B		£60.38	2.20
105BA	3 Ele Yagi 10 metres	18.5'LE	24.0'B		£112.70	3.95
153BA	3 Ele Yagi 15 metres	23.0'LE	12.0'B		£74.75	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	26.0'B		£135.13	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	16.0'B		£159.85	4.90
204BA	4 Ele Yagi 20 metres	36.5'LE	26.0'B		£217.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	34.0'B		£281.75	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	16.0'B		£201.25	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		£159.28	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	6.0'B		£136.85	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	14.0'B		£205.85	5.30
TH5DXX	"Thunderbird" 5 Ele	31.0'LE	18.0'B		£228.85	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		£419.75	8.75
HYQUAD	2 Ele Quad 10-15-20M	13.5'TR	8.0'B		£240.35	6.00
18TD	Dipole Tape 10-80M		132'		£80.39	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		£181.70	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	£115.00	4.00

G4MH MINI BEAM

	Mini Beam 10-15-20M	£82.50	4.00

MOSLEY

TA32JRE	2 Ele beam 200W	13.7'TR	6.0'B		£106.95	3.20
TA33JRE	3 Ele beam 200W	14.7'TR	12.0'B		£161.00	3.40
TA33JRHPE	3 Ele c/w Balun H.P.	14.7'TR	12.0'B		£181.70	3.70
MUSTANG2	2 Ele beam 1KW	14.7'TR	6.0'B		£161.00	3.40
MUSTANG3	3 Ele beam 1KW	15.0'TR	12.0'B		£200.10	3.70
RD5	Trap dipole, 10-15-20-40-80M		69.0'E		£46.00	1.80
SWL7	Trap dipole, B.C. bands		40.0'E		£46.00	1.80

SMC DIPOLE

SMC10MD	10M	7029H	max	17.5'	£14.38	0.90
SMC12MD	12M	7029H	max	19.7'	£14.55	0.90
SMC15MD	15M	7029H	max	23.4'	£14.61	0.90
SMC17MD	17M	7029H	max	27.2'	£14.95	1.05
SMC20MD	20M	7029H	max	35.2'	£15.87	1.40
SMC30MD	30M	7036	max	48.7'	£17.25	1.80
SMC40MD	40M	7036	max	70.3'	£19.38	2.10
SMC80MD	80M	7036	max	140.6'	£24.96	2.10
SMC160MD	160M	7044	max	273.3'	£49.28	2.10

SMC MANPACK

LW8A	3-30MHz, c/w 9M RG58 80' halyards	£40.88	2.20

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

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 10-18-24M. 1000W pep					
SMC3Y1015D20	3 ele 10-15, Dipole 20M		13.2'B		£134.95	5.00

CABLES, RADIO FREQUENCY

COAXIAL 50 OHM CABLE

URM95	Solid centre 2.2mm	p/m		£0.23	
UR43	Solid centre 5.0mm	p/m		£0.25	
UR43/100	Drum 100m UR43	100m		£24.15	2.20
UR76	Stranded core 5.0mm	p/m		£0.28	
UR76/100	Drum 100m UR76	100m		£26.45	2.20
RG58U	Stranded core 5.0mm	p/m		£0.29	
RG58U/100	Drum 100m RG58U	100m		£27.60	2.20
RG213	Low loss 10.2mm	p/m		£0.62	
RG213/100	Drum 100m RG213	100m		£57.50	4.50
UR67	Low loss 10.2mm	p/m		£0.67	
UR67/100	Drum 100m UR67	100m		£62.10	4.50

COAXIAL 75 OHM CABLE

307EP	Economy 4.3mm	p/m		£0.21	
307Ep/100	Drum 100m 307EP	100m		£18.40	2.20
UR70	Stranded light	p/m		£0.30	
UR70/100	Drum 100m UR70	100m		£27.60	2.20
UR39	Medium duty 7.8mm	p/m		£0.44	
UR39/100	Drum 100m UR39	100m		£41.40	3.40
UR57	Low loss 10.2mm	p/m		£0.69	
UR57/100	Drum 100m UR57	100m		£65.55	4.50

BALANCED TWIN CABLE

302	75 ohms light duty	p/m		£0.17	
302/100	Drum 100m 302 (75)	100m		£14.95	2.20
306	300 Ohms Ribbon	p/m		£0.20	
306/100	Drum 100m 306 (300)	100m		£17.25	2.20

ANTENNAS VHF/UHF MOBILE

ASCOT

340	Base Stand ½λ 60-550MHz			£2.30	0.50
310	Base Swivel ½λ 60-550MHz			£4.20	0.50
344	Base Sprung ½λ 60-120MHz			£6.38	0.60
440	Base Stand ⅝λ 3dB¼ 145MHz			£2.70	0.50
330	Base Swivel ⅝λ 3dB¼ 145MHz			£5.00	0.50
341	Base Sprung ⅝λ 3dB¼ 145MHz			£7.30	0.60
350	Base Fine tune ½λ 3dB¼ 145MHz			£7.30	0.60
351	Base Sprung ½λ 3dB¼ 145MHz			£8.05	0.80
057	Whip tapered SS 127 Cms			£1.96	1.20
056	Whip parallel SS 63 Cms			£0.75	0.80
085	Mount cable ⅜ & ¼ c/w 4.5M cable			£3.05	0.80
085LR	As 085 (but for Tupperware cars!)			£3.85	0.80
092	Mount bag ⅜ ' ¼ c/w 4.5M cable			£10.75	1.00
084	Mount cable ¼λ, c/w 4.5M cable			£5.00	0.80
088	Mount cowl ¼λ, to S0239			£5.75	0.50
091	Mount Magnetic ¼λ, c/w 4.5M cable			£10.75	0.95
089	Gutter Clip adaptor		all bases	£5.00	0.80
093	Boot lip adaptor		all bases	£3.80	0.60

BANTEX

42SS	Ele Stainless 42" 70MHz ¼λ			£2.53	1.30
40GF	Ele Glassfibre 40" 70MHz ¼λ			£4.62	1.30
20SS	Ele Stainless 20" 144MHz ¼λ			£2.09	0.90
18GF	Ele Glassfibre 18" 144MHz ¼λ			£3.80	0.90
B5	Ele ⅜ Glassfibre 144MHz			£9.68	1.30
BGASS	Ele ½ Stainless 144MHz			£9.23	1.30
BGAGF	Ele ½ Glassfibre 144MHz			£10.95	1.30
B5U	Ele ⅜ Stinless 432MHz			£3.36	0.90
UCL	Ele Mid load coln 432MHz ¼ + ¼λ			£10.95	1.00
UDL	Ele Mid base load 432MHz ⅜ + ¼λ			£18.09	1.00
BM	Base standard ¾" hole			£2.91	1.30
BA	Base snap-in type ⅜" hole			£3.80	1.00
BC	Base claw fixing 11-16mm hole			£5.06	1.20
BD	Base trunk lip 2 screw fitting			£9.36	0.80
BMM	Base Magnetic c/w 12' cable			£16.01	1.40

SMC-HS

SMC118M	Colinear 2M 11/8λ	7dB¼	97'	£28.35	2.20
SMC6P2T/PL	Telescopic 2M PL259	0dB¼		£3.45	0.50
SMC6P2T/BNC	Telescopic 2M BNC	0dB¼		£3.97	0.50
SMC2H/PL	Helical 2M PL259			£3.45	0.50
SMC2H/BNC	Helical 2M BNC			£4.43	0.50
SMCHS430	½λ 432MHz "Handie" 2.5dB¼			£5.75	0.60
SMC4	Ele 70MHz ¼λ	ϕdB¼	34'	£7.65	1.80
SMC2QW	Ele 144MHz ¼λ	ϕdB¼	16'	£2.30	1.30
SMC2NE	Ele 144MHz ⅜λ	3.ϕdB¼	43'	£6.90	1.80
SMC2VF	Ele 144MHz ½λ	3.ϕdB¼	35'	£8.63	1.80
SMC78F	Ele 144MHz ⅝λ	4.5dB¼	57'	£12.25	1.80
SMC78B	Ele 144MHz ⅝λ ball		5.6'	£12.65	1.80
SMC78SF	Ele 144MHz ⅞λ short		4.7'	£12.25	1.80
SMC88F	Ele 144MHz ⅞λ	5.2dB¼	65'	£16.10	1.80
SMC258	Ele 432MHz 2× ⅝	5.5dB¼	31'	£11.50	1.80
SMC358	Ele 432MHz 3× ⅜λ	6.3dB¼	47'	£14.95	1.80
SMC70N2M	144 and 432MHz	2.7dB¼	6.1dB¼	£14.20	1.80
SMCHS770	144/432 duplexer, 50W, 30dB, 0.5dB			£13.40	1.30
SMCSOMM	Magnetic base c/w 4M cable			£8.45	1.20
SMCSOWM	Wing mount base			£3.45	0.72
SMCGCCA	Gutter clip, c/w 4M RG58, PL259			£8.80	1.20
SMCTMCAS	Trunk mount c/w 6M cable			£7.30	0.95
SMCSOCAL	Cable assembly 239M, 6M cable			£4.20	0.50
SMCBSD	Bumper strap stainless			£7.71	1.00
HS88BK	Bumper mount 144MHz extension tube			£16.50	1.50
MX913/M	Dust cover fits SMCOCA			£0.46	0.50
YCGA	Cable grip adhesive (5 off)			£0.45	0.50

ANTENNA ROTATORS

KR500	Kenpro, elevation Meter calb ± 90°	£86.25	Free	
KR400	Kenpro bell, box as KR500	£86.25	Free	
RLD3	SMC, Bell Auto control	£38.53	Free	
AR30	CDE, Offset Turn and Push	£51.75	Free	
9508	Channel Master, offset	£74.75	Free	
9502B	Channel Master, offset	£54.63	Free	
KR250	Kenpro, Bell Twist Switch	£44.85	Free	
AR40	CDE Turn and Push	£65.55	Free	
KR400RC	Kenpro Round meter 360°	£90.85	Free	
AR50	CDE 5 position pre-selector	£113.85	Free	
CD45	CDE 8 × 4cm meter readout	£113.85	Free	
KR600RC	Kenpro Round meter 360°	£132.25	Free	
Ham IV	CDE 8 × 4cm meter readout	£189.75	Free	
KR2000RC	Kenpro Heavy Duty Round meter 360°	£241.50	Free	
T2X	CDE 8 × 4cm meter readout	£270.25	Free	
H300	Hy Gain Digital readout	£451.95	Free	

ROTOR ACCESSORIES

CD562	Bearing CDE AR30 etc.	£7.76	1.25
AK 121	Adaptor Kit, CDE Bell to plate	£4.60	0.90
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 HAM4 etc.	£24.15	2.10
9523	Support Bearing Channel Master	£14.38	1.70

SOUTH MIDLANDS COMMUNICATIONS LTD

MAIL ORDER; AS NEAR AS YOUR 'PHONE OR PEN

SMC SERVICE
Free Securicor delivery on major Yaesu 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
2 YEAR warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu factory.
Tens of thousands of spares and test equipment.
Twenty-four years of professional experience.

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

& MIRAGE PRESENT PART OF THEIR ANTENNA STOCKS!

ANTENNAS HF MOBILE

G WHIP			
TRIBANDER	Element, 10-15-20M, slide switch	£25.88	1.00
GWBASESTND	Base standard type	£5.75	0.80
LF40	Loading coil 40M	£6.56	0.60
LF80	Loading coil 80M	£6.56	0.60
LF160	Loading coil 160M	£6.56	0.60
LFWHIP	Telescopic whip	£4.26	0.60
MULTIMOBILE	Mast/head 10-15-20M self selecting	£30.48	1.40
GWBASESTND	Base standard type	£5.75	0.80
MM40	Loading coil 40M	£6.56	0.60
MM80	Loading coil 80M	£6.56	0.60
MM160	Loading coil 160M	£6.56	0.60
MMWHIP	Telescopic whip	£4.26	0.60
FLEXIWHIP	Mast/Whip (10M basic)	£18.11	1.00
GWBASESTND	Base standard type	£5.75	0.80
FF15	Loading coil 15M	£6.56	0.60
FF20	Loading coil 20M	£6.56	0.60
FF40	Loading coil 40M	£6.56	0.60
FF80	Loading coil 80M	£6.56	0.60
FF160	Loading coil 160M	£6.56	0.60
THREADADAPTOR	Thread adaptor G Whip to USA Base	£0.92	0.50
EXTENDAROD	Mast extension 39"	£12.08	0.90
SMC35	Base heavy duty Ball type	£6.32	1.80
HY-GAIN ACCS.			
492	Spring mini whips to 52"	£3.39	0.90
415	Bumper strap, c/w base	£12.42	2.10
498	Body mount split ball 90°	£13.23	1.40
511	Spring heavy duty 3lb 4.5"L	£10.93	1.80
417	Spring medium duty 2lb 4.5"L	£9.78	1.40
SMC			
SMCHW/4/A	Antenna (spot f) complete, 2-30MHz	£67.85	2.00
SMCHW/4/A1-2	Coil/Whip (spot f)	£16.10	0.80
SMC-HS			
SMC20SE	Ele 20M 1.72M 'fold over' 100W PEP	£15.35	1.80
SMC17SE	Ele 17M 1.915M 'fold over' 200W PEP	£14.20	1.80
SMC15SE	Ele 15M 1.72M 'fold over' 130W PEP	£13.80	1.80
SMC12SE	Ele 12M 1.915M 'fold over' 200W PEP	£13.40	1.80
SMC10SE	Ele 10M 1.72M 'fold over' 200W PEP	£12.65	1.80
SMCSOWM	Adjustable wing mount base upper S0239 lower	£3.45	0.72
SMCGCCA	Gutter clip, c/w 4M RG58, PL259	£8.80	1.20
SMCTMCAS	Trunk mount c/w 6M cable	£7.65	0.95
SMCSOCAL	Cable assembly 239M c/w 6M cable PL259	£4.20	0.50
SMCBSD	Bumper + strap deluxe stainless band	£7.71	1.00
SMC35	Mount ball type	£4.89	1.40
THREADADAPTOR	Thread adaptor fits SMC35 to UK	£0.92	0.50
MX913/M	Dust cover metric fits SMCSOCA	£0.46	0.50

UNITOWER			
HT30M	Tower 30ft 10ft lattice	£339.25	Dist
HT40M	Tower 40ft	£437.00	Dist
TELETOWER			
TT17	Tower 17m c/w Rig	£391.00	Dist
TT24	Tower 24m c/w Rig	£569.25	Dist
TT30	Tower 30m c/w Rig	£690.00	Dist

MASTS AND TOWERS

VERSATOWER MINI TOWER (10M10 SERIES)

10M10P30	30ft	£388.36	Dist	**10M10BP30**	30ft	£411.13	Dist
10M10W30	30ft	£373.18	Dist	**10M10FB30**	30ft	£360.53	Dist

VERSATOWER STANDARD (13M20 SERIES)

13M20P25	25ft	£318.78	Dist	**13M40T120**	120ft	£1960.75	Dist
13M20P40	40ft	£436.43	Dist	**13M20BP25**	25ft	£373.18	Dist
13M20P60	60ft	£533.83	Dist	**13M20BP40**	40ft	£492.09	Dist
13M20P80	80ft	£1018.33	Dist	**13M20BP60**	60ft	£586.96	Dist
13M20SP25	25ft	£371.80	Dist	**13M20BP80**	80ft	£1071.46	Dist
13M20SP40	40ft	£488.29	Dist	**13M20W25**	25ft	£256.80	Dist
13M20SP60	60ft	£586.96	Dist	**13M20W40**	40ft	£374.44	Dist
13M20SP80	80ft	£1071.46	Dist	**13M20W60**	60ft	£471.85	Dist
13M20M25	25ft	£1715.34	Dist	**7M20FB**	25ft	£179.00	Dist
13M20M40	40ft	£1877.26	Dist	**13M20FB25**	25ft	£237.82	Dist
13M20M60	60ft	£1993.64	Dist	**13M20FB40**	40ft	£354.20	Dist
13M20M80	80ft	£2527.47	Dist	**13M20FB60**	60ft	£451.61	Dist
13M40T85	85ft	£1435.78	Dist	**13M20FB80**	80ft	£934.84	Dist

VERSATOWER HEAVY DUTY (16M20 SERIES)

16M20P40	40ft	£650.21	Dist	**16M20SP100**	100ft	£1414.27	Dist
16M20P60	60ft	£738.76	Dist	**16M20M40**	40ft	£2179.60	Dist
16M20P80	80ft	£1113.20	Dist	**16M20M60**	60ft	£2306.10	Dist
16M20P100	100ft	£1342.17	Dist	**16M20M80**	80ft	£2834.87	Dist
16M20FB40	40ft	£511.06	Dist	**16M20M100**	100ft	£2929.74	Dist
16M20FB60	60ft	£604.67	Dist	**16M20BP40**	40ft	£662.86	Dist
16M20FB80	80ft	£951.28	Dist	**16M20BP60**	60ft	£766.59	Dist
16M20FB100	100ft	£1163.80	Dist	**16M20BP80**	80ft	£1141.03	Dist
16M20SP40	40ft	£705.87	Dist	**16M20BP100**	100ft	£1370.00	Dist
16M20SP60	60ft	£809.60	Dist	**16M20W40**	40ft	£521.18	Dist
16M20SP80	80ft	£1185.31	Dist	**16M20W60**	60ft	£611.00	Dist

ANTENNAS VHF/UHF FIXED

JAYBEAM						
4Y/4M	Yagi 4 ele	7.5'B	7dBd	£22.43	2.20
PMH2/4M	Harness 2 way			£13.23	1.70
HO/2M	Halo head only	1' sq	ϕdBd	£5.18	0.70
HM/2M	Halo with 24" mast	1' sq	ϕdBd	£5.75	0.95
UGP/2M	Ground plane	1.7'	ϕdBd	£10.93	2.20
C5/2M	Colinear	13.1'	7.1lb 4.8dBd	£47.73	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	£39.68	2.20
PBM14/2M	14 ele parabeam	19.5'	13.7dBd	£48.30	2.20
Q4/2M	Quad 4 ele	4.9'	9.5dBd	£25.88	2.20
Q6/2M	Quad 6 ele	8.7'	12dBd	£33.93	2.20
Q8/2M	8 ele quad	11.6'	13.8dBd	£39.10	2.20
5XY/2M	Yagi 5 ele cross	5.5'	7.8dBd	£24.73	2.20
8XY/2M	Yagi 8 ele cross	9.2'	9.5dBd	£31.05	2.20
10XY/2M	Yagi 10 ele cross	11.8'	10.8dBd	£40.83	2.20
PMH2/C	Circuilar polarisation harness			£8.05	1.20
PMH2/2M	Harness 2 way			£10.93	1.20
PMH4/2M	Harness 4 way			£25.30	1.20
X6/2M/X12/70	6 ele 2, 12 ele 70	7.2'	8.5/12	£41.40	2.20
C8/70	Colinear	10.5'	6dBd	£54.05	2.20
D8/70	Yagi 8 over 8 slot	3.6'	12.3dBd	£22.43	2.20
PBM18/70	Parabeam 18 element	9.2'	14.0dBd	£27.60	£2.20
PBM24/70	Parabeam 24 element	14.8'	15.1dBd	£36.80	2.20
MBM28/70	28 ele multibeam rear mount		12.5dBd	£18.40	2.20
MBM48/70	Multibeam 48 ele	6.0'	14.5dBd	£31.05	2.20
MBM88/70	Multibeam 88 ele	13.1'	16.3dBd	£42.55	2.20
8XY/70	Yagi 8 ele crossed	8.5'	10dBd	£36.80	2.20
12XY/70	Yagi 12 ele crossed	8.5'	12dBd	£46.00	2.20
PMH2/70	Harness 2 way			£9.20	1.00
PMH4/70	Harness 4 way			£19.55	1.50
D15/23	15 over 15 slot length 2.8'		15dBd	36.80	2.20
CR/23	Corner reflector		14.8dBd	£35.08	2.20
SBM4	Yagi 4 ele Band 2			£16.45	2.20
SBM6	Yagi 6 ele Band 2			£24.04	2.20
SMC					
GP2U	Ground Plane		1.7'	£5.75	1.70
SMC-HS					
SMCGDX1	Discone 80-480MHz 3dB¼		33'	£41.40	2.20
SMCGDX2	Discone 50-480MHz 3dB¼		6.2'	£47.95	2.20
GDXA	Discone 100-440MHz			£34.90	2.20
SMCVHFL	Discone 65-520MHz, Rx only		5.0'	£16.85	2.20
SMCGP144W	Colinear 2M, ½λ, 6.5dB¼		102'	£24.90	2.20
SMCGP2M	½λ, 2M ground plane, 3.4dB¼		46'	£15.70	2.20
SMCSQ144	2M Swiss Quad vertical			£52.90	2.20
SMCGP432X	Colinear 70cm, 3×½λ, 6.8dB¼		5'	£25.70	1.70
SMC70N2V	Vert. 2.8dB¼ 2M, 5.7dB¼ 70cm		3.6'	£25.70	2.20
SMC2HB6	6M, 2ele, HB9CV Beam			£19.95	2.20
TELEWAND					
TW435D	Discone 400-1200MHz		1.2'	£26.45	0.85

ANTENNA PARTS

ANTENNA WIRE				
CU14SWG	Hard Drawn Copper	p/m	£0.20	
CU14SWG108	HD Copper 33m Coil	108'	£6.33	1.90
CU14SWG132	HD Copper 40m Coil	132'	£7.42	1.90
CU7/029H	Hard Drawn Stranded	p/m	£0.22	
CU7/036	CAD Copper Stranded	p/m	£0.32	
CU7/044	CAD Copper Stranded	p/m	£0.45	
CU/TER	CU/Terylene Braid About 3mmD	p/m	£0.20	
CU/029S	Soft Copper Stranded for Radials etc.	p/m	£0.19	
BALUN TRANSFORMERS				
BN86	Hy-Gain 1:1 3-30MHz	Ferrite	£15.53	0.90
H1Q1	Van Gorden 1:1 3-30MHz	Air	£10.00	F.O.C.
DIPOLE CENTRE PIECE				
CCJ2BNC	Standard c/w fittings UG88 etc		£5.69	0.65
CCJ2UHF	Standard c/w fittings PL259 etc		£5.69	0.65
CCJ1UHF	HD type c/w fitting PL259 etc		£7.99	0.80
AJU	Polyprop. clamp and lug type		£1.09	0.55
INSULATORS END STRAIN				
SMCP2	Polypropylene 3 inch		£0.55	0.45
PORC3	Porcelain 3 inch		£0.67	0.45
SMCP1	Polypropylene 8.5 inch		£2.24	0.45
EG38	Porcelain Egg 1.5 ins		£0.44	0.45
EGG51	Porcelain Egg 2.1 ins		£2.13	0.70
LIGHTNING ARRESTORS				
SMC566	Spark S0239/PL259 in line		£2.99	0.55
SMC567	Spark S0239/S0239 in line		£2.99	0.55
LA1	Gas Discharge Bulkhead		£48.19	0.90
ANTENNA TRAP				
SMCHPT	High Power, 1kW, 7MHz	per pair	£13.80	1.10

ANTENNA/MAST FITTINGS

CABLE GRIPS				
CG5	Bulldog Grip 5mmD (0.1875") Galv.		£0.17	0.55
CG6	Bulldog Grip 6mmD (0.125") Galv.		£0.18	0.55
HD9	Brass Line Clamp for copper wire		£0.55	0.55
WALL BRACKETS (STAND OFF'S)				
W12	12" c/w 2" U Bolts T Section	Pr	T.O.S.	2.60
W18	18" c/w 2" U Bolts T Section	Pr	£10.06	2.60
W21	21" c/w 2" U Bolts T Section	Pr	£10.92	2.60
W21HD	21" HD c/w 2" U Bolts D with Brace	Pr	£12.92	2.10
W24	24" c/w 2" U Bolts T Section	Pr	£13.23	2.80
W24HD	24" HD c/w 2" U Bolts with Brace	Pr	£15.48	2.80
D SHACKLE (PIN SIZE)				
DS6	6mm (¼ins)		£0.32	0.55
DS8	8mm (⅜ins)		£0.37	0.55
DS10	10mm (⅜ins)		£0.47	0.55
DS11	11mm (7/16ins)		£0.75	0.55
DS13	13mm (½ins)		T.O.S.	0.55
GUY ROPES				
HTS3	HT Steel 3mmD 1×19 BS 720Kg	p/m	£0.26	
HTS4	HT Steel 4mmD 1×19 BS 1285Kg	p/m	£0.32	
HTS5	HT Steel 5mmD 1×19 BS 2000Kg	p/m	£0.25	
HTS6	HT Steel 6mmD 1×19 BS 2875Kg	p/m	£0.48	
X150	Rustproof 3mmD Multistrand	150m	£20.59	2.60
FE7X18G100	Galvanised 7 by 18 Gauge	100'	£6.90	2.80
FE7X18G300	Galvanised 7 by 18 Gauge	300'	£20.13	4.20
TPS3	Terylene 3mmD BS 70Kg	p/m	£0.10	
TPS4	Terylene 4mmD BS 295Kg	p/m	£0.15	
TPS6	Terylene 6mmD BS 570Kg	p/m	£0.22	
TPS8	Terylene 8mmD BS 1110Kg	p/m	£0.37	
GUY STAKES				
GS18	18" 'T' section 38×38×5mm Galv.		£4.08	2.10
GS27	27" 'T' section 38×38×5mm Galv.		£5.64	2.50
GS36	36" 'T' section 51×51×6mm Galv.		£10.64	3.70
GUY TENSIONERS				
TPR933	Turnbuckle 115×8mm, 4.5"		£2.70	0.90
RS150X10	Turnbuckle 150×10mm, 6"		£5.12	1.30
MAST FITTINGS (2" MASTS)				
SMCMP3	Guy Plate 3 hole		£1.38	0.75
SMCMP4	Guy Plate 4 hole		£2.19	0.75
SMCMB3	Guy Band 3 hook		£1.61	0.85
SMCMB4	Guy Band 4 hook		£2.24	1.05
SMCMC1	Cap. Cast Alloy		£3.74	0.80
SMCMBP1	Base Plate Alloy Shoe		£5.58	0.95
THIMBLES				
THIM30	Galv. 30mm OA (1.25") for Wire		£0.18	0.50
THIM38	Galv. 38mm OA (1.5") for Wire		£0.21	0.50
THIM44	Galv. 44mm OA (1.75") for Wire		£0.23	0.50
THIM51	Galv. 51mm OA (2.0") for Wire		£0.28	0.50
F1235	Nylon 30mm OA (1.25") for Terylene		£0.20	0.50
F985	Nylon 38mm OA (1.5") for Terylene		£0.24	0.50
MASTING				
AL32X16G	Aluminium 1.25" 16 Gauge	p/m	£1.83	
AL38X16G	Aluminium 1.50" 16 Gauge	p/m	£2.21	
AL49X7G	Aluminium Nom 2" 7 Gauge	p/m	£4.54	
MISCELLANEOUS HARDWARE				
RB6	Rawlbolt 6mm Bolt		£0.32	0.50
RBD20	Rawlbolt 8mm Bolt		£0.51	0.50
RBE19	Rawlbolt 10mm Bolt		£0.61	0.60
RBG20	Rawlbolt 12mm Bolt		£1.08	0.70
RB16	Rawlbolt 16mm Bolt		£2.66	1.30
PSS25	Pulley 25mm winch		£0.76	0.50
PSS38	Pulley 38mm winch		£0.94	0.50
55904	Cable clip 10-14mm		£0.10	0.50
55903	Cable clip 7-10mm		£0.08	1.10
SMC53	Mast to boom clamp 1-2" to 1"		£1.73	1.40
SMC63	Mast to boom clamp 1-2" to 1-1.25"		£2.19	2.10
SMC73	Mast to boom clamp 1-2" to 1" H.D.		£2.82	2.10
SMC59/15	Mast sleeve 15" for 2"		£6.61	2.10
SH63	Shap hook 63mm O/A		£0.99	0.50
UBOLT2	'U' Bolt 2" Centre 9mm Galv.		£0.46	0.60
ER4	Earth rod copperweld 4', c/w Clamp		£6.15	2.10
SMC2LK	Double lashing kit		£13.80	2.50
SMCCP1	Cross over plate 5"×5"×¼"		£4.77	1.90

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 only.)

Where Securicor delivery on an item, or any number of items combined, 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 charge, send a cheque crossed, "not more than £....."

All prices include VAT @ 15%.

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 (0632) 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	**Bangor**	John	GI3KDR	(0247) 55162
Stourbridge	Brian	G3ZUL	(03843) 5917	**Tandragee**	Mervyn	GI3WWY	(0762) 840656
Edinburgh	Jack	GM8GEC	(031657) 2430 Day (031665) 240 Eve				
Jersey	Geoff	GJ4ICD	(031665) 240 Eve				

ICOM

TRIED, TESTED AND TRUSTED

See revue in February Radd.Comm.

IC-720A
Possibly the best choice in HF.
£883.inc.

The main problem that the amateur of today has to deal with is deciding just which rig out of the many excellent products available he is going to choose. Technology is advancing at such a rapid rate and getting so sophisticated that many cannot hope to keep up. Some go too far!

Perhaps one way of dealing with the problem is to look at just what each model offers in its basic form without having to lay out even more hard earned cash on "extras". The IC-720A scores very highly when looked at in this light. How many of its competitors have two VFOs 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 a really excellent general coverage receiver covering all the way from 100kHz to 30MHz (with provision to transmit there also if you have the correct licence)? How many need no tuning or loading whatsoever and take great care of your PA, should you have a rotten antenna, by cutting the power back to the safe level? 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 getting hot enough to boil an egg? How many have band data output to automatically change bands on a solid state linear AND an automatic antenna tuner unit when you are able to add these to your station?

Well you will have to do quite a bit of hunting through the pages of this magazine to find anything to approach the IC-720A. It may be just a little more expensive than some of the others – but when you remember just how good it is, and of course the excellent reputation for keeping their secondhand value you will see why your choice will have to be an IC-720A!

IC-PS15 Mains PSU £99

ICOM

Nearly everybody has an IC2E – the most popular amateur transceiver in the world – now there is the 70 cm version which is every bit as good and takes the same accessories. Check the features.

Fully synthesized – Covering 144 – 145.995 in 400 5KHz steps. (430-439.999 4E)
Power output – 1.5W with the 9v. rechargeable battery pack as supplied – but lower or higher output available with the optional 6v or 12v packs. Rapid slide-on changing facility.
BNC antenna output socket – 50 ohms for connecting to another antenna or use the Rubber Duck supplied (flexible ¼ λ whip – 4E)
Send/battery indicator – Lights during transmit but when battery power falls below 6v it does not light, indicating the need for a recharge.
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 – reduces power output from 1.5W to 150mW reducing battery drain.
External microphone jack – if you do not wish to use the built-in electret condenser mic an optional microphone speaker with PTT control can be used. Useful for pocket operation.
External speaker jack – for speaker or earphone. This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

A full range of accessories in stock.		**£ p**
ICML1	10W mobile booster for IC2E	49 00
BP5	11 volt battery pack	30 00
BP4	Empty battery case for 6 x AA cells	5 80
BP3	Standard battery pack	17 70
BP2	6 volt pack	22 00
BC30	Base charger for above	39 00
BC25	Mains charger as supplied	4 25
DC1	12 volt adapter pack	8 40
HM9	Speaker microphone	12 00
CP1	Mobile charging lead	3 20
IC12'3	cases	each 3 60

All prices include VAT

The IC4E is going to revolutionise 70 CM!

No carriage charges.

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

BARCLAYCARD VISA

COMING SOON
IC 740
The set to beat them all

ASK ABOUT THE NEW RANGE OF CUE DEE ANTENNAS....the winners in recent tests!

Please note: Access Barclaycard owners – goods must be sent to address registered with credit card company

IOW RF ouput 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 input for repeaters.

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 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 todays crowded bands. Full metering WWV reception and connections for transverter and linear control almost completes the IC-730's impressive facilities.

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.

Both are really well designed and engineered multi-mode transceivers capable of being operated from either the mains or a 12 volt supply. Both contain such exciting features as scan facilities, automatic selection of the correct repeater shift for the band concerned, full normal and reverse repeater operation, tuning rate selection according to the mode in use. VOX on SSB continuous power adjustment capability on FM and 3 memory channels. Of course they are both fitted with a crystal controlled tone burst and have twin VFO's as have most of ICOM's fully synthesized transceivers.

The famous IC-240 has been improved, given a face lift and renamed the IC-24G. Many thousands of 240's are in use, and its popularity is due in part to simplicity of operation, high receiver sensitivity and superb audio on TX and RX. The new IC-24G has these and other features. Full 80 channels (at 25kHz spacing) are available and readout is by channel number – selected by easy to operate press button thumbwheel switches. This readout can clearly be seen in the brightest of sunlight. Duplex and reverse duplex is provided along with a 12½ KHz upshift, should the new channel spacing be necessary.

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 FM mobile ICOM have ever made.

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. Previous ads have told you quite a lot about these products – but why not call us for further information and a brochure?

The MT-240X Multi-band trap dipole antenna (80m – 10m) is a superbly constructed antenna with its own Balun incorporated in the centre insulator with an SO239 connector. Separate elements of multi-stranded heavy duty copper wire are used for 80-40-15 and 20-10 Metres. Really one up on its competitors. £49.50 inc. VAT

Thanet Electronics

143 Reculver Road, Beltinge, Herne Bay, Kent. Telephone (0227) 63859

Agents (phone first – all evening weekends only except Scotland)
Scotland – Jack GM8 GEC 031 657-2430 (daytime)
031 665-2420 (evenings)
Midlands – Tony G8AVH 021 329-2305
Wales – Tony GW3 FKO 0874 2772 or 0874 3992
North West – Gordon G3LEQ Knutsford (0565) 4040 ansaphone available

Lee Electronics Ltd

LEE

Now only £250

The C7800 is one of the most advanced mobile 70cm transceivers available. Its features include:– Digital Readout, Five Memories, Two Speed Scan Rate, L.E.D. Display. Its new low price now makes it exceptional value.

– C7800 –

SPECIAL OFFER!

"By the time that you read this advert, the new C5800 should be in stock (if the wind's in the right direction). So what is the C5800? It's the new 2 metre multi-mode from Standard which gives 25 Watts on FM (30W on SSB) and has lots of buttons to keep you happy!!

The set that I've been playing with is the Japanese 10W version and even that seems to have the edge on most other makes, so what will the 25W one do? The receiver is typical "Standard" sensitivity, of course, which means that it far outmatches the transmitter.

Now we come to the rub, to date we haven't any leaflets – this advert goes in some two months before you get to read it. If you would like some gen, phone me or my assistants and we'll be glad to help. Better still, why not come in the shop and play with it?

The price:– **£359 inc."**

NORMAN G8THJ

– FT290 –

All mode 2m portable

- ★ 10 Memories
- ★ 2 VFO's
- ★ LCD Display
- ★ C Size Battery
- ★ Easy Car Mounting
- ★ 2.5 Watts Output

TC9000 CB

This is a top of the line set that far exceeds the MPT 1320 specifications. It features: *Priority Channel; *Delta Tune; *Noise Blanker; *Squelch; *Volume; *Accessory switch for optional Sel – Call etc.; *P.A. Output; *Hi – Low Power. Now available at a new low price, only:–

£69.95 inc. VAT

– C58 –

2 metre MULTI-MODE

The C58 has all the features possible on a portable rig many of which some mobiles don't have. It's optional accessories allow it to be used in the car with a power output of 25W. Come in and compare this with the FT290, you may be glad you did.

£245.00 inc. VAT and carriage.

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

Please allow up to 14 days for delivery

Buy it with Access

BARCLAYCARD VISA

NEAREST TUBE:
EDGWARE ROAD
PADDINGTON

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

BI-PAK

BI-PAK's COMPLETELY NEW CATALOGUE

Completely re-designed. Full of the type of components you require, plus some very interesting ones you will soon be using and of course, the largest range of semiconductors for the Amateur and Professional you could hope to find.

There are no wasted pages of useless information so often included in Catalogues published nowadays. Just solid facts i.e. price, description and individual features of what we have available. But remember, Bi-Pak's policy has always been to sell quality components at competitive prices and **THAT WE STILL DO.**

BI-PAK'S COMPLETELY **NEW** CATALOGUE is now available to you. You will be amazed how much you can save when you shop for Electronic Components with a Bi-Pak Catalogue. Have one by you all the time—it pays to buy BI-PAK.

To receive your copy send **75p** plus 25p p&p.

8 Bit MICROPROCESSOR

National INS8080AN 40 Pin DIL N. Channel Silicon GATE MOS TECHNOLOGY As used in Nationals N8080 Micro Computer Family
Instruction Cycle Time 2 uS
Supplied with functional Block Diagram
BRAND NEW — NOT seconds or reclaims
100% perfect ORDER NO. SX8080
Normal Sell price £4.50 each
Our BI-PAK Special Price **only £2.00**
SO HURRY — LIMITED STOCKS

40 Pin IC Socket to fit SX8080 ORDER NO. 1609 Offer price **30p**

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
● Power Output 5 watts RMS ● Load Impedance 8-16 ohms ● Frequency response 50Hz to 25 KHz—3db ● Sensitivity 70 mv 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** each
You could not Build one for this price.

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**

MW398 **NI-CAD CHARGER**
Universal Ni-Cad battery charger. All plastic case with lift up lid. Charge/Test switch. LED indicators at each of the five charging points.

Charges: —	Power: —
PP3 (9V)	220-240V AC
U12 (1.5V penlite)	Dims: —
U11 (1.5V "C")	210 x 100 x 50mm
U2 (1.5V "D")	**£6.95**

POWER SUPPLY OUR PRICE **£3.25**
Power supply fits directly into 13 amp socket. Fused for safety. Polarity reversing socket. Voltage switch. Lead with multi plug.
Input: — 240V AC. 50HZ Output: —3, 4.5, 6, 7.5, 9 & 12V DC Rating: — 300 ma MW88

TRIACS — PLASTIC

4 AMP — 400v — TO202 — TAG 136G.

1 OFF	10 OFF	50 OFF	100 OFF
40p	£3.75	£17.50	£30.00

8 AMP 400v — TO220 — TAG 425

60p	£5.75	£27.50	£50.00

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 — 103
SPECIAL PRICE £0.70 each
10 off £6.50

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.
O/no SX85

Send your orders to Dept PW9
BI-PAK PO BOX 6 WARE HERTS
SHOP AT 3 BALDOCK ST
WARE HERTS

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.

SELECTRONIC SERVICES

DO YOU WANT AN ANTENNA WITH A DIFFERENCE?

Over the coming months we will be producing over 14 different types of antennas for the amateur bands, i.e. from LF through to microwave.
Our aim is to manufacture a range of antennas to suit every operator and every pocket. Remember if you would like something extra special or you have a problem fitting a high performance antenna into a small space, get in touch and we can discuss your particular requirements.
The VHF/UHF range are made from glass fibre, removing all unnecessary metal-work from the field of the antenna, allowing performance to come closer to the magic theoretical maximum. You will not see your investment fall to pieces with a Selectronic Services glass fibre beam.
If required we can design an antenna for your needs from low cost wire to military specifications.

SATELLITE ANTENNAS

GET READY FOR PHASE 3B with our Helix antennas range designed for 70cms and 23cms. Remember Helix antennas are wide band and very high gain also a very important factor is **no-compromise circular polarization.** Just think with one Helix antenna you can work through satellites – repeaters and SSB/CW tropo which as you will know require different polarizations.

ATV ANTENNAS

There are some excellent ATV transmitters on the market now. Why not compliment their excellent performance with an excellent ATV antenna.
Wide bandwidth and immense gain is a very important factor with ATV. These antennas will be available in multiples of 16 element stacks, i.e. 16, 32, 64, etc. Their gain is unquestionable as stacked arrays have been successfully used for E.M.E.
The bandwidth is far greater than any so called ATV antenna available today, 7MHz for 70cms is a typical figure and even wider for 23cms. Incidentally these antennas can be tuned to any part of the 23cms T.V. band by one adjustment.
Our ATV antennas are of course constructed from glass fibre for lightness, strength and less corrosion problems. These antennas also make an excellent tropo array. A good buy for an all-round high performer.

NOT INTERESTED IN SATELLITES OR ATV? RATHER STICK TO THE HF BANDS?

Why not try our 10MHz and 14MHz Broadside arrays, excellent performance with this classic design and, of course low cost. These are also very unobtrusive to neighbours and very simple to erect – superb for Q.R.P.

For further information contact:

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

ELECTRONIC Lightning COMPONENTS

DO YOU NEED:— Electronic components, Tools, Test Equipment, Cases, Cabinets and Hardware etc. **IN A HURRY ?????????**
THEN YOU NEED:— LIGHTNING Electronic Components.
WHY ???? Because **LIGHTNING** Strikes out where others fail:—
Express Despatch
All Low Prices
In Depth Stock
All New Guaranteed Goods from Leading Manufacturers

With all that gong for us, Going to you can you really afford to be without a copy of our brand new exciting CATALOGUE
Many Prices Reduced – Many More Stock Lines
Send For YOUR Copy Now ONLY 70p Post Paid.

LIGHTNING ELECTRONIC COMPONENTS
84 Birchmoor Road, Birchmoor, Tamworth Staffs B78 1AB
(NOTE New Address)

Auto Marine

YAESU

WE STOCK YAESU, JAYBEAM, CUSHCRAFT, MICROWAVE MODULES, MUTEK, DAVTREND ETC.

ALL AT COMPETITIVE PRICES.

Access

AUTO MARINE DEVELOPMENT COMPANY
60 ORLANDO STREET, BOLTON
'Phone (0204) 21059

BARCLAYCARD VISA

AMATEUR RADIO EXCHANGE

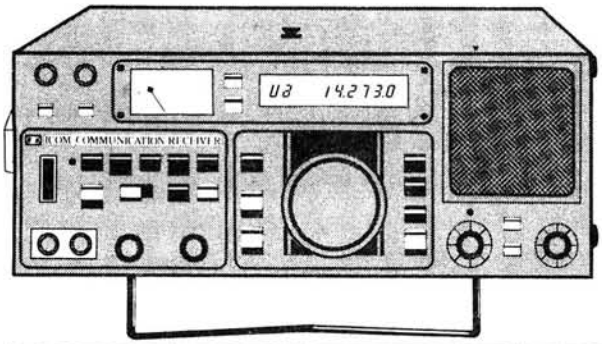
ONCE UPON A TIME, THERE WAS THE HRO...

Customers often ask, after they have decided on a new rig, whether it's the most up-to-date equipment on the market, or whether there is something even more exciting lurking round the corner...and our honest answer to that question has to be that, however sophisticated the rig you buy, there is **always** something newer on some manufacturer's launching pad. The trouble is, if you insist on waiting for the ultimate rig, you'll miss out on a lot of superb equipment in the meantime.

The recent progress in communications receivers is a case in point. About seven years ago YAESU introduced an absolute gem of a receiver, the FRG-7, which sold by the thousand world-wide, and is still in demand today as sheer good value for money when funds are limited.

Then, however, TRIO/KENWOOD burst upon the market with their even more remarkable R-1000. YAESU's answer was not long delayed, and came in the form of the FRG-7700 which outclassed even the R-1000 and has been, until today, the market-leading receiver...

...until today, and the entry of a new name into the receiver field, namely ICOM, who are about to announce a really outstanding new model which we had the opportunity to see and try on our recent trip to Japan. Having done so, we are convinced that everyone who wants the best in today's receiver technology will now be asking for ICOM. Here are just a few of its key features.



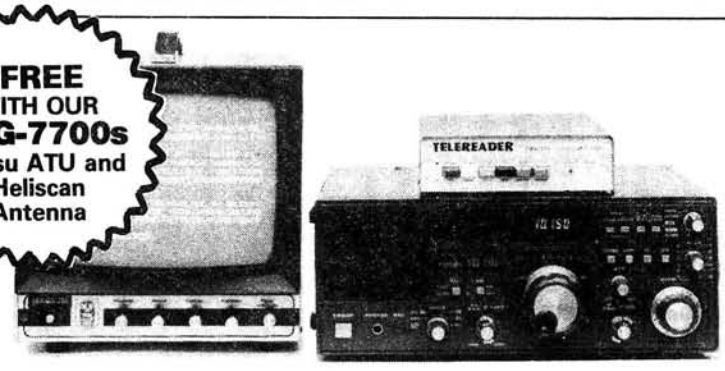
- **Tunable from 100kc to 30MHz**
- **AM/SSB/FM right across the range**
- **Pass band tuning • Scan facility**
- **Notch filter • Two VFO's**

Whether you want to buy outright or part-exchange your existing receiver—FRG-7700, R-1000, FRG-7 or even an old HRO—phone or call in without delay and be one of the first to enjoy a remarkable new experience in radio reception...and have a cup of Brenda's coffee while you're waiting.

The further fruits of our trip to the Land of the Rising Sun are a whole new generation of scanning receivers, all synthesised (of course!), for UHF, VHF and Low Band, with digital readout, scanning in 5/10/12.5/25kc steps, and in hand-held and mobile format. Also airband receivers, including a professional-type model tunable from 118 to 136MHz on AM.

All of these should start to arrive in August, so come and hear the full story.

FREE WITH OUR FRG-7700s Yaesu ATU and Heliscan Antenna



Ever wanted to decipher all those funny morse code (CW) and radio teletype (RTTY) noises you hear on your communications receiver? Well, now you can—with the new TASCO Morsemaster CWR 600.

Simply connect the input side of the Telereader to your receiver or transceiver, and the output either to a domestic TV (UHF) or to a proper VDU which we can also supply. RTTY and CW will be automatically demodulated and displayed on the screen, CW at speeds of up to 250 characters per minute, RTTY at between 45.5 and 110 Bauds.

£189 inc. VAT

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 Mike (G4NAR), 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.

LICENSED CREDIT BROKERS • Ask for written quotation.
INSTANT HP AND NO-INTEREST HP TERMS AVAILABLE FOR LICENSED AMATEURS AND BANK/CREDIT CARD HOLDERS
Credit card sales by telephone

BARCLAYCARD VISA — We welcome Access

Phone for up-to-date price information, or send 50p for our full Stock List (refundable against any purchase over £5).

WATERS & STANTON ELECTRONICS

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

★ *CALL IN AT OUR SUPER STORE*
LARGEST STOCKS IN SOUTH EAST

★ *TELEPHONE YOUR CREDIT CARD NO.*
SAME DAY DESPATCH

★ *SEND CHEQUE OR P.O.*
BY RETURN DESPATCH

PART EXCHANGE WELCOME. FULLY EQUIPPED SERVICE DEPT

SHORT WAVE RECEIVERS – WE STOCK THE LOT!

£235 If you're a beginner just starting out in radio you'll be delighted with the performance that the R600 offers you. Considering the electronics that are packed into this receiver, the price is remarkably low. A few years ago this performance would have cost you twice as much. Full digital readout and really simple tuning in of SSB signals makes this one of the few top receivers that the beginner should consider. With all the gloom and doom one hears about in the news these days, why not put a pair of headphones on your head, plug them into the R600 and whisk yourself away into the wonderful world of wireless. Signals from the Australian outback or the flying doctor, radio amateur expeditions on some remote Pacific island, signals from Russian amateurs or young American novices, the latest World news even before the *BBC reports it,* aircraft over the Atlantic, shipping distress frequencies; all this and much more is possible on this little receiver. So don't delay any further, send today for full details and introduce yourself to an exciting new hobby.

Sony are well known for the innovations and the new ICF2001 is no exception. This receiver covers the full spectrum from 200kHz to 30mHz plus the FM broadcast band. The clear LCD display gives precise frequency readout to 1kHz and the set has six memories for storing popular frequencies. Its diminutive size and complete portability means you can take it anywhere. Powered from internal dry cells it is just as happy on an executive desk as it is in the radio shack. The telescopic aerial gives very creditable performance together with built in aerial tuner. Plug in the external aerial and the World is at your finger tips. It handles both SSB and AM signals and with excellent FM reception can equally double as a domestic receiver. The dual speed electronic tuning and fine tune vernier control make this set a remarkable package at a price that is quite amazing. As the only officially appointed amateur radio Sony dealer in the UK we can give you the kind of after sales service that has made us second to none.

£149

£319 The FRG7700 is for the advanced listener or for the enthusiast who demands the best in short wave reception. The receiver covers the complete spectrum 200kHz to 30mHz with a highly accurate digital display. The receiver offers excellent sensitivity and selectivity and has separate detectors for AM, FM and SSB, plus switched bandwidth on AM. Other controls include automatic gain control, noise blanker, attenuator, squelch, rf gain control and clock with timer. There is also facilities for fitting an optional 12 channel memory unit. The receiver runs from 230v AC mains or 12v DC and there is an optional aerial tuner to go with it. And if you are interested in VHF, there is a complete range of specially designed converters to go with the receiver that covers the amateur, aircraft and marine bands, etc. Why not send today for our coloured brochure and get to know more about what the FRG7700 has to offer.

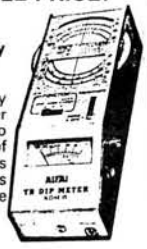
– – – AND REMEMBER – – – EVERY RECEIVER WE SELL IS BENCH TESTED TO SPECIFICATION
SO DON'T TAKE RISKS – – – COME TO SPECIALISTS – – – WHERE SATISFACTION COUNTS

LEARNING MORSE?
. . . HERE'S A SPECIAL OFFER

We've put together a complete package for anyone wanting to learn morse. It's based around the now famous Datong electronic morse tutor that we recommend as the best on the market. Add to this our special top grade morse key that plugs straight into the Datong D70 for sending practice plus our free copy of the RSGB morse code manual and you have a real bargain. Price **£59.95 (p&p £1.50).**

A NEW DIP METER . . .
. . . AT AN UNBEATABLE PRICE!

£49 inc. delivery



Here's a brand new Dip meter at a very competitive price. You won't find better value anywhere. Covering 1.8mHz to 250mHz it performs a host of measurements and will also function as a wavemeter which of course is required by the amateur radio licence regulations.

GLOBAL AT1000 ATU

£32 p&p £1.75

The Global AT1000 is the answer to top class reception. It's designed to perfectly match the aerial to any short wave receiver. We recommend this an accessory you should not be without.

NEW PRODUCT!

2M SSB/CW HANDHELD

200mW 144.25 to 144.35MHz

This ultra compact portable is revolutionary. Little larger than a packet of cigarettes it even incorporates a morse key! It will open up new horizons for Dxing from hills, mountains, tops of buildings, etc. If you want to put 2 metre SSB in your pocket send us a S.A.E.

Price should be about **£85!**

FDK
M750E TRANSCEIVER
2M FM-SSB-CW

SUPER DEAL

★ 1/10 Watts
★ All modes
★ Digital readout
★ 144-146MHz
★ Tone burst
★ RF gain control
★ Dual VFO
★ Up/down Mic
★ Hardware kit

£289 (carriage free)
SAE FOR COLOUR LEAFLET

FDK
M700EX TRANSCEIVER
2M FM 25 WATTS

SUPER DEAL

★ Synthesized
★ 25 & 12½ KHz steps
★ Priority scanning
★ Variable power
★ Digital display
★ Tone burst
★ Reverse repeater
★ Fully protected
★ Hardware kit

£199 (carriage free)
SAE FOR COLOUR LEAFLET

THE COMPLETE ELECTRONICS CENTRE
FOR AMATEUR RADIO – CB – HI-FI – VIDEO *E&OE*

Prices correct at time of going to press.

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

WATERS & STANTON ELECTRONICS

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

EXCITING NEW PRODUCTS!

NEW AIRBAND MONITORS – ATC720

The ATC720 will revolutionise air band monitoring. At the flick of a switch you can immediately dial up any one of the 720 VHF aircraft channels. In fact, it works just like the receivers built into the pilots cockpit. This means no more wondering whether you are tuned to the right frequency. The clear, white on black thumbwheel digits give instant confirmation of the channel frequency and the drift-free performance of the circuitry ensures that it will stay spot on channel indefinitely.

A new high sensitivity circuit ensures that even the weakest of signals can be copied and there is an external aerial socket so that it can be used indoors as a base station monitor. Extensive fatigue-free monitoring is possible using the squelch control setting and a built-in earphone socket provides for private listening. Included with the set is a flexible rubber antenna, rechargeable batteries and AC mains charger.

Two models are available; the ATC720SP is designed for commercial and professional applications, housed in a metal case and built to a stringent specification to meet all kinds of environments; the model ATC720 uses plastic mouldings and is rated for normal domestic and flying club use.

Whether you're a pilot, engineer or aircraft enthusiast, you'll enjoy the performance of these monitors. Follow the action at air shows and listen to the skills of the air crews as they guide their aircraft through the air lanes and finally down onto the runway.

SPECIFICATION

Frequency range	:118-136mHz
Channel Steps	:25kHz
Mode	:AM
Sensitivity	:0.5uv
Selectivity	:8kHz/6dB & 25kHz 60dB
Antenna	:50 ohms

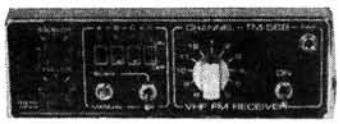
(HOBBY MODEL ILLUSTRATED)
PRICE £129.00
(PROFESSIONAL MODEL £189.00

THE MOST SENSITIVE MONITOR WE KNOW OF!

TM56B MkII

AVAILABLE FOR 2m or MARINE

ONLY £89.00



SPECIFICATION

Frequency Band	:144-146mHz Amateur version
	:156-162mHz Marine version
Number of Channels	:16 max. 10 fitted
Sensitivity	:0.4uv for 20dB
Mode	:FM modulation
Audio output	:1 watt 8 ohms
Power requirements	:13.8v DC or 230v AC
Sizes (mm)	:190(D), 140(W), 45(H)

The TM56B Mark II is probably the most sensitive scanning monitor available on the domestic market. It is a highly professional design intended for serious monitoring purposes and as such has found wide acceptance throughout the World.

The TM56B can be supplied either covering the 2m amateur band or the VHF marine band. In accordance with professional techniques, it uses crystals to ensure maximum receive performance. There is a total capacity of up to 16 channels, of which 10 channels are ready fitted, leaving the user the choice of 6 additional channels. 12 channels are selected by the main rotary front panel control and 4 further channels operate in a scanning mode. As soon as a station is heard, the receiver locks itself onto the appropriate channel indicated by an LED display. Any one of these channels may be "locked out" so that the scanner misses that channel. Other front panel controls include volume and squelch and on the rear panel is a standard SO239 aerial socket. The unit is also supplied with a mobile mounting kit. Power requirements are 12v DC or 230v AC for the built-in power supply.

If you are just starting out into amateur radio, then this receiver is a must. Enjoy listening to all your local amateurs both at home and mobile. Switch to your local repeater channel and hear the activity from miles around. The TM56B will give you a splendid introduction to amateur radio and is thoroughly recommended by us.

THE INCREDIBLE SX200N MONITOR RECEIVER

POLICE, AIRCRAFT, TAXIS ETC.

The SX200N is an extremely versatile and wide range receiver. This revolutionary design embodies a host of features that makes this unit a completely self-contained monitoring station. The frequency coverage extends from 26mHz to 512mHz and covers every conceivable service that utilises the VHF and UHF spectrum. Both AM and FM reception is provided, giving coverage of the Police, Fire Brigade, Ambulance, Aircraft, Taxis, Public Services, etc! The clear digital display gives instant frequency readout and a comprehensive scanning system makes easy work of hunting out the thousands of stations. The SX200 operates from 12v DC or 230v AC and comes complete with aerial. Simply plug the unit in and whisk yourself away into the wonderful World of radio.

ONLY £259.00 + £2.00 Carr.

CHEAPEST SCANNER AROUND! VHF 2m HAM BANDS COMPLETE WITH BRACKETS £39.00

M161

Here's a unit that is really incredible value. Look at the price! This is a complete 16 channel scanning receiver designed for either mobile or home use. It requires 12v DC and comes complete with mobile mounting brackets. Designed for use on the 2m amateur band, the set uses crystals for really top performance. Two of the most popular amateur channels are ready fitted and most other channels of your choice can be supplied from stock. This high performance receiver is ideal for those becoming interested in amateur radio and can be thoroughly recommended.

MAIL ORDER SLIP to: Waters & Stanton Electronics, Warren House, Main Road, Hockley, Essex.

Name..... Goods required .....
Address..... .....
....
....

Please rush me the above. Cheque enclosed for £...../Please charge to credit card No .....

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.

TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
30 VA 70×30mm 0.45Kg Regulation 18%	1x010	6+6	2.50	**£5.12**
	1x011	9+9	1.66	
	1x012	12+12	1.25	
	1x013	15+15	1.00	
	1x014	18+18	0.83	
	1x015	22+22	0.68	
	1x016	25+25	0.60	
	1x017	30+30	0.50	
50 VA 80×35mm 0.9Kg Regulation 13%	2x010	6+6	4.16	**£5.70**
	2x011	9+9	2.77	
	2x012	12+12	2.08	
	2x013	15+15	1.66	
	2x014	18+18	1.38	
	2x015	22+22	1.13	
	2x016	25+25	1.00	
	2x017	30+30	0.83	
	2x028	110	0.45	
	2x029	220	0.22	
	2x030	240	0.20	
80 VA 90×30mm 1Kg Regulation 12%	3x010	6+6	6.64	**£6.08**
	3x011	9+9	4.44	
	3x012	12+12	3.33	
	3x013	15+15	2.66	
	3x014	18+18	2.22	
	3x015	22+22	1.81	
	3x016	25+25	1.60	
	3x017	30+30	1.33	
	3x028	110	0.72	
	3x029	220	0.36	
	3x030	240	0.33	
120 VA 90×40mm 1.2Kg Regulation 11%	4x010	6+6	10.00	**£6.90**
	4x011	9+9	5.66	
	4x012	12+12	5.00	
	4x013	15+15	4.00	
	4x014	18+18	3.33	
	4x015	22+22	2.72	
	4x016	25+25	2.40	
	4x017	30+30	2.00	
	4x018	35+35	1.71	
	4x028	110	1.09	
	4x029	220	0.54	
	4x030	240	0.50	
160 VA 110×40mm 1.8Kg Regulation 8%	5x011	9+9	8.89	**£7.91**
	5x012	12+12	6.66	
	5x013	15+15	5.33	
	5x014	18+18	4.44	
	5x015	22+22	3.63	
	5x016	25+25	3.20	
	5x017	30+30	2.66	
	5x018	35+35	2.28	
	5x026	40+40	2.00	
	5x028	110	1.45	
	5x029	220	0.72	
	5x030	240	0.66	

★ **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
225 VA 110×45mm 2.2Kg Regulation 7%	6x012	12+12	9.38	**£9.20**
	6x013	15+15	7.50	
	6x014	18+18	6.25	
	6x015	22+22	5.11	
	6x016	25+25	4.50	
	6x017	30+30	3.75	
	6x018	35+35	3.21	
	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 110×50mm 2.6Kg Regulation 6%	7x013	15+15	10.00	**£10.17**
	7x014	18+18	8.33	
	7x015	22+22	6.82	
	7x016	25+25	6.00	
	7x017	30+30	5.00	
	7x018	35+35	4.28	
	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 140×60mm 4Kg Regulation 4%	8x016	25+25	10.00	**£13.53**
	8x017	30+30	8.33	
	8x018	35+35	7.14	
	8x026	40+40	6.25	
	8x025	45+45	5.55	
	8x033	50+50	5.00	
	8x042	55+55	4.54	
	8x028	110	4.54	
	8x029	220	2.27	
	8x030	240	2.08	
625 VA 140×75mm 5Kg Regulation 4%	9x017	30+30	10.41	**£16.13**
	9x018	35+35	8.92	
	9x026	40+40	7.81	
	9x025	45+45	6.94	
	9x033	50+50	6.25	
	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 _____

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)

UHF RECEIVER Type R278 covers 225 to 400Mc/s in steps of 100Kc any 11 frequencies can be selected by means of rot swt on front panel, for use on 230v mains provides AF O/P of 3 watts 600 ohms. Uses some 38 crystals to cover full range no ext crystal required, 19" rack mt unit about 50Kg. Supplied tested with circ & book. **Price £115.**

COMMUNICATIONS RX made by Murphy for R.N. general purpose Rx covers 60/560Kc two bands & 1.5/30Mc/s in three bands as 13 min valves inc 2x RF, 3x IF, BFO, Xtal Cal, Var Selectivity, AVC, N.L. in case size 13×14×14" note these Rx req ext power at 250v DC 100Ma, 150v Stab & 6.3 AC at 4 amps. Supplied tested with circ & book. **Price £115.**
Also available for callers; in poor condition at **£25.**

H. F. TRANSMITTER AMP. Freq. 2.8 to 18Mc/s in two bands rated for 100 watts min o/p, reqs ext supplies of 300 & 600v DC needs RF drive 2v RMS from 70 ohms at fund freq. Uses valves 6CH6, 5B255, & 2x 4X150 in P.A. as int 24v blower. These are normally tuned remotely but can be manually tuned from front panel, in case size 8×8×13" about 8Kg, RF O/P to match into 70 ohm with circ & book. **Price £37.** Also crystal osc to suit above **£3.**

TUNING ASS From above TX Amp comprises 3x Roller Coaster coils with band swt relays, padder & trim conds etc all on die cast chassis new cond with circ. **Price £12.50.**

ROLLER COASTER COILS ex ATUs nom 2/18Mc/s coil 36 trs on 2" ceramic former 5¼" long overhaul size 6¼×3×3" silver plated wire carbon brush. **Price £9.50.**

MORSE KEYS. Ex Army general purpose adjustable new unused supplied with small 9v practice buzzer. **£5.50.**

SPARE VALVE SETS all CV types as follows. 6BA6×5, 6BE6×2, EF91×4, EB91×3, EL91 total 15. **Price £10.**

AIRCRAFT ADF Equipment comprises R1937 Rx 150Kc to 1500 Kc 3 bands, Rx Control box, Loop Ae ass with motor drive unit,360° bearing Ind, Ae Amp unit, Junction box. This can be used as normal Rx or ADF to give bearings on stations in freq range also manual control of loop, reqs 24v DC at 5 amps, some tech info. **Price £85.**

R4187 Rx & Control Box 24 chan crystal controlled Rx covers 2.8 to 18Mc/s in 3 bands as 16 min valves inc, 2x RF, Dual Conversion, BFO, N.L, etc O/P for 100 ohm power req 24 & 19v DC in case size 15×8×8" reqs Hc6/u crystals not supplied. With circ & book. **Price £35.**

BENCH POWER UNIT general purpose unit by Solartron gives 0 to 500v DC at 100M & 6.3v AC at 3 amps. in case size 13×13×8" with meter to volts or Ma tested with circ. **£30**

S.T.C. STR.18 Equipment comprises R4187 Rx, T4188 Tx Amp, T4243 C.U.T. 4180 ATU, T4192 Mod & Power unit, T4189 C/Bx provides 24 Tx & Rx channels in freq range 2.8 to 18Mc/s rated for 100 Watts A.M. for use on 24 & 19v DC crystal controlled, with circs no connectors. **Price £115.**

Above prices include Carr/Postage & VAT. Please allow 14 days for delivery. Goods ex equipment unless stated new, SAE with enquiry or 2×15p stamps for list 28.

A. H. SUPPLIES

122, Handsworth Rd., Sheffield S9 4AE. Ph. 444278 (0742).

IONISER KIT

This negative ion generator gives you the power to saturate your home or office with millions of refreshing ions. Without fans or moving parts it puts out a pleasant breeze. A pure flow of ions pours out like water from a fountain, filling your room. The result? Your air feels fresh, pure, crisp and wonderfully refreshing.

All parts, PCB and full instructions..... **£12.50**
A suitable case, including front panel, neon switch etc..... **£6.50**

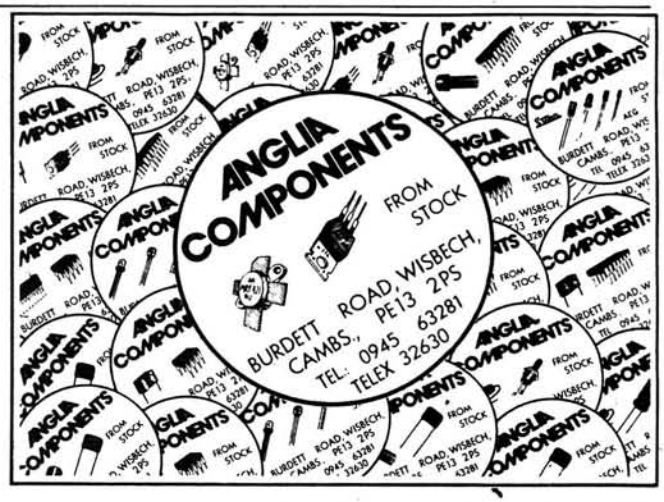
P.W. KITS

28MHz Preamplifier	ZW23	Aug '82	
3 band Short-wave Converter	ZW20	Feb '82	**£38.50**
Amateur TV UP Converter	ZW22		**£14.50**
Morse Practice Oscillator	ZW16	Jan '82	**£8.25**
R.F. Noise Bridge	ZW15	Jan '82	**£17.50**
SWR Warning Alarm	ZW18	Nov '81	**£6.20**
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**
Wideband RF Preamplifier	ZW8	Jan '80	**£7.50**
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.*

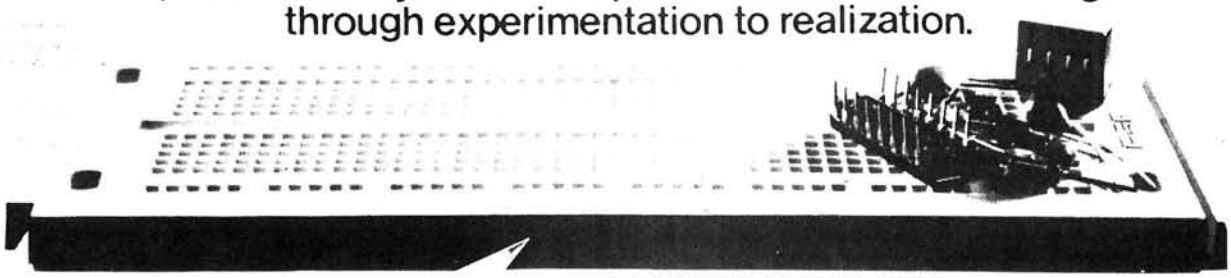
T. POWELL

Advance Works, 44 Wallace Road, London N1.
Telephone 01-226 1489
Personal callers: Mon to Fri 9 am-5 pm; Sat 9 am-3 pm.

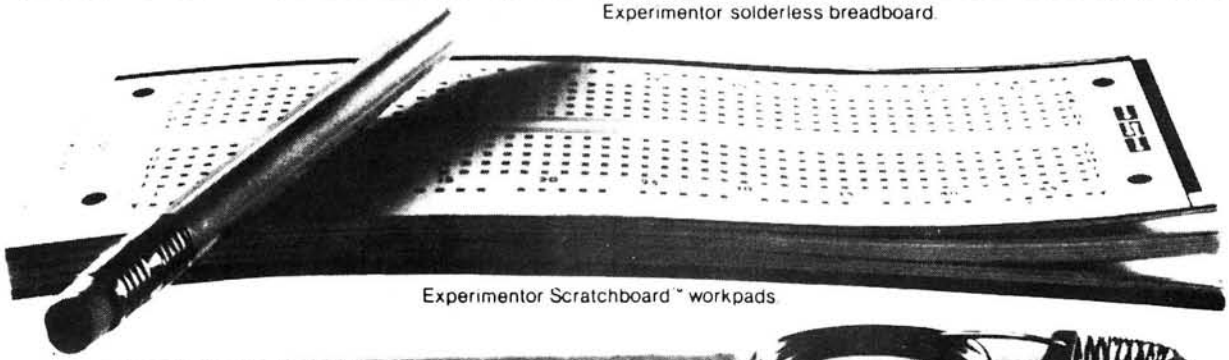


You can't beat The System.

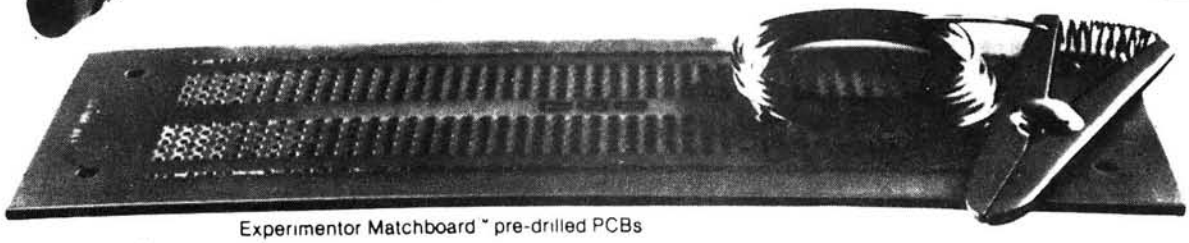
The Experimentor System™ — a quicker transition from imagination through experimentation to realization.



Experimentor solderless breadboard



Experimentor Scratchboard™ workpads



Experimentor Matchboard™ pre-drilled PCBs

When you have a circuit idea that you want to make happen, we have a system to make it happen quicker and easier than ever before: The Experimentor System.

You already know how big a help our Experimentor solderless breadboards can be. Now we've taken our good idea two steps further.

We've added Experimentor Scratchboard workpads, with our breadboard hole-and-connection pattern printed in light blue ink. To let you sketch up a layout you already have working so you can reproduce it later.

With Experimentor Matchboard you can go from breadboard to the finished product nonstop! We've matched our breadboard pattern again, this time on a printed circuit board, finished and ready to build on. All for about £1.20

There's even a letter-and-number index for each hole, so you can move from breadboard (where they're moulded) to Scratchboard™ (where they're printed) to Matchboard™ (where they're silkscreened onto the component side) and always know where you are.

When you want to save time and energy, you can't beat The Experimentor System.

1. EXP-300PC, which includes one item. A Matchboard pre-drilled PCB **£1.20**	**2.** EXP-302, which includes three items. Three 50-sheet Scratchboard workpads **£1.50**	**3.** EXP-303, which includes three items. Two Matchboards and an EXP-300 solderless breadboard **£7.60**	**4.** EXP-304, which includes four items. Two Matchboards, an EXP-300 breadboard and a Scratchboard workpad **£8.70**

GLOBAL SPECIALTIES CORPORATION

GSC

G.S.C. *(UK) Limited*, Dept. 6W
Unit 1, Shire Hill Industrial Estate,
Saffron Walden, Essex. CB11 3AQ.
Telephone: Saffron Walden (0799) 21682
Telex: 817477

GLOBAL SPECIALTIES CORPORATION DEPT. 6W
Unit 1, Shire Hill Industrial Estate, Saffron Walden, Essex

Name _____

Address _____

Inc P&P and 15% VAT

1 EXP 300PC **£2.25**	Qnty Reqd	2 EXP 302 **£2.58**	Qnty Reqd
3 EXP 303 **£9.89**	Qnty Reqd	4 EXP 304 **£11.15**	Qnty Reqd

FREE Catalogue tick box

I enclose cheque PO for

£ _____

Phone your order with Access, Barclaycard or American Express

Card No. _____ Expiry date _____

Goods despatched within 48 hrs.

comment...

First, the Bad News (II)...

EACH YEAR about this time, I come to the task I like least in editing *PW*: telling you that (in case you hadn't noticed) our cover price has gone up, this time to 85p. Unfortunately, the cost of materials and services which go towards producing magazines still spiral upwards, though I know that's little comfort to those of you on fixed incomes.

Regular readers may have noticed the subscription special offer card in our last issue, with which you can get *Practical Wireless* posted to any UK address for the next twelve months for just £9.00. It's not too late to complete and post the card, and it will actually save you money.

★ ★ ★ ★ ★ ★

This year, we've managed to get around to a few more rallies and shows, which is nice for us, because it gives us a chance to meet more of our readers, and it gives them a chance to tell us what they think of the magazine. We also get quite a few suggestions for new features, and though we can't use all of them, they're welcome nevertheless.

Incidentally, whilst we are on the subject of shows, we are planning to mount a new exhibition for radio and electronics hobbyists in November, in conjunction with our sister magazines *Practical Electronics* and *Everyday Electronics*.

The venue for the Electronic Hobbies Fair, as it is to be called, is the new Pavilion at Alexandra Palace, London, where the RSGB Exhibition was held last April. Besides a wide range of stalls selling goodies for anyone interested in radio (be it for communication or for control of models), electronics, computing, etc., we plan to have demonstrations of hobby and professional radio and electronic systems.

We'll be giving more details in due course, but meanwhile try to keep a day free between the 18th and 21st of November.

★ ★ ★ ★ ★ ★

As I write this at the beginning of July, we hear that the Home Office has dealt with Amateur Licence applications received up to March 17. We all know about the recession and Government spending cutbacks, but since the issue of Amateur Licences is supposed to be self-financing from the fees collected, why can't extra staff be put onto the job to help clear the backlog, which can only get worse with the increase in the number of candidates with each RAE. The cheques were cashed as they were received, so there's no excuse—the money's there. Why not write to the Home Secretary and to your MP, asking that something be done about it, and quickly.

Geoff Arnold

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 £13.00 per annum, from **"Practical Wireless" Subscription Department, Room 2613, 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 95p 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.

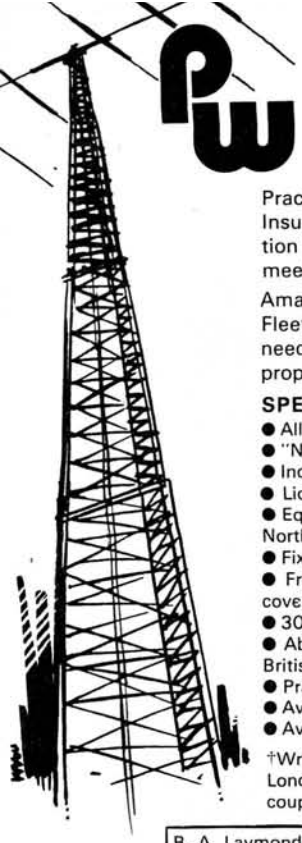
Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

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 PW9/82

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 £

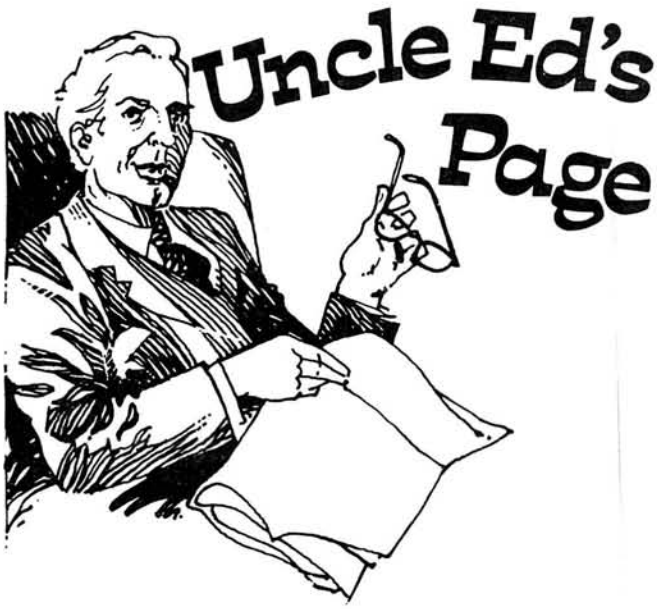
DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract 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.



TRANSMITTER POWER—1

The recent argument over the new UK Amateur Licence Schedule has made some people think more deeply about the ways of specifying the power of a radio transmitter. Several readers have admitted that they are rather confused by the whole business; perhaps the following may make things a little clearer.

There are currently four ways of rating the power of a transmitter. The traditional method for the amateur service is d.c. input power, defined in the UK Licence as: *The total direct current power input to (i) the anode circuit of the valve(s) or (ii) any other device energising the antenna.* It is worked out by multiplying together the d.c. supply voltage fed to the anode or collector of the final stage and the current flowing in the anode or collector circuit (see Fig. 1). In either case $V \times A = W$(d.c.). How much r.f. power you'll get out of the transmitter depends on several factors, including the efficiency of the final stage and of the antenna coupling circuit, the method of modulation and the level of distortion of the modulated output waveform you allow.

The other three ways of rating a transmitter refer to how much r.f. power actually comes out of it to be applied to the antenna. Each is laid down internationally in the *Radio Regulations,* and at the risk of frightening you off altogether, I'll quote the definitions here in full and try to explain each one.

Carrier Power (of a radio transmitter): *The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle taken under the condition of no modulation.* Since there is no modulation, it doesn't actually make any difference whether you look at just one r.f. cycle or more than one, so long as it's a whole number (known to mathematical types as an integral number) of cycles. Because the carrier is a sinewave, you can treat it in just the same way as a power-frequency or audio-frequency sinewave (Fig. 2).

There are three important relationships to remember here (sure-fire favourites for just about every Radio Amateurs' Examination): (a) average power is proportional to the square of the r.m.s. voltage of the sinewave; $W = V^2 \div R$, (b) peak power is proportional to the square of the peak voltage of the sinewave, (c) the peak voltage of the sinewave is equal to 1·414 times the r.m.s. voltage. Therefore, the peak power must be equal to $1{\cdot}414^2$ times average power. Your pocket calculator will tell you that $1{\cdot}414^2 = 2$, so the peak power of a sinewave is twice its average power.

Mean Power (of a radio transmitter): *The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encounterd in the modulation taken under normal operating conditions.* This one doesn't appear in the amateur licence, but it's worth knowing about as it illustrates the basic principle that when amplitude modulation is applied to a carrier, the average power increases. For 100 per cent modulation depth, the power output goes up by a half. The definition of mean power says that your measuring instrument must average power out over a period of time at least equal to one complete cycle of the lowest modulating frequency.

You can use this change in average power with modulation to estimate modulation depth on an a.m., d.s.b. transmitter, provided your power meter responds to true power (using a thermo-couple ammeter, for example). Just to remind you that power is proportional to current squared, as well as to voltage squared, if the power output has gone up to 1·5 times what it was, because of the modulation applied, the current flowing into the load (the antenna) will be $\sqrt{1{\cdot}5} = 1{\cdot}225$ times what it was for the unmodulated carrier.

Unfortunately, most r.f. power meters used by amateurs employ a diode voltmeter combination which actually responds to the peak voltage of the r.f. If you try to use the change in power indicated by one of these to gauge modulation depth, your result could be out by as much as 167 per cent!

Any power meter intended and scaled to read average power needs a steady input signal such as plain carrier if it's to give a truthful reading. The average amplitude of a speech signal (not one that's gone through a processor or clipper) is usually reckoned to be about half the average (r.m.s.) value of a sinewave having the same peak amplitude, though this depends very much on the individual voice. Since the peak-to-r.m.s. ratio of a sinewave is 1·414, on that basis, the peak-to-average amplitude ratio of unprocessed speech is $2 \times 1{\cdot}414 = 2{\cdot}828$. Because the figures are very approximate anyway, this is usually spoken of as a ratio of 3:1, giving a power ratio of 9:1. ($3^2 = 9$; okay?)

The third way of rating a transmitter, peak envelope power (p.e.p.), which isn't really a peak power at all, I'll have to talk about next month.

Fig 1a

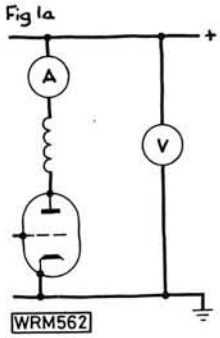
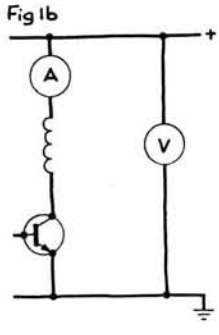
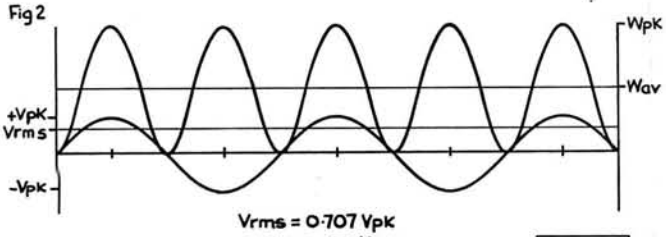


Fig 1b



WRM562

Fig 2



Vrms = 0·707 Vpk
Vpk = 1·414 Vrms
Wav = 0·5 Wpk
Wpk = 2 Wav

WRM624★

144 MHz RING-BASE ANTENNA

PART 1

F. C. JUDD G2BCX

With the exception of the popular "Slim Jim" two metre omni-directional antenna published some time ago in *Practical Wireless,* there have been few, if any, single element end-fed vertical antennas designed for "free-space" 144MHz operation i.e. without the necessity of a ground-plane.

Although tests carried out recently by *PW* proved the Slim Jim to have a very good performance by comparison with various mobile ground-plane type antennas, the normal construction of the Slim Jim makes it mechanically difficult to use for mobile working. A Slim Jim was, however, designed by the writer specifically for mobile operation but this employed a helical stub drive system which owing to its complexity made it unsuitable for publication as a home constructed project.

An alternative to the Slim Jim but having the same performance and "free-space" function has therefore been considered for both fixed station and mobile operation and particularly with the capability of working efficiently on vehicles of glass fibre construction.

The designs offered in this article not only fulfil the above requirements but can, in addition, be tuned for operation in the v.h.f. marine band (156MHz) for use by boat owners who have the appropriate marine equipment. *It must be mentioned however, that construction for mobile operation, as will be described in Part 2, would be somewhat difficult without the use of a lathe and certain other machine tools and that the materials would not be very easy to purchase. An arrangement has therefore been made with an engineering company to supply the essential machined parts at reasonable cost.*

A simplified version of the ring-base antenna can be constructed without too much difficulty for 144MHz home base operation, or for use on a boat for either 144MHz or 156MHz v.h.f. marine communication. Details are included in this part of the article. Once the principle of operation of this antenna is understood, many will no doubt see ways of constructing it other than as described, providing the physical lengths of the elements, etc., are adhered to. The diagrams and photos should provide ample information for construction on one basis or another.

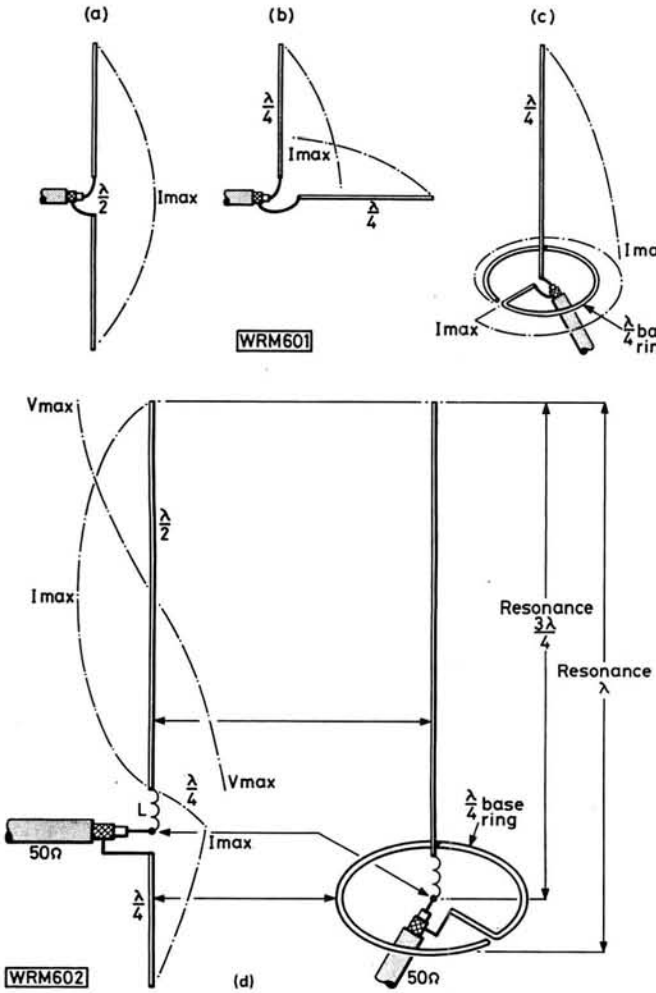


Fig. 1: Evolution of the Ring-Base Antenna

How the Ring-base Antenna Functions

Basically it is a half-wave radiating system with an overall full-wavelength resonance. The quarter-wave ring and small inductance, L, serve only to provide a suitable low impedance (50 ohms) feed and a voltage drive to the half-wave radiator. This method obviates the use of a ground-plane. The diagrams in Fig. 1 illustrate the evolution of the ring-base antenna from what is a normal dipole (a). First, the lower quarter-wave portion is set at right angles as in (b) and then formed into a circle (c). This still enables a low impedance (50 ohm) feed to what is now the base of a quarter-wave vertical antenna.

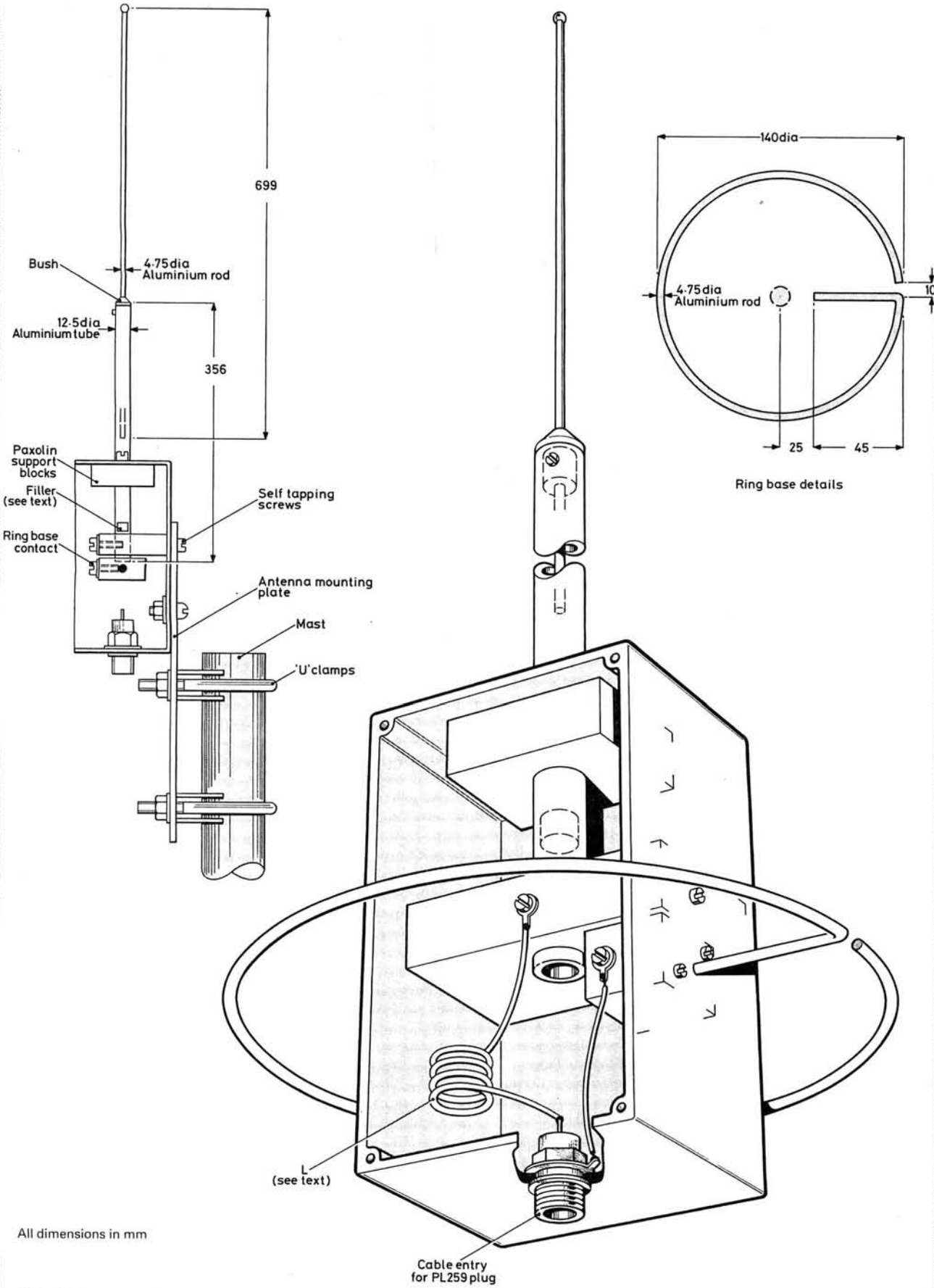


Fig. 2: Construction of a Ring-Base antenna. See text for further details

WRM600

However, to obtain the required voltage drive to a half-wave radiator, the quarter-wave vertical section is replaced by a small inductance, L, as in (d) so as to maintain the necessary half-cycle current distribution around the ring base and the inductance, L. This ensures the voltage feed required for the radiating half-wave section and that radiation from the quarter-wave ring and the inductance is otherwise virtually cancelled out. By adjustment to the inductance, L, and the physical length of the radiating section, the antenna can be tuned to operate on either the 144MHz band or the 156MHz marine radio band.

The Basic Model

The possibilities for home construction are illustrated in Fig. 2. The size of the plastics box which is used to protect the feed connections and inductance should be as near as possible to that shown, but it is very important to ensure that water cannot enter when the antenna is finally assembled and ready for use. To this end all possible entries that would allow water to seep through must be sealed with a suitable adhesive or rubberised sealant. Note the "filler" at the base of the radiating element which may be a tightly fitting piece of cork set in with adhesive. This is to prevent water running down from the telescopic radiating section to the inside of the box.

The support blocks should be Delrin, Perspex, Tufnol or other good insulating material, as the top of the inductance and the driven end of the radiating section is at high r.f. potential. For 144 to 146MHz, the inductance consists of 4 turns of 16 s.w.g. tinned copper wire 12·5mm diameter and pulled out to approximately 19mm long. The length of the radiating sections are as shown and have enough adjustment for either the 144MHz band or the 156MHz marine band. For 156MHz marine operation, however, the inductance consists of 3 turns of 16 s.w.g. tinned copper wire, 12·5mm diameter and pulled out to about 12·5mm long.

A side view of the main antenna assembly is shown in Fig. 2 and this also shows how mounting is effected by a rear support plate and a pair of 'U' clamps (car exhaust pipe clamps) for attachment to a mast top. Details for this plate are also given in Fig. 2.

The only other item for construction is the quarter-wave ring, details of which are shown in Fig. 2. Made from 4·75mm diameter aluminium rod it is not difficult to form the circle by hand if done carefully and slowly. The sharp inward bend is best formed in a vice.

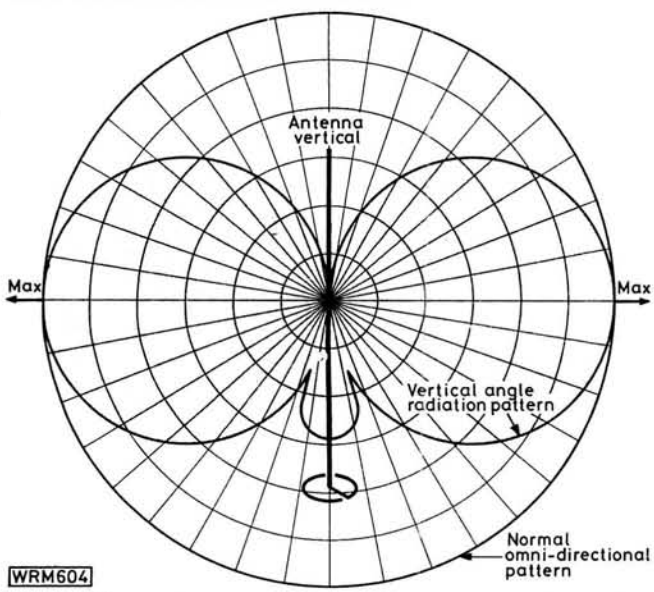


Fig. 3: Vertical angle radiation pattern taken from the prototype Ring-Base antenna as shown in the photo

Radiation Pattern and VSWR

As with the Slim Jim there is no tilt to the radiation in the vertical angle which has its maximum at right angles to the antenna as in Fig. 3. In the horizontal plane radiation is of course omni-directional and the gain of the system is unity, the same as a normal half-wave dipole. The very small lobe toward the base of the antenna is due to the residual radiation from the quarter-wave ring.

There should be little or no difficulty in obtaining a low v.s.w.r. across the band and the read-outs obtained with a Bird Thru-Line meter for both versions are shown in Figs. 4 and 5 respectively. Some small adjustment to the inductance L may be necessary, i.e. opened *out or closed in* slightly, this being carried out in conjuction with adjustment to the telescopic top section so as to obtain the lowest possible v.s.w.r. reading at mid-band.

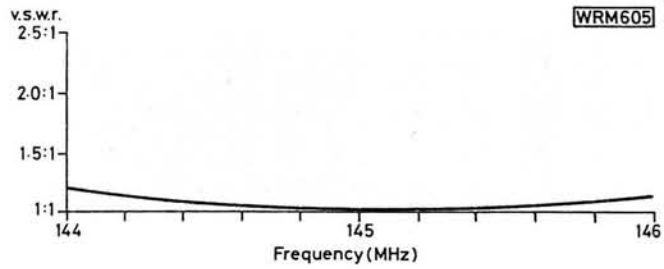


Fig. 4: VSWR—bandwidth readout from a Ring-Base antenna tuned for the 144MHz amateur band

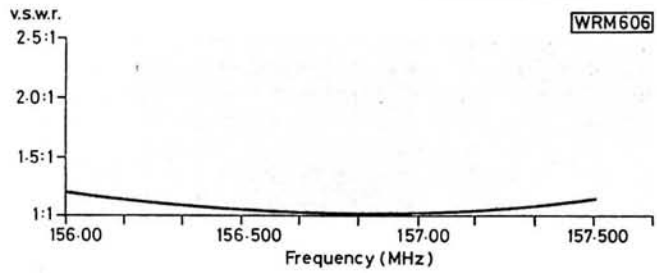


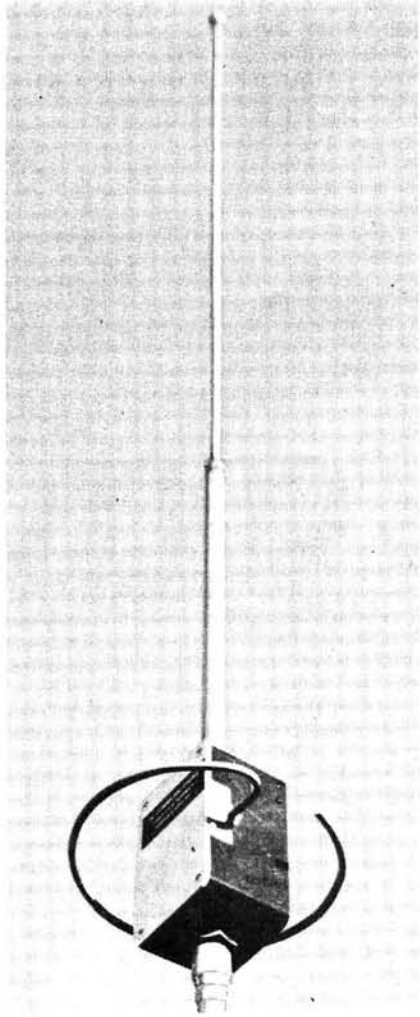
Fig. 5: VSWR—bandwidth readout from a Ring-Base antenna tuned for the 156MHz marine communications band

It is important that when this antenna is installed care should be taken over sealing against the entry of rainwater and that the cable entry and its connection should be well taped and also covered with some form of sealant. Such protection applies even more when an antenna of this nature is made for marine use.

Incidentally, by virtue of the special transmitting licences held by the writer, tests were carried out on a ring-base antenna tuned for the 156MHz marine band with the co-operation of the Great Yarmouth Coastguard. A fully readable signal with quiet background was received by them using a transmitted power of 1W at a distance of 12·5km and with the antenna sited at only 1m above water. Reception from them was at the same level.

Readers who have need for an efficient marine band antenna may be interested to know that a Slim Jim tuned to 156MHz also gives a very good performance. A prototype 156MHz Slim Jim was used for a radio survey on behalf of the Coastguard covering about 1000 square km of sea off the Norfolk and Suffolk coasts, first with the antenna operating at mast height on an ex-wartime motor torpedo boat and then at low height on a high-speed RNLI rescue vessel. Both the RNLI and the Coastguard authorities were not only pleased with the results of the survey but also very impressed with the efficiency of the Slim Jim (marine version) antenna at long range, its performance being quite superior to that of a typical commercially made v.h.f. marine antenna.

The prototype Ring-Base Antenna for operation on 145MHz Amateur Band or 156MHz Marine Communications Band



CONSTRUCTION RATING Beginner

BUYING GUIDE

The aluminium tubing and rods used in this antenna can be obtained from local aluminium stockholders. Look in Yellow Pages under Aluminium & -alloy rods, sheets, etc.

APPROXIMATE COST £6

Slim Jim antennas should not be made from 300 ohm ribbon feed as this reduces the radiation efficiency very considerably and more so when enclosed in ordinary p.v.c. pipe. A 300 ohm ribbon version is really only suitable for a quick-to-make standby antenna, although it will give reasonable results over a limited range. To obtain the wide bandwidth and full radiating efficiency a Slim Jim should be made of aluminium rod not less than 4·75mm diameter and with a spacing of 12·5mm between the folded sections. Otherwise construction should be according to the design originally published in *PW* and re-printed in *Practical Wireless* publication "Out of Thin Air".

Letters to the Editor intended for publication must be original, and not duplicated to or copied from other publications. We reserve the right to shorten or edit them if necessary.

Letters

A Friendly Warning!

Sir: I have just received your March 1982 issue containing an excellent chart of amateur callsign prefixes.

Allow me to point out a small, but unforgivable, error in your list, namely "A3 Republic of Tonga". Surely every British schoolboy knows that Tonga is a Kingdom.

Unless there has been a revolution in the "Friendly Isles" of Tonga within the last 24 hours, a most unlikely event, I can assure you that King Taufa'ahau Tupou IV, KBE, BA, LLB is still firmly seated on his throne, all 20 stone of him.

Should your mistake by chance be brought to the notice of the King of Tonga it is unlikely that he would call out the Tongan Army (50 men), embark them on the Tongan Navy (1 tugboat) and send them off to the assistance of the Republic of Argentina. Most likely he would give one of his hearty chuckles and say to an aide "You know, these British are our good friends, but they do make some peculiar mistakes about the people of the South Pacific."

A correction published in your Kindly Note section will, I am sure, avert any likelihood of *lese-majesty* charges being directed at your office by irate Tongan hams.

Incidentally the hams of Tonga use the prefix "A35".

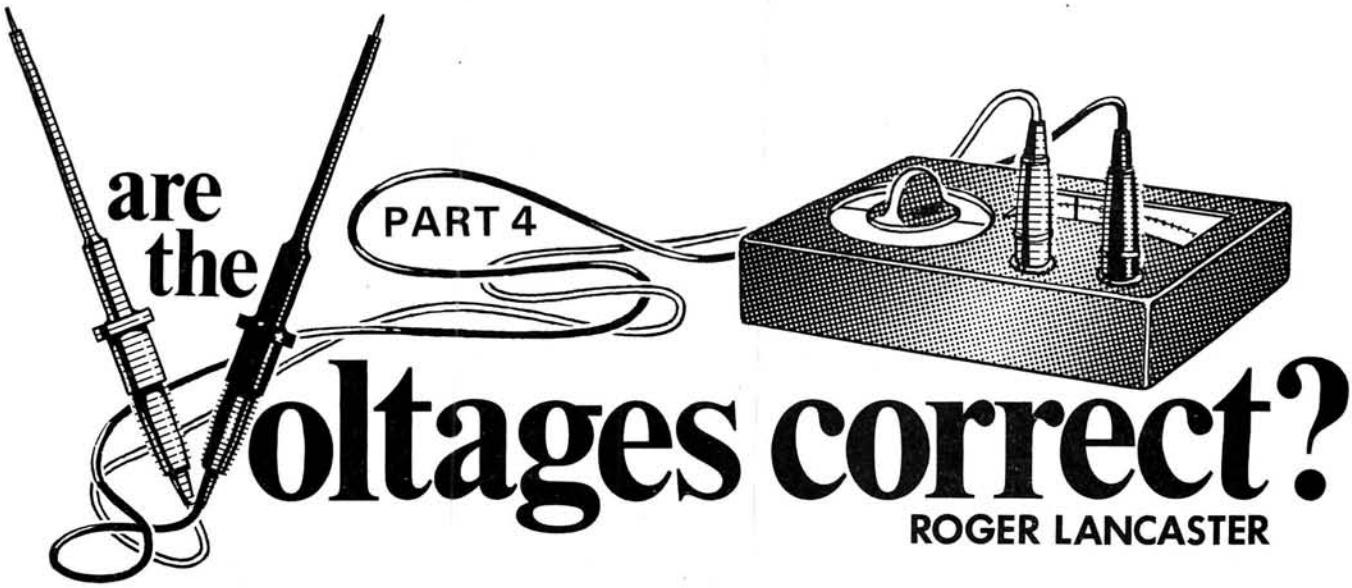
H.A. Coleman
Niue Island

Our sincere and humble apologies to King Taufa'ahau Tupou IV and all his subjects. The mistake crept in from one of the lists which we used to compile our chart.—Ed.

kindly note!

Where are you? Where am I? January 1982
The last paragraph on p. 22 should read . . . instead of Tables 2, 4 and 6 respectively. NOT 2, 4 and 5 as printed.

Modifying the JVC 3040 UKC TV, April 1982
Coil L1 in Figs. 1 and 2 consists of 10 turns of 22/24 s.w.g. tinned copper wire spaced over 10mm on a 4·8mm coil former assembly (Maplin), tapped at 2 turns. Coil L2 is a Toko moulded fixed value type 7BA–100 (Ambit). The integrated circuit IC1 was from the SL 521/SL 571 series.



are the PART 4 voltages correct?

ROGER LANCASTER

Solutions to last month's problems: The circuit is reproduced here in Fig. 4.1.

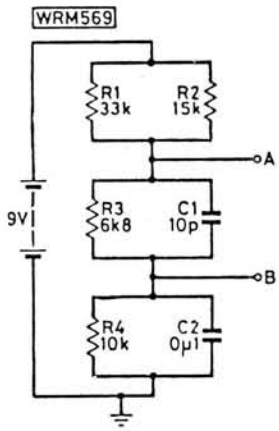


Fig. 4.1

No. 1: You were asked to calculate the potentials at "A" and "B". As the capacitors do not affect the steady d.c. conditions, we ignore them. Resistor R1 in parallel with R2 becomes

$$\frac{33 \times 15}{48} = 10{\cdot}3\text{k}\Omega$$

The total resistance is therefore (10·3 + 6·8 + 10) = 27·1kΩ

$$V_{R1/R2} = \frac{10{\cdot}3}{27{\cdot}1} \times 9 = 3{\cdot}42\text{V}$$

Therefore, potential at "A" = +9 − 3·42 = **+5·58V**

$$V_{R4} = \frac{10}{27{\cdot}1} \times 9 = 3{\cdot}32\text{V}$$

Therefore, potential at "B" = 0 + 3·32 = **+3·32V**

No. 2: The problem was to choose the most likely component fault for the conditions (i) to (iv).

(i) "A" = +9V, "B" = +9V: If "A" and "B" are the same potential, either there is a short-circuit between them or no current is flowing through R3. If "A" is the same potential as the battery positive terminal, either R1 or R2 must be short-circuit or there is no current flowing in them. It is extremely unlikely that one resistor would go short-circuit, and unheard of for two resistors to go short-circuit simultaneously in the same circuit, so we assume no current flows in R1, R2 or R3, yet these resistors are not open-circuit or we would not read the +9V. So there must be a break in the circuit elsewhere to prevent current flow and this can only occur in R4. So **R4 is open-circuit.**

(ii) "A" = +9V, "B" = 0V: There is no voltage dropped across R1/R2 nor across R4. So, by the same reasoning as in (i), we assume no current flows in them. The break must therefore be in R3. We would get the same reading if **both** R3 and R4 were open-circuit but two faults occurring simultaneously in a circuit of this kind is a very remote possibility, so if we assume that a single component is faulty, then **R3 open-circuit** is our only suspect.

(iii) "A" = +4·43V, "B" = +4·43V: "A" and "B" are the same potential so either there is a short-circuit between them or no current flows in R3. Current does flow in R1/R2 and in R4, however, otherwise "A" and "B" would be at +9V and 0V respectively, so there must be a circuit between "A" and "B" through which current can flow and this must be a short-circuit. As it is far more likely that C1 would go short-circuit than R3, **C1 short-circuit is** the prime suspect.

(iv) "A" = +3·04V, "B" = +1·81V: Both potentials are lower than they should be. After checking that the battery voltage is correct and verifying that our meter's resistance is not causing the low readings, we decide that something has gone wrong with the resistor values. Either R4 has gone low in value or the R1/R2 combination has gone high in value, the latter being by far the most likely. Suppose one of these resistors has gone open-circuit, as often happens with resistor faults: If we calculate the potentials we would get if R1 had gone open-circuit, the potential at "B" would be

$$\frac{10 \times 9}{(15 + 6{\cdot}8 + 10)} = \frac{90}{31{\cdot}8} = +2{\cdot}83\text{V}$$

If we calculate the potential at "B" with R2 open-circuit we get

$$\frac{10 \times 9}{(33 + 6{\cdot}8 + 10)} = \frac{90}{49{\cdot}8} = +1{\cdot}81\text{V}$$

Eureka! **R2 is open-circuit.** At least this looks highly probable. If it had not worked out exactly, we would have had to unsolder one end of each of R1 and R2 and carry out an ohmmeter check on them.

Incidentally, in the last example, it is possible to **prove** that neither R4 low nor C2 leaky is the fault. If this

possibility is considered, let the new resistance between "B" and 0V be Rx. From the voltage measured at "B":

$$\frac{Rx \times 9}{(10{\cdot}3 + 6{\cdot}8 + Rx)} = 1{\cdot}81$$

Therefore, $9Rx = 1{\cdot}81\,(17{\cdot}1 + Rx)$

$9Rx = 30{\cdot}95 + 1{\cdot}81Rx$

$9Rx - 1{\cdot}81Rx = 30{\cdot}95$

$7{\cdot}19Rx = 30{\cdot}95$

$$Rx = \frac{30{\cdot}95}{7{\cdot}19} = 4{\cdot}3k\Omega$$

If this is so, the voltage across R1/R2 is:

$$\frac{10{\cdot}3 \times 9}{(10{\cdot}3 + 6{\cdot}8 + 4{\cdot}3)} = \frac{92{\cdot}7}{21{\cdot}4} = 4{\cdot}33V$$

and the voltage at "A" would be $+9 - 4{\cdot}33 = +4{\cdot}6V$.

But the voltage measured at "A" was +3·04V, so this cannot be the fault.

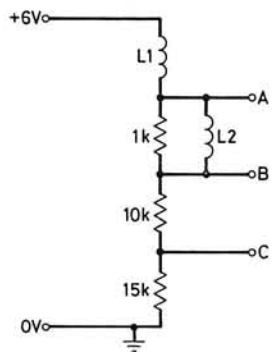
If R3 had gone low or C1 leaky the voltage at "B" would be higher than normal, not lower, so this possibility is quickly dismissed.

Note that in all four cases, the faulty component was pinpointed by analysing voltage readings before any part of the circuit was disconnected, thus illustrating an important point: It is often difficult and time-consuming to unsolder components for testing and it is particularly frustrating when, having gone to such trouble, the components in question are found to be perfectly all right. With a little thought, and a few simple calculations, much time and effort can be saved.

Inductors

Most inductors we meet have very little d.c. resistance—transformer windings (power, audio and r.f.), chokes, tuning coils etc.—and as far as our steady d.c. potential calculations are concerned they can be looked upon as short-circuits. They will have some low value of resistance, but unless the resistors associated with the inductor in the circuit are of comparable low resistance, then virtually all voltage will be distributed across the resistors and only a minute voltage would be measurable across the inductor, if the meter gave an indication at all.

WRM587 **Fig. 4.2**



Consider Fig. 4.2. Regardless of the inductance of L1 and L2, the d.c. resistance between the +6V line and "A" will be virtually nil and similarly the resistance between "A" and "B" will also be zero. Thus the potentials at "A" and "B" will be +6V. The 1kΩ resistor is ineffective because 1kΩ in parallel with zero ohms is zero ohms. With 6V across the other two resistors, the voltage across the 15kΩ resistor is (15/25) × 6 = 3·6V, so the potential at "C" is **+3·6V.**

Not all inductors have negligible resistance, however. A typical 24V relay coil, for example, might have a resistance of 3kΩ. In a case like this the component must be treated as a wire-wound resistor for the purposes of calculating potentials and its d.c. resistance must be known.

Diodes

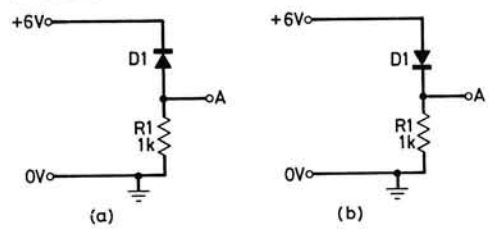
There are many different types of diode to be found in electronic circuits but the most common ones occurring in radio are

(i) silicon junction diodes
(ii) germanium junction diodes
(iii) germanium point-contact diodes and
(iv) Zener diodes.

Of these, the most common is (i) and, except where otherwise stated, it is silicon junction diodes to which reference will be made. Germanium junction diodes will be found in older equipment and germanium point-contact diodes in signal detection circuits, while Zener diodes have a special use which we shall examine separately.

The voltage existing across a diode depends primarily on whether the diode is "forward biased" or "reverse biased" and the voltage applied to the circuit and resistance values are considered only after the diode biasing and voltages have been established.

WRM588 **Fig. 4.3**

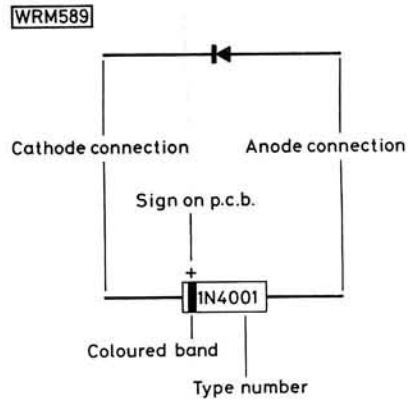


Figs. 4.3(a) and (b) show the two modes of operation of a diode while Figs. 4.4(a) and (b) show the circuit and physical appearance of the diode respectively. In Fig. 4.4(b), the "+" sign which often appears on printed circuit boards shows the **cathode** end of the diode.

In Fig. 4.3(a) the diode is connected in its "reverse biased" mode. The cathode is positive with respect to the anode. In this mode the diode has a very high resistance (of 1MΩ or so) and can be considered an open-circuit in most cases, rather like a very slightly "leaky" capacitor. So virtually all the 6V exists across D1 and negligible voltage across R1 and point "A" will therefore have a potential of zero volts.

Fig. 4.3(b) shows the diode in its "forward biased" mode, the cathode being negative with respect to anode. In

WRM589 **Fig. 4.4**

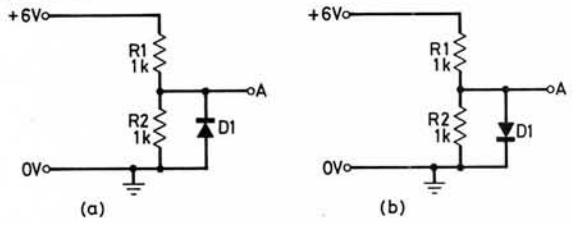


this mode the diode has a low resistance and the voltage across it lies within the very limited range of 0·5V to 1V, provided the voltage across the diode terminals **prior to its insertion** is equal to or greater than 0·5V. If this open-circuit voltage is lower than 0·5V the diode will not be forward biased and the circuit will behave as if the diode was not connected, i.e. open-circuit. The actual voltage across the forward biased, or conducting, diode depends upon the current flowing (as with a resistor), 0·5V resulting from low current flow and 1V from high current flow. As the current is increased, greater voltages than 1V could arise but at this level of conduction, or forward current, the diode is in danger of overheating and of being destroyed, so good design should limit diode forward current to a sensible value. In this series, the author will take 0·6V as the voltage across a conducting silicon diode.

Forward voltage for a germanium junction diode can vary from 0·2 to 1V and for a germanium point-contact diode from 0·1 to 2V. That for a Zener diode will be the same as for the silicon junction diode, although Zener diodes are usually operated in their reverse bias mode, as we shall see later.

WRM590

Fig. 4.5



Consider, then, the examples in Fig. 4.5. In part (a), the diode is reverse biased so the potential at "A" will be +3V, just as if the diode was not in circuit. In Fig. 4.5(b), however, the diode is forward biased and since its open-circuit voltage would be 3V it will conduct, with 0·6V across it. Thus the potential at "A" will be +0·6V.

If the value of R1 was increased to 100kΩ, however, note that the open-circuit voltage of D1 would be (1/101) × 6 = 0·059V, which would be insufficient to allow the diode to conduct and the potential at "A" would be +0·059V.

It is important to notice that when the diode conducts it is no longer possible to apply Ohm's Law to the two resistors in the same way as before. The diode is an example of a non-linear component, i.e. one which does not obey Ohm's Law in the same way as a resistor, and whenever such components are present it is essential to establish the p.d. across them before applying Ohm's Law to the purely resistive parts of the circuit. Kirchhoff's Laws still apply to the whole circuit, however, e.g. in Fig. 4.5(b) with 0·6V across D1/R2 there must be (by Kirchhoff's Second Law) 6 − 0·6 = 5·4V across R1. Ohm's Law applies to the resistors, so

$$I_{R1} = \frac{5{\cdot}4}{1000} = 5{\cdot}4\text{mA}$$

and $$I_{R2} = \frac{0{\cdot}6}{1000} = 0{\cdot}6\text{mA}$$

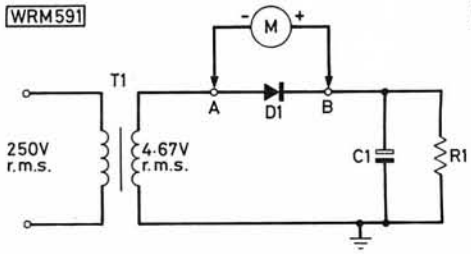
Kirchhoff's First Law tells us that $I_{R2} + I_{D1} = I_{R1}$, so the diode current must be $I_{D1} = I_{R1} - I_{R2} = 5{\cdot}4 - 0{\cdot}6 =$ 4·8mA.

Because of their characteristics of allowing current to flow in only one direction, diodes are often used as rectifiers to convert an a.c. supply to a d.c. supply. Under these circumstances the voltage measured across the diode will be the **average** voltage over a complete cycle.

A simple rectifier is shown in Fig. 4.6. The voltage at "A" is a.c., as shown in Fig. 4.7, the peak values being ±(4·67 × 1·414) = ±6·6V. When D1 conducts, C1 charges to +6V (6·6V peak volts minus 0·6V across the conducting D1). When the diode cuts off C1 will discharge slightly into the load (R1), so the potential measured at "B" on the d.c. range of a meter will be slightly less than 6V.

WRM591

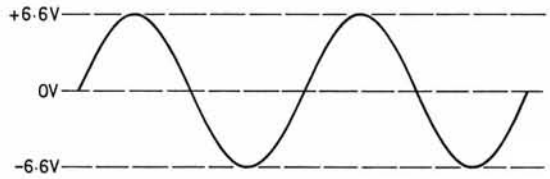
Fig. 4.6



Using the meter on the d.c. volts range **across** the diode we shall read the **average** p.d. across it. The average d.c. potential at "A" is zero while the average potential at "B" is +6V. So the meter will indicate 6V. Note the polarity of the meter connections necessary to measure this voltage—this is why the cathode is marked with a "+" sign on printed circuit boards.

WRM592

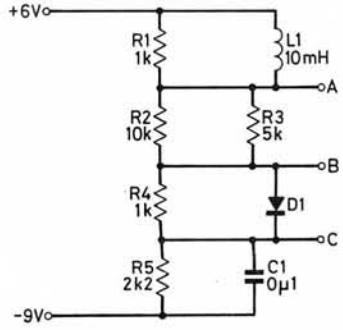
Fig. 4.7



Although the meter does not show it, however, the voltage across the diode is varying at the frequency of the a.c. and varies sinusoidally between −0·6V on positive peaks of the voltage at "A" and +12·6V on negative peaks. The average of these two extreme potentials is 6V, which the meter indicates. Note that the diode must withstand a "peak inverse voltage" of 12·6V, almost **double the peak** of the a.c. applied to its anode.

WRM593

Fig. 4.8



Now to this month's problems—Fig. 4.8, with the solutions next month.

No. 1: Calculate the potentials at "A", "B" and "C" with respect to earth.

No. 2: Repeat the same calculations with D1 connections reversed.

Next month we shall look at two more non-linear components, the Zener diode and (the most common of all) the bipolar transistor.

BARCLAYCARD MAIL ORDER

Photo Acoustics Ltd

MICRO COMMUNICATIONS DIVISION

ACCESS MAIL ORDER

TRIO

TS930S	New HF Trans. + Gen. Cov. Receiver	(T.B.A.)
TS830S	160-10m transceiver 9 bands	£694.00 (5.00)
AT230	All-band ATU power meter	119.00 (2.25)
SP230	External speaker unit	34.95 (1.50)
YK88C	500Hz CW filter	28.60 (0.50)
YK88CN	270Hz CW filter	32.60 (0.50)
TS530S	160-10m trans 200W pep digital	534.98 (5.00)
YK88SN	2nd SSB filter option	29.00 (0.50)
TS130S	8 band 200W pep	525.00 (5.00)
TS130V	8 band 20W pep	445.00 (5.00)
SP120	Base station external speaker	23.00 (1.25)
SP40	New mobile speaker unit	12.40 (1.50)
AT130	100W antenna tuner	79.00 (1.50)
PS20	AC power supply TS120/130V	49.45 (5.00)
PS30	AC power supply TS120/130S	88.50 (5.00)
MC50	Dual impedance desk microphone	25.75 (1.50)
MC35S	Fist microphone 50K impedance	13.80 (1.00)
MC30S	Fist microphone 500 ohm imp.	13.80 (1.00)
LF30A	HF lowpass filter, 1kW	17.95 (1.00)
TS780	2m/70cm all mode transceiver	748.18 (5.00)
TR9130	New 25W synthesised multimode	395.00 (5.00)
TR9500	70cm all-mode	449.00 (5.00)
BO9	Bass plinth for TR9000/9130	34.95 (5.00)
TR7800	2m FM synthesised mobile	284.00 (5.00)
TR7850	40W version of above	314.00 (5.00)
TR8400	70cm FM synthesised	299.00 (5.00)
PS10	AC psu for above	84.75 (2.50)
TR2300	2m FM synthesised portable	188.75 (5.00)
TR2500	2m FM synthesised handheld	207.00 (2.50)
HC10	Digital desk World Clock	58.75 (1.50)
HS5	Deluxe Comm. headphones	21.85 (1.00)
HS4	Standard headphones	10.35 (1.00)
DM801	Dip meter	60.00 (1.75)
TR7730	New 25W FM transceiver	247.00 (5.00)
R1000	Gen. Coverage Receiver	297.00 (5.00)
SP100	External speaker	26.90 (2.50)
R600	Gen. coverage receiver	235.00 (5.00)
SX200N	Scanning Receiver	264.00 (5.00)
R517	Airband Receiver	49.45 (2.50)

YAESU

FT101ZDFM	160-10m 9 band transceiver	£685.00 (5.00)
FT902DM	9 band AM/FM transceiver	885.00 (5.00)
FC902	9 band atu. swr/pwr etc.	135.00 (5.00)
SP901	External speaker	31.00 (2.00)
FT707	8 band solid state 100W	569.00 (5.00)
FP707	230V AC power supply	125.00 (5.00)
FC707	Aerial tuner (unbalanced only)	85.00 (2.00)
MMB2	Mobile mounting bracket	16.00 (1.00)

IC 720A £883.00

FRG7700	SSB/AM/FM recvr. dig. readout	£329.00 (5.00)
MEM7700	Memory unit for above	90.00 (1.00)
Converters for above:		
FRV7700A	118-150MHz	69.75 (1.75)
FRV7700B	50-60MHz & 118-150MHz	75.50 (1.75)
FRV7700C	140-170MHz	65.95 (1.75)
FRV7700D	70-80MHz & 118-150MHz	72.45 (1.75)
FRT7700	Receiver aerial tuner	37.85 (2.00)
FT480R	2m all-mode transceiver	379.00 (5.00)
FP80A	230V AC power supply	63.25 (2.00)
FT780R	70cm all-mode transceiver	449.00 (5.00)
FT290R	2m all-mode portable	249.00 (5.00)
FT230R	New 25W FM synthesised	239.00 (5.00)
NC11C	AC charger	8.50 (1.00)
CSC-1	Carrying case	3.45 (0.50)
MMB-11	Mobile mounting bracket	22.25 (1.50)
QTR24	World Ham clock	19.95 (1.50)

FT208	2m synthesised portable FM	209.00 (2.50)
NC9C	AC charger	8.00 (1.00)
FT708R	70cm hand-held	219.00 (2.50)

ICOM

IC 730	HF mobile transceiver 8 band	586.00 (5.00)
IC 720A	HF transceiver and gen. cov. receiver	883.00 (5.00)
PS 15	Power supply for 720A	99.00 (5.00)
IC 251E	2m multimode base station	499.00 (5.00)
IC 25E	2m synthesised compact 25W mobile	259.00 (5.00)
IC 290E	2m multimode mobile	366.00 (5.00)
IC 2E	2m FM synthesised handheld	159.00 (2.50)
IC 4E	70cms Synthesised Handheld	199.00 (2.50)
IC L1/2/3	Soft cases	3.50 (0.50)
IC HM9	Speaker/microphone	12.00 (1.00)
IC CP1	Car charging lead	3.20 (0.50)
IC BP2	6V Nicad pack for IC2E	22.00 (1.00)
IC BP3	9V Nicad pack for IC2E	17.70 (1.00)
IC BP4	Empty case for 6 x AA Nicads	5.80 (0.50)
IC BP5	11.5V Nicad pack for IC2E	30.50 (1.00)
IC DC1	12V adaptor pack for IC2E	8.40 (0.50)

FDK VHF/UHF

Multi 700EX	2m FM synthesised 25W mobile	199.00 (5.00)
Multi 750E	2m multimode mobile	289.00 (5.00)
Expander	70cm transverter for M750E	219.00 (5.00)

(ALSO FULL RANGE OF WELZ METERS)

WE ALSO STOCK:–

JAYBEAM ANTENNAS
G-WHIP MOBILE ANTENNA RANGE
MICROWAVE MODULES
AERIAL ROTATORS

All prices inc. VAT, P&P, inc. Brackets

Buy it with Access

24 HOUR ANSWERPHONE CREDITCHARGE PART EXCHANGE

58 HIGH STREET, NEWPORT PAGNELL, BUCKS.

TEL: 0908 610625

BARCLAYCARD VISA

MARCO TRADING

VOLTAGE REGULATORS

Ref.	Voltage	Current	Price Each	100+	Style
78L05	+5V	100m/a	30p	20p	TO92
78L12	+12V	100m/a	30p	20p	
78L15	+15V	100m/a	30p	20p	
78L18	+18V	100m/a	30p	20p	
7805	+5V	1 Amp	55p	30p	TO220
7812	+12V	1 Amp	55p	30p	
7815	+15V	1 Amp	55p	30p	
7818	+18V	1 Amp	55p	30p	

Mixing within each current rating is O.K. to obtain quantity price.
10 Million carbon film 5% resistors from stock.
1/4W Range: 10R to 820K **£3.00** per 1,000 (NO MIXING OF VALUES)
45p per 100 (NO MIXING OF VALUES)
1/2W Range: 2R2 to 10m **£3.50** per 1,000 (NO MIXING OF VALUES)
50p per 100 (NO MIXING OF VALUES)
Our Stock List of the above Resistors is available upon request.

TRANSFORMERS

British made transformers at very attractive prices.

Primary	Secondary	Current	1+	10+	100+
240V:	4.5-0-4.5v	400m/a	50p	45p	35p
240v:	6-0-6v	100m/a	58p	52p	43p
240v:	6-0-6v	500m/a	65p	60p	48p
240V:	9-0-9v	200m/a	75p	70p	58p

Manufacturers note: We can supply FROM STOCK, 1000+ quantities of the above transformers and adaptors below.

These very high quality British made two pin European adaptors are ideal for driving Radios, cassette recorders, TV games, calculators etc. The adaptors fit the UK shaver socket.

EUROPEAN ADAPTORS

REF.	D.C. Volt	Current	1+	10+	100+
EO8	4.5V	200m/a	50p	45p	32p
EM3	6V	200m/a	£1.00	80p	55p
EO9	6V	400m/a	£1.50	£1.25	85p
ET4	9V	150m/a	£1.50	£1.25	85p

Please note that there is no extra P/P charge on the above transformers and adaptors.
Export please add Sea/Air mail at cost.
Callers welcome Mon-Fri 9-5.

This advert is only a fraction of our range, send 25p for our latest catalogue. Please add 35p P/P to all orders. Add 15% VAT to total. Send orders to:

Dept. PW9, MARCO TRADING,
The Maltings, High Street, Wem, Shropshire SY4 5EN.

Latest Catalogue 25p per copy. Includes Multimeters, Chart Recorders, and Components.

All orders despatched by return of mail. **Tel: Wem (0939) 32763**

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 **£1,090.**

RECEIVERS

TRIO R1000 Solid State Receiver 200KHz to 30MHz **£297.00. TRIO R600** Solid State Receiver 150KHz to 30MHz **£235.00. Yaesu FRG7** Solid State Receiver **£199.00. Yaesu FRG7700** Solid State Receiver **£329.00.**

+ 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.

AUDIO LEVEL METER

R.A.PENFOLD

Most items of equipment that are fitted with an audio level indicator have an ordinary moving coil VU (volume units) meter connected in an "average reading" circuit. A well-known drawback of such meters is that on input signals which have a very spikey waveform, such as speech modulation, a quite low reading may be obtained even if the peak level is well beyond the overload threshold. This can cause problems with over deviation and non-linearity in transmitter stages or excessive distortion when applied to subsequent decoding and processing sections of a receiver.

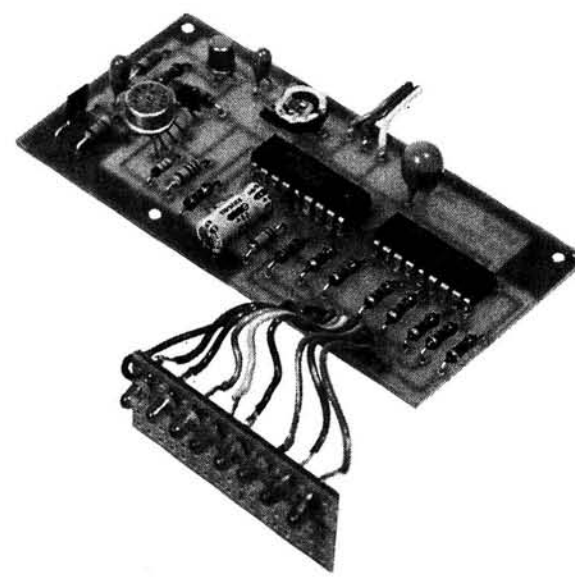
The circuit described here is really a cross between a peak reading VU meter and an l.e.d. peak level indicator. It will indicate the monitored audio level by means of a display of eight l.e.d.s, and has the same response time as a conventional peak reading VU meter. The circuit has been found to give excellent results in use, and does of course respond to peak and not average levels. Moving coil meters are quite expensive these days, and this makes the unit an economically attractive alternative to a conventional meter system.

Display Drivers

The obvious basis for a circuit of this type is a bargraph display driver i.c. These devices are designed to drive a row of l.e.d. indicators, the number of l.e.d.s that are switched on being proportional to a pre-determined input voltage. To function in this application it is merely necessary to precede the display driver circuitry with a precision rectifier, and a smoothing network having the required attack and decay times.

The LM3914N i.c. is such a bargraph display driver device and can drive up to ten l.e.d.s. In common with most devices of this type, two or more of these i.c.s can be connected together to drive a greater number of l.e.d.s. Whether one or more devices are used, the threshold voltages for the l.e.d.s are evenly spaced out, thus by using two LM3914N devices in the unit a dynamic range of 20:1, or 26dB, can be covered. This is comparable to the dynamic range covered by an ordinary VU meter.

It is not really necessary to use all twenty l.e.d.s, and in practice an eight element display seems to be both easy to use and adequate in the number of signal levels covered. The sequence numbers of the l.e.d.s used in this circuit, and the relative signal level each one represents, is shown in Table 1.



The display drivers can be used in either the "bar" or "dot" mode. In the former case, a true bargraph display is obtained with the number of l.e.d.s illuminated being proportional to the input voltage. In the "dot" mode only one l.e.d. at a time is switched on, this being the highest in the sequence that the input voltage merits.

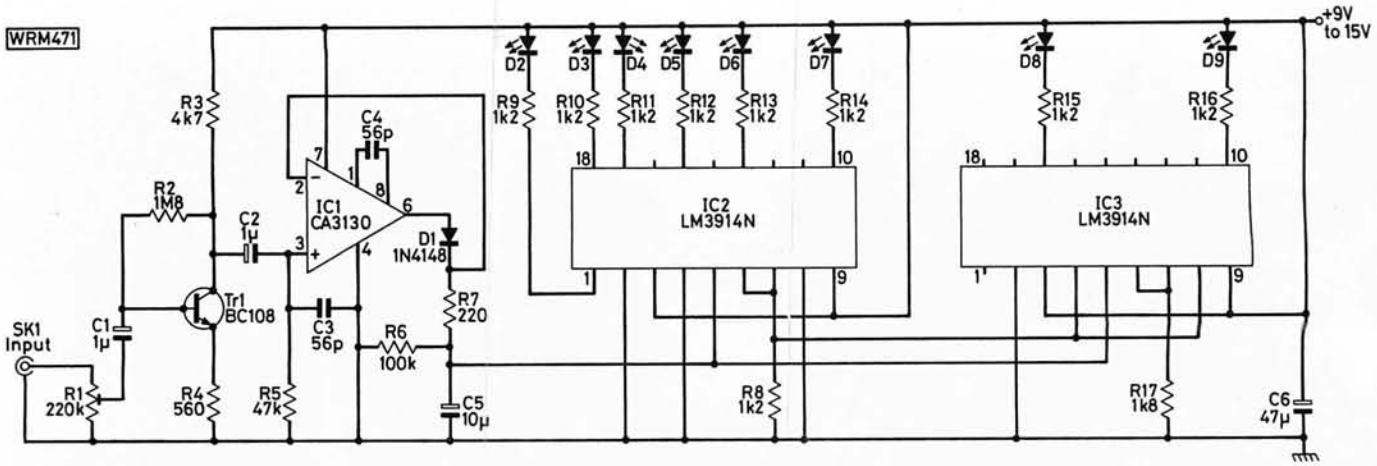
In this circuit the "dot" mode is not really usable because less than the full twenty l.e.d.s are employed. This would lead to the display being blank when an unused output was the one that was energised.

CONSTRUCTION RATING Intermediate

BUYING GUIDE

All components required for this project may be purchased from regular suppliers advertising in the magazine.

APPROXIMATE COST £10



▲ Fig. 1: Circuit diagram of the level meter

Circuit Details

Figure 1 shows the complete circuit diagram of the unit. Integrated circuits IC2 and IC3 are the bargraph display drivers, and they give a full-scale sensitivity of about 2·4 volts. Diodes D2 to D9 form the l.e.d. display with each diode having its own series current limiting resistor, R9 to R16. The l.e.d. consumption is approximately 8mA per device with a 12 volt supply, and changes roughly in proportion to the supply voltage. This gives quite a high maximum current drain of about 80mA with a 12 volt supply. If necessary, a lower current consumption can be obtained by using the new "high brightness" type l.e.d.s and increasing current limiting resistors, R9 to R16 to 4·7kΩ. This allows a current of a little over 2mA per diode, and a maximum current consumption of about 33mA. The drivers are made to operate in the "bar" mode by connecting pin 9 of each device to the positive supply. These would be left floating in the "dot" mode.

The precision rectifier uses IC1 in a conventional circuit. The non-inverting input of IC1 is biased to the negative supply rail by R5, and has the input signal applied to it. There is a negative feedback path provided from the output of IC1 to its inverting input, via diode D1. The output is taken from the junction of D1 and the inverting input of IC1. Negative feedback action tends to stabilise the inverting input at the same potential as appears at the non-inverting input, so that the circuit acts as a form of unity gain buffer stage.

However, the circuit can only source a current through R7 and into C5, and a current cannot flow in the opposite direction, due to the blocking action of D1. No significant current can flow into the inverting input of IC1 either, since the input impedance here is extremely high, typically 1·5TΩ.

Positive-going input signals therefore cause C5 to be charged from the output of the rectifier circuit via R7. The low output impedance of IC1, and the fairly low value of R7, gives this circuit a fast attack time, so that it responds properly to transients. The decay time is much longer, since the only discharge path for C5 is through R6 and the high input impedance of the display circuitry. The reason for having a relatively long decay time is that once the unit has responded to a transient, the display reading is held long enough to be clearly visible to the user.

The standard attack and decay times for a peak reading VU meter is 2·5ms and 1s respectively. The specified component values will give approximately these response times. The voltage developed across C5 is proportional to the peak input amplitude, and is used to drive the input of the display circuitry.

The CA3130 device does not have internal frequency compensation, and so discrete compensation capacitor C4 is needed. Capacitor C3 also aids the stability of the circuit.

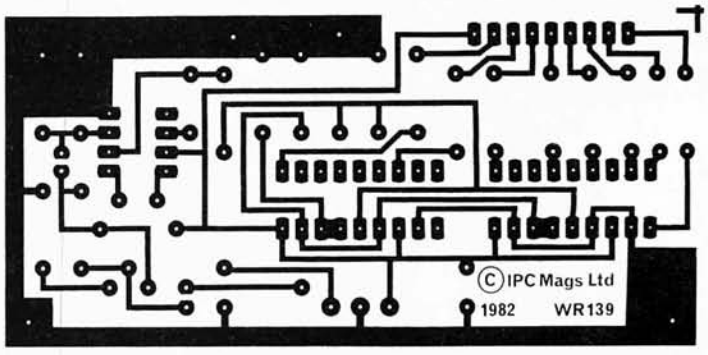


Fig. 2

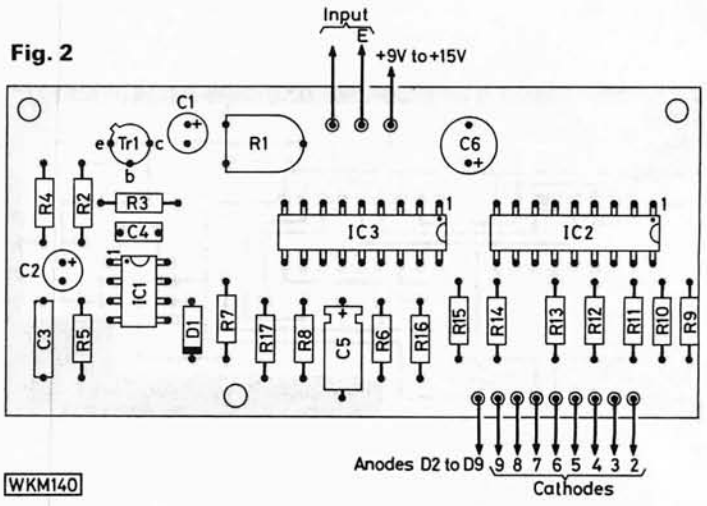


TABLE 1

Diode	Relative level (dB)
D2	−20
D3	−14
D4	−10
D5	− 6
D6	− 3
D7	0
D8	+ 3
D9	+ 6

★ components

Resistors

¼W, 5% Carbon film

220Ω	1	R7
560Ω	1	R4
1·2kΩ	9	R8, 9, 10, 11, 12, 13, 14, 15, 16
1·8kΩ	1	R17
4·7kΩ	1	R3
47kΩ	1	R5
100kΩ	1	R6
1·8MΩ	1	R2

Miniature horizontal preset

220kΩ	1	R1

Capacitors

Electrolytic, single-ended 63V

1µF	2	C1, 2
47µF	1	C6

Electrolytic, double-ended 25V

10µF	1	C5

Miniature ceramic plate

56pF	2	C3, 4

Semiconductors

Transistor

BC108	1	Tr1

Integrated circuits

CA3130	1	IC1
LM3914N	2	IC2, 3

Diodes

1N4148	1	D1
TIL209	8	D2, 3, 4, 5, 6, 7, 8, 9

Miscellaneous

Display l.e.d. mounting hardware; p.c.b. (1).

An input level of about 1·7V r.m.s. is needed at the input of IC1 in order to switch on all the l.e.d.s, and this is a higher level than most items of equipment will be able to supply.

A low gain common emitter amplifier is therefore used at the input of the circuit to increase the sensitivity to a more realistic level of about 200mV r.m.s. Any normal item of equipment should be able to provide 200mV r.m.s. or more, at a VU level of +6dB. Potentiometer R1 forms a simple input attenuator enabling the sensitivity of the unit to be set at the appropriate level.

The input impedance of the unit depends to some extent on the setting of R1, but is in excess of 100kΩ, which is sufficiently high enough to ensure that there is little loading of the main equipment. A supply voltage of 9 to 15 volts is required, the absolute maximum supply voltage being 16 volts, which is the maximum the CA3130 can withstand. The l.e.d. threshold levels are not significantly affected by variations in the supply potential, and it is not necessary to use a stabilised supply. The quiescent current consumption of the circuit is about 15mA.

Construction

Figure 2 shows the printed circuit layout for the unit. The CA3130 i.c. has a c.m.o.s. input stage, and all normal handling precautions should be observed when dealing with this device.

The l.e.d.s are situated away from the board, and are connected to it by way of a nine way cable, only a single wire being needed to carry the common anode connection to the display. If desired, l.e.d.s of various colours can be used in the display.

For example, diodes D2 to D6 could be green types, with an amber type for D7, and red for D8 and D9. This would help to make the 0dB and overload indicators stand out from the rest of the display.

Adjustment

In order to calibrate the unit a 0dB reference tone should be fed into the main equipment. Potentiometer R1 is then adjusted for the lowest sensitivity that can be achieved without D7, the 0dB l.e.d. becoming switched off. Fully clockwise rotation of R1 corresponds to maximum sensitivity.

If the audio output of a receiver is being indicated, the input signal to the level indicator may be taken from across the volume control. Additional pre-amplifier sensitivity, if required, may be obtained by reducing the value of R4.

Most transmitters feature a fairly high gain pre-amplifier ahead of the microphone gain control and it should be possible to obtain a suitable signal from across the track of this potentiometer, if the unit is to indicate microphone level. This connection would be made to the slider, if an indication of modulation level is required. Again, a reduction in the value of R4 may be needed to achieve the required sensitivity. ●

REMINISCENCES 2

Stan KEELEY

Remember the old junk box full of old "bits" that were supposed to be useless, but were absolutely invaluable to any radio constructor? I was amazed at the number of venerable characters who climbed out of that box after my reminiscences in the May edition and took the trouble to write in.

"Old Timers"

The daddy of them all must surely be 71-years-old Bill Webb of Wells in Somerset. His story is a classic which epitomises the efforts of the "do-it-yourselfer" way back in 1922.

He was 11 years old then, when his science master Mr. Richard Wignall (Dicky Wiggy to the boys) asked: "How many of you would be interested in building a wireless set?"

Bill continues "I put my hand up, knowing little on the subject. First I had to inveigle Father into parting with the money for an ebonite panel 14 by 9 inches. My next attack was on my mother. I had to persuade her to buy two tins of salmon—'John West is the right type' said Wiggy. 'Tell your mother to get a large and a small tin. Empty the contents carefully, she can have those for home use, but the tins are required for a tuner. Wash the tins out well and dry them thoroughly'."

All this was done. The next job—cutting out the centre of the base of the large tin, leaving half-an-inch of metal to fasten the tin to the ebonite. Then finding the centre of the ebonite, and tapping a 2BA hole.

"The centre of the small tin was then found, and a 2BA rod with nuts either side was screwed into place into the tin. The knob for screwing the 'tuner' in or out (slow motion was not the word for it) was solved by the production of a broken school chair leg. The woodwork class were put into service turning out a series of knobs, which after a coat of gloss paint were agreed by all to be 'just the ticket'.

"The next point was the coil. A two-inch round former came from somewhere (the Smallest Room?) on which 400 turns of s.c.c. copper wire were wound, twisting a loop out at regular intervals as tapping points.

"In the meantime Father had bought for me a catswhisker, crystal and a pair of headphones. When the whole lot was assembled I was in seventh heaven."

And—like the boy who had a train set for Christmas and just had to be a railwayman—the hobby has stuck with him ever since.

What a beautiful picture of the ingenuity of the 20s!

Don Howard of Helston, Cornwall, started in the mid-thirties with a home-made 0-V-0 and well remembers the thrill of hearing his first ham station—G5OH, Rex Heatley.

Mind you, that was hardly a DX record—he only lived 300 yards away! "I had never heard of him before that," says Don, "and I rushed off to tell him that he could be heard.

"With rare insight into the art of not dampening the enthusiasm of a beginner he listened to me and invited me in to see his gear."

He advanced through "toilet roll" circuitry and joined a radio club in Pool, remembers with affection G2NS and G3BM in particular; and he recalls with regret the old *World Radio* and the now defunct *Amateur Wireless* at the humble price of tuppence in old money . . . Don is now returning to the hobby and hopes soon to get his ham "ticket". Good luck, OM!

Bill Webb of Wells in Somerset

L. J. Hill of Glastonbury harks back to his Thirties efforts with h.f. chokes wound on a chemistry test-tube and an old Telsen coil stripped and re-wound. Regeneration was obtained by tapping the aerial down the coil with a crocodile clip. Tuning and reaction condensers were conventional ones stripped down and re-assembled with half the plates.

A two-volt PM2DX triode valve, a half-exhausted 60V battery from the domestic set, and Mr. Hills was away.

He also recalls W8XK and Westinghouse KDKA in Cincinnati—and amateur W2BSD who came over nightly on 20 metres. Legend has it, he says, that he was using a 1kW RCA transmitter.

Old basket-weave coil king H. E. Chamberlain of Newark-on-Trent recalls his first Saturday switch-on which netted an immediate Radio Normandy (how about that!), and comments on Ted Jones of Woking renovating a vintage RAP radio.

"H.E." has recently exhumed a Pye PCR2 communications radio of 40 years ago—"built like a battleship"—and having brushed off sundry cobwebs and replaced capacitors finds it performs remarkably well on all bands. Has anyone any data or diagrams on this old friend? he asks.

Finally, reader E. F. Brock of Water Orton, Birmingham recalls the Modern Boy One-Valver using a Lewcos coil encased in black bakelite. A proper "valve man", he has recently got into construction with transistors—and without too much success, owing to unavailability of the proper transistors and "equivalents" which aren't. He comments bitterly: "In the transistor field there are now as many manufacturers as there used to be thermionic valve types!"

His efforts at getting the Active Antenna described in *PW* February 1981 issue going have been fairly disastrous, since he never could get a pair of TIS88 f.e.t.s.

"Designers really should specify parts which can be obtained and also alternatives which have been tried and are proved to work," he thunders.

Ah well . . . that's the price of "progress". Fortunately, since he's an old-timer I've no doubt he'll press on and refuse to be defeated. After all, doing the impossible was always the fascination, wasn't it—even if it did take a little longer!

Keep on writing in, old timers. Oddly enough our memories seem to be fascinating the young 'uns who buy Japanese black boxes and switch 'em on. What a lot of lucky devils we were!

DXers and s.w.l.s

All DXers and s.w.l.s are mad and should be certified without more ado.

This is a fact propounded by the majority of "sensible" people—those who make up jigsaw puzzles and pull them to pieces on completion; who sit on riverbanks for hours with a rod and line in the rain and only catch a cold; and those who expect a fortune from one-armed bandits.

When my two-valver and I left school in 1932 my father was of this opinion. How I could sit for hours decked in a pair of headphones and listen to languages I couldn't understand was completely beyond him. Besides, I wouldn't go to bed when I was told.

Mother wasn't happy about me cluttering up the place either. So we came to a mutual arrangement where I moved out into the corner of the garage, which I partitioned off with old pieces of tea-chest to make a "shack", and pursued my obsession without making the place untidy.

I also got a job on a morning newspaper, which meant night work from 1900hrs to 0300. This created a new rumpus.

For by pedalling my bike home furiously I could be back in the shack by 3.30 am. That was 10.30 pm American time, and the 31 and 49 metre bands were wide open.

What delights awaited me! The American short-wave stations each carried the domestic late-night entertainment, and I huddled down in the cold to listen to the bands of Tony Pastor, Duke Ellington, Louis Armstrong and other great names who were only obtainable here—and infrequently at that—on record.

Of course, it was too idyllic to last. After a week or so I was nabbed by an indignant Dad who, tousled and pyjama'd, wanted to know why I wasn't in the proper place—bed.

This started the feud of the century. When I got home the following night I found the shack had been fitted with a lock. By torchlight I learned how to pick it, and settled down to my nightly feast.

But I was "nicked" again. Next day a stout staple secured a monstrous padlock. I decided to box clever and bide my time.

Eventually I managed to prise out the staple, grease it and push it back into the holes complete with padlock so that there was no sign of "illegal entry", and this ploy worked for a week or two.

But I was "rumbled" again. A truce was declared, and I was allowed a night-time ration on the airwaves.

It was at this time that I discovered that the 60 metre band was alive with Latin Americans. Since every station had its own callsign I learned the sound of the letters and numbers in Spanish.

The walls of the shack soon became festooned with rare QSL cards. There were other bonuses too. One station—TGWA Guatemala City, I think it was—sent a QSL and a packet of coffee. A low-power Cuban sent me a box of cigars.

All this, remember, on a humble two-valve regenerative receiver. I had some notable bonuses down at the other end of the spectrum, too.

There was no v.h.f. radio at this time. But hams were trying out their paces on 10 metres, and there were a few Americans, mostly mid-West, broadcasting domestic programmes on the 11 metre band.

One of my best and most reliable catches on this band was W9XJL in St. Paul, Minnesota. Meanwhile, down on 31·6MHz I found the DXers dream.

The American Federal Communications Commission had made the first move towards v.h.f. local radio by allocating this channel for what was euphemistically called "educational radio". In practice a welter of low-power local US stations right across the country opened up, relaying their domestic commercial programmes.

The channel was just one big heterodyne. But having tuned it in one just sat and waited . . .

Out of the drone a signal would emerge. Gradually it would rise to, perhaps, an S9 on a good day. A callsign, a few identifiable news items, a commercial or two, and it would sink back into oblivion.

But stay on the channel and up would come yet another signal from the murk. The first one, I recall, had been W3XEY in Baltimore, Maryland. But as I sat there, pencil in hand, the States was my oyster.

Over a period of a couple of hours I logged, perhaps, 20 or 30 stations. None of them had any expectations of reaching more than 20 miles or so. You can imagine the QSL response I had from those no-hopers!

By this time I was getting a little restive with my humble little set. Getting a job had meant a few bob in the pocket, and I decided to invest in one of the new-fangled superheterodyne receivers.

My choice was an American Hallicrafters Skybuddy—a five-valve RX with four wavebands and fantastic bandspread which cost me . . . wait for it! . . . the enormous sum of £9·45, including import duty.

It was a simple set indeed by modern standards, but the wavebands were not congested as they are in the 80s. It did away, too, with the necessity for calibration graphs, and I settled down to doing things the sophisticated way. I even decided, with the help of *PW*, to build myself a preselector to winkle out the really tough ones. But more of that another time . . .

Tokyo Amateur Radio Exhibition

Such is the pace of amateur radio these days that some of the new models mentioned in this article have already appeared in the UK, in sample quantities at least. This peep at the Far East scene is no less fascinating for all that.

Over half a million amateurs and the heart of the world's domestic electronics industry — just two vital statistics that Japan can boast. Each year, equipment becomes more and more sophisticated, and the Japanese are just as enthusiastic about the latest products as the rest of the world. In order to provide a shop window for the new amateur radio products, the Japan Amateurs' Industries Association (JAIA) mounts an annual exhibition in Tokyo. This year, the 10th anniversary show was held in a large, purpose-built exhibition centre in the middle of Tokyo, at the

beginning of April. As all the major manufacturers are members of JAIA, it is looked upon as an opportunity to view the new products for the coming year. The writer was in Japan on business at the time, so it seemed an ideal chance to get a sneak preview of what is likely to hit the European market later in 1982.

The exhibition centre is served by a regular rail service right to the door. On entering the building, one's initial reaction is how neat and clean it is, with all stands well lit and well spaced out. The usual queue of enthusiasts was waiting at the doors for the exhibition to open, a feature that seems common the world over! The Japanese amateur is far less self-conscious about his hobby than is his European counterpart. Baseball hats, clothing with callsigns, Walkman radios — all are widely worn, indicating one's enthusiasm with one's hobby. Judging by the number of operators using portables in and around the exhibition, there can't be many clear channels!

The big news for Japanese amateurs was that permission had at last been given for repeaters to be set up. Yes, that's right, up until now there have been no repeaters in Japan, a fact unknown to many westerners. Operation is to be confined to the 430MHz band and above, but it will obviously boost manufacturers' interest in this part of the spectrum.

So what's new? Basically there are no radical changes or revolutionary new products. But, of course, the Japanese are ever conscious that to sustain output and production levels they must press forward with new models and up-dated designs. In fact, the competition in Japan between the various manufacturers has bred a very efficient "jungle telegraph" system. This effectively prevents any one manufacturer from being more than a few months ahead of his competitors with any new designs. The average life expectancy of a new model is 18 months, with the tendency for this time to become even shorter. Life in the design department of Japanese companies must be pretty hectic at times!

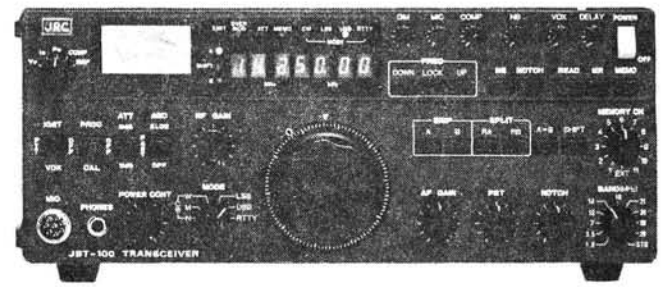
Apparently, the Japanese radio industry is experiencing a drop in world sales at present, so even the Japanese are affected by the recession. Despite this, there were new models on display from several manufacturers, and most of these should be hitting the UK market fairly soon.

A new name in h.f. transceivers is National, known in the UK as National Panasonic. For quite a few years they have been successfully producing v.h.f. amateur radio equipment but, as the channel spacing is not suitable for countries outside Japan, the sets have been sold only on their domestic market. The new h.f. transceiver, designated RJX-810, covers the nine h.f. bands, features digital readout and has a power output of 100 watts from a solid-state p.a. The a.c. mains supply is built in and the v.f.o. has four programmable memories. Other features include three selectable tuning rates (25Hz, 100Hz and 1kHz), i.f. tuning and r.f. compression. It looks like a solid, well-engineered rig that would probably sell for around £700 in the UK. Unfortunately, there are no immediate plans to export this model, and its 100V a.c. p.s.u. would not make it suitable for Europe. However, if it proves successful in Japan, then maybe National will build an export version.

The National RJX-810P h.f. s.s.b./c.w. transceiver

One manufacturer that is represented in the UK is JRC, which stands for the Japan Radio Corporation. They have until recently produced only separate transmitters and receivers, but this has now changed. On demonstration was their new h.f. transceiver, the JST-100. The almost clinical layout of the front panel, so typical of JRC products, is neat and self-explanatory. This all solid-state transceiver has all the normal controls and functions common to its competitors with, in addition, 11 memory channels, receiver notch-filter, i.f. passband tuning, split frequency working using dual v.f.o.s., and speech processing. No doubt the UK importers will have more news on this item later in the year. However, JRC equipment is not renowned for its cheapness, but there again, quality always costs a little extra, so expect the Sterling price to be at the upper end of the market.

Icom is now a well-established name on the amateur radio scene, and their large and well laid-out stand was bristling with all their products. A couple of new models from this manufacturer were attracting attention. The first is not of any practical interest to the European customer but is nevertheless worth mentioning — their 50MHz (6m band) model IC-505. This is a combined portable and base station, with a power output of 3 watts on internal batteries and 10 watts on an external d.c. supply. Employing l.c.d. readout, it covers 50–54MHz f.m., s.s.b. and c.w. In typical Icom style,



The JST-100 h.f. transceiver from JRC

it has a fairly comprehensive memory and split frequency working system. It really is a great pity that the 50MHz band is not available in Europe. Its propagation potential is a mix between 28MHz and 144MHz and it is certainly popular in Japan. However, there is gathering interest in 50MHz operation in Europe for cross-band contacts using 28MHz for transmit. It is not beyond the realms of possibility that 50MHz will eventually be allocated for use in the UK, but it's a long way off yet!

Back to Icom. The second model that had everybody knob-twiddling was the new Icom general-coverage receiver. No prices or delivery dates were available, nor were any leaflets. It seems that the model on show was a pre-production sample. One may wonder why Icom have dragged their feet a little on this part of the market, letting Yaesu and Trio have it all to themselves with the FRG-7700, R-600 and R-1000. However, until one has the chance to check the price and technical specification, it is difficult to know how this model fits in with the competition. No doubt Icom will put that right soon.

The news from the Yaesu stable is that the long-running FT-101 is almost at an end. Certainly a success story, it must be by far the most widely sold h.f. transceiver in the world. News is that limited production may continue for specific export orders, but for the Japanese home market it is seen as finished. Perhaps not surprisingly, the new model is known as the FT-102. Not unlike the FT-107 in appearance, it has the same basic specification as the FT-101, but with the facility of being fitted with both a.m. and f.m. modes as well as s.s.b. and c.w. The big difference is, however, immediately obvious when you remove the lid and peep into the p.a. compartment. Instead of the normal two 6146B valves there are three! The thinking behind this is that three valves running a total of 100 watts output provide a cleaner signal than two valves at the same power

The first Icom general coverage receiver, as yet without a model number

The Yaesu FT-102S (the low-power version) plus the SP-102 loudspeaker with switchable a.f. filters

level. Whether this is sufficient to justify all those owners of FT-101s trading them in for FT-102s must be a debatable point. However, to be fair, there are other minor differences, but one novel new control on the front panel is an r.f. amplifier switch. This would appear to switch in or out of circuit an f.e.t. 2SK125 low-noise pre-amp. As the writer's leaflet is in Japanese it is difficult to tell what the maker's claim is for this feature, although it would appear that great thought has gone into improving the dynamic range of the receiver, certainly a parameter that is sadly overlooked in many designs. Supplies of this model should be arriving shortly in the UK, so we shan't have to wait too long to assess its performance.

The FT-1, Yaesu's de-luxe h.f. transceiver, was given good publicity and there was even a special version of this designed to link into home computers. It wasn't exactly clear to the writer what uses this item could be put to, but judging by the enthusiasm of the youngsters who could have been no older than 10 or 11, they not only understood its uses, they could happily use it!

The next stand to be visited was that of Trio, where a glance left one in no doubt as to what their big hope was for 1982 — the new TS-930. Hot on the heels of the Yaesu FT-1, it is obviously designed to be a competitive model. Covering all the amateur bands from 1·8 to 29·7MHz, it also has a general-coverage receiver facility from 150kHz to 30MHz. Dual v.f.o.s. and eight memory channels add to its versatility. It is also claimed to have full c.w. break-in operation and an optional automatic antenna tuner. The p.a. is all solid-state, operating from a higher than normal d.c. voltage to give the standard 100 watt output power level. Unusually for Trio, the specification includes a.m. in addition to s.s.b. and c.w. but, of course, this has had to be added for the general-coverage receiver section. The writer had also expected to see Trio bring out a competitive model to the Yaesa FT-290, but there was no sign of this on their stand. Perhaps Trio intend to go a step further and bring out the first 144 MHz s.s.b./f.m. hand-held — we shall have to wait and see.

The last stand to be visited was that of Standard. They were announcing a radical new-look v.h.f./u.h.f. range of mobile transceivers. Their philosophy seems to be, *forget* about the multitude of buttons and switches sprouting from competitors' rigs and go back to basics. The result, a beautiful, slim-line mobile transceiver with 10 watts f.m. output. The first model, to cater for the new home-market repeater operation, is for 430MHz. Later in the year a 144MHz model will also be introduced. The front panel is no more than 25mm high and should fit into the smallest of car parcel shelves, etc. A novel feature is the digital display which may be switched upwards on the front panel to make the read-out easier to see.

The Trio/Kenwood stand, featuring their latest h.f. transceiver, the TS-930S

The new slim-line u.h.f. f.m. mobile from Standard

At the end of the exhibition one was left wondering, what next year? Certainly, the Japanese seem to be making it more and more difficult for themselves to bring out new models with new features. However, their enthusiasm and confidence in their products was very obvious, and most certainly there will be new models next year. One interesting sideline was that there appeared to be no security measures taken or indeed necessary. Any piece of equipment could be easily removed, even the smallest of hand-helds. A far cry from our experience in the western world! ●

NEW BOOKS

OBTAINABLE FROM BOOKSHOPS

IC PROJECTS FOR BEGINNERS
by F. G. Rayer
Published by Bernard Babani (publishing) Ltd.
96 pages, 177 × 111mm. Price £1.95

Covering such items as power supplies, radio and audio circuits, oscillators, timers and switches, this book has been written for the less experienced hobbyist. To simplify construction, many projects have complete layout and/or point-to-point wiring diagrams. If you can handle a soldering iron and other simple tools most of the designs in this book would be well within your capabilities.

ELECTRONICS SIMPLIFIED—CRYSTAL SET CONSTRUCTION
by F. A. Wilson
Published by Bernard Babani (publishing) Ltd.
72 pages, 178 × 112mm. Price £1.75

Written especially for anyone who wants to take part in the intricacies of electronics through constructional projects rather than theoretical study. For all ages as long as you can read the book and handle simple tools.

MINI-MATRIX BOARD PROJECTS
by R. A. Penfold
Published by Bernard Babani (publishing) Ltd.
102 pages, 178 × 111mm. Price £1.95

These projects, being fairly simple and easy to build, should appeal to those without a great deal of experience in project construction. There are 20 projects in the book using a handful of components and a piece of stripboard 24 holes by 10 copper strips in size.

ELECTRONIC COMPONENTS & SYSTEMS
by W. H. Dennis
Published by Butterworths
258 pages, 214 × 135 mm. Price £12.50

The purpose of this book is to introduce the basic aspects of semiconductor components and to link the basic operating principles to the commercially available devices and systems.

Hopefully by concentrating on fundamental principles this book will avoid becoming obsolete almost as soon as it is published.

The 13 Chapters cover such subjects as passive components, active components from diodes through to unipolar transistors, analogue circuitry, digital logic technology, v.l.s.i. and opto-electronic components.

HOW TO IDENTIFY UNMARKED IC's
by K. H. Recorr
Published by Bernard Babani (publishing) Ltd
1 sheet, 637 × 450 mm. Price 65p

The chart shows how to work out the "signature" of an unmarked i.c. to enable it to be either identified by manufacturers' data sheets or used in a particular application without knowing the type number. It enables the reader to use i.c.s that might otherwise have been scrapped.

VIDEO QUESTIONS AND ANSWERS
by Steve Money
Published by Newnes Technical Books
112 pages, 165 × 110mm. Price £1.95

Questions such as "What is video?", "How does television work?", "How does a Vidicon tube work?", "What is displayed on a teletext page?", and many others are answered in this book. Each of the eight chapters takes a different topic relating to video as the subject for the questions and answers.

Many questions that puzzle the beginner and student are covered—from first principles to a useful level of practical knowledge.

THE UK CB HANDBOOK
by Alan C. Ainslie
Published by Butterworths
150 pages, 215 × 135mm. Price £6.95

This book covers Government legislation, telling you what you can or cannot do, installing rigs and antennas, home base stations and dealing with interference.

It has been written with the UK reader in mind and carries information on the 10-codes, CB slang and technical data.

PRODUCTION LINES

ALAN MARTIN G8ZPW

Look-in

Anyone who has used an industrial illuminated magnifier will know how much easier it becomes to see into the innards of a piece of equipment. For home workshop use though, the price is usually rather off-putting.

An inexpensive solution to the problem comes in the form of a magnifier, designed to hang from the rim of an Anglepoise or similar style lamp, and is fully adjustable by a ball and socket clamp. The lens which measures 90 × 75mm, gives ×2 magnification and the whole assembly is manufactured in polycarbonate material with an anti-slip rubber in the clamp.

The Lamp Magnifier No. LM79 is available price £8.80 including p&p and VAT from: *TE Controls Ltd., 41a Darracott Road, Southbourne, Bournemouth BH5 2AY.*

Linear Amplifiers for 144MHz

Solent Electronics (Gosport) Ltd., already well-established in the field of sub-contract work for major names in the electronics industry, have begun to diversify into the amateur radio market.

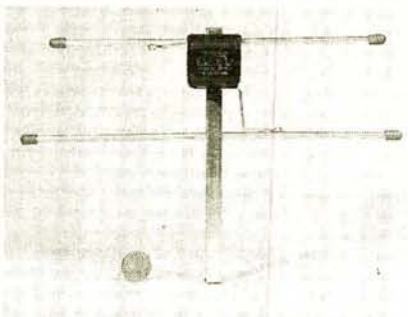
Among the first products listed, are three linear amplifiers for 144MHz (2m), delivering 15, 25 and 70W of r.f. out.

The mid-range model, the SEMA 144-25, has been designed for the low power rig owner. For an input of approximately 2·5W and a supply voltage of 13·8V, the unit will deliver 25W into 50Ω.

This model is switchable between a class C mode for f.m. use and a class AB1 mode for s.s.b. use. It also features automatic r.f. sense switchover and VOX delay for sideband, automatically selected when switched to s.s.b. mode.

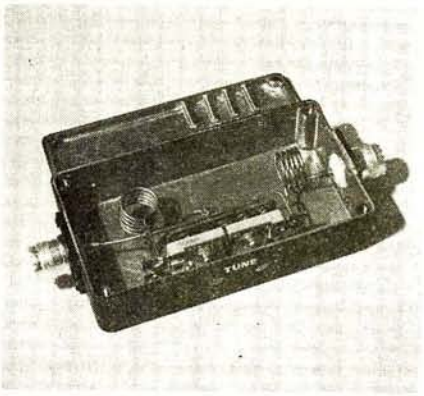
The SEMA 144-25 is housed in a die-cast case measuring only 115 × 64 × 45mm and the VAT inclusive price is £54.60 plus 70p p&p.

These compact units should prove of particular interest to owners of low-power hand-portable rigs such as the C-58, FT-290, IC-2E etc., and will be available in early September from: *Solent Electronics (Gosport) Ltd., Elmore Road, Lee-on-the-Solent, Hants PO13 9DT. Tel: (0705) 550596.*



CB Antenna Tuner

One of the latest products from Frémark Electronics is a 27MHz CB a.t.u. which they claim will overcome a considerable range of mismatch.



The a.t.u. should be installed as close as possible to the base of the antenna and connected via an s.w.r. meter to the CB rig. As the circuit functions equally well in both directions, the unit may be connected either way round.

Then with the transmitter operating, adjust both variable capacitors, going from one to the other, until the lowest s.w.r. reading is obtained. The s.w.r. meter may then be removed (with the transmitter switched off) and the a.t.u. connected directly to the rig.

Housed in a diecast box with SO239 connectors, the a.t.u. costs £7.96 which includes VAT and p&p and is obtainable from: *Frémark Electronics, Unit 1, Strattons Walk, Melksham, Wiltshire SN12 6LA.*

HB9CV for 432MHz

Recently introduced by the CQ Centre is a 432MHz (70cm) compact beam antenna based on the renowned HB9CV design.

The 2-element antenna features a double-gamma match system enabling rapid adjustment for s.w.r. matching. With its directional properties this antenna will provide a very effective gain of 4dB over a dipole and a front-to-back ratio of 18dB.

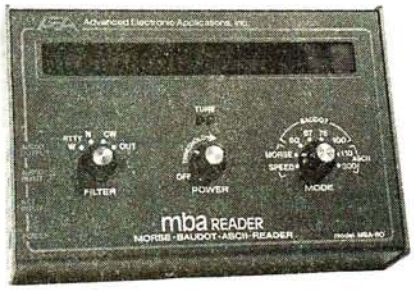
Its compact nature makes the antenna ideal for use in portable situations and for direction finding hunts.

The antenna, which probably represents the best combination of physical size versus gain, is constructed of high quality materials and costs, with the mounting clamp, £8.50 plus £1.25 p&p.

Available from: *The CQ Centre, 10 Merton Park Parade, Kingston Road, London SW19. Tel: 01-543 5150.*

MBA-RO Reader

Recently introduced by AEA Inc. is the MBA-RO Morse, Baudot and ASCII code reader. Imported by ICS Electronics Ltd. the specifications for the reader are as follows:



Display: Blue 32 character vacuum fluorescent with 8mm high 14 segment characters. **Modes:** Morse Code, Baudot RTTY, ASCII RTTY. **Speed:** Automatically tracks Morse code from 3 w.p.m. to 99 w.p.m. Baudot RTTY speeds are: 60 w.p.m., 67 w.p.m., 75 w.p.m., and 100 w.p.m. (45, 50, 56 and 75 baud). ASCII RTTY speeds: 110 baud, 300 baud (useful for hand typed transmission or sampling only). **Filtering:** 100Hz c.w. filter centred at approximately 800Hz. Narrow shift dual RTTY filter factory tuned to 970Hz and 800Hz (170Hz shift). Wide shift dual RTTY filter factory tuned to 1225Hz and 800Hz (425Hz shift). RTTY filters can be easily tuned for other desired shifts. Changing capacitors allows for tuning higher frequency a.f.s.k. tones. The c.w. filter position can be used in RTTY mode for tuning space frequency only, to copy unusual frequency shift transmissions, but without the noise immunity advantage of the normal narrow and wide shift dual filter positions. All filters can be switched out, which can be particularly useful if a centre frequency other than 800Hz is desired. **Input Impedance:** Will match virtually any receiver or audio output amplifier impedance. **Power Requirement:** 13V d.c. ± 2V at 500mA. **Dimensions:** 222 × 149 × 51mm.

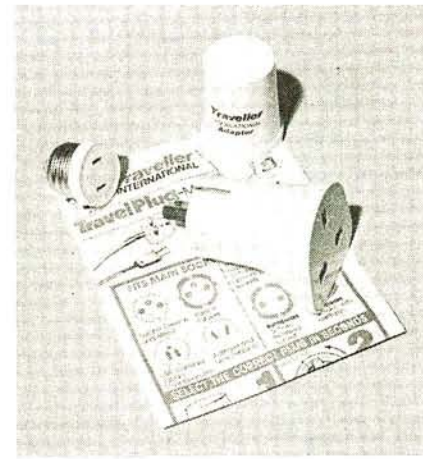
The MBA-RO costs £169, inclusive of VAT, plus £2.00 p&p and is available from: *ICS Electronics Ltd., P.O. Box 2, Arundel, West Sussex BN18 0NX. Tel: Slindon (024 365) 590.*

Versatile Mains Plug

Most people who travel abroad have probably run up against the problem of a variety of mains plugs in the different countries.

Now a British company, Traveller International, have solved the problem by introducing the versatile new Travel Plug, a handy adaptor that will take a 3-pin 13 amp or 2-pin (shaver) 5 amp plug at one end, and at the other end provides a choice of pins to suit most of the principal international sockets, held in by a rotatable selector plate. It also comes with an Edison screw type connector so that it may even be linked to ceiling fittings abroad.

Weighing just 113g the adaptor is quite compact and will slip easily into the pocket, handbag or briefcase. It will retail at between £4 and £5, including VAT, and will be available from most leading department stores, as well as the smaller electrical shops.



Further details from: *Traveller International Ltd., 51 Hays Mews, London W1X 5DB. Tel: 01-499 2774.*

Easy-fit Car Antenna

Hitachi has introduced a new roof-mounted car antenna which is claimed not only to offer improved radio reception but is extremely easy to install compared to most other types of roof-mounted antennas. Designated the CA-300R (MK II), it has a telescopic two-section stainless steel element which is coil sprung and can be easily replaced if damaged or vandalised.

In fitting, a screw discreetly covered by a flushed grommet is inserted through the roof from inside the vehicle, and a trapped nut in the main antenna element allows it to be firmly connected to the screw. As the tightening is carried out from outside the car, the minimum of trim from the car interior needs to be removed. Another useful feature is that the design allows the element and spring to be removed before a car wash and quickly replaced afterwards, using a small spanner provided.

Retailing for around £6.59 which includes VAT, the antenna is available through a large UK network of specialist car audio dealers and selected High Street stores. Alternatively, details can be obtained from: *The Sales Manager, In-Car Equipment Division, Hitachi Sales (UK) Ltd., Hitachi House, Station Road, Hayes, Middlesex UB3 4DR. Tel: 01-848 8787.*

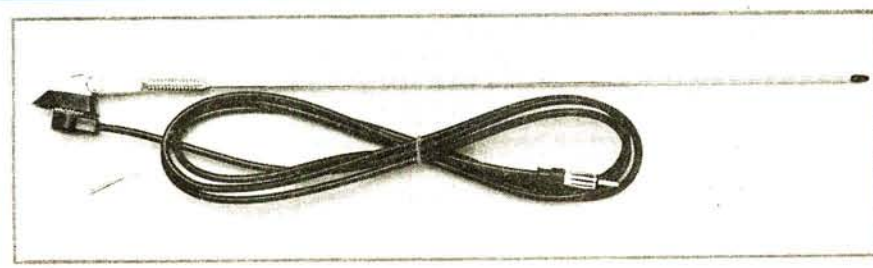
Digital Capacitance Meter

Lascar Electronics have recently introduced a new digital capacitance meter which is claimed to compare with instruments costing almost twice the price.

Called the DP600, the instrument features three measuring ranges covering between 1pF and 20μF. The display reading automatically updates, making the unit ideal for setting up variable capacitors. It is also suitable for carrying out a wide variety of tests, including cable length, cable capacitance, p.c.b. track capacitance etc. and accuracy is 0·75% ±3 digits.

The unit, which is housed in a compact moulded case, has a 12·5mm high l.c.d. readout which also indicates when the battery needs replacing.

Priced at £39.95 plus VAT and £1.00 p&p, the DP600 is available from: *Lascar Electronics Ltd., Oakland House, Reeves Way, South Woodham Ferrers, Chelmsford CM3 5XQ. Tel: (0245) 329773.*



CB OPERATING IMPRESSIONS

Part 1

Gordon J. KING

This article deals mainly with my impressions and experiences as a practising CBer for several months using the two Cybernet rigs reviewed last month. At the outset I must say that both models have withstood a good deal of protracted lab testing, harsh tests and almost continuous use both inside the lab and mobile. At the time of writing they are both responding just as good as when new.

I am not particularly impressed, however, by the choice of 27MHz for local communications. It lies in the "no man's land" between the top of h.f. and the bottom of v.h.f. and as such is influenced by both sky- and space-wave propagation. CB, of course, is meant to rely on the limited distance space-wave, but during my experiments the sky-wave propagation has been very severe causing Italian skip in particular to impair even relatively local communication during some late mornings and afternoons.

At my Devon QTH antenna-to-antenna radio horizon distances up to 65 or 80 kilometres are feasible, and this sort of communications path can be established during periods of ionospheric inactivity. For example, at Brixham using Cybernets I have had excellent copy with places as far afield as Honiton, Portland, Exeter, Minehead, Bridport, Bridgwater and even the Channel Islands when operating from the car but stationary at the top of a hill. When the skip is in full force, however, copy distance is greatly diminished. The strength of the skip has been so great as to light up three out of the four signal strength l.e.d.s, so copy of signal strength less than that is difficult to achieve.

I have thus concluded that CB can certainly only be regarded as a very local communications path if consistent copy is required. The situation might well alter with the advent of 934MHz CB, provided you have the advantage of elevation and virtual line-of-sight paths. At u.h.f., of course, propagation is essentially by the space-wave, so there will be no sky-wave or skip interference.

Despite the inherent path limitation built into the CB system, I have discovered that there are numerous people who delight in CB DXing. Most of these (in my area, anyway) operate perfectly legally. They do not use powerful linear amplifiers or high-gain antennas. They are content to find out just what can be achieved with CB as it is specified by the HO. There are nightly "link-ups" which attract many participants, and remarkably long-distance copies have been recorded, sometimes obviously aided by tropospheric ducting and possibly sporadic-E. Quite a few CBers of this kind that I know have become so entrenched in radio that they are now studying for their RAE, which can't be bad.

Link-ups of this nature have highlighted the shortcomings of CB rigs and antennas. On the transmit side most rigs are much of a muchness; but differences can be detected between the receiver departments in particular. Rigs with abnormally poor r.f. intermodulation and adjacent channel selectivity ratios are relatively poor DXers. This is because as the antenna efficiency is improved (while still remaining legal!) so the amplitude of the multiplicity of signals fed to the receiver increases, not only from nearby CBers but also from strong signals outside the CB band. All these signals arrive at the front-end together and collectively constitute a very strong input which pushes the front-end into severe non-linearity, thereby creating spurious signals some of which fall in band and appear as interference on different channels. This is annoying if the channel so perturbed happens to be the channel on which a link-up is taking place.

Extremely strong r.f. can also "desensitise" the receiver and totally "block" all but very strong signals on a given channel or channels which might be well removed from the strong interfering carrier frequency itself. CBers using more than the specified r.f. power by adopting r.f. power amplifiers ("burners") are often responsible for this sort of thing.

However, general "bleedover" is not always caused by a too powerful or bad transmitter. Its origin can often be traced to a receiver with inadequate r.f. intermodulation immunity and/or poor adjacent channel selectivity. There are still, sadly, CBers using a.m. and these, too, can cause havoc to legal CBers.

Many are the antennas which are now available to the 27MHz CBer. To be legal the radiating element must not exceed 1·5m in length and must be end-fed and hence resonated by a loading inductance to combat the effective capacitance of a shortened quarter-wave antenna. This is complemented by an earth plane or counterpoise of some description.

Most mobile antennas are of this type, the earth plane being formed by the large metal area of the car body. Antennas for home base working are similar but the earth plane is differently formed. A typical type employs a number of horizontal radial rods around the base of the radiating element. An even more efficient antenna appears to be a recent design (at the time of writing) known as the "Wot Pole". Although not of the normally accepted ground plane configuration the antenna, nevertheless, appears to have the HO blessing. I look upon it as an asymmetrical dipole since although the radiating element is 1·5m (approximately) long the so-called ground plane continues the top element linearly below an insulator, and it is

to this that the outer braid of the coaxial cable connects. The upper element is inductively-loaded and this is connected to the inner conductor of the coaxial cable. The antenna is resonated by adjusting the length of the so-called ground plane! It would appear to possess a more horizontal angle of radiation than other antennas used for CB and is thus particularly effective.

For mobile use the American Moonraker mag-mount antenna is along with the very best in terms of efficiency, radiation angle and design. When stuck to the middle of the roof of a car it is not difficult to s.w.r. and is capable of excellent copy. Indeed, it is with this antenna that I have achieved some of the best DX copy. Its length does not exceed the requirement of the HO and, of course, is driven and inductively-loaded at the base.

Now, while a physically resonant antenna has a radiation resistance close to that of the characteristic impedance of the feeder, a shortened quarter-wave ground plane antenna has a significantly reduced radiation resistance, a function which places supreme importance on the efficiency of the ground plane and loading coil. If the net resistance of these is high then the power radiated by the antenna proper is reduced, and with a poor system more than half the allowed 4 watts of transmitter r.f. can be lost as heat! With an efficient quarter-wave ground plane antenna, on the other hand, more than half the 4 watts can be radiated while still remaining legal in terms of the HO antenna requirements. Curiously, though, the HO stipulate 2 watts as the upper limit of effective radiated power (e.r.p.), so it would seem that with a particularly efficient ground plane antenna you can still remain legal and yet radiate in excess of 2 watts!

Some aspects of CB antenna legality are still pretty hazy despite the HO specification which tends to encourage one's own interpretation. Even the extra information contained in Home Office CB Radio Information Sheet No. 5 (see later) is not conclusive. For example: "The size of the ground plane is left to individual preference." The field is wide open to CB antenna makers!

There is at least one country (Australia) where the use of power mics is prohibited. Indeed, there any mic other than that supplied with the rig is illegal. There is nothing in the HO specification which renders the use of power mics, speech processors and the like illegal in the UK, which seems a pity. Incorrectly used, some power mics can cause a chronic rise in the modulation index (deviation frequency/modulation frequency), encouraged by high audio drive and frequency response tailoring. I have monitored deviations higher than $\pm$10kHz and have been greatly troubled by the multiple higher-order sidebands spilling over into adjacent channels ("bleedover").

Many breakers worry unduly about v.s.w.r., always trying to achieve the impossibility of a unity ratio. Provided the ratio is not greater than 2:1 there is really nothing to worry about and the power loss is remarkably small.

On the other hand, some CBers in my area have been given the totally incorrect idea that to adjust for a ratio of around 1·6:1 improves the transmission power. Exploration into this would appear to be due to the idosyncrasies of some of the cheaper meters, which include a power meter. A form of current transformer is used for s.w.r.ing, while a simple peak-responding rectifier is used to monitor the voltage across the load for power indication. Because the r.f. voltage is greater across a mismatch which reflects a higher impedance, a greater power indication is given when the s.w.r. is shown to be greater than unity!

Insertion loss of such devices can be greater than 0·5dB, so if you want to pump the nth-degree power to the antenna remove the meter from the antenna feeder after completing the s.w.r. adjustment. I have also discovered that the resulting mismatch by retaining some of the cheaper meters in circuit can encourage TVI (television interference). Curiously this seems mainly to affect the colour subcarrier, causing colour desaturation symptoms and slight patterning. High-pass filtering at the TV can help, as will low-pass filtering at the rig; but in some cases the poor r.f. dynamic range of the TV front-end is to blame. Very little trouble with legal f.m. has so far been experienced in terms of radio and hi-fi audio breakthrough; but the few a.m. breakers remaining still cause the trouble which, hopefully, is on the wane.

Finally, then, the primary shortfall of the first-generation f.m. CB rigs appears to the front-end dynamic range encouraged by lack of preselection of any magnitude. Perhaps the next generation rigs will be equipped more with r.f. f.e.t.s rather than bipolars and include, if possible, a better form of preselection. I must admit to having experimented with designing an add-on preselector, but to achieve the required Q-factor for 10kHz 27MHz-based channels has been much of a nightmare!

Taking the subject of 27MHz CB propagation and antennas further, I feel impelled to reiterate my observations regarding the (unwise?) choice of 27MHz as a short-range communications frequency. In addition to the serious medium-distance ionospheric skip interference, I have also experienced seemingly high tropospheric activity during more recent propagation tests at a ratio of probability that would appear to be abnormally high for 27MHz.

This has no doubt been exacerbated by our somewhat curious spring-time weather conditions but it is, nevertheless, of significant moment to CB buffs (and others) in a way that is related to their particular mode of interest. Those with a predominantly DXing turn of mind observe with glee the tell-tale signs of a lift which they sense will bring to them copy over paths of many hundreds of miles from distant CB stations operating legally, on f.m. and at 4 watts r.f. transmitter output.

Others with a less adventurous outlook and who have adopted legalised CB essentially for local communications view the resulting impairment to reception reliability with despair.

Having in mind the h.f. skip (but now reducing with the waning sun-spot cycle) which often deposits quite powerful sideband signals into the UK on the legal f.m. CB channels, coupled with the probability of 27MHz tropospheric propagation, it is little wonder that the prevailing 40 27MHz channels are currently being used more for long-distance reception trials than for local point-to-point communication for which they were intended. In my area, at least, there are often several channels engaged in so-called "link" or "network" trials thereby reducing the availability of channels for local work. The fact must be faced that responsible operators have paid out the £10 licence fee and have invested up to £100 or possibly more in station equipment.

UHF Solution?

Clearly, we have to look to the u.h.f. channels for a solution or a substantial part of it, but at the time of writing there were virtually no 934MHz transceivers to be had, even though the fee of the licence covers them. It seems a great pity that all-mode 27MHz operation was not made the subject of an "experimental" licence by the government in the first place, possibly obtainable after a short-form examination, while placing stress on the exclusive use of 934MHz for CB. There would then have been greater incentive and encouragement for manufacturers to develop and produce 934MHz equipment, while at the same time the initial "anarchy" of 27MHz usage could have been brought under licensed control. The problems of interference are appreciated, of course, but a

good few of these must be placed at the door of the afflicted equipment itself, which was not designed to combat high-density radio fields, including CB!

Tropospheric Propagation

Anyway, to get back to the subject in hand. Tropospheric propagation is well known to radio amateurs working on the 144MHz band and it is this sort of propagation which takes their signals well over the radio horizon. It is also well known to broadcast engineers and TV and f.m. radio service technicians in terms of communication distance reliability and co-channel interference when the "steady-state" laws of propagation change temporarily to enhance the local signal field of distant stations working on shared channels. This sort of propagation is usually more prevalent above 30MHz.

On the other hand, ionospheric propagation occurs mostly at h.f., reducing at v.h.f. and falling virtually to "zero" at u.h.f.—the sky wave then tending to pass through the ionised layers above the earth's atmosphere into space. As I have already mentioned 27MHz is not the best choice for reliable local communication.

Anyway, keeping at this frequency, because it is the one in which we are currently interested, its use has hitherto been confined mostly to propagation of the sky wave over many hundreds, indeed thousands, of miles by way of ionospheric refraction which bends the wave path so that it returns to earth many miles in advance of the normal path distance of the space wave. When used for local CB talk it is the space wave that is applicable which, from first principles, is propagated over a distance a little in advance of that represented by a line between the transmitting and receiving antennas which just skims, but does not fall below, the horizon, assuming a "smooth" earth. Of course hills, topography and buildings will influence the distance. Fig. 1 shows the effective optical horizon distance d_h from the top of a transmitting antenna of height h_t. When d_h is in kilometres and h_t in metres, then:

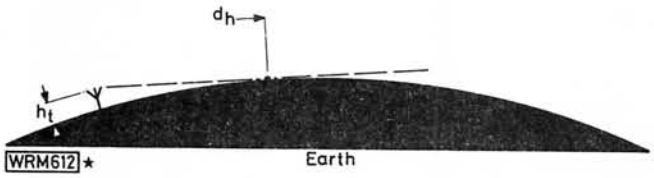


Fig. 1: Optical horizon distance

Fig. 2 shows that for a substantially steady-state troposphere there is a slight bend (shown exaggerated on the diagram) of wave path, the effect of which is equivalent to assuming that the earth's radius is increased by factor k. Thus the maximum possible distance for space wave transmission between transmitting and receiving antennas of heights h_t and h_r is:

$$3{\cdot}56k\ (h_t+h_r)$$

where, again, the heights are in metres and the distance in kilometres.

When k corresponds, say, to 30 per cent (1·3), then the space wave transmission distance between transmitting and receiving antennas each of 9m works out to around 28km over an essentially non-obstructed path. CBers, of course, secure greater distance copy than this when operating on hills some hundreds of feet above sea level (a.s.l.) and when k is enhanced. For example, the elevation of my home QTH is about 61m a.s.l. where I use a 9·14m mounted Wot Pole (legal CB antenna) and I quite commonly communicate with a station at Portland (about

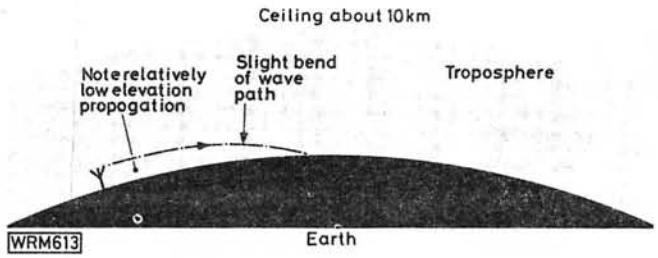


Fig. 2: Radio horizon distance with the bend of the wave path exaggerated for clarity

80·5 kilometres over sea from Brixham). If that station's total elevation, including antenna, is 70m a.s.l., then from the basic principles just expounded k would have to be 1·35, corresponding to the equivalent of the earth's radius having increased by no less than 35 per cent owing to tropospheric refraction.

Diffraction

In addition to tropospheric refraction, the space wave is also slightly diffracted over the curved surface of the earth which, again, tends to enhance the communication distance, while also making it possible for the wave to negotiate obstructions. An idea of this mode of propagation is shown in Fig. 3, where it will be appreciated that the

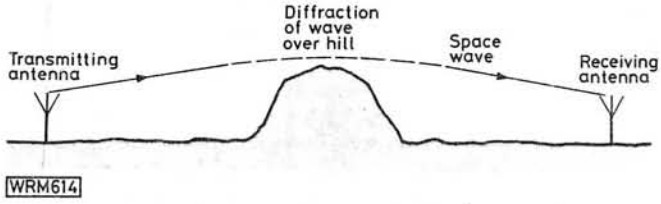


Fig. 3: Diffraction of radio signal over hill

chance of reception improving increases with distance from the obstruction. It has also been discovered that the copy distance can increase quite dramatically over that expected from the preceding expression when the signal is launched at sea or water level from a shortened 1·5m ground plane antenna of the kind commonly used on motor vehicles. This could well be caused by enhancement of the ground plane situation resulting from the extra good conductivity of water as distinct from the mediocre conductivity of normal terrain along with enhanced diffraction over water. The effect has been proved to be remarkably consistent and I shall refer back to it later when I expose the practical aspects of my findings.

I have been talking glibly about the troposphere without really explaining what it is! It is that part of the earth's atmosphere reaching up to a ceiling of about 10 kilometres and is responsible for refraction of the space wave owing to variation of pressure, temperature and moisture content with height. In other words, the refractive index decreases with height, and it is this which tends to bend the waves back to earth in mathematically the same way as the more elevated ionised layers bend h.f. waves back over greater distances.

Under normal conditions the refractive index is reasonably steady and does not exhibit severe irregularity, propagation then being through the lower reaches of the troposphere. However, there are times when a sudden

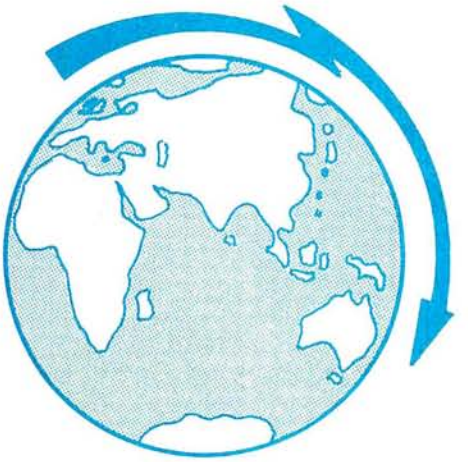
continued on page 51 ▶▶▶

Next month

ON SALE 3 SEPT

PW IS 50 YEARS OLD

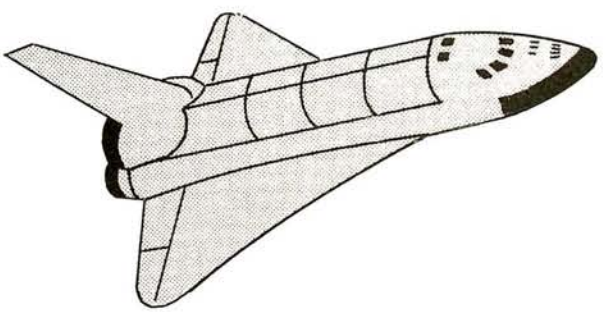
WE LOOK BACK - AND FORWARD!



PLUS

WORKING DX

Long distance or a rare location, both examples of radio contacts that can be classified as DX. Jeff Maynard G4EJA explains how to work both, using well proven techniques and ordinary equipment

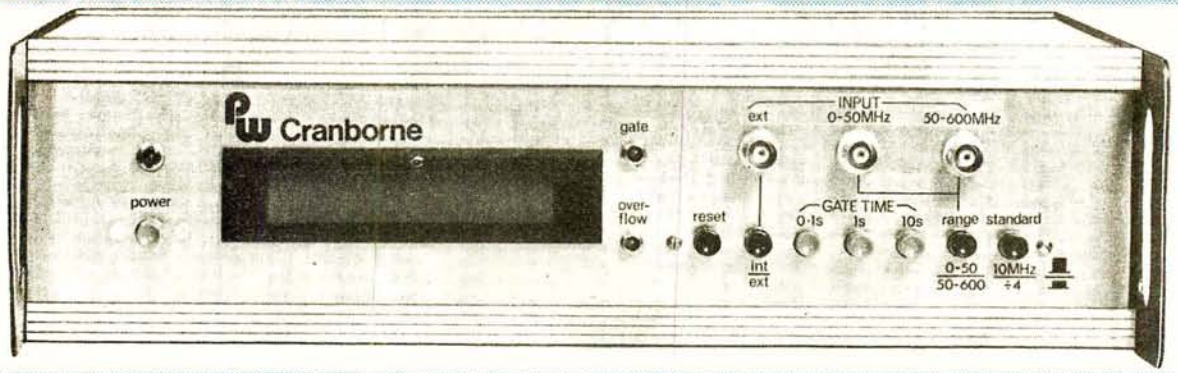


SPACE SHUTTLE COMMUNICATIONS

Described as the most complex machine yet produced the communication systems of the shuttle are no exception

SPECIAL OFFER – AM/FM TUNER MODULE

PW Cranborne



600MHz FREQUENCY METER

Part 1

Stephen IBBS G4LBW

Without doubt, the most accurate way of measuring frequencies is with a digital frequency meter, and with the development of i.c.s this piece of equipment has gradually come within the constructional and financial realms of the average radio amateur.

Early attempts demanded scores of TTL i.c.s and a lot of ingenuity but when Intersil introduced the ICM 7216 and 7226 to the world suddenly the one-chip frequency meter was with us. Both i.c.s would accept a frequency up to at least 10MHz and directly drive a l.e.d. display and projects have appeared using the 7216 and multiplexed l.e.d. display.

The 7226 will do everything the 7216 does and also provide a multiplexed b.c.d. output and buffered oscillator output; the relatively simple design of an 8-digit l.c.d. counter to 600MHz, extendible to 1·3GHz, becomes possible.

Readers are probably aware that liquid crystal displays require very different conditions to l.e.d. displays and so cannot simply be connected in place of the latter. However, Intersil also manufacture the ICM 7211 b.c.d. to l.c.d. decoder and driver, which neatly overcomes the problem. It is capable of driving four digits and can be cascaded to drive an 8-digit display.

The project described here is for a two- or three-range (0–50MHz and 50–600MHz, extendible to 1·3GHz) counter, with three gate times (0·1, 1, 10s). Each range has its own pre-amplifier and is logic-switched into the input of the 7226. The main i.c. has other facilities which, though not used in this project, can be utilised easily by the reader to make a multi-function counter.

For those who do not wish to use a liquid crystal display, a description will be given as to how a l.e.d. display can be used. An extra input is also included and can be switched in to enable signals (0–10MHz) to reach the 7226 via a couple of logic gates, without going through either of the pre-amplifiers.

There is a switched 10MHz calibration signal output, as well as a hold input and reset switch. In addition, constructors can choose either to provide a 1MHz calibration signal by slightly modifying the p.c.b., or by using a 74LS74 and the unmodified p.c.b. to provide the necessary oscillator frequency to extend the range of the counter to at least 1·3GHz.

The 600MHz pre-scaler is a separate module designed by the author to fit into a standard die-cast box, so that it can be shielded from the rest of the meter and also enable constructors to build it as a module in its own right for use with other frequency meters.

0–50MHz Pre-amp. and Pre-scaler

The circuit used in this meter is an excellent one used by the author for some time. Designed by Sam Jewell G4DDK for the Intersil 7216 it is used here with his permission. It consists of a source follower to give a high impedance to the incoming signal. To allow for the f.e.t. characteristic spreads, the operating point is adjusted by R25. From the f.e.t., the signal is passed to the bipolar amplifier and emitter follower to increase the signal level and give a low impedance output to the logic stages, with IC4c and d, R1 and D1 providing a Schmitt trigger to give a good square wave output, before going into the input of IC5, a divide-by-ten pre-scaler, and then into the logic switch network.

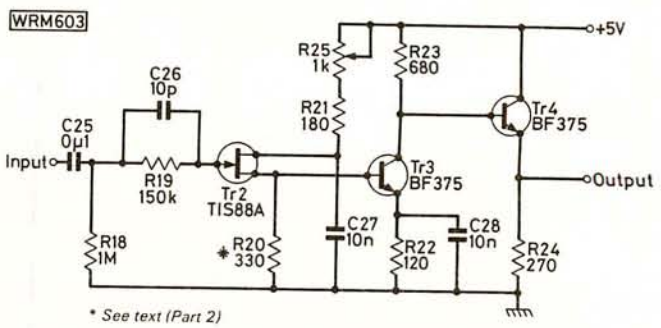
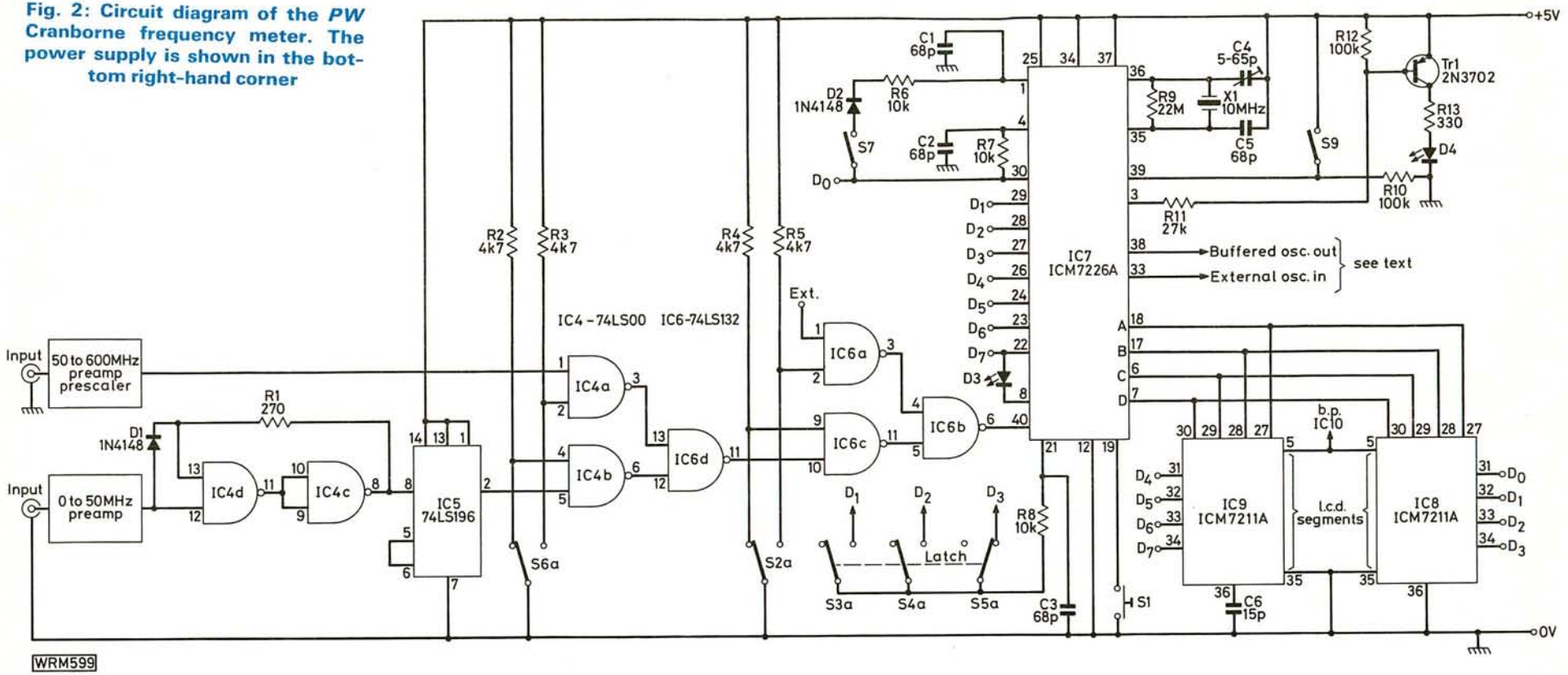


Fig. 1: 50MHz pre-amplifier circuit

Fig. 2: Circuit diagram of the *PW* Cranborne frequency meter. The power supply is shown in the bottom right-hand corner

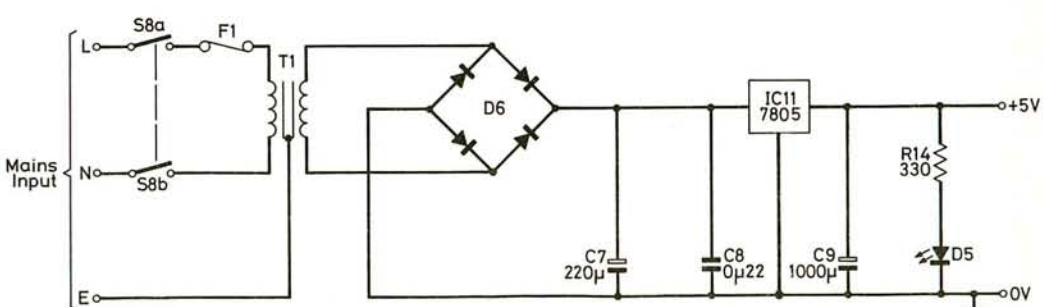


Decimal point switching

Gate	Digit	Digit
0·1	D_4	D_3
1·0	D_5	D_4
10	D_6	D_5
Range	0–50	50–600

Options

Option	Pin 4
Frequency	D_0
Period	D_7
Frequency Ratio	D_1
Time Interval	D_4
Unit Counter	D_3
Osc. Frequency	D_2



50—600MHz Amplifier and Pre-scaler

With the upsurge of interest in the 432MHz band, helped by the recent flood of new transceivers, a need for a sensitive pre-amp. and divide-by-100 pre-scaler covering the band has arisen. The module described here is a simple-to-build, high-performance unit, requiring no setting up procedure, measuring up to at least 600MHz. It is housed in a standard die-cast box, powered from the same 5V supply as the rest of the meter and uses a double-sided p.c.b. to reduce stray capacitance problems. As such, it can be built as a totally separate module and, if desired, can be built as a high-performance 432MHz pre-amp.

It was decided, for various reasons, to use two Plessey pre-scalers, the first being the SP8630B with a guaranteed toggle frequency of 600MHz. For those who do not wish to go above the 432MHz band, the cheaper SP8631B can be substituted, being pin-for-pin compatible and having a toggle frequency of at least 500MHz.

The output from either i.c. is still too high for the counter, which has a maximum frequency of around 10MHz, so a second i.c.—the SP8660—is used which has a maximum toggle frequency of 200MHz and an open collector output, hence the inclusion of R17 to provide a collector load.

The input sensitivity of the SP8630 on its own varies with frequency, requiring some 75mV at 432MHz but about 140mV at 144MHz. This is sensitive but the author wanted more and so added a pre-amp. circuit based on a third Plessey i.c.—the SL952. This was developed primarily for frequency synthesis applications and has differential inputs and outputs. However, it can be modified for our purposes using the circuit shown in Fig. 3.

The prototype was measured using Hewlett-Packard equipment and triggered reliably at 434MHz with just 5mV across a 50 ohm load. The TTL output from the module is capable of driving the counter or logic direct and this switching system needs some explanation.

The truth table of a NAND gate is given below. It can be seen that if one of the inputs is LOW, the output will remain HIGH. Thus, if say pin 4 of IC4 is pulled LOW by S6a, then pin 6 (IC4) and pin 12 (IC6) will be HIGH, as will pin 2 (IC4), tied to the supply by R3. The truth table also shows that a HIGH on one of the inputs enable signals to pass through the gate inverted. Thus, any signals on pin 1 (IC4), from the 600MHz pre-scaler will pass through to pin 13 (IC6).

Because pin 12 of this i.c. is also HIGH, the signal will pass through to pin 11. However, if S6a is operated pin 2 goes LOW, pins 3 and 4 of IC4 and pin 13 go HIGH, allowing signals from the 0–50MHz amp. to go through to pin 11. This whole process is then duplicated using IC6a, b, c to allow the inclusion of an external input socket. The final TTL output from pin 6 of IC6 goes to input A of IC7, pin 40.

The main counter is the 7226A and this is capable of measuring frequencies, periods, units, frequency ratios or time intervals, depending on which strobe line D_0 to D_7 is connected to the function input, pin 4. Only the first option is included in this project but the table shows how to obtain the others, using also the second input (B) on pin 2. Both inputs are digital and thus normally require signal amplification and level shifting to achieve compatibility. There are four gate times available but only three are used because the author felt the 0·01s gate (obtained by connecting D_0, pin 30 to pin 21) was too small to give the desired resolution and it also made the provision of decimal points easier because only 4 decimal points need to be utilised.

LED Display

The counter i.c. was originally intended to drive an 8-digit l.e.d. display direct and for constructors who wish to choose this option, simply omit the l.c.d. drivers IC8 and 9 and connect the l.e.d. multiplexed display according to details in Part 2. Note that the digit strobe lines are numbered D_7 (least significant digit, on the right looking from the front) to D_0 (most significant digit). This labelling is used by Intersil and should not be confused with the diodes!

Choosing a l.e.d. option will necessitate modification to the decimal point driver network. The display will have leading zero blanking, something that is not easily possible with liquid crystal displays.

There is a "measurement in progress terminal" on pin 3 of the counter, which goes LOW whilst a count is in progress. It is a simple matter to drive an l.e.d. using this pin, 3 resistors and a *pnp* transistor. Connecting a l.e.d. between pin 22 (D) and pin 8 (p.d.) provides an overflow warning, and a third l.e.d. is included to act as a power-on indicator. Pin 38 of the counter i.c. is a buffered oscillator output (10MHz) and is available via a switch to a socket on the back panel. This pin can drive one low-power Schottky TTL device and constructors can choose *either* to slightly modify the board as shown in Part 2 to accommodate another divide-by-ten 74LS196 to give a 1MHz signal out as well, *or* to keep the original p.c.b. design and insert a 74LS74 divide-by-4 to extend the meter's range up to at least 1·3GHz. Plessey produce a SP8617 (divide-by-4) up to 1·3GHz and this can be used with the meter to read frequencies in the 1296MHz band if the EXTERNAL OSCILLATOR INPUT is enabled by a diode from pin 30 to pin 1 via S7 and a 2·5MHz signal is fed into pin 33 (EXT. OSC INPUT). This is done most easily by using the buffered

Truth Table for a NAND gate

A	B	Output
0	0	1
1	0	1
0	1	1
1	1	0

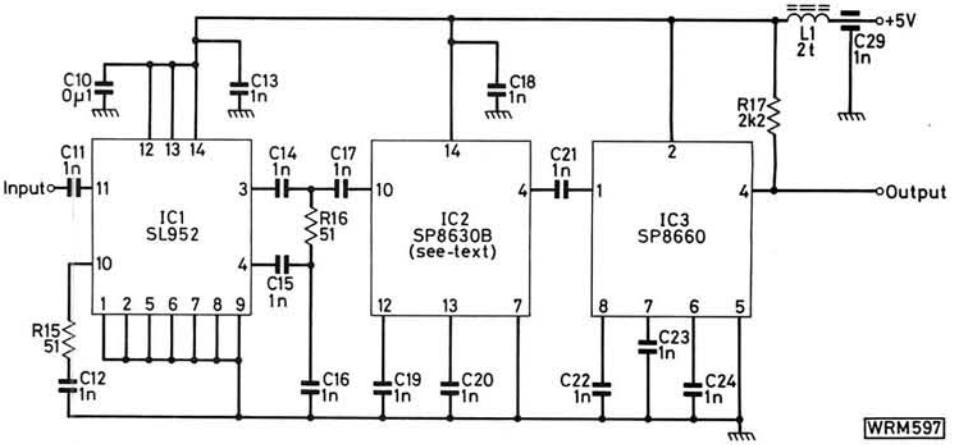


Fig. 3: 600MHz pre-amplifier and pre-scaler circuit

Fig. 4: Block diagram of the *PW* Cranborne frequency meter

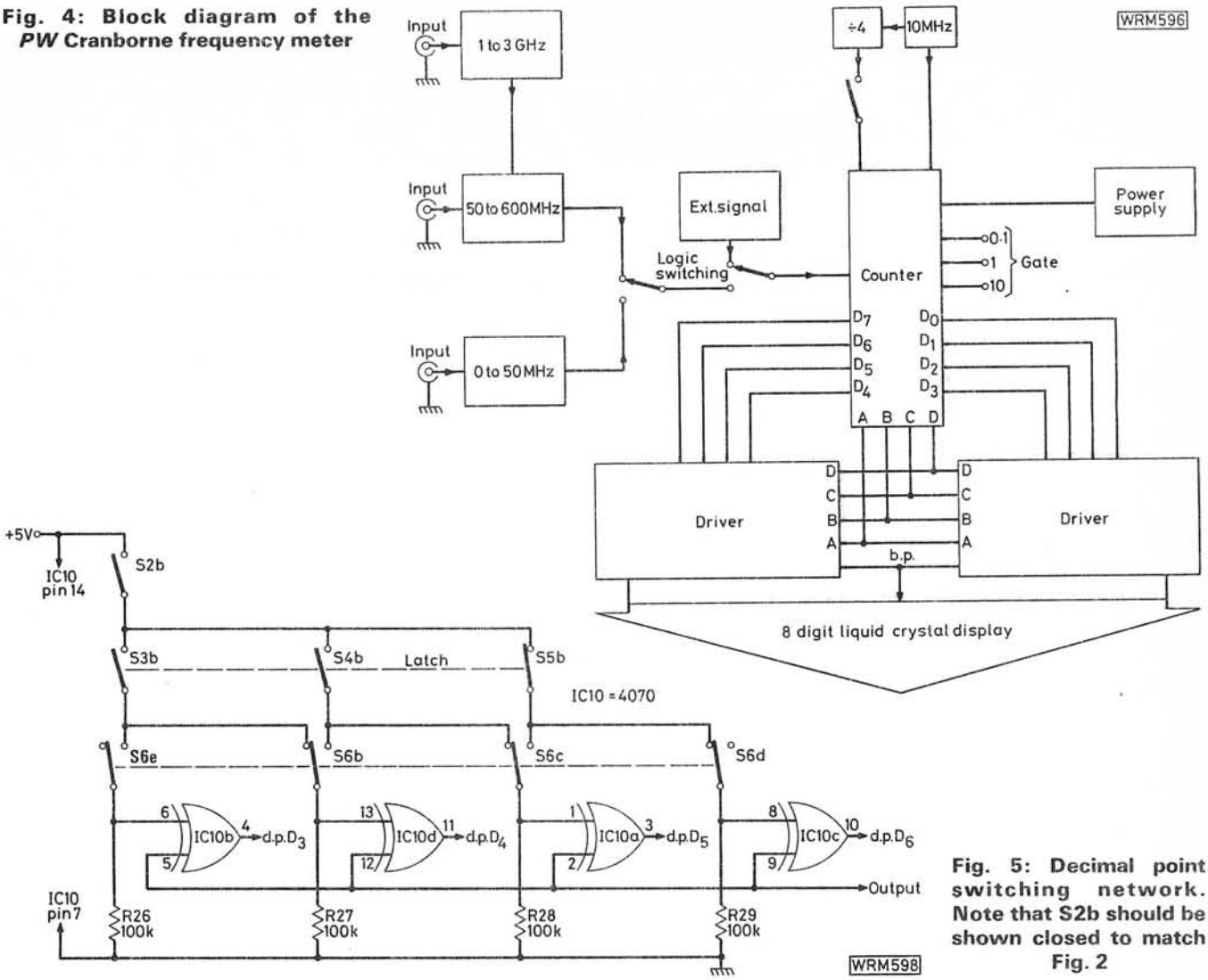


Fig. 5: Decimal point switching network. Note that S2b should be shown closed to match Fig. 2

oscillator output and dividing it by 4 using the 74LS74 before feeding it back to pin 33. The effect of this change in the master oscillator frequency is to extend the gate times by a factor of four, so the counter receives from the pre-scaler four times as many clock signals. As the pre-scaler has just divided the incoming signal by four, the two cancel out, so the counter gives a true reading of the frequency.

The 7226A has other tricks up its sleeve which are not used in this project such as a store output, external range input, external decimal point input etc., and the data sheets explain these functions fully.

To drive an l.c.d. requires the use of the 4 b.c.d. multiplexed outputs on pins 18, 17, 6 and 7. These are fed in parallel to IC8 and 9, each an ICM 7211, which decodes the signal and drives 4 digits of the 8-digit l.c.d. display. Pin 5 of the ICM 7211 is the backplane frequency pin and the one i.c. has its backplane oscillator disabled to enable both i.c.s and the display to run from one master oscillator. The digits are controlled by the strobe lines of the 7226.

When designing a frequency meter with pre-scalers, there is always a problem in attempting to control the decimal points. The table will show when a particular decimal point should be on and this is done by IC10, a 4070 quad exclusive OR gate, controlled by the backplane pins of IC8 and 9 but the switching is accomplished by the switch bank S2–5 which also controls the gate times and ranges.

For example, when S3a is closed, the digit strobe line D_1 is connected to pin 21 selecting a 0·1 second gate. At the same time, S3b connects +5V to the line running to S6e and S6b which selects 0–50 or 50–600MHz. If the lower range is chosen, then pin 13 of the 4070 goes HIGH, driving decimal point D_4. However, if S6 is operated, selecting 50–600MHz, then pin 6 of the 4070 goes HIGH selecting decimal point D_3, etc. The switch S2 disconnects the +5V line from the decimal point switching network. This disables the decimal points if the EXTERNAL INPUT signal switch position is selected. Fig. 5 should make the switching system more understandable.

The power supply consists of a 6V 3VA transformer, a bridge rectifier, smoothing capacitor C7, a 5V 1A positive regulator (IC11). This has two capacitors (C8 and C9) associated with it to aid stability. A finned heatsink may be included to keep the voltage regulator cool and the transformer chosen was p.c.b. mounted for ease of construction. Though not used in the prototype, it would be good practice to use a mains filter.

Part 2

The second, and last, part will cover the construction of this very useful piece of laboratory test gear. Full details including p.c.b.s and casework will be given to enable constructors of intermediate standard to build the *PW* Cranborne.

IC of the month

Brian DANCE M Sc

PLESSEY SEMICONDUCTORS SL6640/SL6650

The Plessey Semiconductors SL6640 and SL6650 integrated circuits have been designed for intermediate frequency applications in f.m. receivers. As indicated in Fig. 1, each of these devices contains an i.f. limiting pre-amplifier which accepts an input from a front-end amplifier-mixer-oscillator unit and provides an input to the main limiting amplifier. The latter provides an output of almost constant amplitude irrespective of the input voltage over a wide range of input levels.

The output from the main limiter section feeds a quadrature demodulator circuit that involves a single tuned circuit and which provides an audio output to the d.c. volume control section. (A d.c. volume control circuit is one in which the amplification is controlled by a steady voltage from a variable resistor; as no audio signals flow through this control resistor it can be some distance away from the device and no hum pick-up problems should be encountered if unscreened leads are employed.)

The SL6640 device (but not the SL6650) also contains a small audio power output stage as indicated by the dashed lines in Fig. 1. Both devices contain a "squelch" circuit which can be employed to silence the audio output when the input signal falls below a certain preset level to remove inter-station noise.

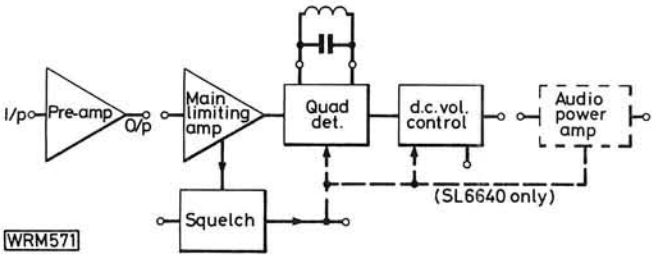


Fig. 1: Block diagram of the SL6640C and the SL6650C, the dashed components being incorporated in the SL6640C only

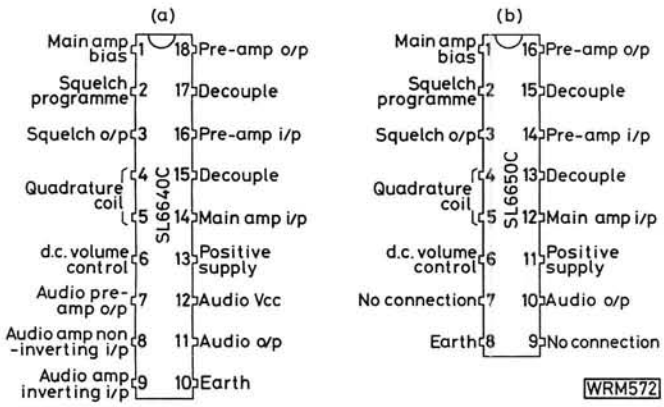


Fig. 2: Pin connections for the SL6640C and for the SL6650C

Connections

The SL6640C is encapsulated in an 18-pin dual-in-line package with the connections shown in Fig. 2 (a). As the SL6650C contains no audio power amplifier, the number of pins required is less and it is housed in a 16-pin dual-in-line package with the connections of Fig. 2 (b). The two devices have been designed so that as many as possible of their pins are in the same position so that similar board designs can be used in receivers using either device; it is the pins concerned with the audio output stage of the SL6640C which differ from those of the SL6650C.

SL6640C Circuit

The basic circuit for the use of the SL6640C as an i.f. amplifier and audio system is shown in Fig. 3. The supply voltage is normally +6V, but both of the devices being discussed will operate well from any supply between +5V and +9V, but care should be taken to ensure that the absolute maximum rating of +12V is not approached. The audio output stage of the SL6640C obtains its power supply from pin 12, while pin 13 supplies the remainder of the internal circuitry of this device. Pin 11 of the SL6650 is the positive supply connection for the whole device. Pin 12 of the SL6640 may be left unconnected if the audio stage is not being used, but it must not be connected to a point which differs in potential by more than 0·5V from that of pin 13.

The SL6650C requires about 6mA and the SL6640C 3·5mA (when squelched) and 10mA (when not squelched) or more if it is supplying audio power, all of these currents being quoted for a 6V supply. As with all high-gain, high-frequency amplifiers, it is important that good decoupling should be incorporated into the circuit. In Fig. 3 a 0·1μF capacitor, C8, is used to provide good high-frequency decoupling; it should be a low-inductance component with short leads directly connected to the device sockets. The electrolytic capacitor C9 provides the thorough low-frequency decoupling required to enable the audio section to operate at its maximum output level without the amplitude modulation rejection being affected.

Volume Control

The d.c. volume control consists of a fixed resistor R6 connected to pin 6 in series with a 470kΩ variable resistor, R13 to ground. The gain can be varied over a typical range of 70dB (3000:1), the gain increasing as the value of R13 is raised.

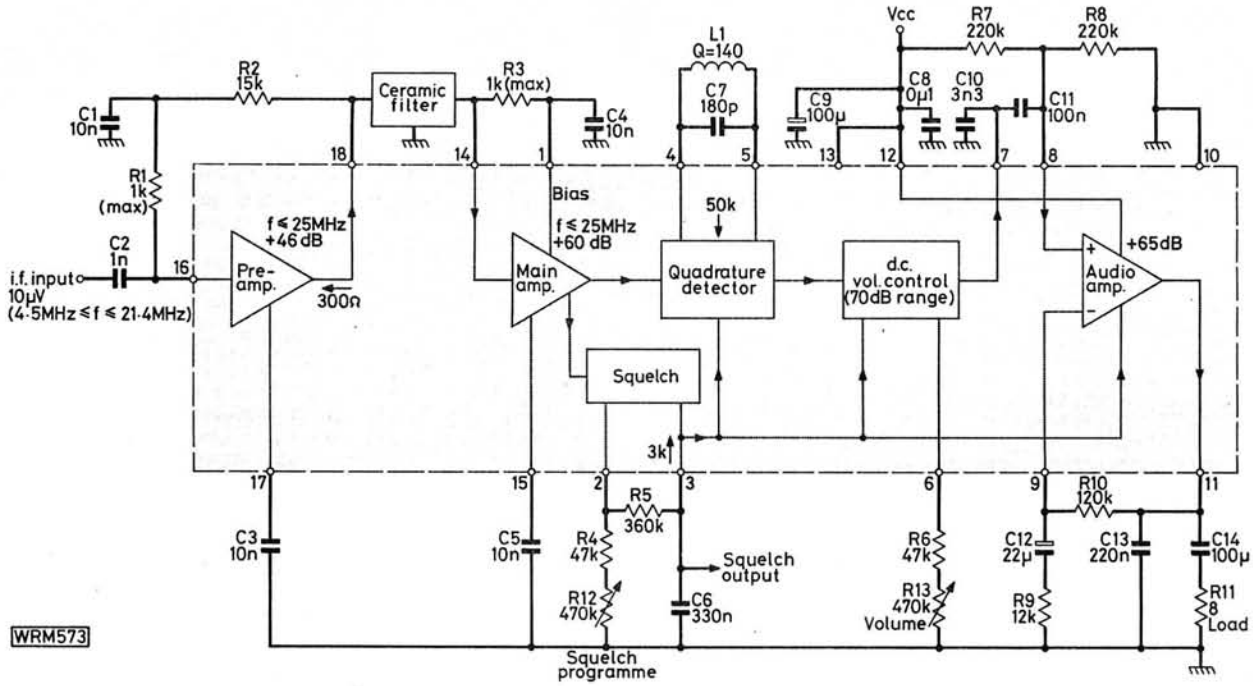


Fig. 3: Basic circuit and internal blocks for the SL6640C

It is important that the input to the main amplifier (pin 14 of the SL6640C) is biased from pin 1 through R3 of Fig. 3. The input impedance at the input pin to this main amplifier is 5kΩ shunted by 2pF, so conditions at this pin are similar to those at pin 16. The value of R3 may be chosen to match the required output circuit impedance of the ceramic filter connected to pin 14. The pre-amplifier output impedance from pin 18 of Fig. 3 (pin 16 of the SL6650C) is about 300Ω. The inter-stage filter between pins 14 and 18 is a "roofing" filter which limits the noise bandwidth somewhat; it does not provide a major contribution to the overall selectivity of the receiver, so a high performance filter is required before the circuit of Fig. 3. The inter-stage filter need not have a very good shape factor nor even a large stop-band attenuation, so a cheap and small ceramic filter is quite suitable for 10·7MHz use and requires no setting up. The Murata SFE10·7MHz filters or similar Toko devices are quite suitable and match the pre-amplifier output impedance. A suitable filter must always be employed between the pre-amplifier and the main amplifier or instability will occur.

The output of the main limiting amplifier feeds a double-balanced modulator and also an external phase-shift circuit which in turn feeds the other input of the double-balanced modulator. Thus this double-balanced modulator acts as a quadrature detector circuit. A feature of these devices is the high impedance at the quadrature coil connections of over 50kΩ; thus the quality factor (Q Factor) of the tuned circuit is not appreciably affected by being loaded, unlike such circuits employing many other types of integrated circuit. Hence the quadrature circuit can provide a good performance even when demodulating narrow-band f.m. signals with intermediate frequencies of up to 21·4MHz.

The quadrature circuit connected between pins 4 and 5 should consist of an inductance-capacitance tuned circuit resonant at the centre of the i.f. pass-band. Crystal quadrature circuits and quadrature circuits employing ceramic resonators are not suitable for use with these devices.

There must be no direct current path between either pin 4 or pin 5 and any other point, but these two pins may be connected together through a resistor if it is desired to reduce the Q value of the quadrature tuned circuit. Narrow-band f.m. may be demodulated with a signal-to-noise ratio of at least 50dB using the demodulator in these devices.

Squelch

The squelch system is driven by the detectors in the main limiting i.f. amplifier and contains a comparator circuit which requires an input to set the squelch level. The resistor R5 in Fig. 3 is connected between this programming input and the squelch output; it provides hysteresis in the system which stops the circuit from switching between the squelched and unsquelched states for very small changes in the input signal level.

In the SL6650C circuit, the squelch system merely provides a d.c. output to indicate the presence of a signal larger than the squelch threshold, but in the SL6640C the squelch system controls the power supply to both the quadrature detector and to the audio stages so that the standby power required by the SL6640C in the squelched state is lower than that of the SL6650C even though it is a more complex device than the latter.

The squelch programming resistor R12 should be increased to 1MΩ if a power supply in excess of 6V is employed, the same 47kΩ series resistor being used as shown in Fig. 3. Squelch sensitivity increases as the value of R12 is increased. Pin 3 is at a relatively high potential when no signal is present and falls to nearly earth potential when a signal is detected. The output current available from pin 3 is less than 2mA, but may be fed to a buffer amplifier if more current is required.

The decoupling capacitor C6 prevents brief breaks in the signal (such as mobile flutter) from causing squelching. The hysteresis resistor R5 should be increased if the supply voltage is raised, a minimum value of hysteresis is about 10dB. This means that the signal level required to cause switching to the unsquelched state is some 10dB greater than that at which squelching occurs, to remove unwanted background noise from the receiver in the absence of any reasonable signal level.

In the case of the SL6650C, if the squelch function is not required, the circuit may be modified as shown in Fig. 4 with the addition of an SL3046 transistor array to drive an "S" meter to indicate the signal strength. This circuit involves the use of a negative feedback amplifier and is not applicable in the case of the SL6640 where the squelch must always be used as such.

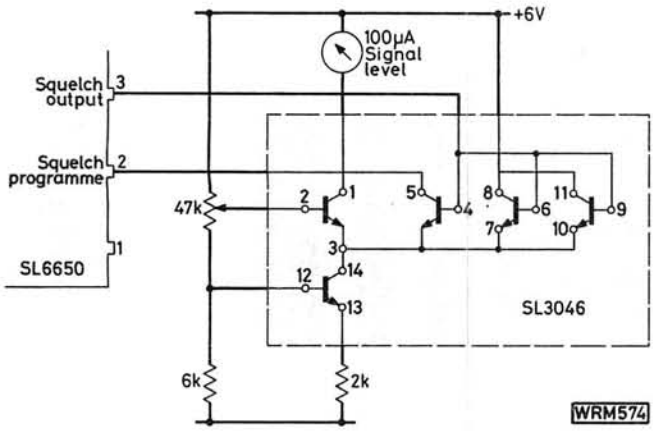


Fig. 4: This circuit may be used with the SL6650C for driving a signal strength meter

Input

The input signal is coupled to pin 16 of the SL6640C by C2 (or to pin 14 of the SL6650C in a similar way). The input pin is not self-biased, but is fed with bias from pin 18 (pin 16 in the SL6650C) through a total resistance of a little over 15kΩ. The input impedance of the pre-amplifier stage is about 5kΩ shunted by 2pF. This input impedance appears in parallel with the series combination of R1 and C1. If, as is often the case, the signal is fed to pin 16 through a r.f. filter requiring a matching impedance, the value of R1 should be chosen to provide this matching. For example, R1 may have the value of 330Ω required by many ceramic 10·7MHz filters, but in any case R1 must not have a value of over 1kΩ, or the input will not be correctly biased.

The i.f. input frequency to the circuit of Fig. 3 should not be less than about 4·5MHz, since an external phase shift circuit in the demodulator is fed via internal capacitors of only 2pF in value which cannot pass lower frequencies satisfactorily. Neither the SL6640 nor the SL6650 are suitable for the common 455kHz i.f. The maximum frequency is limited by the 25MHz bandwidth of the i.f. pre-amplifier and main amplifier units. The normal input frequency is 10·7MHz with 21·4MHz as an alternative.

The i.f. pre-amplifier provides a gain of about 46dB (200 times voltage gain) and consists of an internal chain of five cascaded long-tailed pairs. The main i.f. amplifier is rather similar, but employs a chain of six cascaded long-tailed pairs to provide a gain of some 60dB (1000 times voltage gain). The third and sixth stages of the main amplifier contain detectors which provide the signals required by the squelch stage.

SL6640C Audio Stage

In the SL6640C, the output of the d.c. volume control section is fed to pin 7, this output being taken from an internal emitter follower with a low-current tail. It will drive only high impedance loads and requires a high frequency roll-off capacitor, C10 in Fig. 3, to act as a de-emphasis component. The value of this capacitor should be about 0·01µF/f where f is the required roll-off frequency in kHz (about 3kHz with the values shown in Fig. 3).

The resistors R7 and R8 provide the bias to pin 8, the input of the audio output stage, to keep the quiescent output voltage centred at half the supply voltage so that the circuit can deliver maximum output power. The output from pin 7 is coupled by C11 to this output amplifier input.

Negative feedback is provided by R10, R9 and C12 to control the d.c. operating point and to define the stage gain. The value of R9 can be chosen to obtain the required output stage gain. The minimum recommended value of R9 of 1·2kΩ produces a gain of 100 (40dB). If one attempts to achieve a higher gain by a further reduction in the value of R9, instability may occur together with excessive distortion (since the open loop gain of the output stage amplifier is only some 55dB).

The power output pin 11 is decoupled by C13 to ensure high frequency stability and drives the load through a 100µF capacitor to prevent any steady current from flowing through the load. If a 9V supply is employed, an output of some 250mW can be obtained into an 8Ω loudspeaker, but a more practical output at which one should aim is about 175mW. Owing to the logarithmic response of the human ear, one would barely notice the difference!

Complete Circuits

A complete SL6640C circuit is shown in Fig. 5. The tuned circuit between pins 4 and 5 should resonate at the centre of the i.f. passband, usually at 10·7MHz.

A similar circuit using the SL6650C is shown in Fig. 6. In this case the output appears at the open collector of a transistor (at pin 10) and must therefore be connected through a load resistor (normally 10kΩ) to the positive supply line, the audio output being taken from the circuit through an electrolytic capacitor. Pin 10 should also be decoupled at radio frequencies, the value of the decoupling capacitor required being equal to 0·015µF/f where f is the cut-off frequency in kHz.

Performance

The SL6640C and SL6650C provide a sensitivity no worse than 10µV r.m.s. for a 20dB signal-to-noise ratio at 25°C from a 10·7MHz i.f. signal modulated with a 1kHz tone with a ±5kHz deviation and using a 6V supply. When the input is 1mV r.m.s., the typical signal-to-noise ratio is 50dB (minimum for any device 30dB). For a 100µV signal at the input, amplitude modulated to a depth of 30 per cent, the a.m. rejection is a minimum of 25dB (35dB typical).

The squelch range is typically 45dB and the squelch law about 2µA per dB. The d.c. volume control provides a minimum range of 50dB with a volume control law of some 2µA per dB.

The SL6640C provides a minimum output power of 150mW r.m.s. using a 1mV r.m.s. input signal with a typical audio distortion of 2 per cent (maximum 5 per cent). The SL6650C provides a minimum audio output level of 50mV r.m.s. into a 10kΩ load when fed from a 10·7MHz source modulated with a 1kHz tone with a ±5kHz deviation, the maximum level being 100mV r.m.s. Under these conditions the total harmonic distortion is typically 1 per cent (maximum 3 per cent).

The SL6640C and SL6650C are very suitable for use in portable hand-held transceivers with narrow-band frequency-modulation transmission. They can also be em-

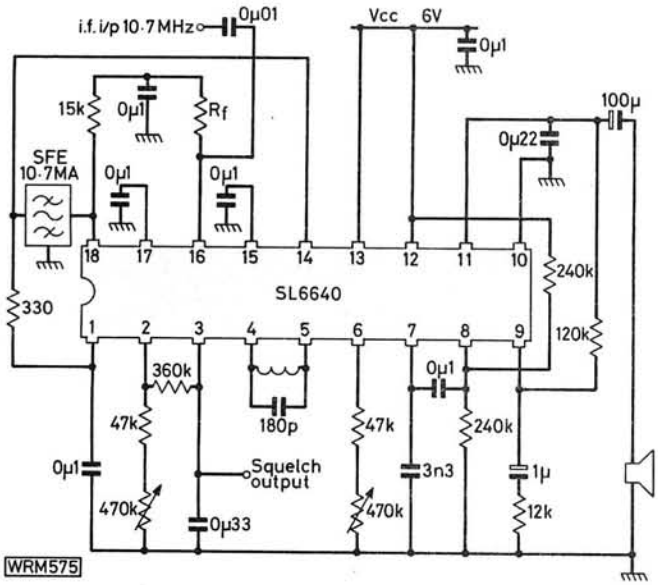


Fig. 5: A 10·7MHz SL6640C circuit

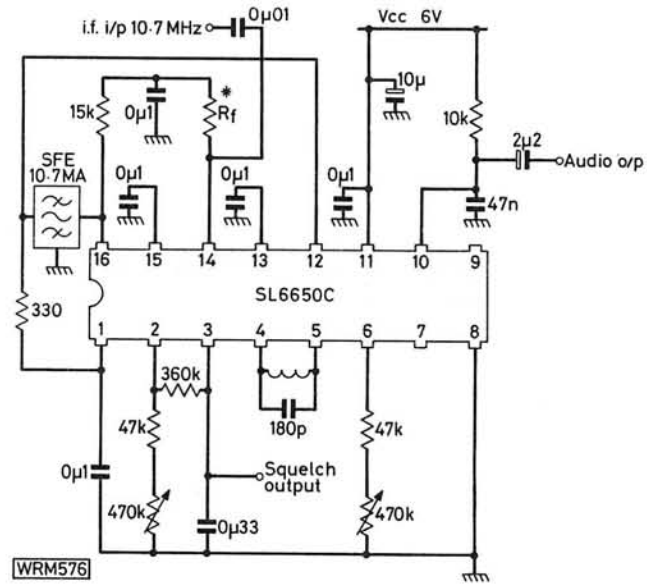


Fig. 6: A 10·7MHz circuit using the SL6650C device

ployed for wide-band f.m. broadcast detection, but in this case the bandwidth of the quadrature tuned circuit will need to be increased by loading it with a suitable resistor between pins 4 and 5 of the device used. In addition, the filters in the receiver must be appropriate for either narrow- or wide-band work.

The devices cannot be used for single side band (s.s.b.) reception, since the last stages of the i.f. amplifier are always limiting on noise. The Plessey Semiconductors SL6700 device is much more suitable for s.s.b. However, the SL6640 and SL6650 devices can accept inputs with frequency deviations of up to 2 or 3MHz provided that the i.f. has a value of over 20MHz and that the quadrature coil is suitably loaded to greatly reduce its Q value.

The SL6640C is especially useful in portable f.m. receivers because it will supply adequate power to a small loudspeaker, while its low current consumption will prolong the battery life. The circuits can be somewhat simpler than those employing double frequency conversion with phase-locked-loop detection, although the latter exhibit better capture ratio.

The SL6640C is available from Ambit International, 200 North Service Road, Brentwood, Essex CM14 4SG together with suitable coils and filters. ●

CB OPERATING IMPRESSIONS

▶▶▶ *continued from page 42*

irregularity will occur, and when this is illuminated by a sky-bound wave a degree of "scattering" results and the wave is returned to earth over a distance significantly greater than that of the normal radio horizon. This is shown in Fig. 4, where it will be seen that the elevation of the irregularity determines the distance over which the space wave will be returned to earth.

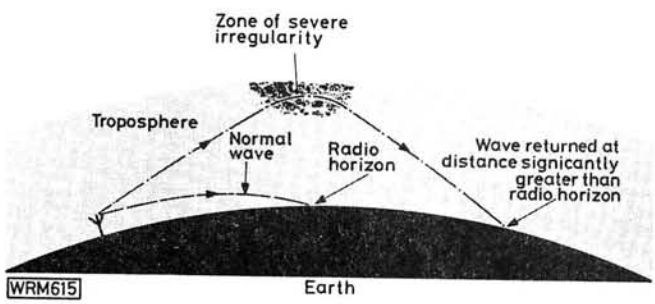


Fig. 4: One mode of enhanced-distance tropospheric propagation

Another mode of enhanced distance propagation is revealed in Fig. 5. Here sudden discontinuities of the normal temperature gradient result in sharp changes of refractive index, thereby bending the wave path. Tropospheric temperature inversion effects are typical of this mechanism, and the signal can be "ducted" through the troposphere over astonishingly large distances with very little attenuation.

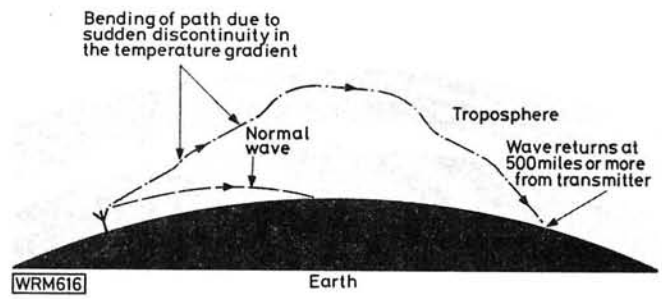


Fig. 5: This sort of tropospheric propagation resulting from modification of the refractive index by sudden discontinuities of the temperature gradient is sometimes called "tropospheric ducting"

As might now be realised, the energy carried by the so-called ground wave is swiftly dissipated at upper h.f., v.h.f. and above. The ground wave is mostly used for the propagation of l.f. and m.f. signals.

Due to pressure on space, the promised explanation of the HO Information Sheet on CB antennas has had to be held over until next month

NEWS NEWS NEWS

RAE Courses

Courses to prepare students for the Radio Amateurs Examination (City and Guilds 765) will be available at the following locations:—

Near Bristol—*Thornbury Adult Education Centre, The Castle School, Park Road, Thornbury,* commencing Thursday 23 September between 19.30 and 21.00hrs. Enrolment Thursday 16 September between 19.30 and 21.00hrs. Course Tutor will be Alan Jones G8ATZ.

Farnborough—*Oak Farm Centre, Chaucer Road, Farnborough, Hampshire,* commencing Thursday 23 September, enrolment Tuesday 14 September. Further details from the centre, tel: (0252) 515045.

Hertfordshire—*East Herts College, Turnford, Herts.,* commencing in September, probably on Mondays between 19.00 and 21.00hrs. Further details from either Jim Sleight G30JI, QTHR, tel: Ware (0920) 4316, or Mr. J. France at the college, tel: Hoddesdon (099 24) 66451. It is also hoped to run a "Beginners CW Course" in the Cheshunt area, details from Jim G30JI.

Chatham, Kent—*Mid-Kent College of Higher and Further Education, Maidstone Road, Chatham, Kent,* classes to be held on Wednesday evenings, enrolment on 13 and 14 September between 14.00 and 20.00hrs. Details from the Course Tutor, D. A. Chamberlain G8RPM, at the College, tel: Medway (0634) 41001.

Lincolnshire—*Deeping School, Deeping St. James, Lincs.,* commencing in September. Details from Gordon Parker G4EMK, QTHR, tel: Bourne (077 82) 5224.

South London—*Brixton College of Further Education, 56 Brixton Hill, London SW2 1QS, tel: 01-737 2323/6.* Commencing in September, enrolment 6, 7, 8 and 9 September between 18.30 and 20.30hrs. The Course Tutor will be Mr. R. McEwan Reid G4GTO.

North London—*Hendon College of Further Education, The Burroughs, Hendon NW4 4BT, tel: 01-202 3811 Ext. 147.* Full details from Chris Holford at the College.

Nottingham—*Arnold and Carlton CFE, Digby Avenue, Mapperley, Nottingham, tel: (0602) 876503,* commencing 22 September for 30 weeks. Course Tutors G4DVW and G4NZU. Also a shortened course commencing 21 September for 13 weeks. This course is not suitable for absolute beginners. Course Tutor G4DVW. Enrolment for both courses 13 to 17 September between 14.00 and 20.00hrs.

Hucknall CFE, Portland Road, Hucknall, Nottingham, tel: (0602) 637316, commencing 20 September. Course Tutor G4DVW, also a separate course commencing 23 September, Course Tutor G3KTX. Enrolment for both courses 6 and 7 September between 14.00 and 20.00hrs.

Kirkby in Ashfield Comprehensive School, commencing 21 September, enrolment 8 September between 18.30 and 20.00hrs. Course Tutor G3KTX.

Northumberland—*Further Education and Youth Centre, Astley High School, Seaton Delaval,* on Wednesdays between 19.00 and 20.45hrs, commencing September. The Course Tutor will be S. Wisher G8CYW and further details from K. B. Fawcett, tel: Seaton Delaval (0632) 371784.

Walsall—*Civic Centre, Adult Education Department, Darwall Street, Walsall, West Midlands.* Full details are available, by telephone from Aldridge (0922) 52706, or by writing to the

On The Move

Lascar Electronics, the Essex based manufacturers of digital instruments have moved to a new head office in South Woodham Ferrers, Chelmsford. The new premises are located approximately five miles from their existing facility, at Basildon, which will be retained, but used for manufacturing only.

The expansion in staff and product range is already underway with the introduction of a new digital capacitance meter (see Production Lines) and mains powered panel meters. During the next twelve months, a new series of ultra-low power handheld instruments will be introduced.

The 1982 shortform catalogue is now available from: *Lascar Electronics Ltd., Oakland House, Reeves Way, South Woodham Ferrers, Chelmsford CM3 5XQ. Tel: (0245) 329773.*

2 Metre f.m. Contest

Stevenage and District A.R.S. ran a 2m f.m. contest on 11 April 1982 (News May 1982), which proved to be very popular despite poor conditions. There was a high level of activity in both antenna polarisation sections of the contest, with the interesting result that contestants who used horizontally polarised antennas worked both more stations and at greater ranges. Regrettably there were no entries for the s.w.l. section.

Winner of the High Power Section (over 25W) was G8RZO with a score of 947 and a best DX of 410km with PE1GYC. In the Low Power Section (under 25W) G6ECM won with 406 points and a best DX of 314km with G8ZPC.

Many thanks to Trevor Tugwell G8KMV, who sent in the results.

PW Morse Show

During the course of preparation of the PW Morse Show the kit suppliers Heritage Communications went into liquidation. Fortunately another company based at the same address has been able to take over the supply of parts for this project at the same price. The name of the new company is Melody Enterprises Ltd., and the address *Lloyds Bank Chambers, 4 The Square, Wimborne Minster, Dorset BH21 1JA. Tel: (0202) 888402.* In addition to the supply of components they are also able to supply ready-built units.

Equipment News

I.C.S. Electronics Ltd., of Arundel, inform me that they are now importing the well-known Advanced Electronics Applications Inc. (A.E.A.) range of products for the amateur radio enthusiast.

This month in Production Lines I am looking at the latest Morse/RTTY/ASCII reader from A.E.A., called the MBA-RO.

For further details of the product range, contact: *I.C.S. Electronics Ltd., P.O. Box 2, Arundel, West Sussex BN18 0NX. Tel: Slindon (024 365) 590.*

NEWS NEWS

Chalk Pits Museum

Early, on the morning of Sunday 6 June, the *PW* editorial team were converging on Chalk Pits Museum at Amberley, Sussex, anticipating an especially interesting day out at the museum's annual Vintage Wireless Day.

In addition to the pleasure of visiting Chalk Pits Museum, we were there to witness *PW* Editor, Geoff Arnold G3GSR, officially opening the new Radio Building, which houses a really superb display of historic wireless and communications equipment.

At 12 noon the ceremony began, in brilliant sunshine, with introductions, a presentation to Ron Ham and acknowledgements to the many people and organisations who assisted in the building of the museum, after which Geoff cut the ribbon and officially declared the building open. He was then called upon to demonstrate his practical skills by putting up a commemorative plaque in the entrance of the museum.

Geoff fixes the commemorative plaque

The crowd of onlookers included many local amateurs, fellow enthusiasts and friends of Chalk Pits, plus Mr Roy Muggleton, Publisher of *Practical Wireless* and the *PW* editorial team—G4LFM, G8MCP, G8VFH and yours truly G8ZPW.

Chalk Pits Museum is situated in 36 acres of countryside, originally a chalk quarry and limeworks, features among its other attractions, nature trail, geology trail, narrow gauge quarry railway, stationary engines, blacksmith's shop, printer's shop, road and canal displays, brick making exhibition, carpentry tools and machines, water pumping, metal-working machine shop and museum gift shop.

For further details contact: *Chalk Pits Museum, Houghton Bridge, Amberley, Arundel, West Sussex BN18 9LT. Tel: Bury (079-881) 370.*

The opening ceremony, from l-to-r, David Rudram, Ron Ham and Geoff Arnold, in front, holding the microphone is Ian Dean, Director of Chalk Pits Museum

Trio in Portsmouth

Telecomms, the Portsmouth based radio equipment suppliers, inform me that they are now an authorised Trio distributor for Southern England.

Along with the full range of Trio products, Telecomms also stock components, antennas, amplifiers and a large range of CB equipment, which should be of interest to the electronics and radio enthusiast.

Telecomms, 189 London Road, North End, Portsmouth. Tel.: (0705) 660036/662145.

BATC Convention

The British Amateur Television Club are holding their annual Convention at The Post House, Leicester, on Sunday 5 September, 1982.

Admission is free and a particular welcome is made to *PW* readers. There will be trade stands, equipment demonstrations, lectures and the club's own ATV outside broadcast unit will be in action. Doors open at 10.00hrs.

Further details from: *Trevor Brown G8CJS, 25 Gainsbro Drive, Adel, Leeds LS16 7PF. Tel: (0532) 670115.*

On the Grapevine

Rumours are circulating about a potential Home Office decision to remove frequencies between 431 and 432MHz from the UK amateur allocation. At present the bottom 2MHz of the 432MHz band is available in certain areas, but restricted to 10W e.r.p. and falls outside the existing UK bandplan.

The reason behind this possible decision is to free this part of the u.h.f. spectrum for p.m.r. use, initially in the already congested Home Counties.

Further rumours suggest that the H.O. may look favourably upon requests for an amateur allocation at around 50MHz, as and when Band I TV transmissions cease.

HMS Mercury 1982

The RNARS Mobile Rally took place on June 13 at HMS Mercury near Petersfield. Talk-in and talk-out was provided by the UK f.m. Southern Group enabling visitors to find their way in and out of the area quickly. The displays during the day included a flyover by a Swordfish of the Royal Naval Historic Flight based at Yeovilton, Field Gun Runs and a marching display from the Hornettes Majorettes.

All the various trade stands were in the two large marquees with RAYNET and the RAIBC having their tents around the arena. Fortunately for the crowds the weather stayed dry and everyone seemed to enjoy their day.

Longleat 1982

Sunday, June 27 saw the City of Bristol RSGB Group's 25th Mobile Rally and *PW*'s first attendance at Longleat—altogether an auspicious occasion! An estimated 8000 visitors enjoyed the sun and sheltered from the rain, swarming around the marquees to pick up bargains on the trade stands and in the bring-and-buy.

A mast-erection contest and an absolutely amazing display by the Bristol Unicorns Marching Band provided hard work for some and much entertainment for others in what was a most enjoyable day.

Can I Help You!

Are you the secretary, organiser or general dog's body of your local radio club or any other group whose functions may interest readers of *PW*? If so, let me know and I will endeavour to publicise your rally, get-together whatever, through this column.

NEWS NEWS NEWS

Seeking Planning Permission?

Recently I have heard of a development that has potentially far-reaching consequences for the radio enthusiast applying for planning permission to erect an antenna mast.

Under a new ruling, stemming from a planning appeal by a taxi operator at Kirklees, some local authorities are apparently applying the outcome of that unsuccessful appeal to radio enthusiasts and issuing planning permission for a limited period only. A recent article in Planning Magazine* explains, "Kirklees planners had understood that interference was not a planning matter. But in consultations with the Post Office they were told that although frequencies were carefully chosen and that it was unusual for transmitters to be faulty, it did not mean that other radio users would be free from interference. The Post Office said that "transmitters should be sited away from residential areas as any comparatively strong transmitter situated among dwellings is almost certain to result in interference of some type." The authority was told that the siting of aerials was the concern of the planning authority."

In the case of PW Technical Editor G8MCP, who received the grant of planning permission on 25–3–82, the temporary period lasts until 31–12–84, when the mast must be removed, within one month of the expiry date, unless permanent planning permission has been received.

The temporary planning document explains the reasons for the conditions in this way, "To ensure no problem of interference being created to the audio/video equipment of adjoining occupants prior to the granting of permanent planning permission." The local authority has stated that the subsequent permanent planning permission application would not incur any extra charge, over the original £20.00 fee.

Exactly how the local authority are to determine the amount and nature of any interference caused is still to be established, but it would appear to depart markedly from the terms of reference employed by the Post Office Radio Interference Branch. The document's concentration on non-radio and non-TV receiving devices, for which there is currently no interference protection within the Wireless Telegraphy Acts, could present operational problems to all users of the radio spectrum.

It would seem that this latest incursion of bureaucratic interference into the legitimate activities of UK citizens, could result in radio enthusiasts being arbitrarily deprived of their rights. Consequently, the RSGB Planning Panel are investigating this matter and have requested that anyone affected by these latest planning rules contact them via RSGB HQ.

*Planning Magazine is published by: *Ambit Publications, 6a College Green, Gloucester GL1 2LX. Tel: (0452) 417553.*

Repeater News

UHF Mixed Polarisation: A recent proposal, to the RSGB's Repeater Working Group, from the GB3IW, RB4, Isle of Wight repeater group requesting permission to instal a mixed polarisation antenna system, has been rejected. Whilst the RWG will always look sympathetically on experimentation and schemes to improve system effectiveness, the overruling factor, in this decision, was the need to preserve the maximum cross-polar isolation between u.h.f. repeaters and ATV transmissions.

1296MHz ATV: Whilst on the subject of ATV, the RWG are still considering the final details of the proposed 1296MHz TV repeaters. Current thinking amongst the constructional groups indicates preference for an f.m. system, however, this would involve an increase in bandwidth and a revision of the recently proposed bandplan.

UHF Phase 6: By the time this issue of *PW* is published, it is confidently expected that the Home Office will have granted licences to the following 432MHz repeaters: GB3FN, RB15, Farnham; GB3GC, RB4, Goole; GB3HA, RB6, Hornsea (Humberside); GB3HV, RB15, St Austell; GB3HD, RB2, Huddersfield; GB3PD, RB10, Peterhead (Grampian); GB3UL, RB2, Belfast; GB3WP, RB11, Manchester East; GB3WU, RB15, Wakefield and GB3XX, RB15, Daventry. As previously reported u.h.f. Phase 7 has now closed and proposals for Phase 8 are being received by the RWG, which includes one for the Rossendale Valley (North of Manchester).

UHF Repeater Closed Down: The Chester repeater GB3CR, RB6, has had its licence withdrawn by the RSGB due to allegations of licence infringements. A site change proposal had been received by the RWG but apparently the repeater had already found its way to the new site. As this created co-channel interference problems, the RSGB were forced to act. It is hoped that the situation will return to normal soon, probably with a return to the original site, pending a full legal site change sometime in the future.

UHF Repeater Opening Up: Next the good news, Hereford's u.h.f. repeater GB3HC, RB6, which has been off-air for the last 12 months awaiting the acquisition of a new site, is due to return soon.

VHF Phase 7: Repeater proposals for v.h.f. Phase 7, were due to close in July, however, they will now be accepted up to 30 September 1982. The deadline for completed, fully documented proposals is 31 October 1982.

Once again our thanks to Mike Dennison G3XDV, who supplied this information.

HF Convention 1982

The first RSGB HF Convention, held at the Belfry Hotel, Milton Common, Oxford on 19 June, was very nearly a victim of its own success. The organising committee had hoped they might get as many as 200 visitors, but in fact over 350 turned up to see the trade stands, the QRP demonstration station and the impressive exhibition of home-constructed equipment mounted by the G–QRP club, and to listen to lectures on Antennas by Louis Varney G5RV and Receivers by Pat Hawker G3VA, which were both "standing-room-only". A chance to throw questions at members of the HF Committee in open forum rounded off the programme.

Reaction to the day was very favourable, and it is planned to make this an annual event, hopefully with a little more elbow room and also a PA system for the lectures, to help the poor souls at the back of the hall!

NEWS NEWS

OSCAR Phase IIIB

The June edition of *World Radio* carried details of tests conducted by AMSAT-DL at Marburg, West Germany, on the Phase IIIB satellite transponders. Preliminary indications of the specification for typical user ground stations are as follows:

U Transponder (Mode B, see table); 21·5dBW e.i.r.p. uplink for a 20dB S/N ratio, at the specified range of the satellite, i.e. 10W applied to a 12dBi antenna. On receive an antenna with a gain of at least 10dBi should be used, assuming a 2·4kHz bandwidth and 5dB n.f. receiver is used. The engineering beacon should appear at a 17dB S/N ratio.

L Transponder (Mode X, see table); 28·8dBW e.i.r.p. uplink for a 20dB S/N ratio at the specified range of the satellite, i.e. 3W applied to a 24dBi antenna or 50W to a 12dBi antenna. On receive an antenna with a gain of at least 13·5dB should be used. In a satisfactory receiving set-up the engineering beacon would be at 17dB above noise.

All the foregoing gain figures assume the antennas employed are right hand circularly polarised. Linearly polarised antennas would require an additional 3dB gain for equivalent performance and downlink fading effects would be more severe, ranging from "noticeable" to "intolerable".

The final recommendations for ground station capabilities will be made once the spacecraft is in orbit and engineering tests have been completed. Latest on the launch date is "early" 1983.

	U Transponder	L Transponder
Uplink	435·025–435·175MHz	1269·050–1269·850MHz
Downlink	145·975–145·825MHz	436·950–436·150MHz
Gen. Beacon	145·812MHz	436·040MHz
Eng. Beacon	145·990MHz	436·020MHz

Be Warned

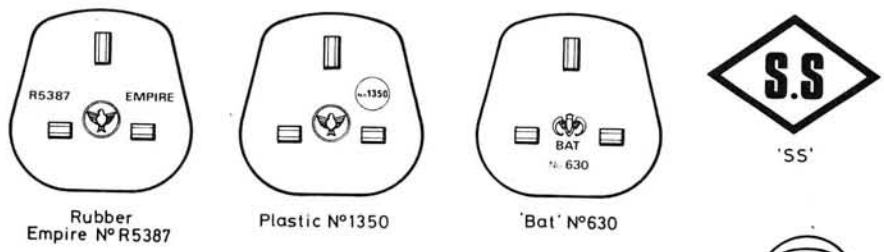
The Consumer Services Department of the Greater Manchester Council is becoming increasingly concerned about the possible dangers to consumers arising from the use of some brands of imported 13 amp plugs and fuses.

These plugs and fuse links imported from the Far East have failed the tests to which they were submitted. They do not comply with the appropriate British Standard despite some of them being marked to that effect. In certain situations the top can be blown off the plug base creating not only a fire risk, but the plug base can be left in the socket with the live pins exposed.

Some fuse links have also failed the tests applied to them and can lead to excessive temperature rises in the plug and socket assembly.

The Warwickshire Trading Standards Department warns of dangerous plugs that they too have found. Household plugs tested by the authority following consumer complaints have been described as extremely dangerous by a testing house. They are constructed of white bakelite and are marked FIORA or FLORA BS 1363 and Made in India. The plugs reach excessively high temperatures in use, have faulty fuses and other constructional defects which represent a real danger to the user. They are known to have been distributed in large numbers and it is understood that similar complaints have arisen in South Yorkshire.

Consumers are advised to remove them from appliances immediately, and should preferably contact their local Trading Standards Office in order that the source of supply may be traced.



Rubber Empire N°R5387 | Plastic N°1350 | 'Bat' N°630 | 'SS' | 'Chi-lik'

The offending plugs (above) and fuse-link markings (right)

Expeditions

Clyde Valley DX Group have organised the Four Points of Scotland Expedition — GB4GB, to take place throughout August.

The intention is to operate from each of four extreme points of mainland Scotland in turn. Each of the four locations will issue a distinctive QSL card, exclusive to that location. Confirmed contact with all four locations will entitle the successful station to claim a certificate, which will be the main expedition award.

Operating times and dates as follows: Mull of Galway (extreme south), QRA locator X026D between 8 and 10 August. Ardnamurchan Point (extreme west), QRA locator WQ29B between 12 and 14 August. Dunnett Head (extreme north), QRA locator YS24F between 16 and 18 August. Buchan Ness (extreme east), QRA locator ZR42H between 20 and 22 August. The station, GB4GM, will be operating continuously from 12 noon on each starting day to 12 noon on each finishing day, both GMT.

Further details from: *Gordon A. Hunter GM3ULP, 12 Airbles Drive, Motherwell, Strathclyde ML1 3AS, Scotland.*

The Barry College of Further Education Radio Society is planning an expedition to Flat Holm Island, to celebrate Marconi's pioneering tests from the island. The station callsign is GB2FI and will be operational between 27 and 31 August.

All the h.f. bands will be covered, especially 1·8MHz (160m) and 3·5MHz (80m). Flat Holm is the only Welsh land in AT26, which is required for the worked all Britain award.

Readers who are interested in contacts on 70MHz (4m), 432MHz (70cm) ATV and 10GHz (3cm) are asked, before the event, to get in touch with: *Simon Lloyd Hughes GW8NVN, 1 Min y Mor, Barry, S. Glam. CF6 8QG. Tel: (0446) 734842.*

MICROWAVE MODULES MML 144/100–LS 144MHz 100W Linear Amplifier

If you are the owner of one of the many 144MHz portable rigs such as the C58, FT290, TR2300 etc., the subject of this review will be of interest. Most portable transceivers arrive with power output levels of between 1 and 3W, ideal for their primary purpose, but usually found to have a transceive capability heavily biased towards the receiving end, when pressed into mobile or fixed station use.

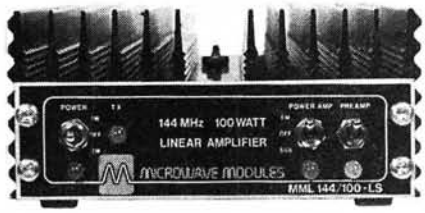
The MML 144/100-LS is the high power version of a range of four 144MHz linear amplifier/receive pre-amplifier combinations manufactured by Microwave Modules and specifically designed for use in conjunction with low power equipment.

Circuit-wise the 144/100-LS p.a. section features two active devices, the first of which is a 2N6082 fed via a *pin* diode switched input attenuator, which is controlled by a front panel mounted miniature toggle switch. Depending on the switch setting the full output rating can be obtained from either a 1W or 3W drive level. The switch is of the centre-off variety and in this position the amplifier stages are bypassed by two double-pole relays.

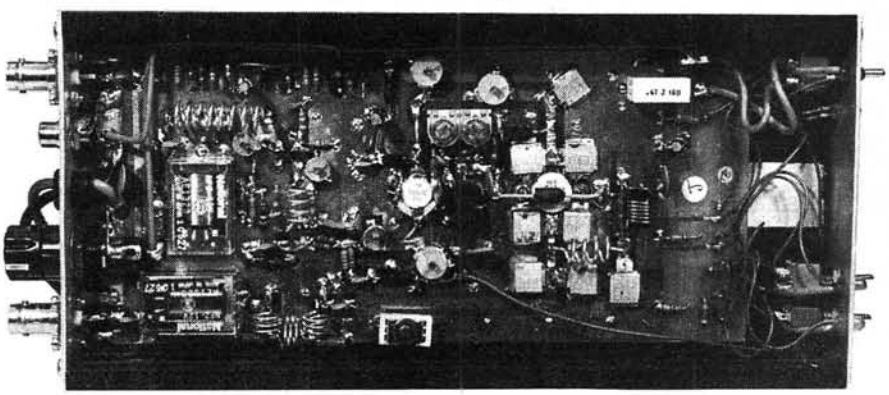
The output of the first stage device feeds the single SRF 1397 r.f. power transistor final stage via printed strip line elements. This 13·8V device is rated at 250W dissipation and in this circuit configuration is quoted to be capable of withstanding the combined effects of a 50 per cent overdrive and 15V supply.

The complete amplifier is biased for linear operation with the biasing network tracked against temperature variations. Both transistor devices are bolted directly to the internal face of the purpose-extruded black anodised aluminium heatsink section, which forms three sides of the housing. Low pass filtering is provided at the output to remove any harmonic energy.

Also contained on the same double-sided glass fibre p.c.b. is an r.f. sensing VOX circuit for controlling the twin r.f. changeover relays. A delayed VOX action may be selected via a further front panel toggle switch; the VOX is automatically overridden by connecting the rear panel mounted phono socket to earth, via the p.t.t. line control of the driving rig.



As previously mentioned, most portable rigs will have a considerable receive capability in hand, however when running at the 100W output level the provision of additional receiver pre-amplification is usually necessary. The 144/100-LS contains a pre-amplifier fitted with a 3SK88 low noise dual-gate MOSFET, in a noise matched configuration. The specified overall noise figure is better than 1·5dB and associated gain limited to 12dB by a pi-section attenuator at its input. Should the existing front end stage noise figure better that of the pre-amp, which is unlikely, it may be switched out of circuit, once again by means of a front panel control switch. All switching actions are confirmed by l.e.d. status indicators also mounted on the front panel.



Operating

Being a 13·8V device the 144/100-LS obviously requires quite a meaty p.s.u. if you're going to run it in the shack. You *could* use a car battery and the amplifier *is* fitted with a sizeable reverse polarity protection series connected diode/15A fuse, **but** the effects of shorted battery terminals are decidedly dangerous and fire insurance always seems to be getting more expensive!

When driven by a Trio TR-2300, via the 1W input setting, the amplifier produced slightly over 90W into a 50Ω dummy load. Equally impressive results were obtained when driven by an Icom 202S 3W s.s.b. portable.

After an hour of contest style operating the amplifier warmed up appreciably; for extended duty cycle operation fan cooling would be advisable. Linearity was maintained throughout the temperature excursions and reports received indicated tight, spurious free output at all times.

It is of paramount importance to ensure that the amplifier is well matched to the antenna system; ideally both input and output feeder lengths should consist of λ/2 multiples, allowing for the appropriate cable velocity factor.

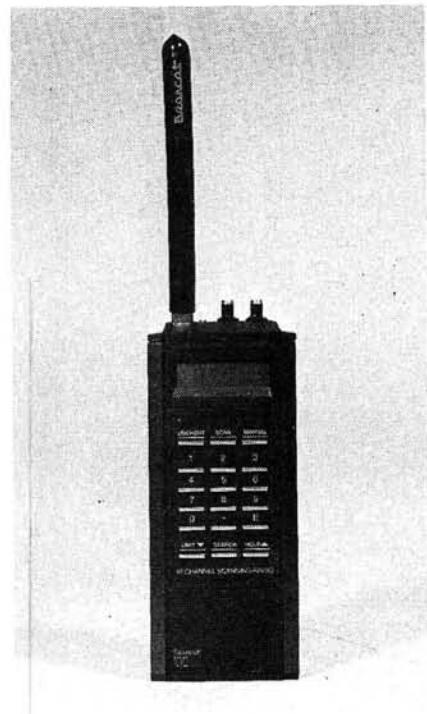
The slim-line construction of the 144/100-LS (265 × 117 × 54mm, overall weight 1·5kg) allows it to be readily shoehorned into most mobile installations, but with a consumption of 14A, operating whilst stationary should be kept to a minimum to avoid the bump starting mode. Quiescent current (with zero drive) of the combined p.a. and pre-amplifier is approximately 1·6A.

In conclusion then the MML 144/100-LS is a well designed 144MHz workhorse suitable for all operating modes and during several months has consistently performed on demand.

Thanks for the loan of the review sample go to **Microwave Modules, Brookfield Drive, Aintree, Liverpool, L9 7AN. Tel: 051 523 4011.** The current VAT inclusive price of the MML 144/100-LS *linear amplifier* is £148.00 inc. p&p and it is available from the above address or through their many agents.

John M. Fell

BEARCAT 100FB
16-Channel Hand-held Programmable Scanning Monitor

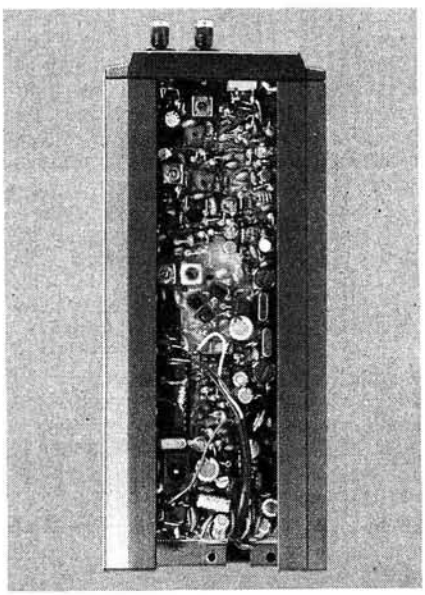


Have you ever wanted to take your scanning receiver portable? With the latest high sensitivity Bearcat hand-held programmable scanning monitor you can do just that.

The 100FB hand-held is very compact, measuring only 75 × 35 × 177mm, and weighing a mere 0·45kg. The 7·2V d.c. needed to run the receiver is provided by six AA size NiCad cells, stored in two tubes integrated into the extruded aluminium frame. Programming is achieved via 18 metallic keys on the front panel, with a 6mm high character liquid crystal display to indicate the frequency, channel number and operating mode.

A memory programmed capacity of 16 channels is available with the option of searching between two user set limits within any one continuous frequency band. With a SCAN/SEARCH speed of 15 channels per second there isn't much chance of missing even a brief transmission. The audio output level of 300mW is also adequate for most situations.

Top panel features include rotary controls for ON/OFF–VOLUME and SQUELCH, l.e.d. BATTERY LOW indicator, 2·5mm EAR PHONE socket and a special threaded antenna receptacle. The supplied antenna is of highly durable, custom designed, flexible construction, fitted with a suitably threaded male base connector.



When the internal batteries reach the LOW condition, the battery indicator l.e.d. flashes; the l.e.d. is continuously illuminated when operating from an external power supply/charger. The batteries require 8–10 hours for full charge, regulating circuitry being integral with the unit.

Amateur bands covered include 70MHz (4m), 144MHz (2m) and 423MHz (70cm). The scanner also covers part of the East European broadcast band, a useful system to monitor for sporadic-E openings. For u.h.f. propagation studies, coverage of channels 21–25 of Band IV TV is also provided.

TABLE 1

Frequency coverage
66– 88MHz v.h.f. (low)
138–174MHz v.h.f.
406–512MHz u.h.f.

RF sensitivity
v.h.f. (low) 0·6µV for 12dB SINAD
v.h.f. 0·6µV for 12dB SINAD
u.h.f. 1·0µV for 12dB SINAD

IF selectivity
50dB @ ±25kHz

Audio output
300mW into 8Ω

Scan/search speed
15 chan. per second

Delay
2 sec after squelch close

Table 1 lists the full range of available frequencies and specifications. Programming of the m.p.u. controlled scanner is extremely straightforward, involving the use of the correct key sequence. Any attempts to enter an out-of-band frequency results in the word ERROR appearing on the display.

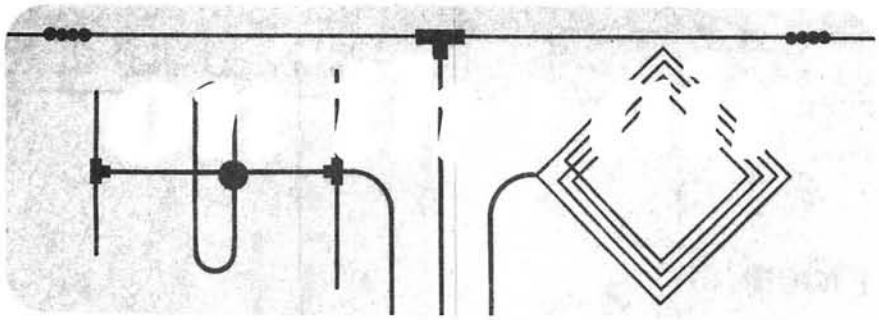
The facility exists to program any combination of available frequencies into the 16 memory channels or to scan between any two in-band limits. If a transmission within the memory group is not required, that frequency may be inhibited from the scan pattern by using the LOCKOUT key. With a very strong signal it is possible that the scanner will not lock onto the exact centre frequency. In this event, depending on the band in use, 12·5 or 5kHz manual indexing is provided to allow accurate tuning.

During the review period the hand-held scanner was taken on walks along many lofty hill tops and gave a very good insight into the vast amount of activity on both v.h.f. and u.h.f. bands.

For monitoring local activity it was ideal and also proved very useful during mobile microphone setting-up tests. Its scanning rate, being much faster than my amateur rig, became very useful whilst looking for contacts on either the 144MHz or 432MHz bands.

The Bearcat 100FB, complete with a.c. adaptor/charger and leather belt mounting, costs £253 including VAT plus carriage. Our thanks go to **Radio Shack Ltd., 188 Broadhurst Gardens, London NW6 3AY, Tel: 01-624 7174,** for the loan of the review sample.

Elaine Howard



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.

Among my regular correspondents are a number who are quite capable of passing the RAE but seem reluctant to have a go. In some cases it is a simple matter of finance. If one has a family there is always something more important that money can be spent on and that must come before amateur radio. Unfortunately the RAE and code test fees are ridiculously high now, compounding the problem.

But I was rather dismayed when one of these readers wrote to say that he wouldn't be taking the exam because the cost of the equipment is too high! I can only conclude that this is really a bit of a lame excuse, but I wonder how many others feel the same way? This factor shouldn't enter into the question at all. After all, the very expensive Far East gear now on the market here was not available a few decades ago but that didn't stop us old-timers from getting down to it and building our own rigs, from a simple straight receiver to a multi-band transmitter. We didn't have transceivers then!

So what has happened to that d.i.y. spirit which seems to be flourishing in so many other fields, like home decorating? While there are a number of practical designs for transmitters and receivers available in various handbooks there is a general dearth of suitable articles on such projects in the magazines in our field. I say "suitable" because it is rapidly becoming evident that many so-called "practical" articles today are so sophisticated as to be positively frightening to even experienced amateurs, let alone the comparative newcomer. It would seem that the authors are so immersed in modern high technology that they can't see the wood for the trees!

I believe the answer is that there are many amateurs that can build transmitters and receivers from their own designs but are unable, or unwilling, to keep the mass of information that accumulates during such an exercise and to write it up in the form of an article for a magazine. Perhaps clubs could see that the essentially practical chap gets teamed up with the technical writer bod to originate projects that will appeal to a much wider readership than do the present articles on transmitters and receivers.

As far as the h.f. bands are concerned a simple direct conversion receiver plus a two-transistor transmitter will get you a lot of fun on Top Band c.w. for next to nothing, so let's not hear any more excuses based on cost! There are also plenty of second-hand rigs to be picked up at clubs or from ads in our magazines at very reasonable prices. For the newly-licensed v.h.f.-only types it is rather a different problem as they cannot be expected to build their own gear for these frequencies but a second-hand handheld unit can be quite cheap and represents a good start, rapidly leading to something a bit better.

Club Corner

In spite of all the sporting diversion of this summer, club committees could very well spare some time looking at their current accommodation and its suitability for the coming winter season. With the upward trend in club membership the pub meeting place should only be regarded as temporary while a more suitable location is found where instructional and constructional facilities can be organised. Local businesses, organisations or factories are all potential club premises that should be investigated. The pub is the easy way out but not the most inviting for potential members, especially the younger ones.

Wirral & District ARC This club just happens to have moved its venue, to the Irby Cricket Club where, on Wednesday August 11 a "Know your new QTH" evening will include drinks and a chat, with all members and visitors most welcome at 8pm, talk-in on S13. The 25th sees a surplus gear sale, so it looks like the second and fourth Weds every month. Note a two-part lecture by G3LEQ on the Sun, Earth and Radio on September 8 and 22. Enjoying his first time on the air newly-licensed Neil McLaren G4OAR of 596 Woodchurch Road, Oxton, Birkenhead will take time off to answer your queries, or interrupt a QSO, on 051-608 1377.

Crawley ARC Meets fourth Wednesdays, I know not where, but interspersed are informal get-togethers at the homes of members. Ah, yes, found it. It's at the Trinity Church Hall, Ifield. Hon Sec David Hill G4IQM is now ensconced at 14 The Garrones, Worth, Crawley, sans telephone at time of writing so give him a moment to unpack his Biro.

Midlands ARS On Tuesday Aug 17 G8FTU will discourse on the design and production of p.c.b.s which makes it the third Tuesdays. Note for your diary, with a lecture on the Antennascope and other test equipment by Mr Naylor Strong on Sept 21. MARS "post boy" Tom Brady G8GAZ of 57 Green Lane, Great Barr, Birmingham, will give you details of meeting place, or call him on 021-357 1924. With a bit of luck, he says, his term as unofficial dogsbody could end with the October AGM. He knows he likes doing it!

Aylesbury Vale RS Welcome to one and all at the Stone village hall at 8pm on August 10 for a grand junk sale on a bring-and-buy basis. M.J. Marsden G8BQH, Hunters Moon, Buckingham Road, Hardwick, Aylesbury, Bucks or (0296) 641 783 will reveal all.

Farnborough & District RS The Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough, near M3 bridge, the second and fourth Wednesday at 7.30pm, with Aug 11 devoted mainly to G3TUX discussing electrical connectors, and Ray Flavell G3LTP talking on an, as yet, undisclosed subject on the 25th, bet it will be good! Farnborough 543036 is the number for Ivor Ireland G4BJQ Mytchett Road, Mytchett, near Camberley, Surrey.

Flight Refuelling ARS Every week on Sundays at 7.30pm at the Sports and Social Club, Merley, Wimborne, Dorset with operational stations on v.h.f. and h.f. while Elaine G4LFM takes time off from *PW* (Sunday nights?) to impart the Morse code to willing members. In case you might think that this could be a case of the blind leading the blind I'd mention that Elaine is a qualified marine op. She wouldn't mention it, of course! Ring Mike Owen G8VFY on (0202) 882771 for more details.

Wakefield & District RS Oh, dear, its "alternate Tuesdays" at Room 2, or it could be 3, Holmfield House, Denby Dale Road, W'field at 8pm prompt or you'll be locked out! This means August 10 for a quiz complete with buttons and buzzers and an on-the-air and natter night on the 24th. Advance notice of Sept 7 and 21 when it will be home-brew equipment evening, and a talk on Interference by G4DXA, respectively. Enquiries to Rick Sterry G4BLT on W'field 255515 have already corralled a few new members.

Fylde ARS Chairman John Parkinson G6DNK tells me the club will be moving to the brand new Fairhaven Hotel, Clifton Drive South, Lytham St Annes, in the near future. Good on ya! It could have happened already. John says "the club intends to push ahead, giving the greatest possible publicity to the advantages of AR to the greatest number of people, offering good facilities and establishing a good relationship with other societies in the neighbourhood in order to attract events to what must be an ideal location". Other clubs, please copy! Latest Society licensee is 15-year-old Anne Parkinson G6HID with 14-year-old brother Timothy over the hurdle of the May

RAE. Could these be the Chairman's offspring, I ask myself. Write to John at 141 High Street, Blackpool, Lancs, or buzz B'pool 21200 or 22110.

Bury RS The meeting on August 10 will, in fact, be a fox-hunt with back-to-normal lecture on radiography by G8LIR on September 14. The 85-plus members meet at the Mosses Youth and Community Centre, Cecil Street, Bury, on the second Tuesday. If you'd like to edit the club mag *Feedback* you'll be most welcome. G3IXC has had five years at it and now lays down his blue pencil. Contact publicity officer D. Hensby G8TKD at the club.

Wirral ARS First and third Weds at Minto House School, Birkenhead Road, Hoylake, Wirral, with Problems night on August 4 and a talk about coaxial cable on the 18th. Ought to tell you now about Sept 1 when it's all about basic fault-finding. Hon Sec Gordon Lee G3UJX is at 30 Manor Drive, Upton, Wirral, or 051-677 1518, waiting to assist.

Ipswich RC Second and last Wednesdays at 8pm in the club room of the Rose and Crown, 77 Norwich Road, Ipswich, the room being detached from the public bars. August 11 sees the final planning for the club's participation in the Ipswich Carnival on Aug 14. On August 25 RSGB Region 16 rep G3PLF will be a most welcome visitor to the club and it is worth mentioning now that a demo station will be found at the "Wheels '82" rally at Christchurch on August 29/30. Drop a line to Jack Toothill G4IFF, 76 Fircroft Road, Ipswich for more details or make it easier all round on (0473) 44047.

Sutton Coldfield RS An exhibition to mark the society's 25th anniversary will be held in the Central Library, SC, from Wednesday August 11 to the Saturday following, with special callsign GB4RSC allocated to the station operating on all h.f. bands plus 144MHz. Harry Griffiths G3BOQ is handling the details and he is on Aldridge 52667. New club PRO is Les McCullough G6DCL who'll be glad to answer questions on the club generally. His QTH is 63 Hill Hook Road, Four Oaks, SC, W. Mids and 021-353 8784 will also serve.

Worthing & District ARC Tuesdays at 7.30pm, Amenity Centre, Pond Lane, Durrington, says Hon Sec Joyce Lillywhite, 41 Brendon Road, Worthing, W. Sx, who suggests phoning Worthing 63062 for details of the club's immediate activities.

Abergavenny & Nevill Hall ARC The club was formed eight years ago specifically to help the blind and handicapped at Nevill Hall, Abergavenny, but anyone interested is invited to join the club, especially the disabled. RAE courses run from September to May so now is the time to get in. The club is an official RAE examination centre. Next big date is the map reading and barbeque on Sunday August 29. Otherwise meetings every Thursday at 7.30pm, above male ward 2 in the Penyfal Hospital. New sec is Dave Jones GW2SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent, or (0485) 791617.

Aberdeen ARS Another club with new club rooms, at 35 Thistle Lane, A'deen, where it will meet every Friday at 7.30pm for lectures, code instruction, junk sales, raffles, etc., and, I would hope, RAE classes. Be warned that the Scottish AR Convention happens at A'deen University on Saturday September 11, more details later or from publicity man P. Elliot GM3GQH, 19 Airyhall Gardens, A'deen.

Meirion ARS A rapidly expanding membership has dictated that the club move premises with GW6DDF spotting something while out mobile. It is the Nannau Country Club, Llanfachreth, with meetings first Thursdays at 7.30pm. Excellent facilities for the ladies as well as for the members, catering in a separate lounge, and ample space for antennas. It can be done! Immediate event is a natter night at the new QTH on August 5. New PRO tells me all this, from Len Bridges GW6COM, Trem Idris, Llanelltyd, near Dolgellau, Gwynedd but if you prefer the hon sec it is Ken Judge GW4KEV, Tyddyn Mawr, Arthog, near Dolgellau, Gwynedd.

Horsham ARC It might be a bit late but I'll tell you of the meeting on August 5 which will deal with Amateur TV, given by the Worthing TV Repeater Group. But plenty of time for you to note September 2 when expert Ken Franklin G3JKF will talk on antennas for the h.f. bands. So, it's first Thursdays at 8pm at the Girl Guide HQ, Denne Road, Horsham. Visitors especially welcome so contact Tony Wadsworth G3NPF QTHR.

Edgware & District RS The club is not on the move, just the sec Howard Drury G4HMD who now resides at 11 Batchworth Lane, Northwood, who, in spite of the upheaval, will probably be able to tell you all about the club if you enquire. Second and fourth Thursdays, 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx. August 12 seems to be a night off for the lads but down to serious matters on the 26th with briefing for the SSB Field Day. New G6's are encouraged to go on for their G4's by Morse practice dished out at meetings by G3ASR as well as on Top Band and 144MHz.

Greater Peterborough ARC Can only tell you that gatherings take place on the fourth Thursday at 7.30pm at the Southfields Junior School, Stanground but Frank Brisley G4NRJ, 27 Lady Lodge Drive, Orton Longueville, P'borough, also 231848, awaits your call.

Braintree & District ARS First and third Mondays at the B'tree Community Centre, Victoria Street, B'tree, the first generally informal at 8pm and the other, usually with formal lecture, at 7.45pm. Lively monthly magazine *BARSCOM* caters for a variety of tastes, although I'm not suggesting one eats it, with practical articles, crossword puzzles, ads from local emporia and members, plus all the info on the committee, sadly missing from most club mags. Publicity person Norma Willicombe is at 355 Cressing Road, B'tree, and looking for your enquiries.

Sutton & Cheam RS Meets either at the Sutton College of Liberal Arts, Cheam Road, Sutton, Surrey, or at the Banstead Institute, High Street, Banstead. G3LQP and G3LCH continue to give code instruction at their own or members QTHs so a steady flow of G4's is assured. Drop a line to sec G. Brind G4CMU, 26 Grange Meadow, Banstead, for the latest on meetings.

Spen Valley ARS Oh, dear, yet another lot moving venue, this time to the Old Bank WMC, Old Bank, Mirfield, W. Yorks with next meetings on August 5 and 19 at 8pm, more or less natter and noggin nights until September 2. So says the new sec Ian Jones G4MLW, 54 Milton Road, Liversedge, Heckmondwike, W. Yorks who will also QSO on H'wike 409739.

Edinburgh & District ARC Tuesdays at 7.30pm in premises let by the City Observatory at the top of Calton Hill with wonderful views all round it seems. Club station often active h.f. and v.h.f., c.w. and s.s.b. More from Dave Mackenzie GM4HJQ, 101 Dudley Avenue, Edinburgh.

Northern Heights ARS Second and fourth Weds, but where?, that is the question, not answered in *NHARS News* but Chairman/Sec G. Milner G8NWK at 3 Briggs Villas, Queensbury, near Bradford, Yorks will reveal all if you contact him. That's also B'ford 882945.

Chichester & District ARC Spitfire Social Club, Tangmere, 7.30, first and third Mondays with Wed next on S11 at 1800GMT. August being a quiet month meetings will be informal at the Bander Arms, Tangmere. T.M. Allen G3ETU, 2 Hillside, West Stoke, Chichester, Sx is your man, or try West Ashling 463.

Vale of White Horse ARS The White Hart Inn, Harwell Village, Berks. at 7.30 on first and third Tuesdays with the first tending to be formal with a visiting lecturer. With about a 50–50 split of "A" and "B" licensees there is no lack of tutors or pupils for the code classes. Hard luck on the last "B" bod left! Secretary Ian White lives at 52 Abingdon Road, Drayton, Abingdon, Berks also home of (0235) 89559.

West Kent ARS Meetings "alternate Fridays" which seems to mean August 6 and 20 at the Adult Education Centre, Monson Road, Tunbridge Wells, 8pm. A big effort is being made to find other, permanent, premises bearing in mind the problem of security. Club mag *QLF* comes out five times a year coupling practical projects with general club news. Brian Castle G4DYF will give you the latest on club events on Sevenoaks 456708.

Barry College of Further Education RS Excitement mounts as members get ready for their annual outing to Flatholm Island in the Bristol Channel on August 27–30th, special event station GB2FI, and the celebration of Marconi's first transmission across water, from the

Welsh mainland to the island in 1897. Operation on all h.f. bands plus 144MHz for 24 hours a day with special QSL for the lucky ones. Otherwise its every Thursday at 7.30 at the College Annex, Weycock Cross, Barry. Contact is John Share GW3OKA, 3 Uplands Crescent, Llandough, S. Glamorgan, also (0222) 702455.

Acton, Brentford & Chiswick ARC The Chiswick Town Hall, High Road, Chiswick, is the venue for general discussion on "Members Problems" presumably limited to those concerning amateur radio! The time is 7.30pm. More from secretary W.G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3.

Radio Club of Thanet The club will be running a station at the annual Phoenix Fair in Ramsgate on Saturday August 7 otherwise you can try the rig on Friday evenings after 8pm at the Birchington Village Centre plus all the other usual club activities. But Ian Gane G4NLF, 17 Penshurst Road, Ramsgate knows much more about it.

Hastings Electronics & Radio Club Interesting article in *Vital Spark,* the club mag, on the bogey stories that surround the idea of learning the Morse code, and how to overcome them, and of the big smile that breaks out when told that one has passed! Get in now for the RAE course starting in September and for the code instruction classes. On Sat/Sun August 7/8 it's the Town and Country Fair at Alexandra Park and the Church Wood School Fete on September 11. Principal meetings at the West Hill Community Centre, Hastings, for the radio boys and the Club Room at 479 Bexhill Road, St Leonards-on-Sea for those keen on computers and peripheral happenings on Mondays, with social events for all on Fridays. However, George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea is the one to contact, or try Cooden 4645.

Radio Society of Harrow The Roxeth Room of Harrow Arts Centre in High Road, Harrow Weald, Middx sees members there every Friday from 8pm onwards, with bar facilities and light refreshments and talk-in on RB14. What else could one want? Aug 6 is a practical night, 13th is a DF foxhunt, 20th a so far undisclosed outside visit, and practical again on the 27th. Be warned in good time of the constructional contest on September 10. Try Chris Friel G4AUF, 17 Clitheroe Avenue, Harrow, Middx or on 01-868 5002.

Verulam ARC Fourth Tuesdays, 7.30, Charles Morris Memorial Hall, Tyttenhanger Green, near St Albans, with Aug 24 being a combined meeting with Edgware club, constructional matters and bring-and-buy sale. Informal meetings on the second Tuesday at RAFA HQ, New Kent Road, St Albans. Further info from Peter Hillebrand G3VJO, Hobbits, 31 Crouch Hall Gardens, Redbourn, St Albans, Herts.

Torbay ARS Meets in Bath Lane at the rear of 94 Belgrave Road but immediate concern of members if the Torbay Rally on Sunday August 29 details of which can be got from G4DZH QTHR (I'd much prefer the full QTH!) In the meantime L.G. Mays G2CWR, Atlantis, Clennon Avenue, Paignton, Devon will fill in the details.

Cheshunt & District ARC Wednesdays 8pm Church Room, Church Lane, Wormley, near Cheshunt, Herts, with a natter nite on Aug 4, equipment evening on the 11th and 144MHz portable operation on Baas Hill Common, Broxbourne on the 25th. September sees the start of an RAE course at the East Herts College at Turnford, aimed at the May 1983 exam, with a beginners c.w. course, somewhere in the Cheshunt area, for which final arrangements are still being made, but for details of either, or both, its Chairman Jim Sleight G3OJI, 18 Coltsfoot Road, Ware, Herts or (0920) 4316. For other club matters contact Bob Gray G6CNV, 2 Sacombe Green Road, Sacombe, Ware, Herts also Dane End 254.

Biggin Hill ARC Now swollen to 30 members after quite a short time in existence, meeting in the Biggin Hill Memorial Library, but not in August. But September 21 sees RSGB's ex-QSL Bureau manager Arthur Milne G2MI telling members how to run a QSL bureau, and who better? More from Ian Mitchells, 37b The Grove, Biggin Hill, Westerham, Kent but try B. Hill 75785 first. Should tell you that Ian is now G4NSD, so congrats OM.

More and more clubs seem to be working in every month but as clubs frequently get new members as a result of these notes it would all seem to be worth while. Incidentally, I do get a lot of information on past club events but as a journalist I regard past news as dead news. I'd much rather hear about events to come.

DX News

Just a reminder that the various calls shown here are relatively scarce ones on the h.f. bands to help those chasing countries and prefixes for the different awards available. Logs from readers are welcome but should not include routine entries or commonly heard stations.

From Llanmorlais, Swansea **Philip Morris** tells of the DX heard on his CR-100 and a loop antenna intended for 3·5MHz (80m) operation. On that band he logged 4S7MX and AP2ZR indicating that the loop is doing quite well there. Catches on 14MHz (20m) were J2OZ on Abu Ali Island and 9Q5C. On 21MHz (15m) it was TN8AJ and J6LKZ, all s.s.b. Not many, but good. Newcomer to the column **Tony Pinnell** hails from Reigate, Surrey, and owns a Sony ICF-2001 which he feeds from a 30 metre wire. He is BRS50886 and just 14 years of age. Covering five bands he starts on 3·5MHz (80m) with PY2ALA, then 7MHz (40m) EA9LZ, HP3FL, then to 14MHz (20m) for DU7RLC, D68AAB, J6LOV, KH6WU, KN8M/SV9, VP2MDG, VP2VA, VP9CP and 6D5XF. Noteworthy on 21MHz (15m) were H44WF, TN8AJ, TT8PR, TYA11, VQ9WB, 5N0HAS and 6W8DS and, finally, on the 28MHz (10m) band it was P29MF, TU2JQ and ZD8RH.

Dennis Sheppard (Earl Shilton, Leics) reports his antennas survived severe thunderstorms. Latest addition is an ex-CB model tuned for 10m, with added radials. However it's s.s.b. this month instead of the usual RTTY log, with DU1RD, FG7BT, HS1AMH, PY7ZZ using 7W p.e.p., S83H, VK8NE for a scarce one, VK9YC, YB0ZM, ZD8JN, 5N3RTE, 7Q7LW and 9J2TY all on 28MHz, Then comes VK7JE, VU2UGI and YB1CB all heard after midnight on 21MHz, with just FM7WE and ZP5WC noted on 7MHz.

Alan Gallowa BRS51330 of Ayr in GM-land joins the column with a report using his Heathkit SB303 receiver and a 30 metre long wire, with an a.t.u. in the offing. On 28MHz the ZL2MHF beacon came in well with ZL2CRN appearing on 14MHz. Alan would welcome any old callbooks so contact him at 26 Celandine Bank, Kincaidston, Ayr if you'd like to help. In Edmonton, London, VP9PG was the catch of the month for **John Hayes** with his FRG-7700 and 7700 a.t.u. plus long wire and Datong audio filter although he has found the bands a bit quiet generally. Others were 5H3DM on 28, EA9LZ, SV5FD who wants cards to Box 348 Rhodes, VQ9PG, YB8VN (QSL Box 115, Ambon City, Ceram Is, Indonesia) and 9J2CJ.

A note here from **Elaine** G4LFM of *PW* who says YJ8ES in the New Hebrides is on 20m Sunday evenings between 1500 and 1600GMT specifically looking for UK contacts. The Trio R-1000 and long wire plus a.t.u. of **Archie Magrath** BRS48064 in Ramsgate located 7Q7LW and S83W on 28MHz, together with VU2DZ, 5Z4CX, VP5-JEX, Z31GI and 9Q5VT all on 21MHz, with more time than he'd like spent on gardening!

Dave Coggins in Knutsford, Cheshire, has an FRG-7700 but was still moved by my comments on direct conversion receivers to contemplate making one to compare it with his commercial rig. Concentrating mainly on 28MHz he logged DU7RLC, HS1AMH, S79WHW, Z21AV, 7Q7LW, 9X5SL while 14MHz produced KH6IJ, VK9NS, VR6TC and 6D5VIC which, as I expect you all know by now, is Mexico. Main antenna is a two-element rotary for 28MHz plus others feeding an FRT-7700 a.t.u. **Jon Kempster** BRS48205 from Berkhamsted, Herts, went on half term holiday to East Anglia with a v.h.f. hand-held but didn't have a crystal for the local repeater. The FRG-7 has been sold and replaced by and old UR1A for the BC bands. Last DX found included DA1WA/HB0, TN8AJ and 9L1MS on 21MHz plus 5N9GM and C53AP on 14MHz.

The RAE was taken by **Jim Dunnett** (Prestatyn, Clwyd) who found the questions vague remarking "clearly the C & G

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.

Amateur Electronics UK
504-516 Alum Rock Road·Birmingham 8
Telephone: 021-327 1497 or 021-327 6313
Telex:334312 PERLEC G
Opening hours: 9.30 to 5.30 Tues. to Sat. continuous – CLOSED all day Monday.

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–

THE CQ CENTRE

LONDON'S NEWEST AND BRIGHTEST EMPORIUM
10 MERTON PARK PARADE,
KINGSTON RD.,
LONDON SW19
TEL: 543 5150
We are open till 8 pm Wednesdays
ACCESS – BARCLAYCARD
INSTANT CREDIT THROUGH
TRICITY FINANCE

NEW AND SECOND HAND EQUIPMENT ALL FULLY GUARANTEED

YAESU – ICOM – SOMMERKAMP
STANDARD – TRIO – AZDEN – FDK

Full range of Mobile/Base Antennas by G Whip – Jaybeam – S.M.C.

Poles — Lashing Kits — Cable — Rotators — Plugs and Sockets

STOP PRESS
THE NEW G4HXZ MORSE TAPE
15 MINS LETTERS 5 WPM
15 MINS NUMBERS 5 WPM
15 MINS MIXED 10 WPM
15 MINS LETTERS 15 WPM
£1.75 *inc. P+P*

2 METRE SLIM JIM

We can now supply this antenna by Mail Order at **£8.50** with 4 metres of co-ax (inc. post & package). The cheapest antenna in the business.

HB9-CV COMPACT 2 EL. BEAM

4.5dB gain, 18dB front to back. **£8.50** (with clamp) ***now available.***
Also in 70cms version (same gain)
N.B. We regret we cannot supply the 2 metre version on Mail Order as it is too long to go by post.

DEALERS FOUND GUILTY!

The CQ Centre in Merton Park were recently found guilty of paying excessive prices for second-hand radio equipment. Roads in the district were totally jammed as eager customers flocked in to take advantage of the generous prices being offered. A spokesman for the company would only comment that this was a firm policy and would be continued in the future. Further investigations revealed that there was a sale or return service in operation for which the charges are only 10%. It was also found that copious amounts of tea and coffee were being served on the premises.

FIRST IN THE WORLD

The ICM12, synthesized, marine hand-portable radio.

FEATURES:

- 12 channels – 6 and 16 fitted as standard.
- No waiting for crystals, can be diode programmed between 156-164MHz.
- Automatic semi-duplex for private and link calls.
- Slide-on nicad pack recharges from mains or 12V.
- Lots of options, speaker mics, alternative battery packs, 12V leads, and desk chargers.
- Comes complete with nicad battery pack, mains charger, belt clip, earphone, rubber antenna.
- Home Office type approved. RTD HP105.
- **PRICE £199.13 + VAT Free carriage.**

TRADE ENQUIRIES VERY WELCOME
ASK FOR PHIL HADLER

ICOM
Thanet Electronics Ltd
143 Reculver Rd, Herne Bay,
Kent. Tel. 02273 63859
Telex 965179

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:

KT82 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

has not benefited very much from the few years experience with multi-choice questions." One question, he says, did not even have a correct answer supplied! Anyway a code test was booked but no problems there for Jim. He also asserts that the HO is not yet up to date with licences with two of his local club members still waiting since December last. So to Jim's c.w. log and 4K1A on 7MHz, CO3LN, VP9GD, 6Y5HN and 7X2SX on 14, CP8AL, CX8DR, FY7BW, M1C, SV0CJ/SV5, and 9V1TL on 21MHz where s.s.b catches included TG9NX, V2AO, VP2MDG, VS5PP and 8P6OR. Back to c.w. on 28MHz, with FR0GGL, DL2VK/ST3, XT2AW, with TN8AJ on s.s.b. RTTY on 14 meant AM7OLH, YO8FR and 4U1ITU with only one of interest on 28, being OE5BS/5N7.

Paul Williams in Whitehaven, Cumbria, has a DX100L plus a wire 15 metres long. He is having trouble identifying frequencies correctly. If anyone can help he is at 44 Meadow Road, W'haven. Sticking to c.w. he found KP4EC on 21MHz and then IT9OWF, VK5FM, KV4CI, IS0MFN and SV1NA all on 14MHz. In Callington, Cornwall, **Vic Doidge** found conditions variable on the h.f. bands but his FRG-7700 picked up VP5WJR, Z2GF and 9X5SL in Rwanda on 28MHz, better on 21MHz with A505BVV said to be in Bhutan, FY7BWD, TU2JL, VQ9PG on Chagos Is, 5H3MO and 9V1VG, C6ANU, HH5CB and 9Y1NP were the best on 14 with a couple of goodies on 7MHz, namely A7AA in Qatar and TR8OIT in Gabon.

Claimed to be the only all-band s.w.l. contest in the world, **Owen Cross** G4DFL of 28 Garden Avenue, Bexleyheath, Kent, sends details of the Cray Valley RS 12th contest running from 1800GMT Saturday September 11 to the same time on the 12th, with a maximum logging period of 18 hours for individuals or 24 hours for multi-op entries. Drop a line to Owen with a LARGE s.a.e. for log sheets and info on the contest. And the best of luck!

Details via Elaine G4LFM of the Four Points of Scotland DXpedition as GB4GM with special QSLs from each point. Operation on 144, 21, 14 and 7MHz s.s.b. only, from noon Sunday August 8 to noon Sunday August 22. **Gordon Hunter** GM3ULP, 12 Airbles Drive, Motherwell, Strathclyde, Scotland of the Clyde Valley DX Group has all the details. An s.a.e. would help here, also.

A late second c.w. log from **Paul Williams** (Whitehaven, Cumbria) shows 3X1Z on 14MHz wanting cards to W4FRU, with others like 6Y5DZ, FG7BV, V2AU (QSL OE3ALW) and AM8QE in the Canaries. This item from **R. Barker** G8UUK of East Croydon, Surrey, is more of a DX-to-be report. Having passed his code test in February he still awaits his G4 ticket, with a Ten-Tec Argosy and HF5 vertical all ready to go. He has used the time to brew up his own p.s.u. for the rig instead of buying one. Good lad!

Photographs likely to be of interest to readers of this column are welcome, such as those of field days events, antenna systems, shacks and rigs BUT they must be good ones, clear and preferably in black and white. If inside shots do tidy up the place a bit first! Straighten up the gear and tidy away those trailing leads!

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

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

Several years ago I did a survey of medium wave reception at mid-day in the month of December. The object was to check if there was anything in the idea that the D layer only partly reforms during the short days of mid-winter, a time of year when the sun ascends slowly to quite a low altitude at noon. The D layer, which exists only during the day, is the lowest region of the ionosphere. It absorbs signals in the medium and long wave bands preventing sky wave propagation and consequently daytime DX. The results of my check seemed to bear out the theory as I did pick up a transmission as far away as North Africa. Something brought all this to mind recently and it occurred to me that it might be interesting to repeat the test in the month of June and see what ground wave reception would be like.

Ground Wave Propagation

Using the BRT 400 along with an omni-directional random wire antenna I started at the l.f. end of the medium waves. It was early afternoon. For the first 200 kHz I did not encounter a single blank channel, a result that really surprised me. Several channels had occupants that were too weak to resolve but a few continentals were identified as well as stations in the UK and Eire. Then I moved to the h.f. end starting at 1602kHz and tuning down the band. This time nothing outside the British Isles was heard. Finally to the long waves where most channels were occupied with strong signals, one as far away as Monte Carlo. Why the differences in range and is this phenomena of any value to the DXer?

In summer, the D layer would certainly be in place during the day so everything that was heard must have been propagated by the ground wave. Radiation from the transmitter follows the curved surface of the earth and is attenuated by varying degrees depending on the type of terrain over which it passes. Eventually the signal becomes so weak that it disappears below atmospheric noise. The waves travel farther over sea than over land. They also travel farther at lower frequencies than at higher frequencies, all other things such as transmitted power and terrain, being the same.

Range and Frequency

So you can expect a greater ground wave range on the long waves than on the medium waves and also at the l.f. end of the medium waves compared with the h.f. end of the same band. As a result, you will come across an increasing number of high power broadcasters as you move from the h.f. end towards the l.f. end. This situation is very apparent if you have a look at the set-up in Spain. A small number of high powered medium range government owned broadcasters are to be found between 585kHz and 855kHz while the chains of low powered locals are on frequencies above 1MHz. The BBC uses its lowest frequency, which is 648kHz, for the World Service, presumably to obtain the maximum range. In the United States nearly all of the high power broadcasters are on frequencies below 1220kHz. A similar situation exists in Latin America, especially in Brazil.

The DXer of course is not normally interested in the ground wave since long range reception on the medium waves is by the sky wave. It is worth remembering though that some countries concentrate their high power transmitters into the lower frequency part of the band, which may make it easier for the DXer if he searches these frequencies first. If you are interested in eavesdropping into domestic broadcasting then the higher frequencies may be more productive. In the United States the region 1230kHz to 1490kHz is free of high power broadcasting and it is here that numerous local broadcasters of 5kW and less, have been logged. In fact the five frequencies 1230, 1240, 1340, 1400 and 1490kHz which are the home of hundreds of local radio stations, are known to DXers as the Graveyard Channels.

A final note. It is easy to identify a ground wave signal. All the stations I heard were quite steady, in contrast to the normal cyclic fading that is a characteristic of a DX signal on the medium waves.

QSL Card from Prague in Czechoslovakia

Breakthrough

Regular readers will remember that in the February issue I mentioned a problem encountered by a reader in Holland who lives near the coastal radio station at Scheveningen. He was getting interference from this station even though it was operating on frequencies below the l.f. end of the medium waves. I made a request for information on how to deal with breakthrough, as this sort of QRM is called, and it has brought an interesting and informative reply from **Max Gill** who lives at Fordon NSW in Australia.

Max thinks that a series tuned wavetrap would give better results with a domestic receiver than the parallel type and he goes on to discuss the relative merits of the series tuned acceptor type of wavetrap and the parallel tuned rejector.

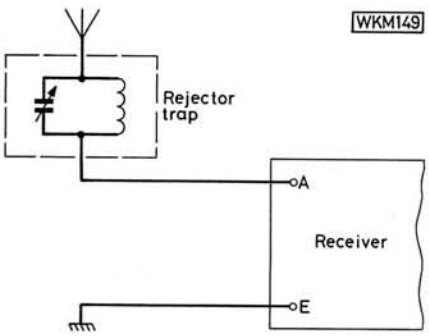


Fig. 1

The rejector, which is placed between the antenna lead-in and the receiver (Fig. 1) operates best when used with a receiver with a low input impedance, which is pretty well standard with communications receivers. The impedance of the rejector is high at resonance and consequently its ratio to the receiver's impedance is also high so most of the energy from the unwanted station is dissipated in the trap.

The acceptor is connected across the antenna and earth sockets (Fig. 2). At resonance its impedance is low so it shunts away the unwanted signal to earth. It will be more effective with a high input impedance receiver as more energy will pass through the low impedance of the trap than through the receiver. Acceptor circuits tuned to the i.f. are to be found before the mixer in some receivers. They reduce i.f. breakthrough.

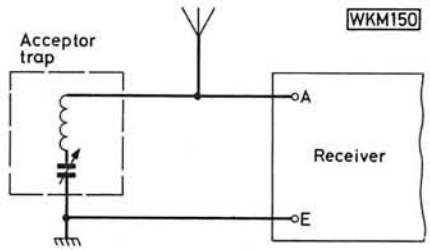


Fig. 2

Local radio DXing

Reader **Ian Kelly** of Reading is still chasing after local radio DX with his Pye 9015 portable casette. He reports hearing 43 different UK stations out of approx 63 that are currently on the air. Nine were received by skywave only and the other 34 were by the groundwave, which seems to be a mode of propagation worth investigating. Best daytime catches were the BBC outlets at Guernsey on 1116kHz, Jersey 1026, Norfolk 1602 and 855, Stoke-on-Trent 1503, Lincolnshire 1368 and Leeds on 774. ILR stations picked up included Trent on 999, Beacon 990, Devonair 666 and 954, Hereward 1352. Four RTE stations (Eire) were also heard.

Ian has been experimenting with antennas. He wrapped a short piece of wire twice (2 turns), loosely around the ferrite rod. Then a long wire or copper pipe was attached to one end of the wire and another long wire or pipe to the other end. "If a large antenna is only attached to one end, terrible overloading is experienced and you are worse off than before . . . different combinations of long wires and pipes favour different directions" concludes Ian.

What is required is very loose coupling between the additional antenna and the ferrite rod. Wrap the antenna lead in a single turn round the entire receiver, you will still get coupling this way and you do not have to tinker with the ferrite rod itself. If overloading occurs, then lay the antenna lead on the table and place the receiver on top of it or even near to it. You may get away with tighter coupling during the day than at night, depending on the number of strong daytime signals that are audible on the band. It is well worth the trouble experimenting as you may be able to get a useful boost in signal strength without overloading the receiver.

Readers' Letters

"Thank you to all those who answered my query (about International Christian Radio) via your June 82 column" writes **Mark Slater** from Beckenham. He is now trying the medium waves with a Murphy A122 receiver of 1930s vintage, which he bought for a pound at a jumble sale. After cleaning it up he attached a 30 metre long wire and an earth and it worked like new. Since this receiver does not have an internal antenna it should work with a medium wave loop and one is in the pipeline.

With the present set-up the best catch to date is Manx Radio on 1368kHz. Mark wonders if reception reports, written in English, are likely to be successful when sent to European stations such as Topalna in Czechoslovakia. He suggests that a tape recording of the programme heard might be more successful. I have written in English to a number of broadcasters on the continent and I've had a reply from most of them. Tape recordings are relatively expensive to produce and send. The person who deals with QSLs at the station may not have immediate access to a tape recorder and in any case it does take time to play one back. There are exceptions though, if you have picked up something out of the ordinary. BBC Radio Merseyside not so long ago, played back a tape of one of their broadcasts that had been picked up by a DXer in Alaska.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

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

It is surprising how few people are aware of the existence of sound broadcasting on the short waves. I recently had a letter from a 75-year-old pensioner who was told by his doctor to take his disabled wife to a milder climate during the winter. Accordingly he towed his caravan to Southern Spain where they stayed for three months. "Daytime the weather took care of everything but at nightfall we missed our usual ration of television. What we need is a radio set which will provide us with something other than Spanish and French programmes which was all we could get on our transistor radio."

Short Wave Listening while Abroad

The BBC World Service, which is in English and is on the air 24 hours a day, can be heard throughout the world. When I lived abroad I used the BBC WS not only as a source of entertainment and news but also as a link with home. DXing had changed from being a hobby to a part of everyday life. Incidentally, the BBC WS can be heard in the UK on 648kHz on the medium waves and on 5·975MHz on the 6MHz (49m) band and I still listen to it occasionally.

The BBC produces a booklet called *English Language Programmes in Europe*. Under Spain, it says "The general listening pattern is that during the daytime the 19m (15MHz) or 35m (11MHz) band should be used and the 31m (9MHz), 41m (7MHz) and 49m (6MHz) metre bands will give best reception in the evening." They are of course referring to reception of the World Service. The booklet is available free of charge from the Engineering Information Department, BBC, Broadcasting House, London, W1A 1AA. *London Calling*, which is the monthly programme journal

of the World Service is available from Box 76, Bush House, London WC2B 4PH for an annual subscription of £6.

Reception in a Caravan

Almost any portable receiver with short wave bands will pick up the BBC WS and a number of other broadcasters in English as well. Receivers for short wave listeners were covered fully last month but it is essential to obtain one which has a socket for an external antenna if you want to use it inside a caravan. The metal body will partially screen the receiver and its antenna, leading to poor short wave reception. That is my experience with a motor caravan which has a raised roof with fabric sides. Reception is very much better when my portable is lifted up into the raised roof area and I have now fitted a short wire antenna up there. In a "proper" caravan it would I think be desirable to fit a car type telescopic antenna outside and plug the lead from it into the receiver antenna socket. Short wave reception will then be a lot better than it would be by just placing the set beside a window.

Short Wave Converter

In the United States it is possible to purchase a non-tunable short wave converter for use with a car radio. The converter is inserted between the car radio and its antenna and consists of a box with a number of press button switches on the front. Each switch controls a short wave band and when it is pressed it converts that band into a range of frequencies on the medium waves which can now be tuned in by the car radio. Such a converter would be very useful to those travelling abroad or to short wave listeners who are on holiday in this country. So far I have been unsuccessful in tracking down a source of supply in the UK. Can anyone help?

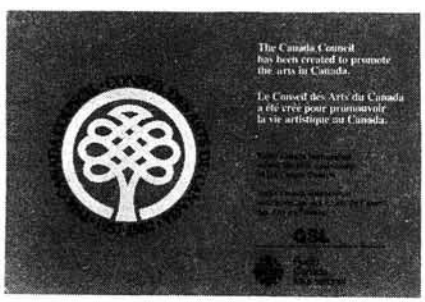
QSL Cards

The 1982 Radio Canada International QSL card arrived recently along with their summer programme schedule. The card is not filled in on the reverse side but a letter in French and English explains how it should be used. "To obtain your verification simply give the date, time and frequency including brief details about the content of the broadcast you wish to report. Mail the completed card to RCI in an envelope and if all the details are correct the card will be verified and returned to you."

Since this do-it-yourself QSL card is only issued once a year along with a programme schedule it means in practice that only those who are already on RCI's mailing list and may well be regular listeners anyway, are able to obtain a verification of reception. On the face of it a rather ludicrous situation.

One has sympathy with major broadcasters who do not wish to expend what may be limited resources in issuing verifications to listeners in areas where it is known that there is a regular audience. Their answer seems to be to make it difficult or impossible for listeners in any area to obtain a verification. Radio Finland has a set of twelve audience cards, one for each month, which are used to reply to reports on the content of their programmes. The BBC has for a time issued a QSL card which is not a verie at all and is little better than a compliments card.

Like it or not, this is a trend which is bound to continue and one can only hope it does not reach into areas of real DX.



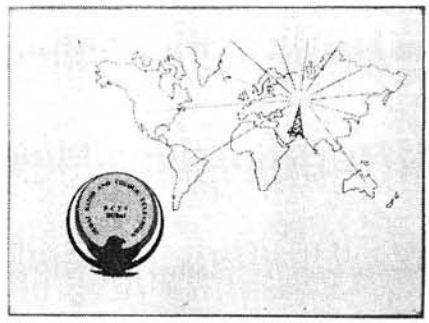
Radio Canada International's 1982 QSL card

All India Radio's QSL card showing the Vashisht Temple Manali

Sudden Ionospheric Disturbance

"It may interest you to know there was a total short wave blackout from at least 6–18MHz from 0945 to 1100 this morning (13 June) with only BBC on 6, 15 and 17MHz bands (49, 19 and 16m) getting through. First total blackout I've heard" writes reader **Ian Kelly** of Reading. Yes it is quite an experience to tune across a deserted band. I always feel awed by the power of nature whether it be an eclipse of the sun which I have witnessed once, or a thunderstorm or a radio fadeout.

There was another s.i.d. on the 15 June which started sometime between 0930 and 1030UTC. 6MHz (49m) was alive with signals at 0930 when, overcome by an excess of zeal I attacked the receiver with trimming tools and a signal genny to check and peak up the alignment. An hour later I started tuning upward from 5·9MHz and for a moment I was baffled. The band was dead. Then I came on a strong signal in French on 6·125MHz which was the BBC European Service. The penny dropped, the RX had not been wrecked after all. A quick check on 10MHz, 15MHz and 20MHz for time signals, which were absent, confirmed my suspicions.



This one is from Dubai in the United Arab Emirates

By 1115 the time signals had returned so I tuned to 5·975MHz and waited. Up came the BBC World Service quite quickly between 1130 and 1135 and the rest of the band was back to normal when I tried it an hour later. It was a typical s.i.d. It occurred during the daytime, it did not last very long and it was very noticeable on the l.f. bands which were the last to recover.

Readers' Letters

A Murphy B40 ex-naval communications receiver has fallen into the hands of **Les McCord** who is very pleased with his acquisition. It is in good working order and he has a spare set of valves for it. He would like to contact other users of this receiver and in particular he would like to have a copy of the circuit for future reference. His QTH is 75 miles SE of Melbourne, 228m above sea level and reception there is very good. The full address is Box 95, Korumburra, Victoria 3950, Australia.

Les plans to replace all the capacitors in this valved receiver with modern ones which is a very good idea since the receiver could well be 40 years old and early paper capacitors were rather prone to leakage. Similarly with the fixed resistors which often change in value and can also be the source of intermittent noise which is difficult to track down. Anyone intending to overhaul an old receiver like the B40 should try to get hold of a copy of the 1980 edition of the *World Radio TV Handbook* which contains a useful article called "Get the best

out of a vintage receiver" in the Listen to the World section.

Two recent QSL cards from Dubai and All India Radio which come from **Adrian Butcher,** Washington, West Sussex are shown this month. I believe that All India Radio has changed its name recently. Does anyone know what the new one is? QSL cards interest **Peter Twinn** of Cambridge. He received one from the Voice of America to mark their 40th anniversary, along with a bookmark, a ruler and car sticker. Vatican Radio sent him a QSL card and this station comes in well at Peter's QTH at 1930 UTC on 6·19, 6·21, 7·25 and 9·645MHz. Peter enquires about Radio Canada's transmission in English at 2000 which uses a frequency in the 21MHz (13m) band. The exact frequency is 21·695MHz which is not used in winter.

VHF Bands

by Ron Ham BRS15744

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

"A day to be remembered", writes **Brian Renforth,** "The strongest was Italian", said **John Fell,** "Either French or Italian", remarked **Julian Clover,** "Numerous stations I think were Italian" commented **Nicholas Wythe,** "The DX this month was overwhelming", said **Ian Kelly.**

This is just a sample of the positive remarks contained in your letters, about the massive sporadic-E disturbances which occurred on or around 5 June and often influenced more than 120MHz of the lower v.h.f. spectrum.

Solar

Although **Ted Waring,** Bristol, counted 21 sunspots on May 18, 25 on the 22nd, 55 on the 29th, 30 on June 2, 62 on the 4th, 54 on the 8th and 55 on the 12th, the sun was very quiet at metre wavelengths throughout May. However, **Cmdr Henry Hatfield,** Sevenoaks, **Reg Taylor,** Shillington and I recorded several small bursts of solar radio noise at 136, 151 and 143MHz respectively, on June 2, 9, 11, 13 and 16 and a strong burst lasting 12 minutes at 1238 on the 3rd. Henry looked at the sun with his spectro-helioscope on the 11th and found 8 sunspot groups and a vigorous looking spray on the east limb which could well have caused the noise storm which we recorded on the 12th. During the morning of the 17th, Henry counted 6 sunspot groups, one of which was very large containing some 30 spots, an angry looking plage and a long dark filament, so we were not surprised when the radio noise from the sun was very strong throughout the day. During the early evening I heard bursts of solar noise in the 28MHz (10m) and the 50MHz (6m) bands and while the sun was setting, John Fell G8MCP, Poole, our Technical Editor, heard the noise in the 144MHz (2m) band with his normal 144MHz gear. Just before noon on the 17th, Henry and I recorded a separate 4-minute burst (Fig. 1) within the main storm which looks like the result of a small flare.

Ian Kelly, Reading, reported a total radio blackout between 6 and 18MHz from 0945 to 1200 on June 13, possibly caused by the solar activity on the 12th.

The 28MHz Band

Apart from a few Russian stations heard occasionally by **Harold Brodribb,** St Leonards-on-Sea, the 28MHz band was generally quiet between May 18 and June 17, in fact on most days there were long periods of complete silence, not even a beacon signal was heard. Although several local European QSOs were received during the times when sporadic-E was about and short skip conditions prevailed, most of them were subject to sharp and varying levels of QSB.

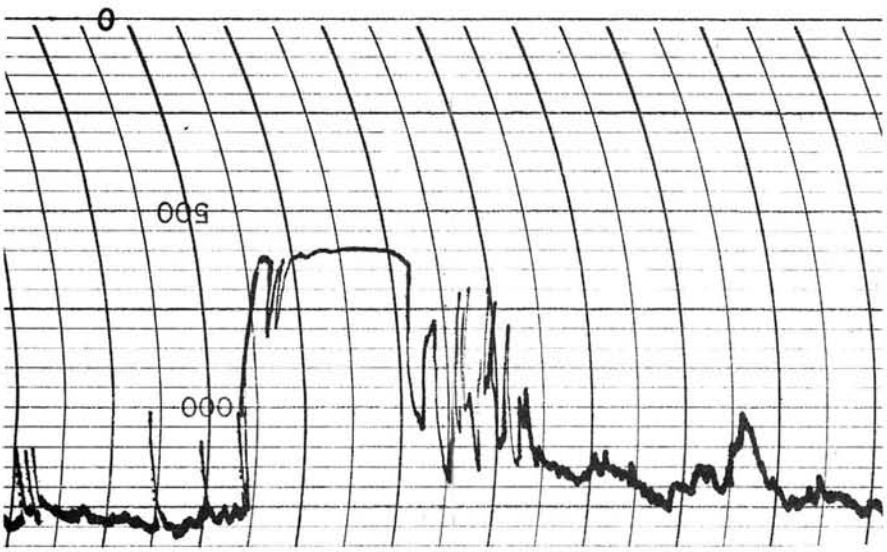


Fig. 1: Solar burst recorded by the author on June 17

28MHz Beacons

Without the sporadic-E disturbances which enabled us to hear signals from the German, Hungarian and Norweigian beacons, the daily reception report (Fig. 2) compiled from the observations of **John Coulter,** Winchester, Henry Hatfield, Ted Waring and myself, would have been a bit sparse. I am always pleased with beacon reports so don't forget readers, keep an ear between 28·2 and 28·3MHz and drop me a line by the 15th of each month.

The 50MHz (6m) Band

"I have now worked 7 countries, HL2, H44, JA, KG6, VS5, YJ8 and ZL on 50MHz and 3 others, KH6, VS6 and ZS6, crossband, 28·885MHz to 50MHz", writes **Graham Rogers** VK6RO, a 50MHz enthusiast from Bunbury, Western Australia. I see from Graham's log, for March to May, that he received signals from the beacons in Japan JA2IGY on April 3, 4, 6 and 17, Papua New Guinea P29SIX on the 4th and 11th and Sri Lanka VS6SIX on the 11th and 12th. At 0650 on March 21 he worked VS6BE, crossband 28·885 to 50·110MHz and again while mobile at 0552 on the 23rd. Around 0350 on April 6, Graham had mobile QSOs with 8 JAs on f.m. and s.s.b. with 59 reports both ways.

RTTY

The BARTG is holding its annual rally at Sandown Park Racecourse, Esher, Surrey, from 1030–1700 on August 29, the admission is £0·50 and the talk-in station will be GB4ATG. Between 1800GMT on September 11 and 1100GMT on the 12th, the BARTG "Autumn VHF RTTY contest" will take place and details are available from the contest manager, Ted Double G8CDW, 89 Linden Gardens, Enfield, Middx, EN1 4DX. Confirmation of contacts with other countries during this event will count toward the 25 different countries required for the BARTG "Quarter Century Award", Fig. 3.

In order to promote interest in the v.h.f./u.h.f. bands, BARTG has introduced a range of 3 operator-awards which are available by submitting satisfactory proof, that the required number of stations have been worked or heard, to the contest manager. The requirements are 100 different stations on the 144MHz band, 50 on the 432MHz band and 10 on the 1296MHz band, Fig.

a Western 'Which Tower' Report! (YOU'LL NEED IT ONE DAY!)

A telescopic self-supporting tower is something to which many of us aspire but cannot afford. If one day, therefore, one can raise the necessary cash for such an investment, it is essential to make the right choice. Basically, the unit must be functional, i.e. do the job for which it was intended; namely to hold your antenna. What you don't want (but may get!) is a bent tower and scrap antenna. Here are some guidelines:

YOU MUST

1. Decide what height you require (then check price lists to see if you can afford it!).
2. Decide what antenna you wish to erect.
3. Determine the **HORIZONTAL** wind load of the antenna (from the manufacturers' specification sheet) and at what wind speed this load applies.
4. Look at the tower manufacturers' specification to see whether the tower you require will be strong enough to carry the wind load of the antenna at the stated windspeed. For example a Western 'Penetrator' DX-33 is 28kg headload at 75 m.p.h. windspeed. At 100 m.p.h. this windload increases to 50kg.
   A Westower type 3S/FBP (17.75m high) will take 57kg at 75 m.p.h. The load from a DX-33 at 75 m.p.h. is only 28kg, well within the specification for the tower and is thus safe at 75 m.p.h. A '3S' tower would take 5kg at 100 m.p.h. and so a DX-33 (with 50kg load at 100 m.p.h.) cannot be put on a '3S' tower and survive a 100 m.p.h. wind. A stronger tower is required. A Westower 3HD (Heavy Duty) takes 66kg at 100 m.p.h. and would be suitable.
5. Ask yourself where you live! If that sounds stupid then let us explain. The effect of the wind blowing on your tower may be increased or decreased according to whether you are on a hill, in a valley or an 'average' situation. Decide this and then seek advice if you are in doubt.
6. Look at the quality of the fabrication. Good welds are smooth and flow into parent metal.

DON'T

1. Buy a tower unless you are sure of its specification. There are a number of relevant BRITISH STANDARDS which relate to towers. These are:
   a) British Standard CP3 "Wind Loads"
   b) British Standard BS449 "Engineering Practice"
   c) British Standard BS729 "Galvanising"
   d) British Standard BS4872 "Welding"

FACTS

1. The wind pressure at 50 m.p.h. is 6.4lbs/sq.ft.
   The wind pressure at 100 m.p.h. is 25.6lbs/sq.ft.
   As you see, as you double the windspeed you have 4 times the wind pressure. As the basic windspeed goes up so does the pressure on the tower and so must the overturning moment. We have seen specifications for some towers where the overturning moment goes **DOWN** as the pressure goes up! Not according to B.S. it doesn't!
2. There are three statistical factors known as S1, S2 and S3 in British Standard CP3. In order to provide the consumer with information about the strength of the tower, we at 'Western' assume average values for the "Ground Topography Factor" S1, the "Ground Roughness and Tower Height Factor" S2, and the "Statistical Factor" S3, which relates to the degree of security required and period of time over which security is required. At 'Western' we use S3 as "1" for security over 50 years.

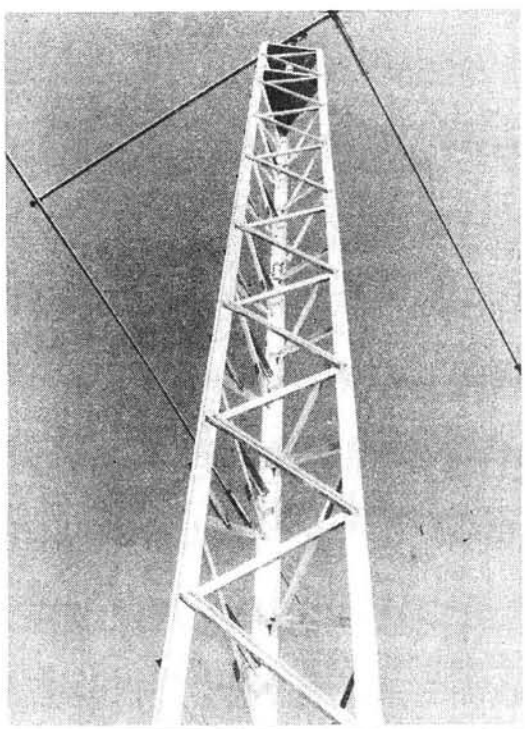
COMPARISON OF 18m SELF-SUPPORTING TOWERS

STANDARD TYPE						HEAVY DUTY TYPE					
Manufacturer	*Model*	*Head Load (kg)*[1]	*Stronger Is*	*Price*[2]	*Comment*	*Manufacturer*	*Model*	*Head Load (kg)*[3]	*Stronger Is*	*Price*[2]	*Comment*
Western	3S/FBP	80	Western by 110%!	£623.30	Save £63.77 at Western	Western	3HD/FBP	115	Western by 67%!	£764.75	Save £101.95 at Western
Strumech	BP60	38.1		£667.07		Strumech	BP60/HD	69		£866.70	

NOTES: 1. Figures taken at 60 m.p.h. for comparison purposes.
2. Prices include delivery in England/Wales excluding Devon/Cornwall for Western.
Prices include delivery over 100 miles and up to 200 miles for Strumech.
3. Figures at 75 m.p.h. for comparison purposes.

Elevate **. . with the WESTOWER . . the stronger one**

Send foolscap SAE for full specifications and price list.



ALUMAST

The ALUMAST is a 15" (375mm) wide triangular cross section lattice sectional aluminium mast based on a 10ft (3.05m) section length. It is supplied "knocked-down" in a tubular carton for ease of transport, but can easily be assembled needing no special tools or skills. The system includes top plate with bearing sleeve, rotor plate and a choice of a fixed base frame (FB-1) or one with hinge joints (HB-1) to enable the mast to be pivoted at ground level. Guy brackets are available for use at heights above 30ft.

- ★ **Made from high strength corrosion resistant alloy using WESTERN EXCLUSIVE 'W' section leg extrusions.**
- ★ **Easy assembly using bolts and "Nyloc" locking nuts for security**
- ★ **Free-standing to 30ft (9.15m) with a typical tri-bander plus GHF/UHF antennas.**
- ★ **Heights to 250ft (61m) with appropriate guy configurations (ask us for quotes).**
- ★ **Lightweight – only 25lb (11kg) per 10ft (3.05m) section.**
- ★ **30ft (9.15m) mast is delivered in a tube only 10ft 6in (3.2m) long. 6in (0.126m) dia.**

Alumast may be seen in London at Amateur Radio Exchange.

A COMPLETE 30ft (9.15m) MAST for 375/PSS/3; FB-1; RMP-1; TP-1 **£258.74**

FULL PRICE LIST

375/PSS/3	30ft mast (3 sections)	£207.00
375/PSS/1	Additonal 10ft section	£69.00
HB-1	Hinged base unit	£34.50
FB-1	Fixed base unit	£24.15
RMP-1	Rotor mounting plate	£13.22
TP-1	Top plate with sleeve	£14.37
GB-1	Guy brackets (set of 3)	£12.65

All prices include carriage and VAT at 15%. Goods normally despatched by return.

Western Electronics (UK) ltd

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

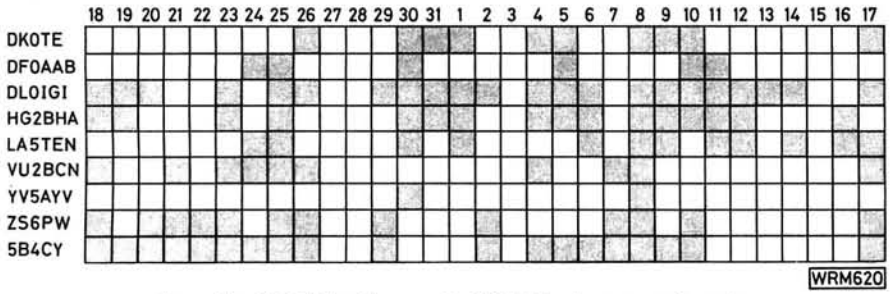


Fig. 2: Distribution of 28MHz beacon signals

4. Although conditions on the 14MHz band seemed generally below average between May 18 and June 17, I managed to log 75 stations in 19 countries, CN, DJ, EA, G, HB9, HP, I, LA, OE, OH, OK, OZ, PA, SM, SV, UA, W, YO and YV. Among the interesting two-way QSOs I copied were EA5CVR and WB9CUC at 0825 on May 23, EA5TD and HP1XLL at 0110 on June 5, EA3BUT and I0EMV at 1330 on the 7th, I0AOF and I0TDR at 1936 on the 15th, G4OAK and SM5BRG at 1230 on the 16th and HB9AVK and I1PZF at 1935 on the 17th.

Sporadic-E

It is now well known that a sporadic-E disturbance will begin to influence radio signals around 50MHz and then, according to its intensity, normally spreads upward to about 80MHz and downward to 40MHz, but occasionally comes the big one, when the entire frequency range between 25 and 150MHz is affected. During the morning of May 16, Harold Brodribb counted 16 east-European broadcast stations between 66 and 73MHz and I logged 30 at 1942 on May 25, 24 at 2115 on the 30th, 19 at 0945 on the 31st, 14 at 1835 on June 4, 19 at 2000 on the 5th, 24 at 1544 on the 8th, 30 at 1910 on the 9th and 12 at 1930 on the 15th. Around 2000 on June 5, I received a telephone call and a member of the G8RBY alert system said, "Sporadic-E out to Italy" and during this big event, John Fell heard many G stations working IT9TDN on 144MHz and S9+ signals were exchanged between the IT9, over 1000 miles from the UK, and **Graham Wood** G3VPC in Wimborne, using only 25W. Around 1640, **Ian Shaw** G4MWD, Ockley, using 20W s.s.b. to a 16-element Tonna array on 144MHz, worked I7TBF, IT9IKG, IT9JLG, IW9ANA/P and heard FC9RY, IS0CSX/P, I8HAU/P and HB9, while **George Grzebieniak** G6GGE, heard 4 Italians and 2 Sicilian stations on 144MHz s.s.b.

Among the CB operators to experience DX via sporadic-E was **Fred Southwell,** using a Midland 2001 and a gutter mount antenna, at Ditchling Beacon, Nr Brighton on May 25, who worked a station in Shetland and heard others in Cumbria and Northern Ireland. At 0500 on June 10, Ian Kelly heard CB stations from several parts of Scotland.

Band II

During the period May 25 to June 10, Band II opened up on several occasions due to sporadic-E and on June 5, many readers heard DX that they never thought possible on a v.h.f. band.

Between 0730 and 0805 on May 25, Ian Kelly heard Arabic music and voices on 96MHz which he thinks was Radiodiffusion Television Morocaine from Casablanca and up to 0900 he received strong signals from Portugal. The following afternoon he received many Spanish stations, some in excellent stereo and on June 5, he sorted out stations from Austria, Italy, Portugal, Spain and Switzerland from a total mess of signals between 87 and 108MHz. "At one time all the local stations except RADIO 210 in Reading were drowned out and only BBC Radios 2, 3 and 4 from Wrotham were left", writes Ian. About the opening from 1400 to 2100 on the 8th he said, "There must have been 100 stations between 87 and 104MHz and again the strength was quite incredible". In addition to the countries he identified on the 5th he added Germany, Yugoslavia and probably Lebanon on the 8th as well as hearing Black and Decker's advert on Portugal's Radio Renascensca and on 92MHz, at 1629, he positively identified Radio Tunis when a YL announcer said "Radiodiffusion Television Tunisienne". At 1758 on 96·2 and 96·6MHz, Ian heard "jive talk" in English from a DJ with an American or Canadian accent, saying, "Oh boy, we're playing music for you here at Ricky's . . . . . morning, overlooking the day, don't be late hey, we've got more of that stuff for you baby. Hey come along with us, we're gonna play this one for Tina . . . . . ." then it faded out and Ian wonders if the signal originated in North America.

Between 1800 and 1930 on June 5, John Fell, situated in Bournemouth using a Sanyo portable with its own telescopic antenna, heard 18 French, Italian and Spanish stations between 97 and 106MHz varying from full locked, noise free, stereo down to a fast flutter. John's best DX was a station, with an American announcer, giving details of activity for a military base social, all very local to Naples and the strongest signal he received was an Italian, transmitting pop music in stereo, around 100·5MHz. Julian Clover, Norwich, received 15 French or Italian stations between 1600 and 2000 and heard one of the Italians give the identity of Radio Uno. At about 1830, Nicholas Wythe, Folkestone, received numerous stations between 100 and 107MHz which he thinks were Italian and confirms hearing AFN on 106MHz and strongly believes that the signal came from Italy. Ian Shaw heard many continental stations between 88 and 103MHz during the evening and around 90·3MHz, Harold Brodribb heard one clear voice among the multitude of signals saying, "Propositione Musicaale". Both George Grzebieniak and Brian Renforth reported hearing many Italian and Spanish stations and at 1610, "Every inch of Band II, 88-108MHz, was filled with Spanish and Italian stations, many in amazing stereo, even making Radio 2 non-existent", said Brian. During periods of high pressure, with a few slight falls, **Simon Hamer** received strong signals from BBC Radios Cambridge, London, Medway and Solent and ILR Capital, Chiltern, LBC and Thames Valley between 2200 and 2300 on May 20. Harold Brodribb counted 21 French stations in Band II at 0835 on May 30, 11 at 0835 on the 31st, 16 at 1405 on June 3 and 18 at 0750 on the 10th. I used the radio section of my Plustron TVR 5D, some 75m a.s.l. near Bodiam during the afternoon of June 11 and with its own rod antenna heard a strong French station around 100MHz and very strong disco type music at 104MHz.

Fig. 3: BARTG Quarter Century Award

Among our many readers that I met at the Chalk Pits Museum on June 6 was Ian Kelly who had recorded the signal from a v.h.f. broadcast station in Lebanon on June 1 and played it to **George Garden** from Bracknell, Simon Hamer and myself.

Tropospheric

Apart from a fall to 29·9in (1012mb) for a few hours on May 27 and to 29·8 (1009mb) from 0200 on June 11 to noon on the 13th, the atmospheric pressure, measured at my QTH, hovered around 30·1 (1019mb) from May 17 to June 17, with peaks to 30·4 (1029mb) on May 29 and 30.

During the 144MHz contest on 23 May, **Jon Kempster** BRS48205, Berkhamsted, was log keeper and rotator controller with the Chesham Radio Club's station and throughout the event the club used a ZX81 micro-computer to check for duplicated calls. Jon uses a hand held for listening on 144MHz and by coupling the set to an external antenna and pre-amplifier he can hear the traffic through the repeaters in north London GB3NL and Leicester GB3CF and also *logged* stations while operating portable on London's Tower Bridge. During the same contest George Grzebieniak G6GGE, using only 3W, worked stations in 12 QRA squares including those in the Channel Isles and Wales.

While holidaying on the Grand Union Canal, on June 9, fourteen-year-old Alan Beech from Dollar, Scotland, logged the v.h.f. test transmissions from BBC Northampton, 5 editions of BBC Radios 2, 3 and 4 and ILR stations BRMB, Capital, Chiltern, Essex, LBC and Mercia Sound.

Ian Goodwin, using a Quad FM4 receiver and a rotatable 6-element beam for Band II, carried out some tests on June 7 and found that he could receive BBC local Radios Cleveland, Humberside, Lincolnshire, Lancashire, Manchester, Merseyside, Newcastle and Sheffield and ILRs Aire, Hallam, Pennine and Tees, from his home in Pontefract, as well as BBC Radios 2, 3 and 4 from Holme Moss.

Microwaves

"The Ipswich Rally was very good this year for microwave amateurs with 2·3GHz PAs, coax relays, wavemeters, TWTs and a TX/RX testing range" writes John Tye G4BYV, who is now operational with a *PW* dish antenna on 5·6GHz and along with G3DY, G4KIY and G4KUX has worked Jan Martin LA8AK on 1·3GHz. Jan told them that they hope to have 5·6 and 10GHz soon.

News Items

At the AGM on May 30 of the UK Horizontal FM Group, Paul Hancock G8UAV was elected Chairman, Arthur Dorsett G8YLH, Secretary/Treasurer, Paul Pasquet G8PVH, Assistant Treasurer, Mitch Tribe G8PMT, Contest Manager and a committee of G6CUJ, G6DOF, G8WZP and G8ZNK. The group is now affiliated to the RSGB and already has more than 300 members including some in Belgium, Eire, France, Germany and Holland. Readers wishing to join should send £2 and a large SAE to Arthur Dorsett, Dogmersfield Park, Dogmersfield, Hants. Congratulations to GW4JZY/P and G8UEB/P who won the single and multi-operator sections respectively of the UK Horizontal FM Group's October 1981 contest and to G8NNJ and G8WYR, the runners up.


THE BRITISH AMATEUR RADIO TELEPRINTER GROUP

VHF/UHF CENTURY AWARD

This certificate has been awarded to

Sample

on the submission of proof of having heard/worked Amateur Radio Stations on the Mhz Band using **RTTY** as a mode of communication. Extra endorsements are attached herewith.

Fig. 4: BARTG v.h.f./u.h.f. Century Award

One of our readers, Gavin McCoy, senior programme presenter of the ILR station "RADIO 210", Fig. 5 and Julian Dean, run a radio enthusiasts' programme called "MODULATION" and since it began in June 1981, they have covered many aspects of radio, with specialist guests, including a 6-week series covering the steps leading to the RAE. "MODULATION" is transmitted live from 2100 to 2200 each Wednesday and

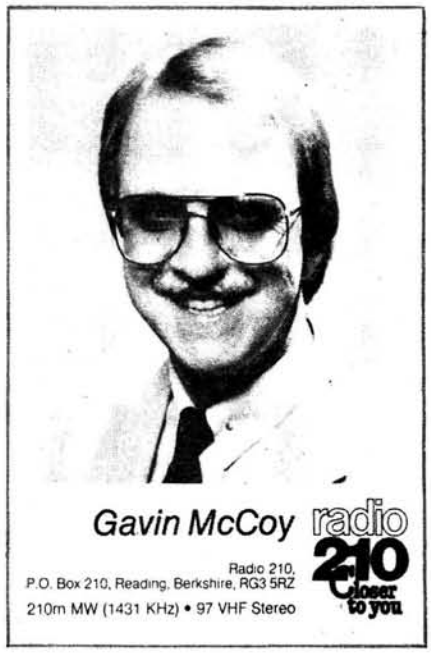


Fig. 5

repeated on Sundays at the same time, on 97MHz f.m. and 1431kHz a.m. Both Gavin and Julian are members of the RSGB, have sat their RAE and are working on their Morse, good luck lads.

Arthur Williams ZL4TIS, Invercargill, New Zealand, has purchased an Icom 2A hand held transceiver so that he can keep in touch with the 144MHz repeaters while pursuing his interest in "tramping the hills".

Congratulations to the organisers of the Elvaston Castle Mobile Rally on June 13 which I understand was a great success.

TV

by Ron Ham BRS15744

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

BPEMR, HOBOCTON, NORDICAS, PROGRAM MUZIKI, RAI TELEVIDEO, TB CCCP, TELEVISION ESPANOLA, TELEWIZJA POLSKA, TV UUTISET and ZAPRASZAMY, are some of the television captions seen by my readers during the, sometimes intense, sporadic-E disturbances between May 20 and June 12.

The newcomers to TV DXing were delighted to see pictures beyond their wildest dreams and the old hands were amazed to see so much activity at the start of the 1982 sporadic-E season. Between **Tim Anderson,** Stroud, **David Appleyard,** Uppsala, Sweden, **Harold Brodribb,** St. Leonards-on-Sea, the **Cawser family,** Burton-on-Trent, **George Grzebieniak,** London, **David Hackwell,** Warrington, **Ian Kelly,** Reading, **Graham Lay,** Pulborough, **Simon Hamer,** Presteigne, **Brian Renforth,** Chippenham, **Graeme Wilson,** Nunthorpe and **Nicholas Wythe,** Folkestone, test cards and programmes from Austria ORF-FS1, Czechoslovakia RS-KH, Denmark DR, Finland YLE-HLKI, Hungary MTV, Iceland RUV, Italy RAI, Nigeria NTA, Norge Bagn, Bremanger, Gulen, Hemnes, Melhus (Fig. 1), NRK and Steigen, Poland TVP, Portugal RTP, Spain RTVE Barcelona, Control Central and Madrid, Switzerland-German +Ptt SRG1, Sweden TV1, USSR TSS and Yugoslavia JRT ZGRB, were seen, sometimes in colour and often mixed up together.

"If this is TVDX give me more" writes Tim Anderson, who watched a variety of signals throughout the period. He commented, "Many of these were long openings with very strong stable pictures, particularly in May. The later ones have been shorter and messy with pictures floating on top of each other".

Pam and David Cawser and their sons Adam aged 12, Christopher 7 and Stephen 3 are keen TVDXers using a Tanberg CTV4-3-22 receiver fed by a rotatable 4-element Yagi for Band I and a 93-element for u.h.f. Dave recently purchased a Plustron TVR 5D for use when they are mobile in the Peak District. "Young Stephen sits in amazement and likes Spanish cartoons, especially the one with the bees", writes Dave whose comprehensive log includes such programmes as Disney cartoons, five-a-side football, a French film about animals and insects, jugglers, a bullfight, *Gulliver's Travels*

Fig. 1: Test card from Norway Melhus received by the author, on May 25. Note digital clock, 2 hours ahead of GMT

with sub-titles and the Del Monte fruit juice cartoon.

Graham Lay is pleased with the performance of his JVC 3040 and Band I dipole especially around 2100 on June 2 when he received strong pictures from Poland, Figs. 2 and 3, on Ch. R1 49·75MHz. David Hackwell, using a Hugh Cocks up-converter into a monochrome portable and a Band I dipole saw the words KOZEL-KELET behind a news reader on June 8 and last year the word VIGESTI appeared, any ideas? Graeme Wilson has modified his

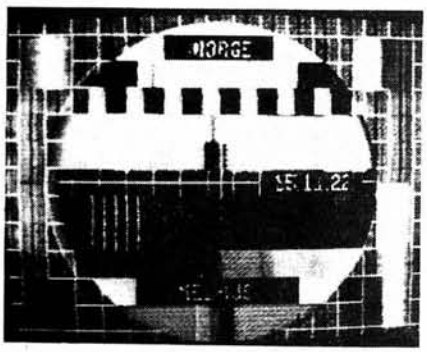


Fig. 2: Received by Graham Lay on June 2

receiver so that the video signal from the i.f. stages can be monitored by the set's internal audio amplifier which saves using a separate communications receiver for this job. On May 25, George Grzebieniak, using a Plustron TVR 5D and dipole received pictures from Scandinavia and the USSR and Simon Hamer watched adverts, dancers, a concert pianist, news, a scientific film and a western all fighting for predominance on the screen. Readers reported seeing adverts from such firms as Ajax, Atari, Bic, Braun, PAL and Sony, cartoon films including *Tweety Pie, Popeye* and *Astroboy* and such programmes as *The Charlie Chaplin Comedy Theatre, To Serve Them All My Days* and *The Hammer House of Horror*. Often the sound for these features is still in English but with local sub-titles.

The Falklands Crisis featured in many east-European news bulletins and at 1854 on May 20, I saw Poland's newscaster in civilian clothes, Fig. 4 and at 1857 there were pictures of Costa Mendez, the UN Secretary General, Francis Pym entering No. 10 and a missile in flight. On several occasions, Russian news presenters appeared with a digital clock to their right showing 4 hours ahead of GMT, thus placing the origin of the signal in the Moscow area. At 0905 on May 30, I saw a caption which looked like YTPEHHRR MOYTA and around 2000 a name that looked like TACO COO6WAET appeared under a news reader, any ideas? Nicholas Wythe has installed a wideband omni-directional array in his loft for Band I and at 0900 on June 12, David Appleyard watched a current affairs programme from West Germany on Ch. E2 48·25MHz, dealing with the fighting in the Lebanon and the Falklands with particular attention paid to Portsmouth throughout British naval history. On a few occasions between February and May, **Graham Rogers,** W-Australia, received Russian television pictures on Ch. R1 from Vladivostok and keeps an eye on this channel during their sporadic-E season.

Amateur Television

Congratulations to **Victor Budas** GM3VTB and **Vic Kusin** GM4HCO, both from Glasgow, on taking a Sony colour TV camera, Microwave Modules 70cm transverter modified for transmitting video, a 19-element Tonna antenna and two 7½Ah NiCads to the summit of Ben Lomond, 973m a.s.l. and transmitting, possibly the first ever, live colour television pictures from this location to amateur stations around Glasgow. The pictures were received between 1300 and 1400 on May 30 by GM3GUO Glasgow, GM3SAN east-Glasgow, GM8BKE north-Glasgow and GM8CUS Linlithgow.

In Croydon, **Paul Thomas** uses a JVC CX610GB and Band I dipole for DXTV and recently, with a 48-element Mul-

Fig. 3: Received by Graham Lay on June 2

tibeam feeding a Microwave Modules converter into a Sony KV1400, has received amateur television pictures from G3CDK, G3NQR, G4CRT, G4HMG, G8LES, G8MNY and G8ZRT. "The furthest of these stations is about 25 miles from my location and I can receive him, noise free and in full colour" writes Paul.

Members of the Worthing ATV group set up an exhibition station at the Chalk Pits Museum, Amberley, on June 6 for the museum's special "Wireless Day". Among the many visitors the group entertained was TV DXer, **George Garden** from Bracknell who called it "the most interesting exhibition that day" and was fascinated to see the quality of the pictures received at the base station from a man pack unit travelling on top of the museum's vintage bus. The group's cameramen also filmed our Editor, **Geoff Arnold,** officially opening the museum's new radio buildings and exhibition.

Fig. 4: Poland's newsreader received by the author, note Falklands item bottom right

Tropospheric

For a few seconds around 1430 on May 23, George Garden, using a Sony Band III, 405-line receiver with an indoor dipole, received strong pictures from Anglia TV (Mendlesham) on Ch. 11 and Central TV (Membury) on Ch. 12. Having never seen these signals so strong before George thinks it was caused by a moving weather front. There is little doubt that movement in the high pressure system enabled Brian Renforth, to receive excellent pictures from the BBC at Crystal Palace, Ch. 26, on May 28, 29 and 30 and from TV South, Dover Ch. 66, on June 9 and 10. At 1520 on June 6, Nicholas Wythe received a test card from Belgium BRT TV1, Wavre, on Ch. E10 and between May 20 and June 6, he watched *Rock Werchter 81* rock concert, *Footballer of the Year, The Pope in Britain* and *Holland Festival* rock show, from Europe u.h.f. stations. Nicholas received pictures from Nederland 2, Goes, on Ch. E32 at 1900 on May 28, RTBF, Wavre on Ch. E28 at 2050 on the 31st. Around 2300 on June 10, Ian Kelly saw the closedown of Anglia TV from Sudbury on Ch. 41 and earlier a French news reader on Ch. 21.

SSTV

"Two new countries have recently appeared on SSTV in the shape of FM7CD, Martinique and ZE1EK, Salisbury, Zim-

babwe, and still newcomers to slow scan television operation are arriving on all bands, worldwide", writes **Richard Thurlow** G3WW, March. On June 15 at 0756 and 0811 he made two-way QSOs with OZ3WP and DJ6QP respectively and Richard's SSTV CQ at 0824 on 14·299MHz was answered by SM5EEP and they exchanged both colour and monochrome pictures. At that time, SM6DGR of Swedish Television, complete with cameraman, was visiting SM5EEP in connection with the 25th anniversary of that commercial TV station's technical programme and asked him to demonstrate amateur SSTV to Sweden's TV viewers. A good bit of publicity there

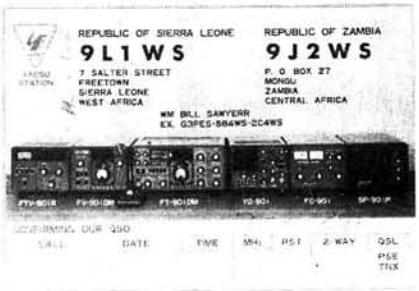


Fig. 5: Equipment of Bill Sawyerr

Richard, I hope my readers in Sweden saw it.

On May 7, **Bill Sawyerr** 9J2WS, Fig. 5, Mongu, Zambia, watched a bullfight during a spell of strong pictures from Spain. In addition to his amateur radio gear, Bill uses a National TC291M and an 8-element array for TVDX and has received pictures from Ghana and a Greek station.

Colin Fawcett is a newcomer to TVDX and between May 25 and June 17 received pictures, with his Panasonic 5030G and 10-element 144MHz beam, from Finland, Iceland, Scandinavia and Spain. Any TV DXer in the Manchester area wishing to compare notes with Colin should write to him at 10, Clifford Ave., Denton, Manchester.

swap spot

Have AR88D receiver fitted "S" meter, manual and spare valves. Would exchange for G2DAF or KW77 receiver. Set requiring attention considered provided complete. G4MNB (Ex G8IHY QTHR). Tel: (0793) 826325 evenings and weekends. *N.906*

Have Mitsubishi HS-200 VHS video recorder. Would exchange for h.f./v.h.f. transceiver or w.h.y. K. Meckin, 71 Senhouse Street, Workington, Cumbria. Tel: 0900-65614. *N.927*

Have a Trio 2500 2m f.m. portable rig complete with case and speaker mic. Would exchange for a TR-7730, IC-25E or FT-290R with NiCads and charger. N. Wallace G6FZN, Tel: Droitwich 773957. *N.917*

Have Canon AE-1 f:1·8 50mm lens plus case, still in box. Vivitar 75mm/205mm macro/zoom telephoto lens and case. New Vivitar 2X matched multiplier and case, both Canon fit, still in boxes. Computerised flashgun, all lenses complete with UV filters and rubber lens hoods. Shoulderstock camera and telephoto lens holder. Would exchange for any of: FT-208R with NC8, YM24 and mic; FT-290 plus p.s.u.; TR-2500 plus ST2 and SMC25; TR-9000 plus p.s.u.; TR-7730 plus p.s.u. K.B. Haynes, 15 Alderley Terrace, Dukinfield, Cheshire SK16 4JD. *N.918*

Have 2m/marine scanning receiver with 12 crystals, NiCads, power supply and charger, two antennas and case. Would exchange for h.f. bands receiver with b.f.o. Must be in working order. W.H. Cross, 45 Rhiwlas St, Liverpool L8. *N.919*

Have two 80 metre and two 40 metre c.w. end xtals. Would exchange for some 160 metre xtals. Geoff Wooster, Medway 253056. *N943*

Have Daiwa Search 9 (v.f.o. plus xtals for R2, R6, R7) and Harrier WT1 2-channel hand-held CB. Would exchange/part exchange for reasonable 2m rig (including adapted Pye Cambridge or pocketfone). 0275, P.O. Box 30, Southport PR8 5DT. *N944*

Have Chinon sound movie camera with tape recorder, indoor movie light and tripod. Would exchange for good general coverage receiver. Pieri, 31 High St., Totnes, Devon, TQ9 5NP. *N956*

Have Ibanez electric guitar in excellent condition, plus extras. Would exchange for anything useful for a radio amateur beginner. Tel: (0294) 71552, Irvine. *N966*

Have complete valved Philips CCTV outfit (camera; power/control unit; 2 14in monitors). Would exchange for good h.f. receiver; 23 cm transverter; u.h.f. gear; antenna rotator; w.h.y.? P.D. Roberts. Tel: (0792) 204146 (home) 55610 (work). *P32*

Have Ekco power unit 1930s, all wave signal generator 1960s, Network balancing universal old? Large number assorted valves. Would exchange for amateur receiver, but multi-meter etc., considered. Tom, 64 Renda Rd., Holbury, Southampton, Hants. Tel: Fawley 897338. *P33*

Have Thandar PDM 35—needs attention some ranges. Would exchange for *Radio and Television Servicing* (good condition) any years or good condition back volumes *Television* any years. All letters answered. 24E Blenheim Drive, Newtownards, Co. Down. BT23 4RA. *P36*

Have Olympus OM1 MD 35mm Camera, f:2·8 lens (with case), 135mm telephoto Tamron lens f:2·8 (with Olympus fittings), 28mm Tamron lens wide angle (with Olympus fittings) with adaptor for converting any lens fitted to double focal length, and various filters. Would exchange for Heathkit transceiver HM 101 with power pack (in working order). I.E. Saunders, 7 Nineacres, Keeworth, Nr Derby. Tel: 3751. *P37*

Have ZX81 with 16K byte memory plus tape recorder. Would exchange for FT208R hand portable (cash adjustment). Stephen Keen, 27 Netheravon Road, Chiswick, London W4. Tel: 01-995 3109. *P48*

Have Sony ICF2001, no faults, as new. Would part exchange for similar condition Yaesu FRG-7700, local only, GM4DHJ. QTHR. Tel: 041-889 9010. *P55*

PW "SWAP SPOT"

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G4? In fact, have you got anything to trade, radio-wise?

If so, why not advertise it FREE in our new feature SWAP SPOT. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless,* Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issue of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing above; it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale.

G4JDT HARVEY

EAST LONDON HAM STORE

G8NKV DAVE

H. LEXTON LIMITED

191 FRANCIS ROAD LEYTON E.10
TEL 01-558 0854 TELEX 8953609 LEXTON G

RADIO & ELECTRONIC ENGINEERS — **ENGINEERS ALWAYS AVAILABLE ON THE PREMISES**

MAIN (UK) SERVICE CONTRACTOR TO HITACHI SALES (UK) LTD

DRESSLER AMPLIFIERS

D to A.T.V.		TBA
D70c to 70cm		£499.00
D200C	*150FM 300W SSB	£300.00
D200	*300FM 600W SSB	£499.00
D200S	*500FM 1kW	£600.00

EXCLUSIVE TO US

These are high power 240V linears using 4C x 150 or 4C x 250 or 4C x 350 Elmac Tubes NOT using the grounded Grid system. Fully protected, no thermal damage to PA finals possible.

GASFET MASTHEAD PREAMPS

VV70GAAS	£75.00
VV2GAAS	£40.00
VV200GAS	£69.00
VV200GAS	£75.00

Powered by the linear or with separate ST200 .9dB signal to noise; .2dB insertion loss; 3SK97 GASFET.

ICOM PORTABLES

IC2E FM 2m £159.00
IC4E 70cm £199.00
IC202 SSB £169.00
IC402 70cm £242.00

All accessories available – see below

ICOM MULTIMODES

IC251 2m £495.00
IC451 70cm
IC290 2m £366.00

ICOM FM MOBILES

IC24G £165.00
IC25E £259.00

ICOM HF TRANSCEIVERS

IC2KL 500W linear £839.00
IC2KLPS Power supply £211.00
A.T. 100 A.T.U. £249.00
A.T. 500 Auto A.T.U. £299.00

ICOM 720A G/C

GENERAL COVERAGE TX ALL BANDS

IC720A 200W £883.00
PS15 Power Supply £99.00
PS20 P/S with speaker £130.00
IC730 200W HF £586.00

MANY ACCESSORIES FOR ABOVE AVAILABLE

ICOM ACCESSORIES

BP5 IIV Pack	£30.50
BP4 Empty case for 6XAA	£5.80
BP3 STA Noard Pk	£15.50
BP2 6V Pack	£22.00
BC30 Base charger	£39.00
DC1 12V adaptor	£8.40
WM9 Mic speaker	£12.00
CP1 Mobile Charging load	£3.20
LC1/2/3 cases	£3.50
ICMLI 10W Mobile booster for 2E	£49.00
BC30 Base charger	£39.00
MML1 10W Booster	£49.00

JAYBEAM ANTENNAS

8Y/2M 8 ELE YAGI	£15.50
10Y/2M 10 ELE YAGI	£33.00
PBM 10/2M 10 ELEMENT PARABEAM	£39.00
8XY/2M 8 ELE X YAGI	£31.00
X6/2M/X12/70CM DUAL BAND CROSSED	£41.40

MANY OTHERS IN STOCK

TRIO/KENWOOD

TS830S HF Transceiver	£690.00
TS130S HF Transceiver	£520.00
TR8400 UHF Mobile	£320.00
TR9500 UHF Multimode	£445.00
TR7800 VHF mobile	£285.00
TR7850 HP FM 2m	£295.00
TR7730 2m FM	£235.00
TR9000	£370.00
TR2500 Portable Due In	£200.00
PS30 20 1 amp PSU	£85.00

Many Trio/Kenwood accessories available

LARGE DISCOUNTS ON ALL YAESU EQUIPMENT

YAESU/SOMMERKAMP

FT1	POA
FT902DM	POA
FT1012	POA
FT101ZDFM	POA
FT101ZDAM	POA
FT707 200W PEP	POA
FP707 PSU	POA
FL707 ATU	POA
FV707DM VFO FC + FT (FT707 + FI707 + FL707 SPECIAL PRICE POA)	POA
FT277ZD Soko all extras inc.	£710.00
FT7670X Soko all extras inc.	£559.00
FT902DM Soko	£935.00
FC902 ATU	POA
FV901DM VFO	POA
SP901 Speaker	POA
Y0901P Scope	POA
FTV901 Transvertor	POA
FT208 VHF	POA
FT708 UHF	POA
FT290 Multimode	POA
FRG7700+ Opt memory	POA

All accessories available

MICROWAVE MODULES

MMA 144V 2m Preamp	£34.90
MML 144/25 RF AMP	£59.00
MML 144/40	£77.00
MML 144/100S New with Preamp	£129.95
MMT 432/144 2-70 Transverter	£184.00
MMT 28/144 10m Transverter	£99.00
MM2000 RTTY Receiver	£169.00
MMI Morse Talker	£115.00

MM 4000 RTTY
SEE IT WORKING AT OUR SHOP
£269.00 + keyboard.
Full range stocked.

STANDARD

C8800 2 mtr mobile	£250.00
C7800 70cm mobile	£270.00
C78 70cm portable	£219.00
C58 2 mtr port. SSB/FM	£239.00
CMB8 Mounting tray	£19.95
CL8 Carry case	£6.95
Battery charger	£7.95
Set Nicads	£11.00
CBP 58 25W linear	CBP 78 10W linear

Due in soon, new standard mobile 2 mtr Multimode.

ROTATORS ETC

DIAWA

DR7600X	£135.00
DR7600R	£144.00
DR7500R	£105.00
CN620 1·8 150MHz Pwr/swr	£52.00
CN2002 2·5 kW PEP auto ATU	£190.00

KENPRO

KR250	£44.85
KR400RC	£90.00

CHANNEL MASTER 9502

CN620 1·8 150MHz Pwr/swr	£52.00
CN2002 2·5kW PEP auto ATU	£190.00

CARRIAGE FREE MAINLAND

DATONG PRODUCTS

PCI General coverage convertor	£120.75
VLF Very low frequency convertor	£25.30
FLI Frequency audio/filter	£67.85
ASP Auto speech processor	£79.35
FL2. Multimode audio filter	£89.70
D75 RF Speech processor (manual)	£56.00
AD270 Active receive aerial (indoor)	£37.95
As above AD270 with PSU	£42.55
AD370 Active rec. aerial (outdoor)	£51.75
As above with PSU AD370	£56.35
DC144/28 2 Meter receive convertor	£35.65
Keyboard Morse sender	£129.00
Cadecall selective call unit (switch)	£29.32

All above carriage free.

CUSHCRAFT AMATEUR ANTENNA

HF, A3 20/15/10 3 ele beam 8bD	£165.00
ATV3 20, 15, 10 Trapped vertical	£38.30
ATV5 10.15.20.40.80 Trapped vertical	£83.69
214B 14 ele boomer 15·2db	£55.77
ARX 2 Ringo Ranger 6dB vertical	£28.00
CS100 Speaker	£13.00
A144·4 ele Yagi	£18.25
A144·7 ele Yagi	£22.82
A144·1 11 ele Yagi	£28.94
ARX2B Ringo Mk11	£33.00
ARB2K Conversion kit RINGO	

FULL RANGE OF A.S.P. MOBILE ANTENNAS IN STOCK

144+10T+Yagi OSCAR
144+20T+Yagi ,
For vertical and horizontal Oscar specials

RECEIVERS ALL ON SPECIAL OFFER

R1000	Kenwood
FRG7700	Yaesu
FRG7700	Memory
Search II	2 metre
Sony IC2001	£140.00

ALL POA ARE ON SPECIAL OFFERS

LARGE DISCOUNTS ON ALL YAESU EQUIPMENT – Phone 556 1415

ALL ACCESSORIES AVAILABLE – PLUGS SKTS CO-AX 2MTR COLINEAR £31.50, 70CM COLINEAR £31.50

Access

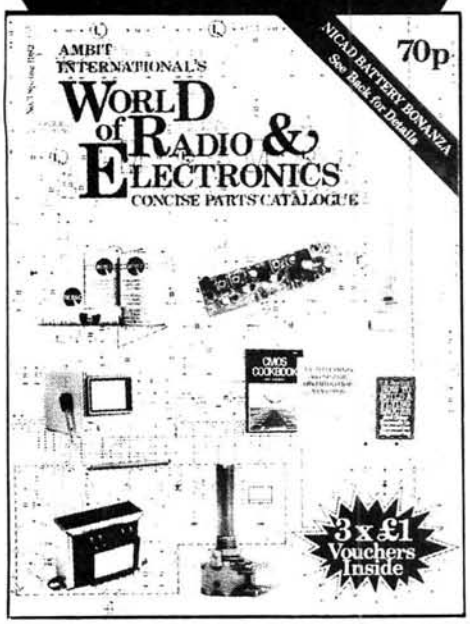
PRICES INCLUDE VAT AT THE PRESENT RATE OF 15%
OPEN MON–FRIDAY 9:00–5.30. SATURDAY 10:00–3:00. INSTANT HP FACILITY AVAILABLE
EASY ACCESS M2–M11–M1 NORTH CIRCULAR ROAD–EASY PARKING

BARCLAYCARD VISA

NICADS : UK's LOWEST PRICES

AMBIT'S NEW CONCISE COMPONENT CATALOGUE IS OUT NOW –

Price on the page



Ambit's new style catalogue continues to lead the market with low prices, new items, info, 3 x £1 discount vouchers. Here's a few examples of some super low prices:

78XX 1A	37p
BC237/8/9	8p
3SK51	54p
10MHz XTALS	£2
8 Pole 10.7MHz XTAL filters	£14.50
2GHz coax relay 150W	£10.95

+ all the usual stuff at rock bottom prices + Toko coils, crystal and ceramic filters, micrometals toroids, Fairite ferrites, Alps switches, OKI LSI, Piezo sounders, RF, IF Modules + Kits etc.

Available at your newsagent or direct, for 70p inc.

RECHARGEABLE UP TO 400 TIMES PER CELL!

CAPACITY	TYPE	1-9	10-49
500 mAh	AA	80	74
2200 mAh	C	2.35	1.99
1200 mAh	D	2.14	2.06
4000 mAh	D	3.05	2.85
110 mAh	PP3	3.70	3.50

Prices shown EXCLUDE VAT. Access/Barclaycard may be used with written or telephone orders, official MA details on application. E & EO.

POSTAGE and PACKING 50p per order

Normal delivery 48 hours

AMBIT international TELEPHONE (STD 0277) 230909 TELEX 995194 AMBIT G POSTCODE CM14 4SG
200 North Service Road, Brentwood, Essex

TIMESTEP ELECTRONICS LTD

FRG7 OWNERS ARE GOING — DIGITAL AND SIDEWAYS

And you can join them by fitting our CUSTOM DESIGNED DFC7 digital frequency counter. The DFC7 is specifically intended for use with the FRG7 and gives a rock steady unambiguous readout on all bands. The counter uses up to date microchip circuitry and has two crystal controlled oscillators for spot on accuracy. Signal frequency is computed from the receiver oscillator and is displayed on a bright green florescent read-out. Connection to the FRG7 is very simple. It is not necessary to drill any holes and only one wire has to be connected to a well marked test point on the FRG7 P.C. board. The DFC7 is supplied as a complete kit using high quality components and ready drilled fibreglass P.C. board, or as a complete and tested module.

SRX30 and SSR/1. The DFC7 can be used with these receivers. *Please mark your order DFC7/30.* **Kit Price £14.95 Tested Module £19.95** P&P £2.00 (VAT inc.)

Case A matching drilled and punched case for counters **£4.95** (P&P £1.25 (VAT inc.)

With our new FM7 adaptor module, you will be able to receive sideways modulation (F.M. as it is otherwise known). Our superb state of art F.M. detector uses the very latest 3359 chip from Motorola, and has a built in I.F. filter and a variable squelch control for noise free monitoring. Although specially designed with the FRG7 in mind, it will happily work with other receivers or transceivers with a 455kHz I.F. amplifier. The FM7 will add a whole new dimension to your listening activities. You will of course be able to follow legal C.B. contacts but you will also hear the exciting D.X. being worked by amateurs on 10 metre F.M. Used in conjuction with our DFC7 counter, you can accurately tune to a specific C.B. or amateur channel and so be sure that you will not miss whatever goes on.

Kit Price £9.95 Tested Module £14.95 P&P £1.00 (VAT inc.)

For F.M. reception on receivers with any I.F. up to 50mHz., the FM 42 is the answer to all your problems. *Please state frequency required when ordering.*

Kit Price £14.00 Tested Module £19.00 P&P £1.00 (VAT inc.)

AFM 4 & DFC 4 = **A Complete Hi-Fi Tuner** with digital frequency read-out. The AFM 4 is a complete L.W./M.W. and Stereo V.H.F. receiver module which was made for a famous U.K. manufacturer. The module is fully tested, all you have to do is connect 12 volt and an aerial. If the AFM 4 is used with our DFC 4 you will have an accurate digital frequency read out wherever you are tuned.
AFM 4 Module Price £14.00 P&P £2.00 (VAT inc.) **DFC 4 Kit £12.00** P&P £2.00 (VAT inc.)
AFM 4 and DFC 4 combined price £22.50 P&P £2.50 (VAT inc.)

120W LINEAR & P.C.B. Due to popular demand we have designed a P.C.B. to enable you to build an H.F. Linear using our 2 N6456. This will produce 120 W on most bands or 100 W from 1·5 mHz to 30 mHz.
Price 2 off 2 N6456 & P.C.B. £17.50 P&P £1.75 (VAT inc.)

70cms P.A. 433mHz POWER MODULE. This very neat power module is only 52 x 20 x 15mm in size. When run off a 13·8 volt power supply, 50mW of input will produce 5 Watts output.
Only £7.25 P&P 75p (VAT inc.)

TIMOTHY EDWARDS MK2 144 mHz PRE-AMP

HEAR IT LIKE YOU NEVER HEARD IT BEFORE

We are proud to announce that the well known R.F. consultant Timothy Edwards has given us the exclusive marketing rights to his new 2 metre pre-amp. Timothy Edwards R.F. designs are used by British Telecom amongst others and so you can be sure that this pre-amp will perform to perfection. It employs the incomparable BF981 which has a better noise figure at 2 M than the often used 3SK88. Spec. Size (tiny) 34mm x 9mm x 15mm (same as Mk1) Noise figure 1·0db Gain 26 db **Kit Price £4.95** (inc. VAT & P&P)

TRANSISTOR BARGAINS

	mHz	P out W	Pin W	Volts	Price
2 N6456	30	60	1·25	13·8	£5 (inc.)
BLW60	145	50	10	13·8	£5.25 (inc.)

Not 3SK88 but BF981 Better 2 M noise figure – 0·6 db £1.40 (inc.) ZTX 501 Gen. purpose P.N.P. 0·5 A. 20 for £1.25 (inc.)

Send 35p for further details and specifications of any of the above modules or components
Timestep Electronics Ltd., Egremont Street, Glemsford, Sudbury, Suffolk.

"...the quality of the colour display is excellent". *Popular Computing Weekly.*
"The graphics facilities are great fun". *Personal Computer World.*
"...the Spectrum is way ahead of its competitors". *Your Computer.*

"The world's best personal computer for under £500."

Chris Sinclair

Sinclair ZX Spectrum
16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional's computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8 colours, sound generation, a full-size moving-key keyboard and high-resolution graphics. Plus established Sinclair features such as 'one-touch' keyword entry, syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours plus flashing and brightness-intensity control.

Sound – BEEP command with variable pitch and duration.

Massive RAM – 16K or 48K.

Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.

High resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.

ASCII character set – with upper- and lower-case characters.

High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and MERGE for programs and separate data files.

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're available later this year, for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

sinclair ZX Spectrum

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			TOTAL £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £_____

*Please charge to my Access/Barclaycard/Trustcard account no. Please print.

*Please delete/complete as applicable.

Mr/Mrs/Miss

Address

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application. **PRW 809**

MASTER ELECTRONICS NOW!

The PRACTICAL way!

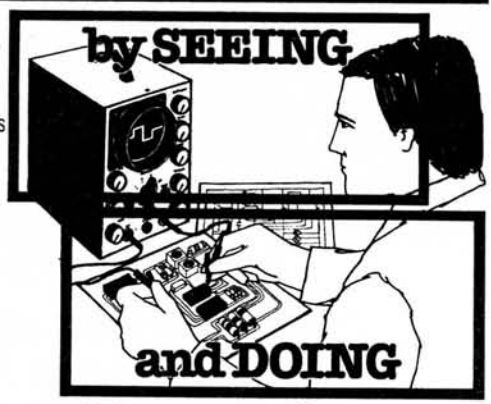
This new style course will enable anyone to have a real understanding of electronics by a modern, practical and visual method. No previous knowledge is required, no maths, and an absolute minimum of theory.

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 I am interested in: PW/9/821

NAME

ADDRESS

BLOCK CAPS PLEASE

- ☐ 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 7BR

VALVES

V.A.T. INCLUDED

A1065	1.40	EF83	1.75	PABC80	0.80	U27	1.15	5V4G	0.75	6JS6C	2.95	2001	0.80
A2293	8.80	EF85	0.60	PC85	0.75	U191	0.85	5Y3GT	0.80	6K7	0.80	20F2	0.85
A2900	9.20	EF80	0.75	PC86	0.95	U281	0.70	5Z3	1.50	6L6M	2.80	20E1	1.30
AR8	0.75	EF89	1.05	PC88	0.95	U301	0.85	5Z4G	0.75	6L6G	2.50	20P1	0.85
ARP3	0.70	EF91	1.50	PC97	1.50	U600	11.50	5Z4GT	1.05	6L6GC	2.10	20P3	0.75
ATP4	0.60	EF92	2.90	PC900	1.15	UB01	0.90	6J30L2	0.80	6L6GT	1.25	20P4	1.25
B12H	3.90	EF95	0.85	PCC84	0.50	UBC41	1.20	6AB7	0.70	6L7G	0.85	20P5	1.35
CY31	1.40	EF96	0.60	PCC89	0.65	UABC80	0.75	6AC7	1.15	6L18	0.70	25L6GT	0.95
DAF96	0.70	EF183	0.80	PCC189	1.05	UAF42	1.20	6AG5	0.80	6L06	2.95	25Z4G	0.75
DET22	26.95	EF184	0.80	PCF80	0.80	UBF80	0.70	6AH8	1.15	6LD20	0.70	30C15	0.50
DF96	0.70	EF804	4.95	PCF82	0.70	UBF89	0.70	6AL5	0.60	6KG6A	2.70	30C17	0.50
DH76	0.75	EF812	0.75	PCF84	0.70	UBL21	1.75	6AL5W	0.85	6Q7G	1.30	30C18	2.45
DL92	0.60	EFL200	1.85	PCF86	1.50	UCC84	0.85	6AK5	0.85	6SA7	1.00	30F5	1.15
DY86/87	0.65	EH90	0.85	PCF87	0.50	UCC85	0.70	6AK8	0.80	6SG7	1.15	30FL2	1.40
DY802	0.70	EL32	1.10	PCF200	1.80	UCF80	1.30	6AL5	4.20	6SJ7	1.05	30FL12	1.25
E55L	14.90	EL34	1.80	PCI201	1.65	UCH42	1.65	6AM6	1.50	6SK7	0.95	30FL14	2.15
E88CC	1.80		2.90*	PCH800	0.50	UCH81	0.75	6AN8A	2.50	6SL7GT	0.85	30L15	1.10
E80CC/01	3.10	EL37	4.40	PCH801	1.75	UCL82	0.95	6AQ4	3.40	6SN7GT	0.80	30L17	1.10
E92CC	1.20	EL81	2.45	PCH802	0.85	UF41	1.35	6AQ5	1.00	6SR7	1.10	30P12	1.15
E180CC	2.80	EL82	0.70	PCH805	2.45	UF80	0.95	6AQ5W	1.80	6SQ7	0.85	30PL13	1.25
E180F	6.30	EL84	0.80	PCH806	1.20	UF85	0.95	6AS6	1.15	6V6G	1.50	30PL14	2.45
E182CC	4.95	EL86	0.95	PCH808	2.75	UL41	2.30	6AT6	0.90	6V6GT	0.95	35L6GT	1.40
EA76	2.25	EL90	1.00	PCH200	1.35	UL84	0.95	6AU6	0.80	6X4	0.75	35W4	0.80
EABC80	0.80	EL91	4.20	PCL81	0.75	UM80	0.90	6AV6	0.85	6X4WA	2.10	35Z4GT	0.80
EB91	0.60	EL95	0.80	PCL82	0.95	UM84	0.70	6AX4GT	1.30	6X5GT	0.85	40KD8	3.15
EBC33	1.15	EL504	1.70	PCL84	0.90	UY82	0.70	6AX5GT	1.30	6Y6G	0.90	50C5	1.15
EBC90	0.90	EL803	5.90	PCL85	1.05	UY85	0.85	6BA6	0.55	6Z4	0.70	50CD6G	1.35
EBF80	0.60	EL509	2.70	PCL805/85	1.25	VR105/30	1.25	6BE6	0.80	7B7	1.75	75B1	1.25
EBF83	0.60	EL802	1.70	PD500/510	4.30	VR150/30	1.35	6BG6G	1.80	7Y4	1.25	75C1	1.70
EBF89	0.80	EL821	8.20	PFL200	1.10	X66	0.95	6BJ6	1.30	9D2	0.70	76	0.95
EC52	0.65	EL822	9.95		2.00*	X61M	1.70	6BQ7A	0.85	9D6	2.90	78	0.95
EC91	3.40	EM31	1.80	PL36	1.25	XR1-6400A		6BR7	4.80	10C2	0.85	80	1.70
EC92	0.85	EM80	0.85	PL81	0.85		82.50	6BW6	8.20	10F18	0.70	85A2	1.40
ECC81	0.85	EM81	0.85	PL82	0.70	Z759	19.00	6BW7	0.90	10P13	1.50		2.55*
ECC82	0.80	EM84	0.85	PL83	0.60	Z749	0.75	6C4	0.50	11E2	19.50	723A/B	11.90
ECC83	0.85	EM87	1.30	PL84	0.95	Z800U	3.45	6C6	0.55	12A6	0.70	807	1.25
ECC84	0.80	EY51	0.95	PL504	1.45	Z801U	3.75	6CH6	8.20	12AT6	0.70	813	14.80
ECC85	0.80	EY81	0.85	PL508	1.95	Z803U	16.00	6CL6	1.70	12AT7	0.85	829B	14.00
ECC86	1.70	EY86/87	0.80	PL509	2.90	Z900T	2.45	6CX8	3.80	12AU7	0.80	832A	8.90
ECC88	0.80	EY88	0.85	PL519	3.20	1A3	0.85	6CY5	1.15	12AV6	0.85	866A	3.80
ECC189	0.85	EZ80	0.70	PL802	3.20	1L4	0.50	6D6	0.70	12AX7	0.85	866E	8.25
ECC804	0.90	EZ81	0.70	PY33	0.70	1R5	0.80	6EA8	3.20	12BA6	0.90	931A	13.80
ECF80	0.85	GM4	5.90	PY80	0.70	1S4	0.45	6F6	1.80	12BE6	1.25	954	0.60
ECF82	0.85	GY501	1.30	PY81/800	0.85	1S5	0.45	6F6GB	1.10	12BH7	1.10	955	0.70
ECF801	1.05	GZ32	1.95	PY82	0.65	1T4	0.45	6F7	2.80	12C8	0.85	956	0.60
ECH34	2.25	GZ33	4.20	PY83	0.80	1U4	0.80	6F8G	0.85	12E1	18.95	957	1.05
ECH35	1.70	GZ34	2.75	PY88	0.85	1X28	1.40	6F12	1.50	12J5GT	0.55	1625	1.80
ECH42	1.20	GZ37	3.95	PY500	1.70	2D21	1.10	6F14	1.15	12K7GT	0.70	1629	1.85
ECH81	0.70	K166	6.30	PY809	8.45		1.85*	6F15	1.30	12K8GT	0.80	2051	2.90
ECH84	0.80		9.20*	PY801	0.80	2K25	11.90	6F17	1.15	12Q7GT	0.80	5763	4.20
ECL80	0.70	KT88	8.95	0DV03/10	2.85	2X2	1.15	6F23	0.75	12SC7	0.85	5842	7.50
ECL82	0.75		13.80*	0DV03-20A		3A4	0.70	6F24	1.75	12SH7	0.85	5881	3.40
ECL83	1.40	MH4	2.50		14.40	3A72	2.40	6F33	10.50	12SJ7	0.70	5933	8.90
ECL85	0.80	ML6	2.50	0DV03-25A		3D6	0.50	6FH8	4.20	12SQ7	1.45	6057	2.20
ECL86	0.90	MX10/01	21.50		21.20	3D22	23.00	6GA8	0.90	12SQ7GT	0.85	6060	1.95
EF37A	2.15	N78	9.90	0DV06/40A		3E29	19.00	6GH8A	0.95	12Y4	0.70	6064	2.30
EF39	1.80	OA2	0.70		18.10	3S4	0.60	6H6	1.60	13D3	0.70	6065	3.20
EF80	0.65	OB2	0.80	0V3-12	4.20	4B32	18.25	6J4	1.35	13D5	0.90	6067	2.30
				SC1/400	4.50	5B/254M	16.90	6J4WA	2.00	13D6	0.80	6080	5.30
				SC1/600	4.50	5B/255M	14.50	6J5	2.30	14S7	1.15	6146	4.95
				SP61	1.80	5B/258M	12.50	6J5GT	0.90	19A05	0.85	61468	5.20
				TT21	16.50	5C22	29.90	6J6	0.85	19G3	11.50	6360	2.85
				U25	1.15	5R4GY	1.80	6J6W	0.90	19G6	8.50	6550	6.50
				U26	1.15	5U4G	0.75	6JE6C	2.95	19H5	39.55	6870	14.00

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

*SPECIAL QUALITY

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.

AJH ELECTRONICS

20, Barby Lane, Hillmorton, Rugby, Warwickshire CV22 5QJ.
Tel: Rugby (0788) 76473

Cash with order, mail order only or callers by appointment. All prices include VAT at 15%, please add 60p post & packing. Full money back guarantee on all items. Allow 14 days for delivery.

2 METER HIGH POWER LINEAR AMPLIFIER

Further to our announcement in previous advertisements to produce 2 meter linear amplifiers, we have finally designed and manufactured a 80 watt version to suit the most popular QRP transceiver – the Yaesu FT290R, but is also suitable for any other transceiver having an output power of 2-3 watts. (And the price is right too.)

This decision was made after a survey amongst our customers who were owners of QRP transceivers their requirements were for a 80 to 100 watt basic amp. with no gimmicks such as receive pre-amp which only adds to costs and degrades the noise performance of the receiver.

Features: Quiescent current (no drive) 300 m/A. Minimum output power with 2½ watts drive – 80 watts with 13.8v. Suitable for FM and SSB. Fully RF switched or can be used via transceivers PTT line. Straight through operation when switched off. Provision for fitting "T" attenuator for higher RF inputs. Separate Led indicators to show "power" and "SSB" selected plus "ON AIR" indicator. Manufactured to high industrial standards. SO239 sockets fitted as standard. Finished in hard stove enamel colour storm grey semi gloss with matt black heat sink. Size 105 × 210 mm long. SPECIAL INTRODUCTORY PRICE OF ONLY **£98.00.**

Yaesu FT290R – £249.00. Mobile mounting bracket – **£22.25.** Set 2.2a nicads – **£21.50.**

SPECIAL OFFER: We can supply you with one of our linear amps and a FT290R for an all in price of only **£330.00.** (FT290 accessories extra.)

3SK88 MOSFET super low noise 1.1db @ 150 MHz with 26db gain, 16db gain @ 900 MHz with only 3.5db noise. Still a good device for 70cms approx 22db gain with 2.2db noise. Supplied with data sheet – new REDUCED PRICE ONLY **£1.20** ea. or two for **£2.20.**

RECEIVER PRE-AMP for 27-30MHz. Suitable for any receiver or transceiver covering these frequencies, circuit is designed around a dual gate mosfet giving a gain of 25db with only 1db noise. Gain is adjustable on PCB. 50 ohm imp. in & out & requires 9-15 volt supply. Ready built on board size 60 × 40mm. PRICE **£8.00.**

We still produce our NBFM adapter for the FT101 up to "E" model. No holes to drill or PCBs to fit, small free standing unit which just plugs into the sockets at rear of FT101 still the best & reduced to **£70.00.** Data sheet available.

SEMICONDUCTORS:– VHF RF POWER 2N6083 30 watt @ 2 mtrs over 7db gain 12v OK FM/SSB. With data sheet **£6.50** (the cheapest you will find). 2N3866 **75p,** BFW16A **75p,** PT4236A (2N4427) **75p,** 2N2631 (2N3553) **75p,** SD1212-6 3 watt @ 2 mtrs 12v 10db gain **£2.50.**

HF POWER – 2N5070 25w pep 24v 30MHz **£4.00,** 2SC1909 5w to 50MHz 13db @ 30MHz 12v **£2.00,** 2SC1307 15w AM 25w pep @ 30MHz 13db gain 12v **£3.00** (data sheet with 2SC1909 & 1307).

MOSFETS 3SK88 **£1,** two for **£2.20,** 3SK45 **50p,** 3SK60 (3N204) **80p,** BFR84 (41673) **60p. FETs** 2N3819 **40p,** TIS88A **43p.**

FILM TRIMMERS 2-25pf 10mm dia ten for **75p,** 10pf 7mm sq. 2 pin **10p ea.,** 2-18pf 9mm sq. 3 pin **15p ea.**

PLUGS/SOCKETS PL259 **45p,** reducer for UR76 etc. **15p,** PL259 right angle plug for UR76 etc. **70p,** SO239 socket flange type **45p,** 50 ohm BNC flange socket **70p,** 50 ohm BNC female plug **50p.**

NEW MODEL 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.

£6.50 Post 65p.

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, 50 volt, VU Meter. 500ma, 1 amp, 2 amp.
Facia 2¼ × 2 × 1½in. Post 65p.

FAMOUS LOUDSPEAKERS

Post £2 each

Make	Model	Size	Watts	Ohms	Price
Goodmans	Tweeter	3½in	25	8	£4.00
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
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 P.A.	Auditorium	12in	45	8/16	£22.00
Baker P.A.	Auditorium	15in	60	8/16	£34.00
Baker P.A.	Group 75	12in	75	4/8/16	£18.00
Goodmans	GR (P.A.)	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 (P.A.)	12in	120	8	£29.50
EMI	450	13×8in	10	3/8	£9.50
EMI	Bass	13×8in	20	15	£12.50
Goodmans	HP (P.A.)	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, 6×4in. 7×4in. **£2.50;** 8×5in. 6½in. **£3;** 8in. **£3.50;** 10in. **£5.**
8 ohm, 2in. 2½in **£2.00;** 3in. 5in. 7×4in. **£2.50.**
6½in. **£3;** 8in. **£4.50;** 10in. **£5;** 12in. **£6.**
15 ohm, 3in. 5×3in. 6×4in. 7×4in. **£2.50.**
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.**
2200mF 6V **25p;** 25V **42p;** 40V **60p;** 2000mF/100V **£1·20.**
2500mF 50V **70p;** 3000mF 25V **50p;** 50V **65p.**
3300mF 63V **£1·20;** 4700mF 63V **£1·20;** 2700mF/76V **£1.**
4700mF 40V **85p;** 1000 mF 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**

MANY OTHER ELECTROLYTICS IN STOCK

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 **50p;** 500+200pF **£1.**
SINGLE SOLID DIELECTRIC 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 60p. COUPLERS 40p.
NEON PANEL INDICATORS 250V. Red 1¼ · ¼ **45p.**
RESISTORS. 10Ω to 10M. ⅛W, 1W, 20% **2p,** 2W, **10p.**
HIGH STABILITY. ¼W 2% 10 ohms to 1 meg., **8p.**
Ditto 5%. Preferred values 10 ohms to 10 meg., **3p.**
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.** 6×½×½in. **25p.**
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 6½ × 4¾ × 2" **£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**
10×7×3 **£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 **30p.** DPST **40p.** DPDT **50p.**
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
337, WHITEHORSE ROAD
CROYDON, SURREY, U.K. TEL: 01-684 1665
Post 65p Minimum. Callers Welcome. Closed Wed. Same day despatch. Access-Barclay-Visa. Lists 31p.

H.A.C SHORT-WAVE KITS

WORLD-WIDE RECEPTION

If you prefer a valve receiver the

MODEL DX MARK III
is still as popular as ever
£15.00
for the complete kit.

To replace H.T. batteries we can now supply a
BATTERY ELIMINATOR KIT
90v HT. 3v, 2v & 1½v LT
£11.00

Also suitable HEADPHONES for use with the DX
£6.00

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.

Designer Approved

PW 'WINTON' Tuner and Amplifier Kits

Matching Tuner and Stereo Amplifier of the highest quality and great versatility. Both designed by the renowned Ted Rule and described in the pages of this Magazine.

The Tuner covers no less than 5 wavebands, LW, MW, SW, FM and TV Sound. I.F. Stages have switchable bandwidth and use the very latest low-noise chip and double discriminator coils to give you a clean undistorted sound. Frequency indication is by a vacuum fluorescent digital readout with clock and timer functions. Stereo decoding is performed by another very advanced chip having noise cancelling and low-distortion characteristics. The ready built and aligned FM Front end has no less than 6 Varicap tuned stages keeping image responses more than 100db down but giving very high gain on the wanted frequency. The unique AM Front end is also supplied ready built and tested. Power supply uses a special miniature low-field toroidal transformer.

The stereo amplifier is of similarly advanced design using Hitachi Power MosFets in the output stages. Power rating is 50 watts per channel and 5 push button selected inputs are provided. Power supply again uses a Toroidal mains transformer of substantial rating. This amplifier received an excellent review from Gordon King, if you would like a reprint just drop us an SAE.

Both units have solid aluminium chassis, silver anodised Front Plates with black lettering and fit in beautiful wood veneered cabinets. Very full assembly instructions are included with both kits. Printed circuit boards are roller tinned for ease of soldering and have component locations marked to remain visible after assembly. All components are of the standard which has made HART KITS the most trusted for 20 years.

Complete Kit of all parts for Tuner **£163**
Complete Kit of all parts for Amplifier **£109**
Prices Plus VAT and £1.50 Post, Packing and Insurance.
We are Importers and Stockists of a comprehensive range of Cassette Heads and Decks. Write or phone for your free copy of our illustrated lists.

HART ELECTRONIC KITS LTD.
Penylan Mill,
Oswestry, Shropshire SY10 9AF.
Tel: 0691 2894
Personal callers are always very welcome but please note that we are closed all day Saturday.

LOOK NO FURTHER

WE ARE PART OF A MAJOR GROUP SUPPLYING THE ELECTRICAL TRADE.

BUY DIRECT!

NO GIMMICKS

LOW COST **KM101**

2000 Ω p.u.
DC VOLTS 0 TO 1000
AC VOLTS 0 TO 500
RESISTANCE 0-1MΩ
Db: —10 TO +22db.

£4.45 EA.

GUARANTEED FREE REPLACEMENT OR MONEY BACK!

KM102
20000 Ω/v Dc
10000 Ω/v AC

DC VOLTS 0 TO 1000
AC VOLTS 0 TO 1000
DC CURRENT
TO 500 mA
RESISTANCE
UP TO 6MΩ
Db: —20 TO +22

£6.45 EA.

NO HIDDEN EXTRAS ALL PRICES INCLUDE P&P AND VAT.

DIGITAL (3½). KM 601

10MΩ ON ALL RANGES

LOBAT INDICATOR
DC VOLTS 0 TO 1000
AC VOLTS 0 TO 750

ACCURACY TO .5%

DC CURRENT TO 2A

AC CURRENT TO 2A

RESISTANCE TO 20MΩ
ALSO INCORPORATES DIODE CHECK.

£32.45 EA.

CHEQUE OR P.O. TO
RECONSTAR LTD.,
LITTLE TENNIS ST.,
NOTTINGHAM NG2 4EL.
TEL NOTTM. (0602) 582714

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.

SMALL ADS

The prepaid rate for classified advertisements is 32 pence per word (minimum 12 words), box number 60p extra. Semi-display setting £10.70 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.

Record Accessories

STYLI for Music Centres etc. Free list for S.A.E., includes other accessories. Felstead Electronics, Longley Lane, Gatley, Cheadle, Cheshire SK8 4EE.

Receivers and Components

WORLD DXing? The Vega 308 (short, medium, F.M.), will pull Radio Vietnam and further, nightly. £17.99 inclusive. Corrigan-Radiowatch, Building 109, Prestwick Airport, KA9 2RT.

BRAND NEW COMPONENTS BY RETURN

HIGH STABILITY MINIATURE FILM RESISTORS 5%
¼W E24 Series 0.51R-10MO. (Except 7M5, 9M1)—**1p**
0.125W E12 Series 1OR to 1M8—**2p.** 0.5W E12 Series 1RO to 1OMO.—**1½p.** 1.0W E12 Series 1OR to 1OMO—**3p.**
¼W Metal Film E12 series 10R to 1MO 5%—**2p.** 1%—**3p.**

CAPACITORS.
MULLARD Min. 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	16p
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.** 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.—**1½p.** 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)

PROTECT YOUR RIG with an overvoltage growbar module. Connects across 13.8v supply, fully built. Includes 25 amp thyristor. Only £4.75 inc. post and VAT. Fremark Electronics, Strattons Walk, Melksham, Wilts.

Equipment Wire

MULTI-COLOUR WIRE-PACKS

28 Different Colours/Bi-colours
DEF 61-12 (part 6) Type 2
Black · Blue · Brown · Green · Grey · Orange
Pink · Red · Violet · White · Yellow · Green/Red
Green/Yellow · Grey/Blue · Grey/Black
Orange/Red · Orange/Black · Pink/Black
Purple/Red · Red/Black · Red/Blue · Red/Brown
Red/Green · White/Black · White/Red
Yellow/Green · Yellow/Red · Yellow/Black
5 metres of each
7/0.2 set **£6.55** 16/0.2 set **£9.95**

Stort Technology
a division of Space Applications Ltd
Ref. PW
The Maltings
Sawbridgeworth
Hertfordshire
CM21 9LY
0279 724970
no extras for VAT p&p inclusive prices

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 **£4·10.** 2-3 week service available.
FILTERS Your best source for 6 and 8 pole and monolithics for AM, CW, SSB, FM, on 455 kHz, 1·6, 9·0, 10·7, 21·4 MHz, etc.
Prices inc. VAT and UK post. SAE lists.
P. R. GOLLEDGE ELECTRONICS
G3EDW, Merriott, Somerset, TA16 5NS.
Tel: 0460 73718

ELECTRONICS COMPONENT SHOP in Maidstone, Kent. Thyronics Control Systems, 8 Sandling Road, Maidstone. Maidstone 675354.

VHF CONVERTOR. 45-220MHz Tunable IF. Very sensitive unit £9.00 inc. PP. TVDX Vhf to Uhf Convertor £11.90 inc PP. SAE data/lists. H. Cocks, Cripps Corner, Robertsbridge, Sussex. Tel. 058 083 317.

SCOOP PURCHASE – TELEPHONES
Black G.P.O. type for extension use. As new only **£4.75** each. Carriage £1.75. 2 for **£12.00** carriage paid.
HAVE YOU SEEN THE GREEN CAT?
1000s of new components, radio, electronic, audio at unbelievably low prices. Send 40p and receive list and FREE Record. Speed Indicator. Try a JUMBO pack, transistors, caps, resistors, pots, switches, radio, and electronic devices. Over £50 worth for £11 plus carriage £2.50.
MYERS ELECTRONICS, Dept PW3,
12/14 Harper Street, Leeds, LS2 7EA.
Tel: 452045. Callers Welcome.

P.C. BOARD S.S. 12"×12" – 3 for £2.00. Glass fibre P. L. Board S.S. or D.S. 12"×12" £1.00 each. Add 60p P&P any quantity. Cooper, 16, Lodge Road, Hockley, Birmingham B18 5PN.

BOURNEMOUTH/BOSCOMBE. Electronic components specialists for 33 years. Forresters (National Radio Supplies) late Holdenhurst Rd. now at 36, Ashley Rd., Boscombe. Tel. 302204. Closed Weds.

RTTY/CW DECODER
Easy to build kit with 8-character alphanumeric LED display (expandable), or with latched ASC11 output and strobe for computer interface – requires same connections and software as parallel encoded keyboard. 45 and 50 baud RTTY, 5 to 30 w.p.m. morse. Kit price (excluding case) **£64.50** with display, **£39.50** as interface. Parts available separately — construction data £3.95 + SAE.
N. MacRITCHIE (Micros),
100 Drakies Avenue, Inverness IV2 3SD
Telephone: 221194

Miscellaneous

AVIATION FREQUENCY LISTS (Europe). 384 pages £5.00. AOS (PW), West London Building, White Waltham Aerodrome, Maidenhead SL6 3MJ.

THE SCIENTIFIC WIRE COMPANY
PO Box 30, London E.4. Telephone 01-531 1568
ENAMELLED COPPER WIRE

SWG	1 lb	8 oz	4 oz	2 oz
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	6.63	3.86	2.28	1.50
TINNED COPPER WIRE				
14 to 30	3.97	2.41	1.39	0.94

10×10 Mtr reels 3 amp PVC cable mixed colours £5.00.
Prices include P&P and VAT.
Orders under £2 add 20p.
SAE for list of Copper/Resistance Wire.
Dealer enquiries welcome.

PARAPHYSICAL JOURNAL (Russian Translations): Psychotronic Generators, Kirlianography, Gravity Lasers, Telekinesis. Details SAE 4 ×9" Paralab, Downton, Wilts.

WAVEGUIDE, FLANGES & DISHES. All standard sizes & alloys stock. Special sizes to order. Call Earth Stations, 01-228 7876. 22, Howie Street, London SW11 4AR.

MORSE CODE CASSETTES
Cassette A: 1-12 w.p.m. for amateur radio examination.
Cassette B: 12-25 w.p.m. for professional examination preparation. Each cassette is type C90.
Price each Cassette (including booklets) **£4.75**
Price includes postage etc. UK only.
MH ELECTRONICS (Dept PW),
12 Longshore Way, Milton,
Portsmouth PO4 8LS.

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. Wilfred's Foundry Lane, Halton, Lancaster LA1 6LT.

AERIALS TELEVISION RADIO C.B. Amplifiers Brackets Towers. 132 Hermon Hill, E18. 01-530 6118.

BURGLAR ALARM EQUIPMENT. Ring Bradford (0274) 308920 for our catalogue or call at our large showrooms opposite Odsal Stadium.

ALUMINIUM TUBES FOR AERIALS, various sizes available. Nerva Metals. Tel. 01-904 4647.

TIME WRONG?
MSF CLOCK is ALWAYS CORRECT – never gains or loses, SELF SETTING at switch-on, 8 digits show Date, Hours, Minutes and Seconds, auto GMT/BST and leap year, receives Rugby 60KHz atomic time signals, built in antenna, **£69.60.**
LOSING DX UNDER QRM? DIG it OUT with a Tunable Audio Notch Filter, between your receiver and speaker, BOOST your DX/QRM ratio, 40dB notch, hear RARE DX, **£16.40.**
Each fun-to-build kit includes all parts, printed circuit, case, instructions, postage etc, money back assurance so GET yours NOW.
CAMBRIDGE KITS,
45 (PJ) Old School Lane, Milton, Cambridge.

PRACTICAL WIRELESS PCB's 1.5mm GLASS FIBRE

Mar 82	Iambic Keyer WR144	**£1.87**
April 82	A.T.V. Up Convertor WR143	**£3.23**
	Mobile radio alarm WK104	**£1.23**
May 82	FM Mains Intercom WR149	**£2.36**
June 82	Audio amp WR150	**£1.43**
July 82	Morse Show WR125	**£6.56**
	Freq Synth WRM505-8	**Set of 4 £8.44**

Postage for the U.K. 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

Wanted

ELECTRONIC COMPONENTS PURCHASED. All types considered – Must be new. Send detailed list – Offer by return – WALTONS, 55A Worcester Street, Wolverhampton.

For Sale

AMATEUR RADIO Mobile Log Books, 800 entries. Send £1.25 inclusive to Chesterfield Aerial Service, 93 Hady Lane, Chesterfield, Derbyshire. Quantity discount for trade.

MURPHY RN RECEIVER, current price £115 less power unit, complete with internal power unit £85. PP5-400 EQU PX25 2 new, 2 used. Best offer. 01-359 2608.

AMATEUR EQUIPMENT bought and sold. Cash waiting. Contact G3RCQ Hornchurch 55733 evenings.

LOWE SRX30D Communications Receiver. Mint condition. Bargain £175. Tel. Alresford 3860.

VINTAGE TELEVISION 1950 Bush, cabinet model, working order. Offers. 0702 202216 (Essex).

2-METRE TRANSCEIVER standard C8800, two months old. Boxed and guaranteed. £200 o.n.o. 01-868 5536.

Books and Publications

"WORLD RADIO TV HANDBOOK", £10.99. "Broadcasts to Europe", quarterly frequency guide, £4.50 yearly (sample copy £1.30). Send payment or Access/Visa number to Pointsea, 25 Westgate, North Berwick, East Lothian.

NEW HANDY FREQUENCY Checklist (MW, LW: Europe, U.K.) with unique map for bearings. £1 postpaid or 6 IRC. DIAL-SEARCH, 9 Thurrock Close, Eastbourne BN20 9NF.

AIRCRAFT COMMUNICATIONS HANDBOOK including spot MF, HF, VHF, UHF, frequencies, airports, air traffic control centres, weather reports, broadcast times, beacons, long range stations, callsigns, maps, etc. 384 pages £7.50p post & packing £1.00. PLH Electronics, 97 Broadway, Frome, Somerset BA11 3HD.

Aerials

AERIAL WIRE. High quality P.V.C. covered multi-strand copper. 50' £2.35, 100' £3.52, 125' £5.87, 150' £7.05, 175' £8.22, 200' £9.40, 250' £11.75, 300' £14.10 inc. vat. P&P 86p. A1 Radio Components, 19 The Borough, Canterbury, Kent CT1 2DR.

TV-DX
FN-DX and all domestic reception requirements – Fringe or 'Local'. Aerials, Amplifiers, Boosters, Filters, Hardware – and the Knowledge. Our 1982 Catalogue costs 50p, SAE all enquiries please.
ROGER BUNNEY'S TVDX BOOK (2ND EDITION) £2.40
Plustron TVR5D Multi-Standard TV/Radio (see review Practical Wireless July '82 issue) **£96.50.**
Labgear CM7065 high gain (26dB) low noise (less than 2dB) 40-860MHz Masthead Amplifier **£16.95.** inc. post + packing
SOUTH WEST AERIAL SYSTEMS (PW)
10 Old Boundary Road, Shaftesbury, Dorset. Tel. (0747) 4370.

G2DYM ANTI-INTERFERENCE ANTI-TVI TRAP DIPOLES TRANSMITTING & S.W.L. MODELS
Data Sheets Large SAE. Aerial Guide 50p.
Indoor and Invisible Aerials £3.50.
Callers welcome Tel: 03986-215
G2DYM, Uplowman, Tiverton, Devon.

COPPER AERIAL WIRE 14swg hard drawn 70' £5.34, 140' £8.84 inc. VAT. Postage £1.75. T.M.P. ELECTRONIC SUPPLIES, Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd, North Wales.

Service Sheets

G.T. TECHNICAL INFORMATION SERVICE
76 CHURCH ST., LARKHALL, LANARKS.
All published full size service sheets £2 each plus l.s.a.e. except CTVs/music centres from £3.
Repair data your named T.V. £6.50 (with circuits £8.50)
Collection of 11 T.V. Repair Manuals covering almost every British & Foreign, colour, standard mono, portables only £65.
L.S.A.E. brings free 50p magazine, quotations, details of unique publications and bargain offers. 2 big catalogues list thousands service sheets/manuals plus £4 vouchers for **£2** + large s.a.e. Complete British Colour TV circuits, etc. in 3 huge binders only **£39.50.**
Phone: 0698 883334 anytime. Callers 4-6 pm weekdays, Sat. 11-1.

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. **£2.00** Old Valve Radio.
C. CARANNA,
71 Beaufort Park, London NW11 6BX.
01-458 4882 (Mail Order).

CLEARANCE SALE of Service Sheets 1p each. S.a.e. for details: Hamiltons, 47 Bohemia Road, St Leonards, Sussex.

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.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for ..... insertions I enclose Cheque/P.O. for £.....
(Cheques and Postal Orders should be crossed Lloyds Bank Ltd. and made payable to Practical Wireless).

NAME .....

ADDRESS .....

.....

Send to: Classified Advertisement Dept.,
PRACTICAL WIRELESS
Classified Advertisement Dept., Rm 2612
King's Reach Tower, Stamford Street,
London SE1 9LS Telephone 01-261 5846
Rate
32p per word, minimum 12 words.
Box No. **60p** extra.

Company registered in England. Registered No. 53626. Registered Office: King's Reach Tower, Stamford Street, London SE1 9LS.

9/82

WATFORD ELECTRONICS

33/35, CARDIFF ROAD, WATFORD, HERTS, ENGLAND
TEL. WATFORD (0923) 40588. TELEX 8956095

ALL DEVICES BRAND NEW. FULL SPEC. AND FULLY GUARANTEED. ORDERS DESPATCHED BY RETURN OF POST. TERMS OF BUSINESS: CASH/CHEQUE/P.O.s OR BANKERS DRAFT WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED (TELEPHONE ORDERS BY ACCESS NOW ACCEPTED Minimum £10·00 please). TRADE AND EXPORT INQUIRY WELCOME. P & P ADD 50p TO ALL ORDERS UNDER £10·00. (excluding VAT). OVERSEAS ORDERS POSTAGE AT COST.

VAT Export orders no VAT. Applicable to U.K. Customers only. Unless stated otherwise, all prices are exclusive of VAT. Please add 15% to the total cost including p & p.

We stock many more items. It pays to visit us. We are situated behind Watford Football Ground. Nearest Underground/Br. Rail Station: Watford High Street. Open Monday to Saturday 9 a.m.–6 p.m. Ample Free Car Parking space available.

POLYESTER RADIAL LEAD CAPACITORS: 250V; 10n, 15n, 22n, 27n **6p;** 33n, 47n, 68n, 100n **7p;** 150n, 220n **10p;** 330n, 470n **13p;** 680n **19p;** 1µ **23p;** 1µ5 **40p;** 2µ2 **46p.**

ULTRASONIC TRANSDUCERS **325p** per pair.

ELECTROLYTIC CAPACITORS (Values in µF). **500V:** 10 **52p;** 47 **78p; 63V:** 0·47, 1·0, 1·5, 2·2, 3·3, **8p;** 4·7 **9p;** 6·8, 10 **10p;** 15, 22 **12p;** 33 **15p;** 47 **12p;** 100 **19p;** 1000 **70p; 50V:** 47 **12p;** 68 **20p;** 220 **24p;** 470 **32p;** 2200 **90p; 40V:** 4·7, 15, 22, **9p;** 3300 **90p;** 4700 **120p; 25V:** 1·5, 6·8, 10, 22 **8p;** 33 **9p;** 47 **8p;** 100 **11p;** 150 **12p;** 220 **15p;** 330 **22p;** 470 **25p;** 680, 1000 **34p;** 2200 **50p;** 3300 **76p;** 4700 **92p; 16V:** 40, 47, 100 **9p;** 125 **12p;** 220 **13p;** 470 **20p;** 680 **34p;** 1000 **27p;** 1500 **31p;** 2200 **36p;** 3300 **74p;** 4700 **79p.**
TAG-END TYPE: 70V: 4700 **245p; 64V:** 3300 **198p;** 2200 **139p; 50V:** 3300 **154p;** 2200 **110p; 40V:** 4700 **160p; 25V:** 4700 **98p;** 10,000 **320p;** 15,000 **345p.**

TANTALUM BEAD CAPACITORS: 35V: 0·1µ, 0·22, 0·33 **15p;** 0·47, 0·68, 1·0, 1·5 **16p;** 2·2, 3·3 **18p;** 4·7, 6·8 **22p;** 10 **28p; 16V:** 2·2, 3·3,**16p;** 4·7, 6·8, 10 **18p;** 15 **36p;** 22 **30p;** 33, 47 **40p;** 100 **75p;** 220 **88p; 10V:** 15, 22 **26p;** 33, 47 **35p;** 100 **55p.**

POLYESTER (MYLAR) CAPACITORS: 100V: 1nF, 2n, 4n, 4n7, 10n **6p;** 15nF, 22n, 30n, 40, 47 **7p;** 56, 100n, 200 **9p; 50V:** 470nF **12p.**

CERAMIC CAPACITORS 50V
Range: 0·5pf to 10nf **4p**
15nF, 22nF, 33nF, 47nF **5p** 100nF **7p**

POLYSTYRENE CAPACITORS
10pF to 1nF, **8p** 1·5nF to 12nF, **10p.**

RESISTORS–5% carbon, High Stab. Miniature, Low Noise.

	Range	Val.	1-99	100+
0·25W	2Ω2-4M7	E24	2p	1p
0·5W	2Ω2-5M1	E12	2p	1p
1W	2Ω2-10M	E12	5p	3p
2% Metal Film	10Ω-1M	E24	6p	4p
1% 0·5W	51Ω-1M	E24	10p	8p

N.B. 100+ price applies to Resistors of each type not mixed values.

VEROBOARDS: 0·1"

	Clad	Plain
2½×3¾"	73p	52p
2½×5"	83p	—
3¾×3¾"	83p	—
3¾×5"	95p	79p
3¾×17"	326p	211p
4¾×17"	426p	—

'VQ' Board **150p**
'DIP' Board **330p**
Vero Strip **144p**
Pkt of 100 pins **50p**
Spot face cutter **118p**
Pin insertion tool **162p**

PROTO – DECs
Veroblock **375p**
S-DeC **350p**
Eurobreadboard **520p**
Bimboard 1 **550p**
Superstrip SS1 **£13**

COPPER CLAD BOARDS

Fibre Glass	Single-sided	Double-sided	SRBP 9·5"x8·5"
6"x6"	90p	110p	95p
6"x12"	150p	200p	

FERRIC CHLORIDE
1 lb **195p** + 50p p&p

DALO ETCH RESIST PEN plus Spare Tip **90p**

SOLDERCON PINS
100 pins **70p**
500 pins **325p**

VERO WIRING PEN + spool **310p**
spare spool **75p;** combs **6p.**

DIL SOCKETS

	Low profile	Wire wrap
8 pin	8p	25p
14 pin	10p	35p
16 pin	10p	42p
18 pin	16p	52p
20 pin	22p	60p
22 pin	25p	70p
24 pin	25p	70p
28 pin	28p	80p
36 pin	—	105p
40 pin	30p	99p

EDGE CONNECTORS TEXAS

	·1	·156
2 10 way	—	135p
2 15 way	—	140p
2 18 way	180p	145p
2 22 way	199p	200p
2 23 way	210p	—
2 25 way	225p	220p
2 30 way	245p	—
2 36 way	295p	—
2 40 way	315p	—
2 43 way	395p	—

DENCO COILS
Dual Purpose 'DP'
VALVE TYPE
Ranges: 1-5 Bl. Yl. Rd. Wht. **122p**
6-7 B. Y. R **110p**
1-5 Green **150p**
'T'-type (Transistor Tuning).
Ranges: 1-5 Bl. Yl. Red, White **150p**

B9A Valve Base **42p**
RDT2 **145p**
RFC 5 chokes **140p**
RFC 7 (19mH) **160p**
1FT 13/14/15/16 17 **120p**
1FT 18/1·6 **135p**
1FT 18/465 **152p**
TOC1 **124p**
MW 5FR **122p**
MW/LW 5FR **154p**

JACKSONS VARIABLE CAPS.
Dielectric
100/300pF **220p**
500pF **250p**
6:1 Ball Drive 4511/DAF **185p**
Dial Drive 4103 6:1/36:1 **775p**
Drum 54mm **59p**
0-1-365pF **350p**
00-2-365pF **435p**
00-2-650pF **650p**
0-2-365pF with slow motion Drive **495p**
00-2-208/176 **435p**
„ „ with slow motion drive **495p**
C804: 5pF; 10 **278p**
25pF **290p**
50pF **290p**
100;150pF **350p**
'L' 3×310pF **725p**
00-3×25pF **575p**

POTENTIOMETERS: Carbon Track 0·25W log & Linear Valves.

470Ω, 680Ω 1K, 2K (Lin only) Single	30p
5KΩ to 2MΩ Single gang	30p
5KΩ to 2MΩ Single with D/P switch	78p
5KΩ to 2MΩ Dual gang	88p
1W Wirewound 50Ω-20K	115p

SLIDER POTENTIOMETERS
0·25W log and linear values 60mm track

5KΩ 500KΩ Single gang	70p
10KΩ 500KΩ Dual gang	110p
Self-Stick graduated Alum. Bezels	40p

PRESET POTENTIOMETERS

0·1W 50Ω-2·2M Minl. Vert. & Horiz.	7p
0·25W 100Ω-3·3MΩ Horiz. larger	10p
0·25W 250Ω-4·7MΩ Vert.	10p

OPTO ELECTRONICS

LEDs plus clip	
TIL209 Red 3mm	11
TIL211 Grn 3mm	14
TIL212 Yel 3mm	14
·2" Red	12
·2" Green or Yellow	14
Rectangular LED's Red, Green, Yellow with bezel	29
7 Seg. Displays Red	
·3" C Cath	99
·3" C Anod	99
·3" ±1 Red or Grn	150
·5" C Cath	115
·5" C Anod	115
·6" C Cath	180
·8" Orange	275
Burgraph 10 seg.	225
3½ Digit LCD	525
4 Digit LCD	650
OCP71	120
ORP12	86
2N5777	45
(Infra Red Emitter) LD271	46
TIL32	58
Detector SFH205	119
TIL78	55

CRYSTALS

100KHz	270
455KHz	370
1MHz	295
1·008M	295
1·6MHz	395

TRANSISTORS

AC141/2	30	BD140	40	OC170/1	50	2N3710/11	10
AC176	28	BD144/5	198	OC200	50	2N3771	179
ACY17/18	70	BD205	110	TIP29A	32	2N3772	195
ACY19/20	75	BD214	115	TIP29C	38	2N3773	210
ACY21/22	75	BD245	45	TIP30A	35	2N3819	22
ACY28	75	BD378	70	TIP30C	37	2N3820	38
AD149	79	BD434	55	TIP31A	38	2N3822/3	45
AD161/2	42	BD517	75	TIP31C	37	2N3866	90
AF106	70	BD695A	99	TIP32A	38	2N3903/4	15
AF118	90	BD696A	99	TIP32C	42	2N3905/6	15
AC125	35	BDY56	180	TIP33A	65	2N4037	46
AC126/7	35	BF115	35	TIP33C	78	2N4058	10
AC128	30	BF167	29	TIP34A	74	2N4061/2	10
AF139	40	BF180	38	TIP34C	88	2N4427	80
AF178	75	BF194/5	12	TIP35A	110	2N4859	78
AF239	78	BF196/7	12	TIP35C	128	2N4871	55
BC107	10	BF198/9	16	TIP36A	130	2N5172	18
BC107B	12	BF200	30	TIP36C	140	2N5179	45
BC108	10	BF224	24	TIP41A	50	2N5191	75
BC108B	12	BF244	30	TIP41B	52	2N5305	24
BC108C	12	BF244B	30	TIP42A	55	2N5457	30
BC109	10	BF256	35	TIP42B	58	2N5485	30
BC109B	12	BF257/8	32	TIP120	70	2N5642	750
BC109C	12	BF259	35	TIP121	73	2N5777	45
BC140	30	BF274	42	TIP141	105	2SA636	250
BC141/2	30	BF336	40	TIP142	105	2SA671	250
BC143	30	BF451	35	TIP147	120	2SA715	60
BC147	9	BF594	30	TIP2955	60	2SC495	70
BC147B	10	BF595	39	TIP3055	60	2SC496	70
BC148	9	BFR39	23	TIS43	32	2SC1061	250
BC148B	10	BFR40/41	23	TIS44/5	45	2SC1096	85
BC148C	10	BFR79	23	TIS88A	50	2SC1173	125
BC149	9	BFR80/1	24	TIS90	30	2SC1306	100
BC149C	10	BFR98	105	TIS91	32	2SC1307	150
BC153/4	27	BFX29/84	28	VN10K	55	2SC1449	85
BC157/8	10	BFX85/6	28	VN66	80	2SC1678	140
BC159	11	BFX87/8	28	ZTX107	11	2SC1923	50
BC160	45	BFY51/2	23	ZTX109	12	2SC1945	225
BC167/8	10	BFY56	32	ZTX300	13	2SC1953	90
BC168C	10	BFY64	35	ZTX301/2	16	2SC1957	90
BC169C	10	BFY81	120	ZTX303	25	2SC1969	140
BC170	15	BRY39	40	ZTX304	17	2SC2028	85
BC172/3	11	BSX20	20	ZTX314	25	2SC2029	210
BC177/8	16	BSY95A	25	ZTX326	30	2SC2078	170
BC179/81	20	BU105	170	ZTX341	30	2SC2091	85
BC182/3	10	BU205	190	ZTX500	14	2SC2314	85
BC184	10	BU208	200	ZTX501/2	15	2SC2166	165
BC182L	10	E421	250	ZTX503	18	2SC1679	190
BC183L	10	MD8001	250	ZTX504	25	2N6027	32
BC184L	10	MJ400	150	ZTX531	25	3N128	112
BC187	26	MJ491	175	ZTX550	25	3N140	112
BC212	10	MJ2955	70	2N697	23	40311	60
BC212L	10	MJE340	54	2N698	40	40313	125
BC213	10	MJE370	100	2N699	48	40315	90
BC213L	10	MJE371	100	2N706A	19	40316	85
BC214	10	MJE2955	99	2N708	19	40361	70
BC214L	10	MJE3055	70	2N918	35	40362	70
BC236	10	MPF102	50	2N1131/2	24	40407/8	75
BC237	14	MPF103/4	30	2N1303	60	40411	280
BC307B	15	MPF105	30	2N1304/5	65	40467	95
BC308B	16	MPF106	40	2N1671B	160	40468	60
BC327	15	MPSA05	25	2N2219A	28	40594	90
BC338	15	MPSA06	25	2N2220A	26	40595	98
BC441	34	MPSA12	32	2N2221A	25	40603	90
BC461	34	MPSA55	30	2N2222A	25	40673	85
BC477	40	MPSA56	30	2N2369A	17		
BC516/7	40	MPSA70	25	2N2646	45		
BC547/8	12	MPSU06	55	2N2904/5	28		
BC549C	14	OC28	130	2N2906/7	26		
BC557/8	15	OC35	125	2N2926G	10		
BC559	15	OC36	75	2N3053	26		
BCY70	16	OC41/2	75	2N3054	58		
BCY71/2	20	OC43	55	2N3055	48		
BD131/2	48	OC44	75	2N3442	140		
BD133	60	OC45	40	2N3663	15		
BD135	45	OC70/71	40	2N3702/3	10		
BD136/7	40	OC74/76	50	2N3704/5	10		
BD138/9	40	OC81/82	50	2N3706/7	10		
		OC83/4	40	2N3708/9	10		

74LS (TEXAS)

74LS00	12	LS12	15	LS196	45
LS01	13	LS13	20	LS197	60
LS02	14	LS14	34	LS200	345
LS03	14	LS15	15	LS202	345
LS04	15	LS20	15	LS221	60
LS05	15	LS21	15	LS240	96
LS06	15	LS22	15	LS241	65
LS08	15	LS26	18	LS242	65
LS09	15	LS27	15	LS243	65
LS10	15	LS28	20	LS244	60
LS11	15	LS30	18	LS245	118
		LS32	15	LS247	40
		LS33	16	LS248	
		LS37	16	LS249	68
		LS38	16	LS251	30
		LS40	16	LS253	40
		LS42	28	LS257	48
		LS47	35	LS258	40
		LS48	80	LS259	58
		LS49	60	LS260	65
		LS51	15	LS261	195
		LS54	15	LS266	25
		LS55	30	LS273	60
		LS63	150	LS275	290
		LS73	25	LS279	30
		LS74	25	LS280	130
		LS75	28	LS283	45
		LS76	20	LS290	57
		LS78	24	LS293	46
		LS83	36	LS295	86
		LS85	70	LS298	85
		LS86	16	LS299	190
		LS90	35	LS300	175
		LS91	80	LS302	175
		LS92	36	LS320	270
		LS93	26	LS323	270
		LS95	45	LS324	200
		LS96	120	LS325	320
		LS107	43	LS326	330
		LS109	30	LS327	315
		LS112	26	LS347	150
		LS113	40	LS348	190
		LS114	35	LS365	37
		LS122	36	LS366	37
		LS123	36	LS367	37
		LS124	90	LS368	90
		LS125	24	LS373	75
		LS126	30	LS374	75
		LS132	40	LS375	43
		LS133	35	LS377	90
		LS136	24	LS378	69
		LS138	35	LS379	65
		LS139	38	LS384	250
		LS148	73	LS390	50
		LS151	39	LS393	45
		LS153	39	LS395	199
		LS155	39	LS398	275
		LS156	39	LS399	220
		LS157	26	LS445	140
		LS158	36	LS447	195
		LS160	35	LS490	245
		LS161	35	LS541	135
		LS162	35	LS668	175
		LS163	35	LS670	175
		LS164	40	LS673	550
		LS165	55	LS674	750
		LS166	55		
		LS170	75		
		LS173	72		
		LS174	72		
		LS175	58		
		LS181	95		
		LS183	275		
		LS190	58		
		LS191	58		
		LS192	58		
		LS193	65		
		LS194	35		
		LS195	35		

74S

74S00	60
74S132	138
74S138	240
74S158	240
74S188	210
74S189	158
74S194	360
74S201	620
74S241	540
74S262	850
74S287	325
74S288	210

VOLTAGE REGULATORS

1A +ve 5V, 12V 15, 18, 24V	50p
1A –ve	55p
100mA –ve 5V 6, 8, 12, 15V	30p
100mA –ve	65p
LM309K	135p
LM317K	350p
LM323K	500p
LM723	38p
78H05	550p
78HG05	650p
79HG	800p
TBA625B	75p

BRIDGE RECTIFIERS

1A/50V	20
1A/100V	22
1A/400V	29
2A/50V	35
2A/400V	46
2A/600V	65
6A/100V	83
6A/400V	95
10A/200V	215
10A/600V	350
25A/200V	240
25A/600V	395
BY164	56
VM18 DIL	50

SCRs THYRISTORS

1A/200V	58
5A/100V	32
5A/400V	40
5A/600V	48
8A/300V	60
8A/600V	95
12A/400V	95
12A/800V	188
BT106	150
BT116	180
C106D	38
TIC44	24
TIC47	35
2N4444	130

TRIACS

3A/100V	48
3A/400V	56
3A/800V	85p
8A/100V	60
8A/400V	69
8A/800V	115
12A/100V	78
12A/400V	82
12A/800V	135
16A/400V	105
16A/800V	220
25A/400V	185
25A/800V	295
30A/400V	525
T2800D	120

DIAC
ST2 **25p**

DIODES

AA119	15
BY100	24
BY127	12
CR033	250
OA9	40
OA70	12
OA79	15
OA81	15
OA85	15
OA90	8
OA91	8
OA95	8
OA200	8
OA202	8
1N914	4
1N916	5
1N4001/2	5
1N4003/4	6
1N4005/6	6
1N4007	7
1N4148	4
3A/100V	15
3A/400V	16
3A/600V	17
3A/1000V	19
6A/400V	50
6A/800V	65

NOISE DIODE
Z5J **195**

ZENERS
2V7 to 39V 400mW **8p**
3V3 to 33V 1·3W **15p**

VARICAPS

	55
MVAM2	158p
BA102	50p
BB104	40
BB105B	40
BB106	40

LINEAR IC's

702	75	LM380	75	TA7310	175
709C 8 pin	35	LM381N	145	TAA621AX1	295
710*	48	LM382	125	TAA661A	190
733	75	LM386	90	TBA120S	70
741 8 pin	14	LM387	120	TBA641-A12/BX1 or BX11	350
747C 14 pin	65	LM389	95	TBA651	190
748C 8 pin	36	LM1458	45	TBA800	80
753 8 pin	185	LM3900	50	TBA810S	95
810	159	LM3909N	85	TBA820	80
9400CJ	350	LM3911	125	TBA920Q	290
AY-1-0212	675	LM3914	180	TCA965	120
AY-1-1320	225	LM3915	200	TDA1004	290
AY-1-5050	99	LM3916	220	TDA1008	310
AY-3-1270	840	LS7220	280	TDA1022	525
AY-3-8910	440	M252AA	625	TDA1024	105
AY-5-1230	450	M253AA	1150	TDA1490	290
AY-5-8100	775	MB3756	440	TDA2020	320
CA3020	186	MS1513L	230	TDA2030	320
CA3028A	80	MS1515L	320	TL061CP	40
CA3043	275	MC1304P	260	TL062CP	60
CA3045	365	MC1310P	150	TL064CN	98
CA3046	70	MC1495	350	TL071CP	24
CA3048	214	MC1496L	70	TL072CP	45
CA3059	225	MC1596	225	TL074CN	100
CA3080E	70	MC3340P	120	TL081CP	24
CA3089E	215	MC3360P	120	TL082CP	45
CA3090AQ	375	MC3403	75	TL083CP	75
CA3130	90	MC3405	150	TL084CN	90
CA3140	40	MFC6040	97	UA2240	120
CA3189	200	MK50398	635	UAA170	170
HA1336W	240	MM5303	635	UAA180	170
ICL7106	750	MM5307	1275	UAA1003	935
ICL7107	975	MSM5526	820	UPC575	270
ICL8038CC	300	NE543K	225	UPC1025H	375
ICM7205	1150	NE544	210	UPC1156	270
ICM7215	1050	NE5534	125	UPC1182	330
ICM7216A	1950	NE555	16	XR2206	350
ICM7217A	790	NE556DB	45	XR2266	360
ICM7555	80	NE560	325	ZN414	88
LA3350	250	NE561	395	ZN424E	130
LA4031P	340	NE562B	410	ZN425E	345
LA4032	295	NE564	420	ZN426E	300
LA4400	440	NE565A	120	ZN427	600
LC7210	300	NE566	120	ZN1034	200
LC7130	340	NE567V	140	ZN1040E	675
LF351	48	NE570	410		
LF353	95	NE571	400		
LF355	85	RC4136D	69		
LF356	95	S566B	245		
LM10	325	SAB3209	425		
LM13600	125	SAB3210	295		
LM301A	24	SN76013N	350		
LM308T	95	SN76023N	350		
LM311H	70	SN76033N	350		
LM318	150	SN76477	350		
LM324	30	SP8629	299		
LM339	47	TA7120	150		
LM348	64	TA7130	160		
LM349	115	TA7204	200		
LM379	480	TA7205A	90		
		TA7222	175		

COMPUTER ICs.

1702	350	4118-200	400
1802CP	650	4164-200	450
2114L 300n	87	4315 CMOS	795
2114L 200n	87	4334-3	325
2532 32K	365	4816	225
2708	175	4864-3	785
2716-5V	215	6116-150N	390
2732 450	380	6502	325
2764	£13	6520	115
4116-200N	80	6521	150
		6522	320
		6545	999
		6551	650
		6800	300
		6802	400
		6804	160
		6805	670
		6807	997
		6810	120
		6820	115
		6821	150
		6840	385
		6845	975
		6847	850
		6850	150
		6852	255
		8080A	260
		8085A	85
		81LS95	83
		81LS96	83
		81LS97	90
		8224	200
		8251	320
		8253	799
		8T26A	99
		8T28A	140
		8T95N	99
		8T97N	99
		AY-3-1015	300
		AY-5-1013	300
		AY-5-2376	700
		DS3691N	00
		DS88LS120N	00
		MC1488	55
		MC1489	55
		MC14411	690
		MC14412	790
		MM5280D	695
		RO-3-2513	600
		SFF96364E	800
		TMS6011	365
		ULN2003	100
		UPD7002	438
		Z80 CPU	350
		Z80ACPU 4	385
		Z80 DART	450
		Z80PIO	290
		Z80APIO	320
		Z80A DART	550
		Z80CTC	265
		Z80A CTC	290

TTL 74 (TEXAS)

7400	11	90	20	74181	140
7401	11	91	45	74182	75
7402	11	92	30	74184	99
7403	14	93	30	74185	99
7404	14	94	34	74188	250
7405	18	95	50	74190	48
7406	20	96	45	74191	46
7407	20	97	90	74192	46
7408	16	100	85	74193	65
7409	16	104	54	74194	45
7410	14	105	55	74195	46
7411	20	107	20	74196	46
7412	20	109	35	74197	46
7413	24	110	40	74198	84
7414	32	111	55	74199	84
7416	25	112	170	74221	54
7417	20	116	50	74246	150
7420	16	118	80	74247	150
7421	20	119	90	74248	150
7422	20	120	75	74249	150
7423	22	121	25	74251	80
7425	28	122	45	74259	150
7426	30	123	40	74265	65
7427	27	125	42	74273	195
7428	28	126	40	74278	100
7430	16	128	35	74279	90
7432	26	132	30	74283	50
7433	22	136	28	74298	100
7437	27	141	55	74365	55
7438	27	142	190	74366	55
7440	17	143	250	74367	55
7441	68	144	250	74368	55
7442	38	145	70	74390	99
7443	90	147	99	74393	99
7444	90	148	75	74490	120
7445	65	150	50		
7446	60	151	45		
7447	50	153	45		
7448	50	154	75		
7450	16	155	75		
7451	16	156	75		
7453	16	157	45		
7454	16	159	99		
7460	16	160	60		
7470	35	161	48		
7472	24	162	48		
7473	24	163	48		
7474	20	164	48		
7475	40	165	48		
7476	30	166	48		
7480	48	167	150		
7481	120	170	168		
7482	70	172	290		
7483	38	173	65		
7484	80	174	54		
7485	60	175	50		
7486	20	176	55		
7489	205	177	75		
		178	95		
		180	65		

CMOS*

4000	14	4027	38	4161	99	40104	95
4001	14	4028	58	4162	99	40105	115
4002	14	4029	77	4163	99	40106	75
4006	66	4030	50	4174	99	40107	60
4007	18	4031	170	4175	105	40108	450
4008	62	4032	80	4194	105	40109	100
4009	35	4033	165	4408	790	40110	300
4010	40	4034	195	4409	790	40114	240
4011	15	4035	95	4410	725	40163	65
4012	18	4036	275	4411	695	40193	68
4013	34	4037	110	4412	800	40244	195
4014	75	4038	110	4415	480	40245	195
4015	66	4039	290	4419	280	40373	240
4016	32	4040	59	4422	770	40374	245
4017	38	4041	78	4433	770		
4018	68	4042	60	4435	850		
4019	42	4043	70	4440	999		
4020	61	4044	65	4450	350		
4021	70	4045	170	4451	350		
4022	66	4046	65	4490	350		
4023	20	4047	50	4500	675		
4024	32	4048	55	4501	28		
4025	19	4049	30	4502	90		
4026	130	4050	30	4503	50		
		4051	78	4504	105		
		4052	78	4506	65		
		4053	78	4508	130		
		4054	85	4510	46		
		4055	85	4511	45		
		4056	85	4512	75		
		4057	1915	4513	199		
		4059	480	4514	115		
		4060	60	4515	115		
		4061	1225	4516	55		
		4062	995	4517	415		
		4063	99	4518	42		
		4066	36	4519	29		
		4067	245	4520	50		
		4068	22	4521	110		
		4069	20	4522	125		
		4070	26	4526	95		
		4071	20	4527	65		
		4072	20	4528	80		
		4073	20	4529	150		
		4075	20	4530	90		
		4076	46	4531	130		
		4077	26	4532	70		
		4078	26	4534	455		
		4081	26	4536	275		
		4082	21	4538	90		
		4085	65	4543	80		
		4086	52	4553	245		
		4089	140	4560	160		
		4093	26	4566	165		
		4094	168	4569	175		
		4095	90	4599	290		
		4096	70	40097	58		
		4097	320	40100	215		
		4098	88	40101	130		
		4099	95	40102	180		
		4160	95	40103	175		

INDEX TO ADVERTISERS

Published on approximately the 7th of each month by IPC Magazines Limited, 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 and Gotch (Asia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions INLAND and OVERSEAS £13·00 payable to IPC Services, Oakfield House, Perrymount Road, Haywards Heath, Sussex. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

AMCOMM are making it even easier to buy your favourite equipment. A choice of easy payments to suit you! (1) Interest free payments from ⅓ deposit. (2) 1% deposit with balance payable your choice up to 3 years and all with 2 year guarantee. Write or call for written details. Free items excluded.

Send 50p for our bumper bundle literature

All items advertised in stock at time of going to press.

YAESU FT 1
'An Astonishment'

An adventure in electronics – and more! An astonishing piece of design and product engineering. Think of a feature, a facility, performance, reliability, flexibility, ergonomics, and value for money. The FT 1 has it all! We have the FT 1 complete with FM facility, AM and CW filter, keyer and microphone and two year guarantee – You have it! P.O.A.

ICOM 730
Mobile or Base Transceiver

An extremely compact 8 Band Transceiver with an output of 100 watts RF, dual VFO's with 10Hz, 100Hz and 1KHz tuning rate – plus an abundance of features including pass band tuning facility. **N.B.** Preamp and SWR Detector. **£586.00** including VAT and carriage. **Two year guarantee.**

YAESU FRG 7700
General Coverage Receiver
150Hz – 30MHz

Must be top of your list when shopping for a Receiver. You'll find it rewarding to use an antenna tuning unit and even more rewarding to get one from us! Buy an FRG 7700 or FRG 7700M and you can have the matching unit FRT 7700 completely **FREE.**
FRG 7700 + FRT 7700 **£329.00**
FRG 7700M + FRT 7700 **£409.00**
Carriage and VAT included.
Two year guarantee.

YAESU FT 230R

Yaesu FT 230R 25 Watt, 2M Mobile 2 VFO's – 10 memories – priority – reverse repeater – scans band and memory. LCD readout in 12.5/25 KHz steps. We'll give you a FREE super 7/8 mobile antenna to go with it at **£239.00** including carriage and VAT.
Two year guarantee.

YAESU FT 290R

The world's leading portable from Yaesu, "the people who know your needs". 2.5 Watt all mode SSB/CM/FM, 10 memories – Price **£249.00** includes FREE nicads and charger, carriage and VAT.
Two year guarantee.

YAESU FT 480R

Big performance mobile station offering you all the options you expect in such a piece of equipment – all mode – full scanning, two VFO's, satellite mode etc. Price includes absolutely FREE your own choice from our stock, any VHF base or mobile antenna at **£379.00** including VAT and carriage.
Two year guarantee.

ICOM 720A
General coverage or amateur transceiver.

Silky smooth tuning and easy operation makes this a delight for the amateur or commercial operator – a host of features which make it ICOM's pride and joy. It can be yours, too, at **£883.00** VAT and carriage paid.
IC PS20 with speaker available at **£130.00.**
Two year guarantee.

YAESU FT 101ZD MKIII AM or FM

We think everybody knows the 101 story! If you don't, listen around. It means value for money – and we'll even include FREE a choice of suitable microphones. The Shure 444D or Shure 526R including carriage and VAT at **£665.00.**
Two year guarantee.

ICOM IC 290E

2 mtr. all mode with 5 memories from which priority channel can be selected – twin VFO's, scanning, reverse repeater – 25KHz tuning rate on FM 100Hz on SSB.
£369.00 including VAT and carriage.
Two year guarantee.

BARCLAYCARD VISA

AMCOMM

OPPOSITE SOUTH HARROW TUBE STATION ON THE PICCADILLY LINE

Amcomm Services,
194, Northolt Road, South Harrow, Middlesex HA0 2EN.
Telephone: 01-864 1166, 01-422 9585.
Telex: 24263.

SHOWROOM OPENING HOURS
TUESDAY TO SATURDAY
10.00 – 6.00 CONTINUOUS

ALL ITEMS OVER £300 AVAILABLE ON EASY TERMS AT CASH PRICE

BY TWO WAY FREEPOST E.&O.E.

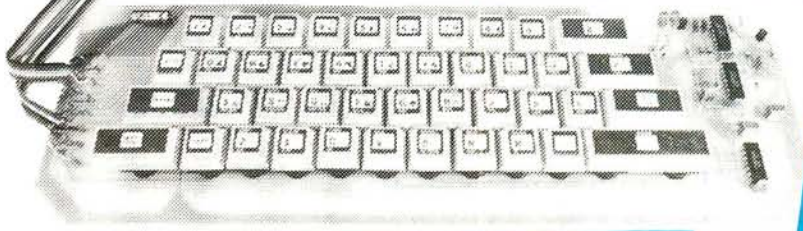
Amcomm Services,
Freepost, Harrow, Middlesex HA2 0BR.
Please send me _____
at _____ enclosed cheque/P.O. for
_____ or charge my VISA/ACCESS
No. _____
Name _____
Address _____
_____ post code _____
PW982

Make it with MAPLIN

KEYBOARD KIT WITH ELECTRONICS FOR ZX81

* A full size, full travel 43-key keyboard that's simple to add to your ZX81 (no soldering in ZX81).
* Complete with the electronics to make "Shift Lock", "Function" and "Graphics 2" single key selections making entry far easier.
* Powered from ZX81's own standard power supply – with special adaptor supplied.
* Two-colour print for key caps.
* Amazing low price.

Full details in our projects book. Price **60p.** Order As XA03D.
Complete kit for only **£19.95** incl. VAT and carriage. Order As LW72P.

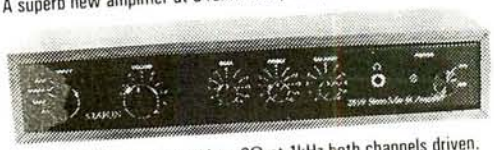


MATINÉE ORGAN

Easy-to-build, superb specification. Comparable with organs selling for up to £1,000. Full construction details in our book. Price **£2.50.** Order As XH55K.
Complete kits available:
Electronics – **£299.95,**
Cabinet – **£99.50** (carriage extra).
Demo cassette price **£1.99.** Order As XX43W.

25W STEREO MOSFET AMPLIFIER

A superb new amplifier at a remarkably low price.



* Over 26W per channel into 8Ω at 1kHz both channels driven.
* Frequency response 20Hz to 40kHz ±1dB.
* Low distortion, low noise and high reliability power MOSFET output stage.
* Extremely easy to build. Almost everything fits on main pcb, cutting interwiring to just 7 wires (plus toroidal transformer and mains lead terminations).
* Complete kit contains everything you need including pre-drilled and printed chassis and wooden cabinet.

Full details in our projects book. Price **60p.** Order As XA03D
Complete kit for only **£49.95** incl. VAT and carriage. Order As LW71N

HOME SECURITY SYSTEM

Six independent channels – 2 or 4 wire operation. External horn. High degree of protection and long term reliability. Full details in our projects book.
Price **60p.**
Order As XA02C.

Maplin launches MAPCARD

A new way of buying from Maplin!
Now Maplin have their own credit card.
You could have one too!

APPLY NOW!

Write to our Rayleigh address for details or pick up a leaflet in our shops.

MAPLIN'S FANTASTIC PROJECTS

Full details in our project books only **60p** each.

In Book 1 (XA01B) 120W rms MOSFET Combo-Amplifier · Universal Timer with 18 program times and 4 outputs · Temperature Gauge · Six Vero Projects

In Book 2 (XA02C) Home Security System · Train Controller for 14 trains on one circuit · Stopwatch with multiple modes · Miles-per-Gallon Meter

In Book 3 (XA03D) ZX81 Keyboard with electronics · Stereo 25W MOSFET Amplifier · Doppler Radar Intruder Detector · Remote Control for Train Controller

In Book 4 (XA04E)* Telephone Exchange expandable up to 32 extensions · Ultrasonic Intruder Detector · Frequency Counter 10Hz to 650MHz · Remote Control for 25W Stereo Amplifier

**Projects for book 4 were in an advanced state at the time of writing, but contents may change prior to publication (due 14th Aug 1982).*

MORE GREAT KITS FROM MAPLIN

Matinée Organ (see box above)
Spectrum Synthesiser. Full details in book XH56L. Price **£1.00**
3800 Synthesiser, 5600S Synthesiser } Full details in book XF11M. Price **£2.00**
150W Power Amp Kit LW32K. Price **£17.95***
75W MOSFET Power Amp Kit LW51F. Price **£11.49***
50W Power Amp Kit LW35Q. Price **£14.95***
15W Power Amp Kit YQ43W. Price **£6.45***
8W Power Amp Kit LW36P. Price **£4.45***
**Construction details with kit.* *(Power supply not included – details with kit).*

NEW SHOP IN BIRMINGHAM

Visit our brand new shop in Birmingham for our complete range of electronic components and computers.

Come and see us at **Lynton Square, Perry Barr, Birmingham** (just off the junction of the Outer Ring Road A4040 and Birchfield Road A34). **Tel: 021-356-7292.** Excellent free parking.

Opening Tuesday 24th August, 1982

Don't miss out – get a copy of our catalogue now!
Over 140,000 copies sold already!

On sale now in all branches of WHSMITH price £1.

320 big pages packed with data and pictures of over 5,500 items.

Post this coupon now!

Please send me a copy of your 320 page catalogue. I enclose £1.25 (inc. 25p p&p). If I am not completely satisfied I may return the catalogue to you and have my money refunded.
If you live outside the U.K. send £1.68 or 12 International Reply Coupons.

Name _____

Address _____

_____

PW882

MAPLIN ELECTRONIC SUPPLIES LTD.

All mail to:
P.O. Box 3, Rayleigh, Essex SS6 8LR
Tel: **Sales (0702) 552911 General (0702) 554155**

Shops at:
159 King St., Hammersmith, London W6. Tel: 01-748 0926
284 London Rd., Westcliff-on-Sea, Essex. Tel: (0702) 554000
Lynton Square, Perry Barr, Birmingham. Tel: (021) 356 7292
Note: Shops closed Mondays