60p

The SHORT WAVE Magazine

VOL. XLI DECEMBER 1983 NUMBER 10

LOWE SHOPS

in Matlock

0629.2817 2430 4057 4995
Lowe Electronics in Matlock, located on the Chesterfield road out of Matlock, that is the A632 and open Tuesday to Friday from 9am to 5.30pm (closed for lunch 12.30 to 1.30) and Saturday, open all day from 9am to 5pm. A visit to Matlock can be an outing for the family, the local scenery, the Heights of Abraham, Lovers Walk etc. Ample free parking in our car park and when you have browsed then lunch in one of the towns pleasant restaurants. Amateur Radio with the family in mind.

in Glasgow

041.945.2626
Lowe Electronics in Glasgow, located at 4/5 Queen Margarets Road, which you will find off Queen Margarets Drive (take Great Western road out of the City and turn right at the Botanical Gardens traffic lights). A quiet sedate part of the city, easy street parking and a warm welcome from Sim, our shop manager. Open all day from Tuesday to Saturday, 9am till 5.30pm during the week and 9am till 5pm on Saturday. Whilst in the area the Botanical Gardens are well worth a visit. The Glasgow Shop has a full display of our range of amateur radio products and a stock room to meet your every demand. For your Amateur Radio needs visit Lowe Electronics in Glasgow.

in Darlington

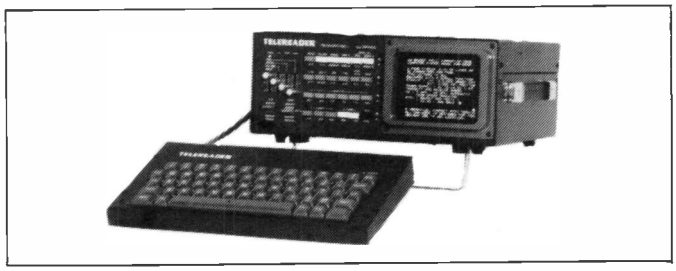
0325.486121
Lowe Electronics in the North East of England, set in the delightful market town of Darlington, the shop displays the full range of amateur products sold by the company. Our address in the town is 56 North Road, that is the A167 Durham road out of Darlington. Open Tuesday to Friday from 9am till 5.30pm, Saturday from 9am till 5pm (closed for lunch 12.30 to 1.30). A huge free car park across the road, a large supermarket, bistro restaurant and banking facilities combine to make a visit to this delightful market town a pleasure for the whole family.

in London

01.837.6702
Lowe Electronics in London, our shop in the Capital City, easily found on the lower sales floor of the Hepworths' shop on Pentonville Road, within 3 minutes walk of Kings Cross railway station. Open all day Monday to Saturday, six days a week, from 9.30am to 5.30pm during the week and from 9.30am to 5pm on Saturday, a warm and courteous welcome, together with sound advice awaits those who enter. The entire range of amateur products is on display, backed by a considerable amount of stock. When in the City, visit Lowe Electronics.

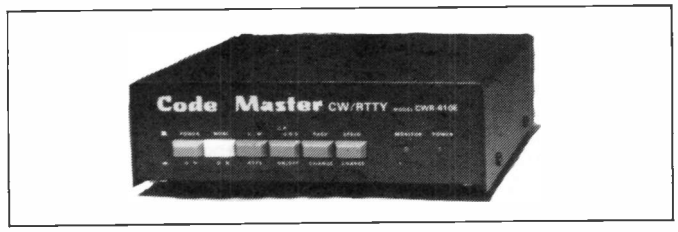
please add **TELEREADER** to the list

We are pleased to announce that the company has recently been appointed U.K. distributors for the **TELEREADER** range of equipment. Those of you who have seen **TELEREADER** products will know that outstanding performance allied with ease of operation are the hallmarks of this particular company. The three models in our range are the **TELEREADER CWR685E** combined transmitter and receiver, the **TELEREADER CWR670E** having receive only and the CODE MASTER CWR610E which not only receives CW and RTTY (Baudot and ASCII) but doubles as a morse tutor.



The **TELEREADER CWR685E** has many outstanding features:
CW, Baudot and ASCII receive and transmit: CW at 3-40 wpm, RTTY at 45.45-300 bauds (six speeds): ASCII transmission/reception of both upper and lower case letters.
Built-in 5" green phosphor screen giving a clarity and brightness that I have not seen before.
A 4 page display giving 32 characters x 20 lines.
An external QWERTY keyboard housed in a substantial metal case and supplied with 3 feet of connecting cable. Not a ''rubber key or plastic faced touchpad'' but a true moving keyboard.
6 Memory channels (63 character capacity each). If required total memory capacity can be allocated to one channel. In addition the 4 standard test transmissions (RY, QBF, Baudot all characters, ASCII all characters) are permanently stored in memory and can be recalled and transmitted in a variety of formats. 480 characters of transmitting buffer memory are also included.
Automatic and manual transmit/receive switching.
Printer output: Centronics compatible parallel interface for hard copy.

The **TELEREADER CWR670E** has a similar specification to the CWR685E but does not include the transmit facility or the built-in 5" green monitor. The CWR670E provides for both the enthusiastic radio amateur and short wave listener access to both the amateur and commercial world of RTTY as well as providing a visual display of received morse code.



The **TELEREADER CWR610E** Code Master is a compact morse and RTTY converter which also includes an audio-visual morse tutor.
Features of the CWR610E Code Master are:
CW, RTTY (Baudot and ASCII reception)
CW: 3-40 wpm, Baudot/ASCII: 45.45-600 bauds (seven speeds)
CW morse practice at 2-30 wpm.
Display characters: 612 characters x 2 pages.
Centronics compatible parallel interface for printer output.
UHF/VIDEO display output.
12 Volt DC operation.

TELEREADER CWR685E..... £730.94 inc. VAT. carr. £6.00
TELEREADER CWR670E..... £335.00 inc. VAT. carr. £6.00
TELEREADER CWR610E..... £175.00 inc. VAT. carr. £6.00

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.
(Delivery of stock items normally by return of post)

There were shepherds abiding in the field, keeping watch over their flocks by night. And lo, the angel of the Lord came upon them, and the glory of the Lord shone about them, and they were sore afraid.

And the angel said unto them, "fear not, for behold I bring you good tidings of great joy, which shall be to all people. For unto you is born this day, in the city of David, a Saviour which is Christ the Lord".

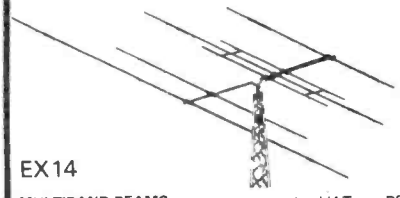
And suddenly there was with the angel a multitude of the heavenly host, praising God, and saying:

"Glory to God, glory to God in the highest, and peace on earth, goodwill towards men".

LUKE 2 V 8 to 14

HF ANTENNAS

S.M.C. have the greatest range of H.F. antennas eg., Multi Beams/Quads, over 20 models. Shown below is the sensational new Explorer 14 – contact us for full details.



EX14

MULTIBAND BEAMS		Inc VAT	P&P
EX14	Explorer 10-20	P.O.A.	
TH3JN	3 Ele 10-20	£202.40	£3.50
TH2MK3	2 Ele 10-20	£169.05	£3.50
TH3MK3	3 Ele 10-20	£274.85	£5.30
TH5DXX	5 Ele 10-20	£419.75	£6.70
TH7DXX	7 Ele 10-20	£511.75	£8.75
TB3	3 Ele 10-20 Jaybeam	£181.70	£5.40
HQ1	Mini Quad 10-20	£139.00	£4.00
G4MH	Mini Beam 1-20	£82.50	£4.00
TA33JNR	3 Ele 10-20 Moseley	£161.00	£3.40
Mustang 2	2 Ele 10-20 Moseley	£177.10	£3.50
Mustang 3	3 Ele 10-20	£220.80	£3.70
GQ2E	2 Ele 10-20 Quad	£189.75	£5.40
GQ3E	3 Ele 10-20 Quad	£313.95	£9.20
GQ4E	4 Ele 10-20 Quad	£446.20	£10.00
Hyquad	2 Ele 10-20	£171.35	£6.70
LP1007	Log Periodic 13-20 MHz	£1474.30	DIST
3Y1015D20	3 Ele 10-20m	£134.95	£5.00
DB10/15A	3 Ele 10-15m	£198.95	£4.80

TB3

MONO BAND BEAMS			
103BA	3 Ele Yagi 10M	£67.85	£3.50
106BA	5 Ele Yagi 10M	£155.25	£3.75
153BA	3 Ele Yagi 15M	£90.85	£3.50
155BA	5 Ele Yagi 15M	£236.90	£5.90
203BA	3 Ele Yagi 20M	£178.25	£4.90
204BA	4 Ele Yagi 20M	£286.35	£7.30
205BA	5 Ele Yagi 20M	£396.75	£9.40
402BA	2 Ele Yagi 40M	£247.25	£6.50
18TD	Dipole Tape 10-80M		

HF5V

HF5R

VERTICALS			
12AVQ	Vertical 10-20M	£50.60	£2.75
14AVQ	Vertical 10-40M	£64.40	£2.75
18AVT/WB	Vertical 10-80M	£113.85	£2.75
18V	Vertical 10-80M taped	£36.22	£2.75
C4	Vertical 10-20	£59.00	£2.50
SMCHF5	Vertical 10-80	£54.80	£2.50
SMCHF5P	Radial Kit for above	£34.90	£2.50
TRAP DIPOLE			
SMCTD/HP	High Power 10-80M	£43.41	£2.50
SMCTP/P	Portable inc coax	£59.80	£2.50
MOBILE			
Tribander	10-20M Slide sw.	£25.88	£1.50
Multiband	10-20M	£30.48	£1.50
Flexiwhip	10M only	£18.11	£1.85
Extra Coils	For above to 160m	£5.70	£1.00
Flexiten	2, 10, 12, 17, 18, 20, 30, 40, 80M	£49.00	£2.00
Bases	For above	£5.75	£1.00

NB: PRICES INCLUDE VAT AT 15%
Carriage extra. Mainland rate shown.

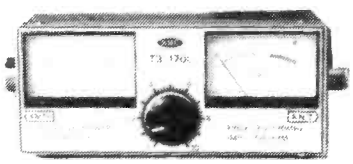
POWER METERS

IN LINE POWER/SWR BRIDGES P.E.P., R.M.S. 1·8-440 MHz

The Hansen range covers 30 quality models with top-of-the-line the FS710. This is a flat frequency response peak envelope power and average in-line wattmeter with many novel features. Notable being the 'power independent' SWR scale – no forward power calibration knob, just direct reading SWR.

HANSEN FS500H

HANSEN		P&P
FS710H	1.8-60 MHz 15/150/1500W Pep	£89.70 FOC
FS710V	50-150 MHz 15/150W Pep	£89.70 FOC
FS50HP	1.8-60MHz 20/200/2000W Pep	£89.70 FOC
FS50VP	50-150MHz 20/200W Pep	£89.70 FOC
FS500H	1.8-80 MHz 20/200/2000W Pep	£69.75 FOC
FS500V	50-150 MHz 20/200W Pep	£69.75 FOC
FS300H	1.8-60MHz 20/200/1000	£46.40 FOC
FS300V	50-150 MHz 20/200	£46.40 FOC
FS200	1.8-150 MHz 20/200 Pep	£50.60 FOC
FS601M	1.8-30 MHz 20/200W Pep	£51.35 FOC
FS601MH	1.8-30 MHz 200/2000W Pep	£51.35 FOC
FS602M	50-150 MHz 20/200W Pep	£51.35 FOC
FS603M	430-440 MHz 5/20W Pep	£51.35 FOC
FS210	1.8-150 MHz 20/200W Auto SWR	£55.20 FOC
FS301M	2-30 MHz 20/200W	£35.65 FOC
FS301MH	2-30 MHz 200/2000W	£35.65 FOC
FS302M	50-150 MHz 20/200W	£35.65 FOC
FS711H	2-30 MHz 20/200W Head	£36.80 FOC
FS711V	50-150 MHz 20/200W Head	£36.80 FOC
FS711U	430-440 MHz 5/20W Head	£36.80 FOC
HB1	FS711H Coupler	£23.75 FOC
VB1	FS711V Coupler	£23.75 FOC
UB1	FS711U Coupler	£23.75 FOC
FS5E	3.5-150 MHz 20/200/1000W HF	£37.20 FOC
FS5S	1.8-150 MHz 20/200/1000W HF	£37.95 FOC
FS7	145 & (432 MHz) 5/20/200 144	£41.00 FOC
SWR3E	3.5-150 MHz 20/200/1000W HF	£25.00 FOC
SWR3S	3.5-150 MHz F/S Meter ant.	£26.45 FOC
SWR50B	3.5-150 MHz Twin Meter	£26.45 FOC
FS20D	3-150 MHz 5/20W	£37.95 FOC
FS-800	1.8-150 MHz 6/30/150W	£115.00 FOC
JD		
JD110	1.5-150 MHz 10/100W	£13.80 FOC
MIRAGE		
MP2	50-150 MHz 50/500/1500W Pep	£100.00 FOC
SMC		
S3-30L	Mini	£8.80 FOC
T3-170L	3.5-170 MHz Relative	£14.95 FOC



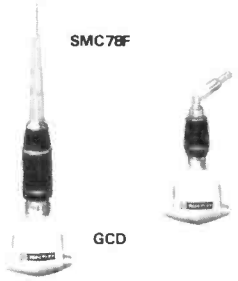
SMC T3170L

NB: PRICES INCLUDE VAT AT 15%
Carriage free by post

SMC-HS

HF, VHF, UHF ANTENNAS MOBILE VERTICALS

SMC-HS Mobile Elements, tabulated below, feature an inbuilt PL259M connector, which mates with the SO239M on any of the four standard mounts. This arrangement is ideal for easy removal – band changes, comparative test, car wash, and anti-vandal, system checks from the feed point, portable operation and for ease of garaging, etc. All models have fold over bases (either lift and lay or locking collar) except the 78B which has an inbuilt ball in case the mount must be fitted askew.



	SMC-HS MOBILE ANTENNA	P&P	
SMC6P2T/PL	Telescopic 2M PL259 fitting 0dB¼	£3.45	£0.60
SMC6P2T/BNC	Telescopic 2M BNC fitting 0dB¼	£5.00	£0.60
SMC2H/PL	Helical 2M PL259 fitting	£3.45	£0.60
SMC2H/BNC	Helical 2M BNC fitting	£5.00	£0.60
SMCHS430	70cm ½ wave BNC fitting 2.5dB¼	£6.90	£0.60
SMC2QW	2M ¼ wave 0dB¼ 1.6'	£2.30	£1.50
SMC2NE	2M ⅝ wave fold 3.0dB¼ 4.3'	£6.90	£1.80
SMC2VF	2M ½ wave fold 3.0dB¼ 3.5'	£11.50	£1.80
SMC78F	2M ⅞ wave fold 4.5dB¼ 5.7'	£13.80	£2.00
SMC78B	2M ⅞ wave ball 4.5dB¼ 5.6'	£13.80	£2.00
SMC78SF	2M ⅞ wave short 4.7'	£13.00	£2.00
SMC88F	2M 8/8 wave 5.2dB¼ 6.5'	£18.80	£2.00
SMC118M	Colinear 2M 11/8 wave fold 7dB¼ 9.7'	£29.90	£2.50
SMC258	70cm 2 x ⅝ fold 5.5dB¼ 3.1'	£12.65	£1.80
SMC358	70cm 3 x ⅝ 6.3dB¼ 4.7'	£16.85	£1.80
SMC70N2M	Dual band 2M 2.7dB¼ 70cm 5.1dB¼	£16.85	£1.80
SMCHS770	144/432 Duplexer 50W	£15.35	£1.50
SMC20SE	20M 1.72M 'fold over' 100W PEP	£17.65	£2.00
SMC15SE	15M 1.72M 'fold over' 130W PEP	£14.55	£2.00
SMC10SE	10M 1.72M 'fold over' 200W PEP	£13.80	£2.00
SMC17SE	17M 1.915M 'fold over' 200W PEP	£15.70	£2.00
SMC12SE	12M 1.915M 'fold over' 200W PEP	£14.20	£2.00
SMCGCCA	Gutter clip 4 mtrs cable	£9.95	£1.80
SMCSOCA	Cable assembly 4M	£5.00	£1.20
SMCSOCAL	Cable assembly 6M	£5.35	£1.20
SMCTMCAS	Trunk mount c/w 6M cable	£8.45	£1.80
SMCSOMM	Magnetic base c/w 4M cable	£9.95	£1.80
SMCSOWM	Adjustable wing mount base	£4.20	£0.90
SMCGCD	Gutter clip deluxe	£4.60	£1.20
SMCBSD	Bumper strap deluxe	£8.80	£1.20
HS88BK	Bumper mounted extension for 144 MHz ant.	£18.80	£1.80

SOMM HS770

NB: PRICES INCLUDE VAT AT 15%

SEND US AN A4 S.A.E. (20p) for our latest 26 page price list and catalogue. Information on Yaesu products, Antennas Towers, etc

SCANNING RECEIVER

MS-8400

New from SMC the MS-8400 VHF/UHF microprocessor controlled scanning receiver with 40 programmable memory channels, keyboard entry of frequency or command, automatic band search, AM and FM selectable 4 selectable scanning steps, priority channel, connections for external antenna and loudspeaker, speaker supplied c/w telescopic antenna mounting bracket, etc:

Frequency Range:

Low VHF	68,000MHz – 88,000MHz
Air Band	108,000MHz – 136,000MHz (Auto AM)
High VHF	136,005MHz – 174,000MHz
UHF	360,000MHz – 512,000MHz

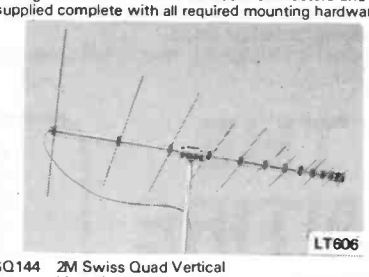
Scanning Steps: 5, 10, 12.5 and 25KHz VHF (10, 12.5 and 25 KHz UHF)
Channels: 40 programmable memories
Modes: AM or FM selectable
Scan rate: Approximately 18 channels per second
Scan delay: 2 second
Priority sampling: 4 second
Audio output: 1.2 Watts
Selectivity: Better than – 60dB @ ± 25KHz
Power supply: DC 12V — 16V 0.6A max
Memory back-up: 9 volt, battery (PP3)
Antenna: Telescopic antenna or External
Loudspeaker: 2.5" x 4" oval speaker
Size: 190(W) x 250(D) x 85(H) mm
Weight: 1.7kgs

£249.00 inc
price includes free carriage

SMC-HS

HF, VHF, UHF, BASE STATION ANTENNAS

SMC HS range of base station antennas covers from 80M through to 70cm. All have SO239M connectors and are supplied complete with all required mounting hardware.

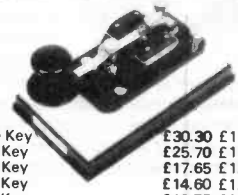


SQ144	2M Swiss Quad Vertical Mounting	£57.60	£2.50
GP2M	2M ⅝ c/w ground plane 3.4dB ¼	£18.00	£2.50
GP144W	2M 2 x ⅝ colinear 6.5dB ¼	£27.60	£2.50
GP23	2M 3 x ⅝ colinear 7.8dB ¼	£39.85	£2.50
GP432	70cm 3 x ⅝ colinear 6.8dB ¼	£29.90	£2.50
70N2V	2M/70cm colinear 2.8dB ¼/5.7dB ¼	£29.90	£2.50
HS770	2M/70cm Duplexer 50W 30dB isolation	£15.35	£1.50
VHFL	65-520 MHz Discone Rx only	£15.70	£2.50
GDX1	80-480 MHz Discone 3dB ¼	£40.25	£2.50
GDX2	50-480 MHz Discone 3dB ¼	£49.45	£2.50
GDXA	100-480 MHz Discone 3dB ¼	£33.75	£2.50
LT606	50-500 MHz Log Periodic 7-8dB	£115.00	£2.50
HF5V	Trapped Vertical 10-80M 5 bands	£54.80	£2.50
HF5R	Loaded Radial Kit	£34.90	£2.50
3Y1015D	20 3 ele 10, 15M Dipole 20M	£144.90	£5.00

NB: PRICES INCLUDE VAT AT 15%
Carriage extra, mainland rate shown

MORSE EQUIPMENT

HK808



MORSE KEYS

BKU1	Squeeze Key	£30.30	£1.20
HK703	Straight Key	£25.70	£1.20
HK704	Straight Key	£17.65	£1.20
HK706	Straight Key	£14.60	£1.00
HK707	Straight Key	£13.75	£1.00
HK710	Straight Key	£36.40	£1.75
HK808	Straight Key	£45.60	£1.75
HK711	Key Mounting	£29.50	£1.50
BK 100	Mechanical Bug	£22.25	£1.75
MK701	Single Lever Paddle	£25.25	£1.60
MK702	Single Lever Paddle	£26.45	£1.60
MK703	Squeeze Key	£25.96	£1.75
MK705	Squeeze Key	£22.60	£1.75
MK706	Squeeze Key	£19.50	£1.75
IKP60	Iambic	£9.95	FOC
SR1	Straight Key	£12.65	FOC
HK802	Deluxe solid brass key	£76.00	£2.00

MORSE EQUIPMENT

KP100	Squeeze CMOS 230/13.8V	£69.00	£2.00
KP200	Memory 4096 Multi Ch Mem Back Up 230/13.8V	£155.25	£2.50

Datong

D70	Morse Tutor	£56.35	FOC

MICROWAVE MODULES — RTTY EQUIPMENT

MM2001	RTTY to Demod./Convertor	£189.00	FOC
MM4001	RTTY Transceiver	£219.00	FOC
MM4000	1KB RTTY Transceiver c/w keybd	£299.00	FOC
MMS1	'Morse Talker'	£115.00	FOC
MMS2	Advanced 'Morse Talker'	£155.00	FOC
MM1000	ASCII to Morse Converter	£69.95	FOC
MM1000	KB ASCII to Morse conv c/w keybd	£89.00	FOC

PRICES INCLUDE VAT AT 15%
Mainland carriage where applicable

10M FM CORNER

£49.00 inc.

SMC OSCAR 2 10M FM

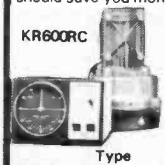
Join the many others who have found that operating 10M FM can be a pleasant alternative to the overcrowded 2M band. The SMC Oscar 2 10M gives you 40 channels, channel 1 being 29.310 MHz and channel 40 29.7 MHz, a power o/p of approximately 4 watts and a receive sensitivity of better than .3uV for 12db sinad. Also for your enjoyment when the band opens up, we have incorporated a — 100KHz repeater shift (by using the original front panel Hi/Low power switch), so from the car or at home you can enjoy 10M FM without having to pay £500 for an HF transceiver.

ACCESSORIES		INC	P/P
SMCGP27	½ x vertical CW radials	£24.15	£2.50
SMCVA27	½ x vertical no radials	£20.70	£2.50
SMC11VIIS	Glass fibre loaded ground plane	£29.90	£2.50
SMC10SE	10M Mobile whip	£13.80	£2.00
SMCGCCA	Gutter mount and cable	£9.96	£1.80
SMCSOCA	4M cable assembly	£5.00	£1.20
FLEXI 10	G. Whip mobile 10-80M	£49.00	£2.00
MULTIMOBILE	G. Whip mobile 10/15/20M	£30.48	£1.85
FLEXIWHIP	G. Whip 10M mobile	£18.11	£1.85
GW BASE	Base for all G. Whips	£5.75	
SMCT3170L	Twin meter SWR bridge	£14.95	FOC
SMC100LP30	Low pass filter	£5.30	FOC
SMCRU120406	4 Amp DC power unit	£15.00	£2.00
FSP1	Extension L/S	£11.15	FOC
MML 28/100S	10/100W + pre-amp	£129.25	
FS711C	Power/SWR met. 10/100W ranges	£24.55	

NB: PRICES INCLUDE VAT AT 15%
and carriage by post or Securicor

ROTATORS

The finest range: be it Kenpro, C.D.E., Channel Master, S.M.C. has over 19 models to choose from. Ask the experts for the right model to suit your requirements — it should save you money. Write, phone or call.



	Type		
RLD3	Bell	5 Core Light Duty	£40.25
505	Bell	5 Core Light Duty	£40.25
AR30	Offset	5 Core Light Duty	£56.35
KP250	Bell	6 Core Lighter Duty	£54.91
9502B	Offset	3 Core Lighter Duty	£56.92
AR22	Bell	4 Core Medium Duty	£67.85
9508	Offset	3 Core Medium Duty	£80.21
AR40	Bell	5 Core Medium Duty	£90.85
BT1	Bell	5 Core 4 Preset Medium	£91.43
KR400	Bell	6 Core Medium matches KR500	£97.75
KR500	Thro	6 Core Elevation	£112.12
AR50	Bell	5 Position Medium	£113.85
KR400RC	Bell	6 Core Medium Duty	£114.94
CD45	Bell	8 Core Heavy Duty	£136.85
KR600RC	Bell	8 Core Heavy Duty	£163.30
HAM IV	Bell	8 Core Heavier Duty	£258.75
KR2000RC	Bell	8 Core Heavier Duty	£314.52
T2X	Bell	8 Core Very Heavy Duty	£327.75
H300	Bell	8 Core Digital Readout	£493.35

Control Cable

RC4W	4 Way	28p/mtr	Carriage £1.80
RC5W	5 Way	33p/mtr	Carriage £1.80
RC6W	6 Way	51p/mtr	Carriage £1.80
RC8W	8 Way	55p/mtr	Carriage £1.80
9523	Support Bearing 9502	£15.81	Carriage £2.50
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4Y/4M	Yagi 4 element	7dBd	£29.90	£2.20
PMH2/4M	Phasing harness 2-way		£16.10	£1.50

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HM/2M	Halo with 24" mast	0dBd	£6.55	£1.50
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LW8/2M	Yagi 8 element	9.5dBd	£17.82	£2.50
LW10/2M	Yagi 10 element	10.5dBd	£24.15	£2.50
LW16/2M	Yagi 16 element	13.4dBd	£35.07	£3.20
14Y/2M	Yagi 14 element	12.8dBd	£36.23	£3.20
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PBM14/2M	14 ele Parabeam	13.7dBd	£55.77	£3.20
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Q6/2M	Quad 6 element	10.9dBd	£39.10	£2.50
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D5/2M	Yagi 5 over 5 slot	10dBd	£25.30	£2.50
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5XY/2M	Yagi 5 ele crossed	7.8dBd	£28.17	£2.50
8XY/2M	Yagi 8 ele crossed	9.5dBd	£35.65	£2.50
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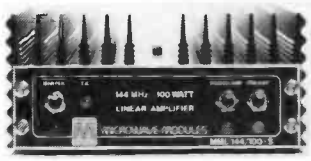

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SHORT WAVE MAGAZINE

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CONTENTS

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AUTHOR'S MSS

Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of A4 sheets. Photographs should be lightly identified in pencil on the back with details on a separate sheet. All drawings and diagrams should also be shown separately, and tables of values prepared in accordance with our normal setting convention — see any issue. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

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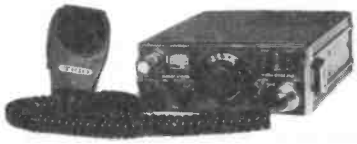

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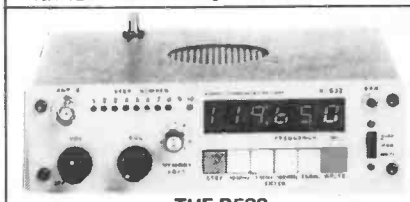

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Cover Price

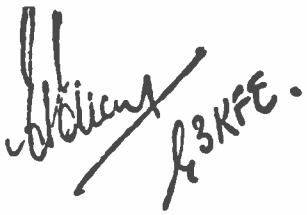
Due to increases in costs we have to announce that, with effect from the January 1984 issue of *Short Wave Magazine,* the cover price will be 65p. Annual subscription rate will be £9.60 (2nd class post) though, naturally, current subscribers will not pay the new rate until their subscription falls due for renewal; single copies posted first-class from Welwyn will cost 90p.

While any increase is always regrettable, we hope that readers will continue to feel that *S.W.M.* gives good value for money — which is one of our primary objectives.

Christmas

Christmas is nearly here again (even though it is distinctly shirt-sleeve weather as this is being written) and so everyone involved with *Short Wave Magazine* takes this opportunity to wish all our readers, advertisers and trade friends a very Happy Christmas and a Peaceful and Prosperous New Year.

It is worth remembering when it comes to peace that although governments may find it difficult to keep their lines of communications open, the radio amateurs of the world experience no such problem; and *that* is something no-one should under-value.



WORLD-WIDE COMMUNICATION

VHF BANDS

NORMAN FITCH, G3FPK

OCTOBER proved to be another rewarding month thanks to a persistent high pressure weather system which produced some very nice DX in the last week of the month. At times, 2m. was more reminiscent of the 20m. band on a contest week-end, as heard at your scribe's QTH.

Awards News

Another reader has joined the 70cm. VHF Century Club: Keith Hewitt, G6DER, from Monk Bretton in South Yorkshire, who was issued with Certificate No. 34 on October 19. He was licensed in August 1981, ". . . not knowing a great deal about VHF propagation . . ." but soon to discover that, in spite of living in a valley, he was able to hear a great deal of DX *via* Auroral, Sporadic E and Meteor scatter modes. A short move to a better location in April this year has enabled a lot of better DX to be worked. Keith's 70cm. station comprises an *Icom* IC-290E, *Microwave Modules* transverter and 2C39A PA, the antenna being a 21-ele. *Tonna Yagi*. He is about to get going on 23cm. with an *Icom* IC-202E, *MM* transverter and 23-ele. *Tonna Yagi*.

Alex McCreadie, GM8YPI, from Eyemouth in Berwickshire, was awarded 2m. VHFCC Certificate No. 360 on Oct. 12. He had been a short wave listener since his schooldays, but was urged to take the R.A.E. by club mates and was licensed in October 1980. The first station consisted of an *FDK* Multi-750 to which a 40w amplifier was later added, then a 100w one. Lately a *Trio* TS-700 has been acquired, the antenna being a 9-ele. *Tonna Yagi* on the gable end of the house. The site is 200ft. *a.s.l.* and only 200 yards from the cliff tops giving a fine take-off to north-west Europe, Alex has ". . . been dabbling in Mode 'A' satellite working." Oscar-10 and some 70cm. operation is on the agenda.

Two members of the QTH Squares Century Club have collected stickers. Erik Cechota, OE3CEW, member No. 22, was awarded his "150" sticker on Nov. 1. 18 of the new confirmations were *via* MS mode on CW, while SSB accounted for three *E's* and four tropo. contacts. Jim Rabbitts, G8LFB, member No. 24, receives his "125" sticker, dated Oct. 18. Four cards were for *E's* QSOs, the rest for tropo. contacts, including one with OE3CEW!

Beacon Notes

Brian Bower, G3COJ, has advised that the beacons at the Crowborough site, AL71d, have had to close down as the owners want the site for other purposes. Beacons affected are GB3SX on 28.215 MHz, GB3WHA on 70.04 MHz and GB3WHA on 432.810 MHz. It is to be hoped that "normal service will be resumed as soon as possible," particularly in the case of the 70cm. beacon, the loss of which leaves a large gap in coverage.

Contests

In the 432 MHz Low Power contest run last July 31, the winner of the fixed section was G8FEZ whose 136 QSOs earned him 1,471 points. G4MDZ was runner-up with 1,275 pts. from 123 contacts. The portable side was won by G3EFX/P with 1,500 pts. from 175 QSOs, and G4DDL/P was next with 1,176 pts. from 133 contacts. The listener section was won by RS 32525 with 144 pts.

In the 144 MHz Trophy event over Sept. 3/4, Geoff Brown, GJ4ICD, won the single operator section with 7,928 pts. from 591 QSOs. GW4ALG/P was runner-up with 3,985 pts. from 490 contacts. The All-other category was won by the *Parallel Lines Contest Group* who amassed 11,443 pts. from 910 contacts, G4APA/P coming second with 9,691/724. There were only 27 entries in the single-op. section and 69 in the all-other. Acknowledgements to the *GB2RS* News Service for the foregoing information.

The next contest after publication date is the *Verulam ARC* event from 0900 to 1300 GMT on November 27 on 144 MHz. Send report and serial number and your administrative county: *e.g.* Tyne and Wear, Greater Manchester, etc. Scoring is one point *per* contact, with club station G3VER and G8VER worth 10 pts. The multiplier is total of counties with overseas countries reckoned as extra counties. Entries postmarked Dec. 12 at the latest, to G4JKS, *QTHR*.

The last major thrash of 1983 is the 144 MHz Fixed contest on Dec. 4 from 0900-1700, a two section event, either single-op. or multi-op. Usual RS(T)/serial no./QTHL/QTH exchanges and radial ring scoring. On the *Cumulatives* front, the last leg of the 432 MHz series is on Dec. 10, 2030-2300. The two remaining sessions in the 1,296 MHz one are on Dec. 2 and 18, 2030-2300.

Looking ahead to next year, two dates to note are Jan. 22 and 29 when the *Swale ARC* is promoting 144 and 432 MHz contests, respectively, the first from 1000-1800, the second, 1400-1800. Full details on scoring, etc., next month, meantime a copy of the rules can be had for an *s.a.e.* from G4NPM at Leahurst, Augustine Road, Minster, Sheppey, Kent, ME12 2NB. (Phone:—Minster (0795) 873147).

On the RTTY scene, G8CDW has forwarded the results of the BARTG's Autumn 144 MHz RTTY contest. In the Single-op. section, the winner was G3NNG who made 53 QSOs worth 283 pts. Runner-up with 233 pts. was ON7CB who made 21 contacts. The multi-op. section was won by G4IVV/A who made 46 contacts for 358 pts., with G3WOR/P in second spot with 178 pts. from 56 QSOs. The accompanying report mentions the poor conditions this year, many of the portables having to endure bad weather as well. The event attracted only a total of 24 entries.

Satellite News

Oscar 10 continues to give excellent service on Mode "U" which is the 70cms. up, 2m. down one. However, many stations are still using far too much power, thus preventing operators with more modest *e.i.r.p.* from "getting in." Once again, a correctly aimed 500w *e.i.r.p.* should be the absolute maximum power necessary at *apogee*, with considerably less than that when the satellite is closer. Mondays are QRP days when users are requested to keep their power down below 100w *e.i.r.p.* In normal conditions, you should use only enough power to hear your 2m. downlink signal no stronger than the general beacon on 145.810 MHz. Under normal conditions, this beacon should be quite strong. If it is weak, then the obvious remedy is to improve your 2m. reception capability.

We were misinformed about the news bulletins, which commenced on Oct.16, being the first amateur radio news broadcasts from a satellite. It transpires that such bulletins have been broadcast over the U.S.A. for some time. However they are the first such broadcasts for Region 1, *IARU*. The first transmissions were not too well received and little could be made of the initial one using a linear *Yagi* at G3FPK. Other listeners remarked that the speech quality was not "punchy" enough. *AMSAT-UK* is trying to practice what it preaches in keeping the *e.i.r.p.* at a reasonable level for these broadcasts. Unfortunately, for various reasons, reception is rather RS33 than RS59. These relays are suffering from deliberate interference from a few FM operators in north London. When asked to move, they point out that there is no mode restriction in their licence. True. But Clause 4(1) quite clearly states:—"The apparatus comprised in the Station shall be so designed, constructed, maintained and *used* that the use of the Station does not cause any undue interference with *any* wireless telegraphy." (Our italics). Since the *Home Office* has specifically sanctioned these satellite news bulletins on 145.973 MHz, any deliberate interference to them must surely be a breach of the

licence conditions.

NASA has just confirmed that the postponed *STS-9 Space Shuttle* launch is set for Nov. 28 at 1600 GMT, the interest being that Dr. Owen Garriott, W5LFL, will be a crew member and has permission to operate on FM in the 2m. band. He will transmit on 145.55 MHz (S22) from *Columbia* for one minute each "even" minute, listening just for callsigns the next minute. QSOs in the accepted sense appear to be unlikely in view of the brief passage of the spacecraft which will only be visible for eight minutes during an overhead pass.

Obviously, since there could be last minute launch delays, it is pointless giving any orbit predictions. There will be several sources of up-to-date information such as the *RSGB's Headline News Service* on Potters Bar 59312; the 80m. *AMSAT-UK* information net from 1900 on 3,780 kHz. *The Space Center Radio Club* station, W5RRR, will operate before and after normal working hours on 28,600; 21,375 and 14,280 kHz so should be able to provide firsthand, up-to-the-minute information. Readers' reports are awaited with great interest on this historic event should it take place.

In a *News Release* dated Oct. 10, the *University of Surrey* announced plans to build a second *UOSAT* spacecraft to be identified as *UOSAT-B* prior to launch and *UOSAT-2* afterwards. *NASA* has confirmed that the planned launch date is March 1, 1984, leaving just five months to develop, build and deliver the spacecraft. This launch opportunity has arisen due to the premature demise of the *LANDSAT 4* spacecraft, a replacement for which will be the primary payload on the March 1 launch. *UOSAT-B* is being built at the University's *Department of Electronic and Electrical Engineering,* with the support of the aerospace and electronics industries and financial input from the *National Westminster Bank PLC.* More details later.

On the operational scene, only Russell Coward, G6HRI, (Blackpool) has reported and he has added Venezuela for a new satellite country. He has developed an *0-10* program for the *Commodore* VIC-20 computer. It prints a simple map and gives 42 DX positions but requires 16K of RAM. Anyone interested should contact AMSAT-UK at LONDON, E12 5EQ.

Sporadic E

October is not a month when *E's* propagation is likely on 144 MHz, so an event on Oct. 28 came as a surprise. It is reported that G3VVB in St. Austell, Cornwall, worked a YU in KE square, while on the 20m. VHF net, YU7NTU (KF42d) told G3IMV that he had worked into south-west England, mentioning the period from 1300 to 1430. Apparently signals were quite strong but it does seem to have been a very limited opening, centred over EI square. It will be interesting to discover if any other paths were worked, such as EA3 to UP2, for example.

QTH LOCATOR SQUARES TABLE

Station	23cm.	70cm.	2m.	Total
G3POI	—	—	404	404
OZ1EKI	—	116	345	461
G3IMV	—	90	343	433
DK3UZ	—	—	317	317
G4IJE	—	—	314	314
G3VYF	—	117	307	424
SP2DX	—	—	280	280
EA3LL	—	30	261	291
G4IGO	—	19	246	265
G4ERG	—	16	243	259
G4DEZ	—	—	240	240
G8VR	2	24	237	263
GJ4ICD	1	110	230	341
G3CHN	—	—	230	230
G3BW	6	36	220	262
9H1BT	—	11	210	221
GW3NYY	—	48	206	254
GW4EAI	—	—	205	205
GM4COK	—	28	204	232
LA8AK	25	62	200	287
G3FPK	—	—	197	197
G3UVR	10	79	196	285
G3KEQ	—	—	194	194
GJ8KNV	12	76	191	279
G8KBQ	8	94	188	290
GJ8SBT	14	25	182	221
G4MCU	—	74	174	248
G4OAE	—	31	174	205
G4KUX	—	36	172	208
G3PBV	30	98	171	299
G6ECM	—	—	170	170
G4PCI	—	28	167	195
G8LFB	—	—	165	165
G3COJ	39	91	163	293
GM4CXP	—	26	163	189
G3JXN	66	106	161	333
G8TGM	—	—	158	158
G4TIF	—	81	157	238
G4BWG	—	64	152	216
G4AWU	—	50	150	200
G8RZO	—	75	148	223
G3XDY	45	99	147	291
G4RZP	—	76	147	223
G4NQC	32	61	146	239
G4HMF	2	35	144	181
G6CMV	1	29	142	172
G6HKS	—	—	142	142
G4JZF	—	68	140	208
G8WPD	—	24	139	163
GM4IPK	—	—	139	139
G8HHI	15	75	135	225
G6ADH	—	35	135	170
G4ERX	7	61	132	200
G8ATK	19	81	129	229
G3NAQ	—	58	128	186
G6DDK	2	13	127	142
G8TFI	28	104	126	258
G2AXI	9	76	121	206
G4MJC	—	12	120	132
G4MWD	—	1	120	121
G8PNN	41	72	115	228
G8ULU	28	83	115	226
GW4TTU	—	2	115	117
GM8OEG	—	—	115	115
G8XIR	—	—	115	115
G4DOL	—	—	114	114
G4MEJ	—	—	114	114
G4STO	20	44	113	177
G4NQX	—	47	113	160
G4HFO	—	60	112	172
G4GHA	—	2	110	112
G8SRL	—	47	106	153
G6JNS	1	3	106	110
G6DER	19	61	102	182
G6DFT	—	—	101	101
GW8UCQ	1	45	100	146
G4RGK	—	32	100	132
G4MUT	—	60	99	159
G8VFV	—	—	97	97
GI4OMK	—	—	96	96
G4NBS	14	75	94	183
GM8YPI	—	—	94	94
G3FIJ	—	29	92	121
G8RWG	—	—	92	92
GD2HDZ	13	50	91	154
GW3CBY	9	30	90	129
G6HKT	—	60	89	149
G8FUO	35	104	88	227
G4TJX	—	40	87	127
G8WPL	—	44	83	127
G8KAX	22	57	82	161
G4FRX	—	49	81	130
G4RSN	2	22	80	104
G6ABB	—	—	80	80
G8FMK	29	65	78	172
G4NRG	—	19	74	93
G8WUU	—	27	72	99
G6ADE	—	64	70	134
G8XTJ	—	—	70	70
G6ELQ	—	—	69	69
G6NWF	—	—	67	67
G4PEM	—	—	63	63
G4ROA	16	55	61	132
G8ZYL	—	—	54	54
GM8BDX	—	33	53	86
G6PFR	—	13	50	63
G6HRI	—	25	47	72
G4FRE	26	87	42	155
G4BVY	9	100	—	109

Starting date January 1, 1975. No satellite or repeater QSOs. "Band of the month," 2m.

Four Metres

It seems that during the late October lifts, nobody bothered with 4m. Graeme Caselton, G6CSY, (Kent) listened on the 23rd and found all the beacons up by five to eight S units, but no activity. Steve Marsh, G4BWG, (Surrey) is intrigued by the very frequent meteor "pings" when monitoring the Polish FM stations, late at night. For example, in the early hours of Nov. 2, the tropo. signal from the Gdansk Tx (JO43g) on 70.31 MHz was just detectable, but there were frequent short bursts with pronounced *Doppler* shift audible. This Tx runs 40kW. The Tx serving Kielce (KK06f) is on 70.49 MHz and runs 62kW, while the one serving Wroclaw (IK14a) on 70.67 MHz runs 120kW.

Denis Jones, G3UVR, (Merseyside) did find one new county on the 25th and contacted G14MKC in Co. Antrim. However, it took ten minutes just to get the basic details across, though.

Two Metres

The period from Oct. 22 through 27 brought some excellent tropo. propagation. At various times, stations in a 180° arc from Sweden, in the north, to northern Spain, in the south, were workable, including a welcome number of Polish stations. Dave Sellars, G3PBV, (Devon) spent most of this period on the higher frequencies so his only contact of note was OK1KHI/P (HK) on the 22nd. This was notable as Dave forgot to switch on his PA, so was only running 8w.

John Hunter, G3IMV, (Bucks.) worked 17 OKs on the 22nd and some SPs including:—SP1AAY (IO), SP2LU (JN), SP5AD (KM), SP6ARE (IL), SP6LB (HK), SP9ED (JK) and SP6FUN (IL). The last said later on 20m. that he worked 56 Gs and 46 PAs. At 2200, John worked SM7IWG. On the 23rd, best DX was M027b locator, the station being UP2AN, a QRB of 1,748 km. SP6XA (IL) was also worked. John has got a QSL from DL0IV/17 (JZ01h) but wonders if anyone has yet received QSLs from the French group which operated from Minorca, EA6, from CZ square in the summer of 1982?

G3URV lists SP6GZZ (IL), OK1QI/P (IK) and OK3KAF/P (KJ62g) for his best ever tropo. DX on the 22nd. John Quarmby, G3XDY, (Suffolk) came on for a short time from 0715 on the 23rd and contacted SP2LU and SP6GZZ for a new country and squares, along with SM7IWG (HR) and OK1AUN (GK). On the 26th, he worked EA1s ED and QJ in VD square but signals in Ipswich were not too strong.

On the morning of the 23rd, G4BWG did very well, Steve's best DX including UP2AN, SP1AAY and UP2BIG (LP). A number of SMs were also worked. On the

25th, EAs in VD, XD and ZD were contacted. Dave Johnson, G4DHF, (Lincs.) mentioned working six SPs on the 22nd and OK3CAF/P and it seems that more Polish stations were worked by stations north of London. Peter Atkins, G4DOL, (Dorset) stuck to SSB and on the 22nd and 23rd worked numerous OZs in EO, EQ, FO, FP, FQ, GO, GP and HP, best DX being OZ1FYW (HP76h) on Bornholm Island. He sent photostat copies of his log which shows four SMs, Y23KD (GM) and some Fs in this period. The 25th brought EA1NU (XD) and DL6NAA (FK), a couple of Ds the next day, and D, OZ and SM contacts on the 27th.

Jon Stow, G4MCU, (Essex) felt he was just on the edge of the good conditions on the 22nd/23rd, the East Europeans and Russians being only S2 with him. The evening of the 22nd brought OK2KFA/P (JJ), SP6FUN and Y22SA (GN), while the morning of the 23rd produced SM1MKY (JR), UP2BIG—at 1,527 km. Jon's best ever tropo DX—SM4AIQ (HT), SP2LU and SP1AAY. A "got away" was UQ2GMD in LR. Ian Shaw, G4MWD, (Surrey) had not reported for some long time but telephoned to say he is still active. He worked a couple of OZs and an SM on the 22nd and re-enters the squares table with 120 on the band.

G6CSY (Kent) worked his all-time best DX on the 23rd, SM0KFJ (IS) at 1,408 km. Other QSOs were with OZ9ZI (GP), OZ1IYT (FB), DK8OL (EO) on the island of Sylt, and LA0DT/MM in AN square; all with just 5w to a 9-ele. *Yagi* at 3m. *a.g.l.* Keith Hewitt's G6DER (S. Yorks.) antenna had been on the floor for some time so he decided to put it on a short pole at the bottom of the garden on the 21st, just in time to catch the nice conditions the following two days. Stations worked included SP9BQA (IK), SP6FUN and three SP9s in JK square, OK2KYC/P (JJ), OK1DIG/P (GK), OK1KHI (HK) and DL7APV (GM). Ten new squares were worked.

G6HRI (Blackpool) worked OK1KHI/P on 70cm. on the 22nd so decided to go out portable. This yielded nothing on 70cm. but, using a *Yaesu* FT-290R and whip antenna, F1FHI (ZH), was worked. Mike Hearsey, G8ATK, (Surrey) came on 2m. on the 27th to work EA1OD (XD), F6APE (ZH) and F6ELI (ZE) in the evening.

It is some time since John Pilags, G8HHI, (Surrey) contributed any news. In a recent letter, he says he has not been too active this year but has entered the Annual Table with 47 counties and 17 countries on 2m. Jim Rabbitts, G8LFB, (London) missed the deadline so passed on his recent news verbally. On Oct. 25, he copied the EA1VHF beacon in VD59e on 144.867 MHz for the first time and then worked EA1ED in that square, EA1OD and EA2ARD (ZD). The following day, he contacted some OZs and SMs and on the 27th, although the Gotland Is. beacon SK1VHF (JR51d) on 144.950 MHz was copiable for long periods, Jim reports no activity.

By contrast, Gordon Emmerson, G8PNN, (Northumberland) wrote, "Not a lot to report this end for October," and lists just G1BOF (Shrops.) on the 26th as a new one for the Annual Table. There were strong winds on the 25th, and GB3VHF was only just audible above the noise. Michael Wright, G8SRL, (Surrey) reckons the only way he can work into Scotland is *via* an *Aurora,* so he was glad he discovered the one on the 4th in which GM4NFC (XP48e) and GM4NFI (XQ15j) were worked. In the later tropo., he contacted OK1KHI/P, a couple of OZs on Bornholm Is., and others in EQ and GP on the 22nd. On the 25th, OK1JKT/P (GK) was worked.

John Fitzgerald, G8XTJ, (Bucks.) did not find anything new on the 22nd/23rd and failed to get through to OK1KHI/P. He heard lots of stations in DM and DL squares, but none of the SPs and Ys others were working. He fared better in the goings-on of the 26th/27th, starting with a "wee hours" session on the 26th with EA2ARD and EA1OD for a couple of new squares, followed by EI4AEB (WN). Later that day, AG, CJ and DI squares were worked, all new, and at midnight, OZ1DOQ (GP) was another new one, after which conditions tailed off.

Walt Davidson, GW3NYY, (Swansea) has added a second 14-ele. *Cushcraft Junior Boomer* to make a stacked pair with 10ft. spacing. Only one MS QSO was made in October, on the 21st with SM0HAX in JT on CW. Walt is QRV with 100w of RTTY if anyone wants XL on that mode, and he will make skeds if required. *Via E-M-E* mode, on the 23rd, K1WHS was worked from 0724-0738 on CW—with one *Yagi,* and on the 30th, between 1324 and 1334, Walt worked WA1JXN/7 in Montana, this time with the two *Yagis,* again on CW. In the period 29/30th, VE7BQH, VE2DFO, K9HMB, I2ODI, SM2GGF and SM7BAE were heard. The period Oct. 22-31 was also productive of much tropo. DX. On the 22nd, he worked 12 OKs in HJ, HK, GK, IJ and IK on SSB and CW, while SP6FUN was his first SP on tropo. 5 Ys were contacted, Y22SA in GN being a new square. On the 23rd, CW accounted for Y23FG (FM) and F3MS (CI). On the 25th, HB9HB was very strong for 11½ hours from 2130, but no Swiss stations were worked. But OK1JKT/P (GK) to the east, and EA1TA (VD) to the south were contacted. On the 26th, many Fs and a couple of LXs were worked, plus EA1OD (XD). Not one single Scandinavian was heard throughout this period, though.

Seventy Centimetres

G3PBV has been trying to reach 100 squares with only 50w, but is still a couple short of that target. Dave's first *Cumulatives* QSO on Oct. 7 was with G6HRI/P (YO) ". . . at long last." On the 22nd, OK1KHI/P was contacted but OZ2LD (FO) faded out. However, OZ2LX (FP) was worked as was Y22ME (HM). Conditions were dropping off all the evening of the 23rd. First QSO was PE1EWR, followed by 10 G and GW folk in the *Cumulatives* session. HB9AMH/P was worked at S9-plus on the 25th.

G3IMV worked a few Fs on the 23rd, and SM7CFE (HQ) at 1,157 kms. before the conditions declined. However, that evening, the PAs were working to UR2, etc. On the 25th, John added new squares BG, CF, CG, XI and ZE, and contacted HB9MIN/P (DH). Bill Green, G3TDG (Kent) mentions QSOs on the 22nd with D, OK, Y, SM, and OZ folk, with OZ, SM, ON and PA stations the next day. OK1KHI/P gave G3UVR another country and square on the 22nd on SSB, while CW yielded Y22ME. On the 25th, Denis worked lots of Fs, but nothing new. G3XDY found F6CCH (ZG) and F9LT (AI) for new ones on the 26th and is just one short of the 100 squares on the band.

G4BWG mentions QSOs with stations in AF, DH, EI, VD, XI, ZF, ZG and ZH on the 25th, the next day producing contacts with CI, DI, DH and FM. Roger Dixon, G4BVY (Worcs.), reports again and is now at the magic 100 squares on 70cm. On the 23rd, he found conditions extremely good into D, Y, OK, SP, OZ and SM and his tally included 5 OKs, 4 Ys, 7 OZs, 5 SMs and 3 SPs, six QSOs being over 1,400 kms. He lists the cream as:—SP6AZT (IL), OK2KZR/P (IJ), OK2BRD/P (JJ), OK1QI/P (IK), SP9MM (JK), SM7CFE (HQ), SM0FMT (IT) and SM1BSA (JR). On the 25th, Roger copied three southerly French beacons and his best contacts to the south were F1DV (BG), F6EXK (AF), F1EAN (AG), F1BYM (ZE) and F1FEN (CF). He runs 40w with a 21-ele. *Yagi* and DJ7VY design, masthead preamp.

Dave Robinson, G4FRE, (Suffolk) says he was not getting into the duct to OK and SP on the 22nd and could just about hear them when they were working people further north. On the 23rd, he was very pleased to be called by G4TIF in Warks. who had read his plea in this feature. He spent the rest of the day ". . . re-building a rebellious PSU," which he got going in time for the *Cumulatives.* Dave made 89 QSOs worth 953 pts. best DX being SM7NNL (IQ22j) at 1,102 kms.

G4MCU added 12 more squares in the period Oct. 22-26, the latter period ". . . being mainly a hole-filling exercise." Very conveniently on the 25th, each F station worked happened to be a new square. Jon remarked that an EA was getting very good reports from London, but was almost inaudible in Billericay. Martyn Jones, G4TIF, (Warks.) was

ANNUAL VHF/UHF TABLE

January to December 1983

Station	FOUR METRES Counties	FOUR METRES Countries	TWO METRES Counties	TWO METRES Countries	70 CENTIMETRES Counties	70 CENTIMETRES Countries	23 CENTIMETRES Counties	23 CENTIMETRES Countries	TOTAL Points
G3UVR	60	7	89	26	66	18	*10*	*4*	266
G8FMK	—	—	62	14	51	11	38	9	185
G8TFI	—	—	58	16	60	15	23	7	179
G6DER	—	—	64	20	54	16	15	5	174
G4FRE	39	5	42	11	57	18	*21*	*7*	172
G8PNN	—	—	59	16	47	12	27	9	170
G3BW	42	6	57	21	37	6	*5*	*4*	169
G3PBV	*3*	*1*	47	24	50	18	21	8	168
G8OPR	—	—	69	20	62	15	—	—	166
GD2HDZ	42	5	51	13	36	12	*4*	*4*	159
G2AXI	34	6	58	14	38	9	*6*	*2*	159
G8ULU	—	—	49	22	37	14	15	9	146
G4MUT	30	4	51	17	29	10	—	—	141
G4ROA	—	—	50	11	41	11	19	8	140
GW3CBY	25	7	56	15	26	8	*6*	*4*	137
G4ARI	28	2	85	19	1	1	—	—	136
G6HRI	—	—	69	13	42	10	—	—	134
GW8UCQ	—	—	61	15	40	12	—	—	130
G8HHI	—	—	47	17	34	13	10	4	125
G4FRX	—	—	59	19	33	11	—	—	122
G4NBS	*12*	*1*	43	11	37	12	15	2	120
G8KAX	—	—	34	11	35	8	15	5	108
G6ECM	—	—	75	32	—	—	—	—	107
G6PFR	—	—	64	14	22	6	—	—	106
GW4TTU	—	—	74	26	1	1	—	—	102
G3FPK	—	—	81	21	—	—	—	—	102
G4STO	—	—	39	12	27	4	9	4	95
G4DEZ	—	—	66	24	—	—	—	—	90
G3FIJ	17	1	39	10	18	2	—	—	87
G6TTU	—	—	66	16	—	—	—	—	82
G8RWG	—	—	59	14	—	—	—	—	73
G8XTJ	—	—	56	15	—	—	—	—	71
G6HDD	—	—	56	13	—	—	—	—	69
G4BVY	—	—	—	—	45	17	—	—	62
G8VFV	—	—	47	15	—	—	—	—	62
G8KMT	—	—	47	12	—	—	—	—	59
G4NRG	4	1	29	12	8	4	—	—	58
G6CSY	—	—	3	4	20	8	8	2	45
GU4HUY	—	—	34	10	—	—	—	—	44
GW4HBK	36	6	—	—	—	—	—	—	42
G4FKI	7	1	20	2	1	1	—	—	32
GM4CXP	—	—	18	12	—	—	—	—	30
G2DHV	5	1	4	1	4	1	—	—	16

Three bands only count for points. Non-scoring figures in italics.

alerted to ". . . the unexpected tropo," on the evening of the 12th by G4SOX and worked F1EZQ (CH) and HB9AMH/P (DH). On the 23rd and 25th, he lists Fs in CJ, AI, AG, ZG—all new—and AF, while on the 26th he contacted HB9MIN/P (DH), DC0PP (EI), DK1KN (DK), PE1FNW (DN) and DB2VY (DJ), another new square bringing the total to 81.

G6CSY's 10w and 19-ele. *Yagi* produced QSOs with Y22ME, OZ1EYE (FQ) and SM6FYU (GQ) on the 22nd/23rd, all new squares. G6DER offers OK1KHI/P, Y23BD for new countries and squares, plus OK1s DIG/P (GK) and A1Y/P (HK) in the same period. G6HRI was out portable for the Oct. 1 contest in YO square but activity was low due to poor conditions. Russell's best DX was F6CTT/P (AJ). He confirms the G3PBV QSO on the 7th and on the 22nd managed EI2DJ and DD1JN (DL). Before going out -/P, he worked OK1KHI/P but, when he got to 1,000 ft. *a.s.l.* no beacons could be heard. When he returned home, the OK was still coming through so it seems he was *above* the inversion layer from the portable site. At home, he has two 48-ele. *Multibeams* at 32ft. but asks if anyone ever beams north from south of Birmingham?

G8ATK lists OK1KHI/P on the 22nd and Y23BD (GM) just after midnight, then OZ7LX (FP). At breakfast time on the 23rd, Mike contacted D, F, ON and PA. On the evening of the 25th 5 Fs in BI, BJ, ZE and ZG were worked, plus HB9AMH/P. Richard Britton, G8FUO, (Berks.) mentions OE2KMM (GH) and OK1QI/P (IK) on the 22nd. G8PNN did not mention any Continental DX on the 23rd, but G4NVA in Cheshire, and GM8MNG/P in Lothian were new 1983 counties.

G8SRL came on at 2330 on the 22nd for a couple of hours, and got up at 0700 on the 23rd for another 90 minutes stint, the result of which was that Michael had worked 10 countries. Best squares worked were FP, FQ, GM, GP, HK and HM, with OK1KHI/P at over 1,100 kms. the best DX. In the following days, best DX was DC0PP at 750 kms. Pete Godfrey, G8ULU, (Kent) reports again and lists DK5AI (FL) on the 22nd, SM6FYU (GQ), and OZ1HTB (HP) on the 23rd, and F6CSI (CI) on the 26th, all new squares.

Gigahertz Bands

G3PBV says activity seems to be on the increase all the time on 23cm. and Dave is now up to 30 squares worked. The lift got going from 2100 GMT on the 22nd and DK8SG (EI) was worked at S4—QRB 893 kms. Next morning brought QSOs with G8KAX and G3SBV, F6GCT (BI), PA0JCA (CM) and G3OSS. On the 25th, he contacted F6DZK (AI), G4CQR who was running just 500 milliwatts, and DC8UG (DK). F1ELL (BI) was worked on the 26th, but LX2RV could not be raised before he trundled off to 13cm. In the Oct. 31 leg of the *Cumulatives,* Dave got five stations including GW8TFI/P (Gwent) who had over 60 QSOs.

John Tindle, G3JXN, (London) is now on 13cm. and is claiming the first G/LX QSO. He has five countries and 11 squares on the band, already. G3TDG also worked F6DZK on the 25th on 23cm. and four other Fs. G8AYY (Birmingham) was worked off the back of the beam and another nice QSO was HB9AMH/P. G3UVR found conditions very poor on the 15th and only made six contacts in the *Cumulatives.*

G3XDY came on 23cm. on the 26th to work F6GCJ (AG), F1EBN (BI), F6DZK, and OZ1ABE and OZ7IS in GP. In the *IARU* contest, G4FRE worked G4TXG (YM), G3NNG/P, G4NVA/P, G3UHF/P (Derbys.), G3OHM/P and G4HWA/P (ZO/N. Yorks.). It seems that neither 'NNG nor 'OHM knew their counties! On the 23rd, Dave contacted DD3KL (DK), ON4TX (CK) and F1DED (BI)—the foregoing on 23cm. He has changed his *Quad-Loop-Yagi* for a *Tonna* one and finds the side lobes much reduced. He inquires if GB3CLE has been tweaked as it is now often audible. On 13cm. Dave at last worked PE1DPX (DM) on the 23rd, at the fifth attempt.

G6DER has a new *MM* 23cm. transverter with 2w output and a *Gasfet* preamp. Keith got OK1KHI/P at 1,211 kms.—not bad for 2w and a 23-ele. *Yagi* just 18ft. *a.g.l.* DJ5BV (DK) and PE1FOT (CL) were also contacted on the 23rd. G8ATK is now on 19 squares and worked F, D, ON and PA stations on the morning of the 23rd, and F6DZK and DK8SK (EI) the night of the 25th. G8HHI added G4APA/P (YN79b) in the Oct. 31 *Cumulatives* session. G8ULU runs just one watt, his 23-ele. *Yagi* being just above the roof. Pete is now up to 28 squares and 9 countries, that last being LX2RV (DJ) on the 26th. DK5AI (FL) and OZ1ABE (GP) were also worked on 23cm. on Oct. 26.

Andy Renouf, GJ8SBT, will be back in Jersey on Dec. 17 for 30 days and will be QRV from 0800 daily on 1,296.200 MHz beaming to the north with 100w output to a 90-ele. array.

Deadlines

That about wraps it up for this month. The deadline for January is **Dec. 7** and for the February issue it is Jan. 4. As usual, all your reports, comments and claims to:—"VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts., AL6 9EQ. *73 and a very Happy Christmas to all, de G3FPK.*

BASICS FOR THE S.W.L. AND R.A.E. CANDIDATE, PART XIII

SUGAR-COATED THEORY

READERS of this regular offering will be wondering — if they are still with us! — when we are going to get down to circuits. The answer is — *now!*

Essentially, we propose not to show individual types of amplifier but rather to go straight into complete circuits, which we will then break down in the course of the explanation.

Most of us would surely agree that the most important part of any station is the *receiver* — after all, if you can't hear 'em, you can't work 'em! At the transmitter, we have taken a carrier wave of some specified frequency, and impressed on to it some intelligence — the term for this is 'modulating' the carrier wave. Modulation can be done in all sorts of ways: by switching the carrier wave on and off by means of a morse key; by using speech (and in the broadcast case, music as well) to alter the phase, the frequency, or the amplitude of the carrier. This covers CW, PM, FM, and AM. In the last case, one transmits both the carrier and two lots of intelligence. It can be shown that only one of the two lots of intelligence need be transmitted; and so long as the receiver can provide a signal at the frequency of the carrier, then there isn't much point in transmitting the carrier either. Thus our popular method of transmitting telephony on the lower bands is 'single sideband suppressed carrier', normally called single sideband or just SSB for short. SSB has certain advantages which have ensured its popularity, such as that at a stroke one has halved the spectrum width occupied by the signal, so twice as many can get into a given band; the fact that one sideband and the carrier never reach the output stage means that valve or transistor can be persuaded to put out a much bigger version of the transmitted sideband than would otherwise be possible; and above all, the mere fact that the carrier heterodynes are removed means that telephony contacts to DX become relatively easy. Back in the days when we transmitted signals with carrier and both sidebands, we could brew up a signal which would be 'as good as the BBC', but in launching it onto a band — say 14 MHz — on which thousands of others were doing the same meant that an average G on AM phone would be quite pleased to work a European and over the moon at raising an American.

The Receiver

Now, since we know what is appearing at our aerial, we are in a position to consider our receiver and what we want it to do. Firstly, we want it to be as sensitive as possible, so as to be able to resolve the smallest possible incoming signal. At the same time, we want it to be as immune as we can make it to big unwanted signals. We want it to be stable, in the sense that if we tune in to a steady old signal, we expect to be still tuned in at the end of his over. This is short-term stability, and is far more important than long-term stability which means taking into account what happens after we have changed bands, taken a holiday, or forgotten to switch the shack heat on . . . really, it doesn't matter a cuss if any of these effects cause a shift in frequency calibration; but if the other bloke disappears out of the passband of the receiver half-way through the over, or every time you go back to receive from transmit, then that receiver will soon be regarded as a first-class pain in the butt, and dealt with as its owner normally deals with such things! We want our receiver to have enough gain to amplify the smallest signal it can hear into a big enough signal to comfortably fill our 'phones or loudspeaker.

To achieve all this, three basic methods have been developed. Firstly what is now known as the tuned-radio-frequency, or TRF, receiver. In essence this has a tuned circuit consisting of inductance and capacity of suitable proportions for the task in hand, some sort of 'detector' whose function it is to separate the carrier wave and its intelligence, and a 'transducer' which could be typically a pair of headphones. *See* Fig. 1(a). The detector in the very early days could have been, for example, a coherer (*see* below), and in the early twenties when broadcasting started our detector was a crystal and a 'cat's whisker' — you spent a lot of time touching the whisker on to the crystal until you found a 'good spot'. Such a receiver was found to be very unselective even on the medium wave with the low-power stations of the day, and so valves — perfected to a considerable degree during World War 1 — were brought in to play by those who lived more than a couple of miles from the local wireless station.

The first step here was to use a single valve stage as a detector and also to get some amplification as well. Obviously someone built a less-than-perfect receiver, because it was very rapidly realised that a mite of *positive feedback* — applied under control would improve the receiver's ability to separate stations (selectivity) and to hear the more distant ones too (sensitivity). The 'positive feedback', or 'reaction' as it was popularly known, was the result of so arranging the circuit that a whiff from the output was taken back to the input in such a phase that, if overdone, the circuit would go into oscillation. (A modern analogue is the chap running a disco who gets a 'howl' each time he tries to use the microphone.) Fig. 1(b) shows a fairly typical form of the circuit; and by changing the input voltages, and maybe juggling the resistors a trifle, a FET could be made to do the same thing, as shown in Fig. 1(b) (inset). For broadcast reception, it was desired to have a bit more sensitivity and the power to drive a loudspeaker on the one hand, and on the other to isolate the aerial from the detector stage lest in unskilled hands — and there were always plenty of those! — the oscillating detector made its owner's neighbours' lives a misery too. A typical three-valve receiver of TRF type — maybe a peak of design elegance as a production job — appears at Fig. 1(c).

Let us now considerd how these circuits in Fig. 1 work. Firstly

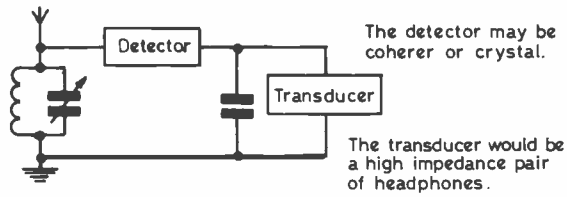


Fig.1a THE MOST BASIC RECEIVER POSSIBLE
(See text for description)

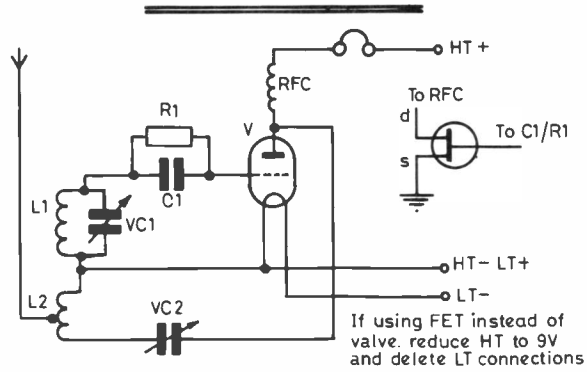


Fig.1b A SINGLE VALVE (or FET) RECEIVER SHOWING REACTION APPLIED

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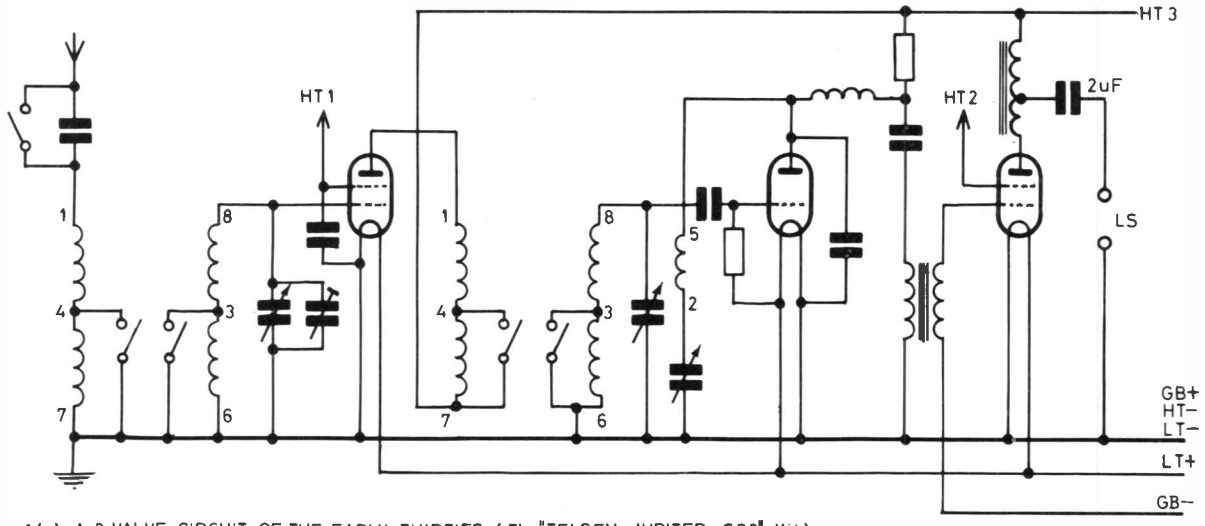

Fig. 1(c) A 3 VALVE CIRCUIT OF THE EARLY THIRTIES. (The "TELSEN JUPITER SG3" Kit)

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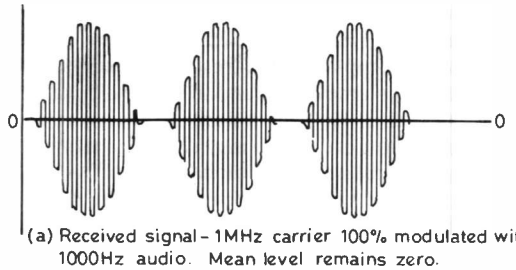
Fig. 1(a). The tuned circuit of L1/VC1 and the aerial itself are tuned as one lump by VC1; for any given station the position of VC1 will depend on the length of the aerial. We advanced types would say the tuned circuit combines the function of receiver tuning and ATU! The detector initially might have been a *coherer* — iron filings in a tube, between a couple of brass, copper or silver discs, which could be adjusted so that in the absence of RF no signal would be passed; if the 'transducer' were in fact a bell and battery, the arrival of some RF would cause the resistance of the iron filings to change and the bell would ring. Tapping the tube would stop the bell ringing ready for the next RF signal to come in! Later, the detector would have been a crystal and cat's whisker, which could behave as a diode, and pass the speech on to the headphones, while the unwanted carrier (RF) component of the signal would be able to bypass the headphones down to earth. Often this bypass capacitor C1 was omitted altogether and faith placed in the stray capacity across the headphones, which would be very high resistance types.

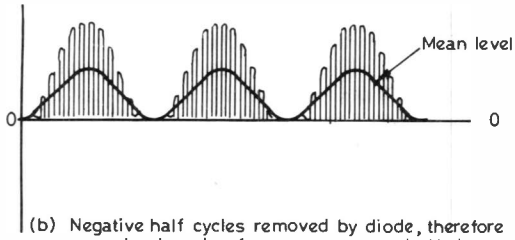
Turning to Fig. 1(b) now, we have a typical one-valve circuit — the *Reinartz*. For medium-wave reception, L1 might have been 75 turns, and L2 25 turns. VC1 tuned to the station desired, and the aerial was tapped on low down the tuned circuit so as to reduce the detuning effect of the aerial swinging in the breeze. VC1 might be 300 pF and VC3 100 or 200 pF; R1 around 2 Megohm and C1 of 100 pF, are complemented by an RFC of some 270 turns on a 1-inch diameter former for the medium wave. Again the headphones would be high-resistance type. The station was tuned in by VC1, and the reaction adjusted by VC2 until the receiver went into oscillation, indicated by a 'plop' followed by increased noise. The trick of setting up such a receiver was to so adjust the values that the receiver would slide into oscillation without the 'plop' noise. Normal operation would see one able to wind up the reaction until, in a good set, one could sharpen up the selectivity until the sidebands of the telephony being received were subject to a degree of loss of audio and distortion, without the set oscillating.

All reaction circuits have a tendency to alter the tuning of the receiver as well, but the Reinartz was one of the better ones in this direction. If one had the connections to L2 reversed, then one would have the wrong sort of feedback and bringing up VC2 would just *reduce* the volume, and show no signs of sharpening up the selectivity. If you overdo the reaction, then you are operating a transmitter, and this is anti-social; but if you have the receiver *just* oscillating, you can (on the amateur bands) receive CW Morse signals, as long as you ensure that oscillation does not get too strong — if you do this the receiver becomes less sensitive and less selective. Driving such a beast is a matter of skill indeed, but in the thirties many operators swore by their Reinartz receivers and reckoned that to add more valves would merely cause weak signals to drop into the noise. Many an old-timer made his first Australian and New Zealand contacts with a one-valve Reinartz.

The final TRF receiver is shown at Fig. 1(c) and is the circuit of the ***Telsen Jupiter 3*** **receiver kit (we have deleted the on/off switch** and fuse). The aerial is now coupled to the primary of a transformer, and there is a series 300 pF capacitor which can be switched in to the aerial lead, to make the aerial seem shorter to the receiver, and thereby hopefully to reduce interference from a nearby station. The tuned circuit is tuned by VC1, and there is a trimmer across it; this is to enable VC1 and VC2, which are ganged, or mechanically coupled together, to be adjusted to gang accurately. V1 is the RF amplifier, and accepts the signals from the aerial, amplifies them and passes them on to the second tuned circuit, tuned by VC2. These two sets of tuned circuits were identical and could be brought by constructors as a component, the switching indicated in them enabling the receiver to cover medium and long waves. In the second stage, the valve is a triode,



(a) Received signal - 1MHz carrier 100% modulated with 1000Hz audio. Mean level remains zero.



(b) Negative half cycles removed by diode, therefore mean level varies from zero to one half the positive peak RF excursion. (See text)

Fig. 2 DIODE DETECTION

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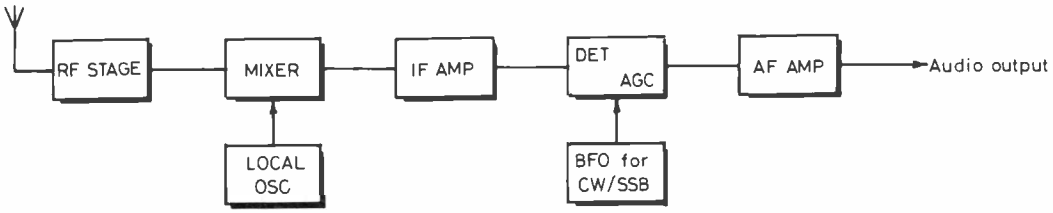
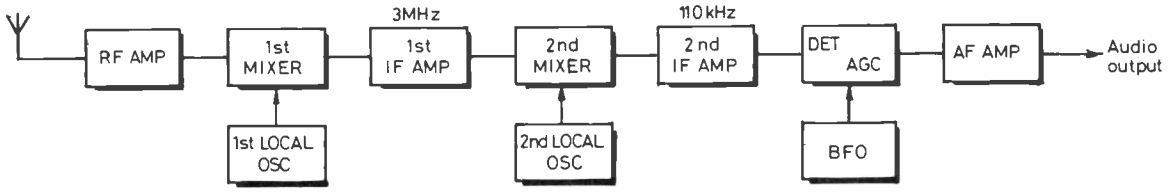


Notes: 1. RF stage may not contain an amplifying stage in simplest case.
2. RF, mixer input and local oscillator tuning will be ganged.
3. For broadcast reception, BFO is not fitted or used.

Fig. 3 (a) BASIC SUPERHET BLOCK DIAGRAM



Note. RF, Mixer and 1st Local oscillator gang tuned.
2nd Local osc. fixed at 3·110 MHz in above example.

Fig. 3 (b) EARLY TYPE OF DOUBLE CONVERSION SUPER- TYPICAL

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and the reaction winding is brought into play, adjustment being by VC3 — note that this reaction arrangement is almost the same as the Reinartz circuit already shown, as indeed is the whole second stage. Detection occurs in the triode, and the carrier wave is decoupled to earth by the RF choke and the bypass capacitor at the anode of V2, while the audio passes through the RF choke, through the capacitor and into the transformer, the valve anode being fed with HT through the resistor up to HT3. The transformer is a step-up type, and increases the amplitude of the audio a bit, and then passes it on to the grid of V3, which has its grid voltage set by way of a grid-bias supply to give the best output. Since the loudspeaker in those days was usually a horn type external to the receiver, the audio from the output of the pentode is taken through what the 1933 text calls a 'tapped choke' — in reality an auto-transformer — and through a 2μF capacitor to the speaker terminals.

Detection

We have skimmed over the vital question! How does the cat's whisker, or the valve in Fig.1(b) or 1(c) actually separate the modulation from the carrier? Practically, we may say that a perfect amplifier will amplify all that reaches it linearly, but if we deliberately make the amplifying action less than perfect (*i.e.* distortion occurs) then we will obtain 'detection', 'mixing', 'modulation' or 'distortion', as we may choose to name it.

Consider Fig. 2. Here we have a carrier wave of, say, 1 MHz, amplitude modulated by the odd cycle or two of audio at, say, 1000 Hz — about a couple of octaves above middle C. The incoming signal is shown at (*a*). Now consider a diode; what do we know about it? That it will conduct in one direction but *not* in the other. Looking at Fig. 1(a) again, and imagining we have a diode detector and a pair of headphones as the output transducer, what will happen? If we short out the diode, the alternations of negative and positive at 1 MHz will be far too fast for the diaphragm of the 'phones, so they will just sit at the mean voltage — at zero in fact — and nothing in the way of a merry noise will be forthcoming. Take the short off the diode, and imagine that it is wired in by chance so that the negative half-cycles of the incoming RF do not pass: what comes out of the diode is shown at (*b*). Notice that now the mean level of the RF getting through is no longer always zero as in (*a*), but is now varying between zero and half the peak RF excursion. Note also that the mean level is moving about at the audio frequency, and so it doesn't need a genius to guess that the diaphragm of the headphone will move in sympathy — presto! — we have noise coming out of the headphones! By putting a capacitor across the headphones themselves as shown in Fig. 1 and selecting the value of C1 such that it has low reactance to the 1 MHz signal and very high reactance to the 1000 Hz component, we can make the life of the headphones that much easier as they only 'see' the audio. Typically, C1 would be around 500 pF with high-impedance headphones.

In the case of Fig. 1(b) or Fig. 1(c) what we are actually doing is so arranging the conditions on the valve grid that the grid and cathode are acting the part of a diode as well as the part of an amplifier. The argument goes a bit like this. Imagine the first half-cycle of RF is positive going; some electrons are attracted to the grid, making it go a little negative. On the next half-cycle of RF the signal drives the grid a bit further negative, and at each cycle of RF the process is repeated until the grid gets down to the curved portion of the characteristic curve. Left to itself, the grid would just cut the valve right off because the accumulation of electrons has nowhere to go, but by giving a resistor to earth across the capacitor the electrons can leak away *slowly* enough for the grid to remain, in the presence of an incoming RF modulated signal, *almost* cut off; thus, only the positive half-cycles of the RF waveform are amplified, and the amplified signal at the anode has a mean that varies at an audio rate and therefore the 'phones will respond. As for the 'reaction', the RF component is choked off by the RF choke and goes down to VC2, while the audio goes on through the RF choke to the 'phones. The amount of the RF feed back is adjusted by VC2 to be just short of letting the set oscillate, which is the point at which the receiver is at its most sensitive. For CW one allows it to just oscillate, and this adjustment is critical as excess of oscillation will de-sensitize the whole works.

Snags

Although the TRF receiver was so popular in the early days, not even home-constructors use the system for a serious design nowadays. Why? Lack of a consistent degree of selectivity is one reason, and a gain shortage doubtless the other — amateurs are gain-obsessed animals. The first problem arises simply because the three-valve job, for instance, has two tuned circuits; one is damped right down by the presence of the aerial, and the other one is sharpened up by the reaction as far as it is possible to go. However, this latter condition is that of a single tuned circuit of, say, a maximum 'Q' of about 1000 or so. Such a circuit is very

narrow across the top, and spreads widely at the skirts; furthermore, since the actual bandwidth achieved is related to both the actual 'Q' and the actual frequency, we find the bandwidth varies from one end of the band to the other. Going back to our high-Q coil at a single frequency, we can say that the bandwidth at a given point down the skirt is a proportion of the centre frequency for any given 'Q'. *Ergo,* double the frequency, same 'Q', double the bandwidth. And it's not easy to alter the laws of nature! The answer, quite clearly, is to forget about reaction, and to incorporate in our receiver an amplifier of *fixed* frequency into which we can breed as much selectivity and as much gain as we want — that way our receiver will always have the same, chosen degree of selectivity and gain.

Superhet

So we come to the superheterodyne receiver. In its basic form, as seen in the transistor portable or home table radio it is shown in Fig. 3(a), while the sort of variations used on the amateur bands are shown in Fig. 3(b). Let us consider these two styles in block diagram form, starting with the simple type. The first thing to note is that into our first stage we may or may not build some amplification; it is simply a stage to isolate the aerial from the receiver proper. Things were not always quite so simple: in years gone by, the second stage of the receiver block was by far the noisiest, and lots of gain was required in the front-end block to overcome this noise, to the great detriment of other useful characteristics.

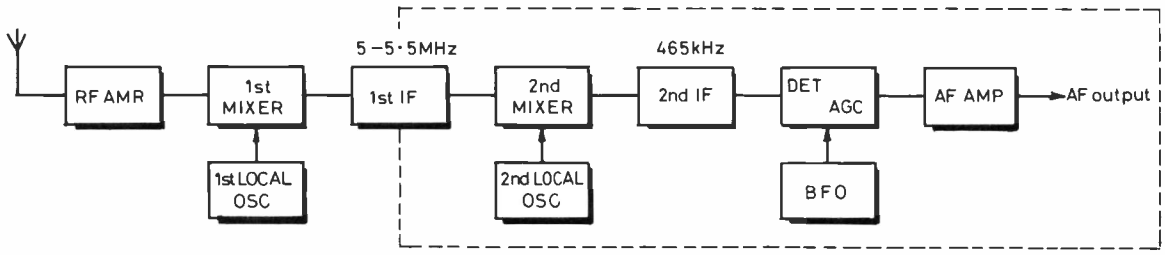
Our second block, it will be noted, is labelled 'mixer' and there are two inputs — one is the signal from the aerial entering at the left, and the other another signal, of much larger amplitude, generated in the receiver, and called the 'local oscillator'. Now, just as we used a diode as detector in Fig. 1(a) so we could use a diode as a mixer. If we connect our two signals to the diode as a mixer, we would expect to get out what we put in; but it can also be shown mathematically that we will also get out additional signals, such as the sum of the two inputs, the difference between them, and various combinations of the multiples of the input frequencies. We can arrange that one or other of these additional frequencies will be constant, regardless how we tune the receiver. In our transistor portable for example, we so arrange things that the local oscillator (lo) always lies around 465 kHz higher than the wanted signal (sig) frequency, so the *difference* between the two, $F_{lo} - F_{sig}$, is at 465 kHz. Now, the trick of things is this: if we make sure our local oscillator signal is much larger than the incoming signal, the output at 465 kHz will carry the modulation of the signal substantially undistorted. So, if now we make an amplifier to operate at the single frequency of 465 kHz (or, more accurately, at a narrow band of frequencies just wide enough to carry our signal centred on 465 kHz) then we can get the gain and the selectivity just how we wish it, and know that it will be constant no matter what signal we offer it from the aerial, both in selectivity and gain. Our receiver has been improved no end; and of course the block is shown in Fig. 3(a) as 'IF Amp' which in full means 'Intermediate Frequency Amplifier' — intermediate because in our case it lies below both signal and oscillator frequencies but above the audio range.

At the output of the IF Amp, we will have some sort of detector; it might be a reacting device, but is usually of diode form as in Fig. 1(a); and as we now have lots of gain to play with, we may use some of the IF obtained by the detection process to control the receiver gain in an automatic manner as a counter to fading, while the audio component obtained is passed on to an audio amplifier and loudspeaker.

Snags

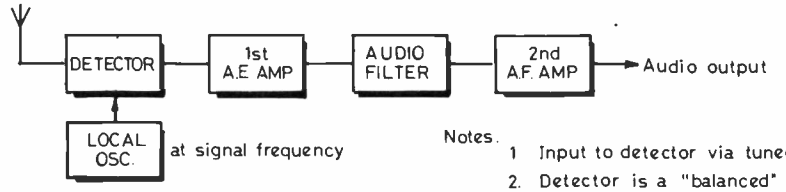
Again — nothing's perfect! Our first problem is that we now have a receiver which can respond at more than one frequency. Let's consider the case of the receiver, having an IF at 465kHz, tuned to a signal coming in at 1 MHz. The local oscillator runs at a frequency such that the difference frequency — *see* a couple of paragraphs back — is 465 kHz. Thus the oscillator is running on 1.465 MHz. Imagine a big signal at 1.930 MHz, that is man enough to break through to the input of the mixer; it will mix with the local oscillator signal, and this time there will be an output which is the difference between the *unwanted* signal and the local oscillator. So we have now got, at the receiver mixer output, our wanted signal, and an unwanted brother, both now on the same frequency at the IF input. Nothing can be done to separate these two signals. This phenomenon is called 'second channel' or 'image' interference.

The second problem with the simple superhet is that the tuning rate — the number of kilohertz covered by one revolution of the tuning dial — will vary from band to band, and even between opposite ends of the same band in a general coverage receiver.



Notes: 1. First osc. crystal controlled. Second local osc. tunes 5·465MHz to 5·965MHz.
2. Area within box is a simple single-band superhet.
3. RF amp, 1st Mixer may be ganged as a "Preselector" control; 1st IF 2nd Mixer input and 2nd Local osc. ganged as in Fig.3 a or b

Fig. 3(c) MODERN AMATEUR BANDS DOUBLE SUPERHET - TYPICAL BLOCK DIAGRAM.



Notes.
1 Input to detector via tuned circuit.
2. Detector is a "balanced" type, preferably to reduce osc. radiation.
3. See text of next article for discussion of balanced mixers

Fig. 3(d) BASIC DIRECT CONVERSION RECEIVER.

Thus a receiver which appears to be over-bandspread on Top Band tunes much too fast for comfort on Ten. We would like to gain consistent tuning rate on each band.

Clearly, the image will always be twice the IF frequency above the signal frequency in our Fig. 3(a) type of receiver, so one solution to the reduction of images is to increase the intermediate frequency such that the tuned circuits can knock the image down to an acceptable (or at least tolerable) level. However, with a conventional type of oscillator, the gang-tuning of signal and oscillator tuned circuits becomes more difficult, certainly for general coverage.

As far as the 'tuning rate' problem goes, this first really came to prominence in the early fifties when SSB first appeared on the bands, and showed up a need both for a better tuning rate than the war-surplus receivers of the day could offer, plus a vast improvement in the *stability* of the receiver through a QSO length of time. Thus it came about that the *double-conversion* receiver became popular. Till then, double-conversion receivers were like the block diagram of Fig. 3(b) and, as will be seen, merely added another mixer and IF system; the idea was that a high first IF would give image immunity, while a low second IF would give easier achievement of the narrow-band characteristics sought after. In practice, one found that with two local oscillators and one BFO, at various frequencies mixed products would appear as tunable whistles, or 'birdies', even when the aerial input was shorted to the earth terminal.

The double-superhet of the fifties came as in Fig. 3(c). To enable easy tuning rate on all bands, it was built and designed for amateur-bands only, and in effect it is a single-band receiver of conventional type, within the pecked lines, preceded by a converter in which the local oscillator was crystal-controlled — the ploy had been used for years as a means of getting the station main receiver to cover, say, 144-146 MHz with an outboard unit, and indeed still is so used. By crystal control of the first oscillator, you can still obtain good image response, and since the oscillator 'stays put' the birdies are manageable. Against this is the fact that the output of the first mixer may be anywhere in a band, so the 'first IF' is in fact tuned by the second mixer. However, if we make the first IF some 500 kHz wide, we can cover each amateur band at one bite, save Ten for which we have four 'sub-bands' each of 500 kHz, and so we gain both a high first IF — typically as high as 9 MHz — for better image rejection, plus a constant tuning rate. Such receivers were a revelation, and the better ones would outrun almost anything in solid-statery even today in most areas of performance. Sad to say many will soon be scrapped for sheer want of valves, when a bit of intelligent conversion would give them years of useful life.

Modern trends in the superhet include the use of frequency synthesis, of which more anon, and of ever-higher frequency crystal-filters; between them, one can get back to single-conversion designs with good image rejection and good selectivity too.

Finally, we must look at Fig. 3(d). This is a block diagram of the 'direct-conversion' or homodyne receiver. It was known and described by G. G. Blake in his 1927 book "The History of Radio Telegraphy and Telephony" but alas, as he said, the techniques of 1927 were not adequate to make the type practical. Thus, it faded into limbo until a few years ago, until indeed some of the QRP lads re-read their history and realised that with modern approaches the direct-conversion receiver could be made into a winner. Costas, W2CRR, probably fired it all by his paper in the famous *Proc. I.R.E.* "SSB issue" back in 1956. How does it work? Imagine the last IF stage, detector and BFO as a single-frequency receiver; to make it work you would need lots more audio gain, but the detector would be much less prone to overload because it would 'see' much smaller signals. With good design one could make the oscillator tunable, and in effect all the selectivity would be obtained at audio — so much *easier* from a design point of view! Another way of looking at the D/C Rx is to imagine it as a superhet with an IF of zero frequency.

The snags are simple. First, the 'image' is in fact the opposite sideband frequency and, second, one has unwanted responses at the harmonics of the oscillator (though this is not too difficult to handle, design-wise). Against this, one has a receiver in which the 'mixing' (or detection, if you prefer) is done at low level, so the potential for superb dynamic range is obvious; a gift for the home constructor when compared with the superhet for the same level of performance. One predicts that it is the receiver of the future at least for amateurs interested in home-brew.

Conclusion

Space runs out on us; this long session has tried to show how we have grown from the crystal set to the latest model in building-block form. Next time we will take some of those building-blocks and show how they go together to produce the sort of receiver circuits you could build and use. Frequency synthesis is a topic for a bit later in the series.

to be continued

BOOK REVIEW

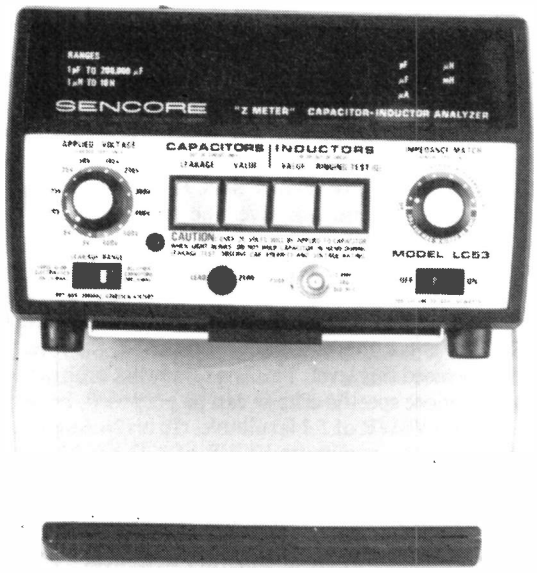
"VHF PROPAGATION HANDBOOK"

by J. D. STEWART, WA4MVI

PROBABLY the most fascinating aspect of amateur radio at 50 MHz and above is the many ways in which VHF signals are propagated. All the general VHF handbooks include a chapter on propagation but it is such a specialised subject that it warrants publications devoted solely to the topic. The **VHF Propagation Handbook**, by J. D. Stewart, WA4MVI, is one such book, now in its second edition. Jim Stewart is the editor of the terrestrial propagation section of the specialist *Lunar Letter Magazine*[1] and is also active on 144 MHz and 432 MHz Moonbounce.

The book consists of eight chapters and an index, commencing with a brief account of VHF activity, past, present and future. Mention is made of sporadic E signals in the 56 MHz band in 1930, and of the pioneering work of Jansky and Reber in that era. Chapter 2 covers the nature of VHF radio waves and the characteristics of the bands above 50 MHz, illustrated by diagrams explaining the various types of propagation and the layers responsible for them. The third chapter is devoted to propagation via the troposphere and stratosphere, topics discussed including the "knife edge" effect, troposcatter, tropospheric ducting and reflections from aircraft.

Chapter 4 covers ionospheric propagation, the nature of the ionosphere being described and of the effect upon it of solar activity. Mention is made of the propagation data transmitted by WWV at 18 minutes past the hour daily, and of how to use it to predict band conditions. Ionospheric scatter, transequatorial scatter and back scatter phenomena are dealt with, along with auroral, E-layer and field aligned irregularities. The author mentions the stratospheric "wind shear" theory to explain E-layer ionisation and also the idea that sporadic E openings are



The LC53, shown above, offers dynamic testing for capacitors, coils, SCR's and Triac's. For further details contact Mike Dawson, *Fieldtech Heathrow Ltd.*, Huntavia House, 420 Bath Road, Longford, Middlesex UB7 0LL. Tel. 01-897 6446. Telex 23734.

related to certain violent weather activity in the atmosphere. He has investigated this subject over several years and states, ". . . almost every 6m. and 2m. *E's* opening could be associated with severe thunderstorm activity. The type of storm associated with the *E's* typically grew to altitudes around 55,000 to 60,000 feet. The majority of openings were across a thunderstorm area of this type with the area lying near the midpoint path."

The fifth chapter is entitled "Meteor Scatter Propagation" and the mechanics of E-layer ionisation by meteors is described. A table of eight, popular, showers is included. The section on schedules and sequencing, and signal reporting in North America, reveals major differences from the long-established, and highly successful European system; *e.g.* 15 *seconds* periods on CW! The following chapter deals with amateur space satellites up to UOSAT, but the reader would think that UOSAT was a wholly American effort, there being no mention of the fact that it was British built, the only U.S. involvement being in the launch from California. The Soviet RS satellites had only been orbiting for a short time when the book was written, so little information is included about them.

The longest chapter is the seventh, "Amateur Moonbounce Communication," and includes all the basic information for an appreciation of Earth-Moon-Experimentation. However, the table of free space path loss at various frequencies seemed odd till it was realised that the losses quoted were for one way and not the "round trip" as usually stated. For example, a 188dB loss at 144 MHz at apogee is tabulated, whereas the two-way figure is 253.5dB. Mention is made of various computer programs for Moon tracking, and of the *Nautical Almanac* for those without visual tracking or computer access. Photographs of several, large amateur E-M-E antenna arrays are shown. The final chapter discusses radio astronomy projects for the amateur, being a secondary use for large E-M-E arrays. A table of cosmic noise sources is included.

This book has 112 pages in 215 × 140mm. format and is offset litho printed. There are a few spelling errors, but the type face is easy to read. All distances are quoted in feet and miles rather than in metric units and some of the examples of propagation possibilities refer only to the U.S.A. The amateur bands referred to are those currently available in the U.S.A. including the 220 MHz allocation which is unavailable in Region 1. The **VHF Propagation Handbook** can be recommended to anyone needing a pocket size book on this topic and would be of particular use to the newcomer to the VHF bands. It is published by Nampa Offset Printing Inc. from Nampa, Idaho, and can be ordered from *Short Wave Magazine*, Publications Department, 34 High Street, Welwyn, Herts., AL6 9EQ, for £3.55 including postage and packing.

N.A.S.F.

[1] *Lunar Letter Magazine* review, *S.W.M.*, June 1983, p. 195.

CONTEMPORARY BRIEFS . . .

ANYONE who examines the waveform of the household mains electricity supply these days is usually amazed to see some of the nasty spikes and distortions that are revealed on the screen of the oscilloscope. Whereas valved equipment of yesteryear was largely unaffected by such spikes, modern solid-state circuits can seriously malfunction and even fail unless some protection is afforded. Such protection has a two-way benefit in that while it attenuates potentially damaging transients getting into the sensitive equipment, it also reduces the mains-borne interference from the equipment being fed back along the power lines. Consequently, Mains Inlet Filters are components featured in various catalogues and we have just received one from **A.F. Bulgin & Company PLC.** Their technical information sheet lists a range of such filters to BS613 and includes graphs showing the insertion loss *versus* frequency of the various products. Intended for the standard, single phase 250v. AC supply, they come in 3, 6 and 10A versions. The PS620/1 series incorporate a series inductance in each line with a 15nF "X" capacitance across the lines and two 2.2nF "Y" capacitors from each line to ground, while the PS621/1 series omit the "Y" components. These Mains Inlet Filters come in panel, bulkhead and baseboard mounting versions and are stocked by *MS Components Ltd., Farnell Electronics Components Ltd.*, etc., and cost about £6.00. Considering the likely value of the gear being protected, they are a worthwhile investment. Further information from Brian Diggle on 01-594 5588. The company's address is:— Bypass Road, Barking, Essex, England, IG11 0AZ.

READERS of our monthly "VHF Bands" feature will be familiar with UOSAT, the orbiting spacecraft built at the University of Surrey and launched by NASA on October 6, 1981. It is not a communications satellite so is of prime interest to those who wish to use it for scientific experiments. Just published is a new UOSAT Guide intended specifically for schools and colleges with no previous experience of working with satellites. Entitled, "UOSAT" — a Guide to its Capabilities, Operation and Usage," it has been sent free of charge to all British schools with sixth forms. The Guide is a handsomely produced, 48 page, A4 book, beautifully printed and well illustrated. It contains all the basic information needed to introduce the subject of Earth orbiting satellites to intelligent students, including sources of supply of such items as antennas, receivers, decoders, etc. The book was compiled by the Department of Electronic and Electrical Engineering, University of Surrey, Guildford, Surrey, GU2 5XH, and printed by the University's printing unit. It was sponsored by the Royal Society and the National Westminster Bank PLC. Copies are available at £4.00 including postage and packing, from UOSAT Project Office at the aforementioned address.

LOW-PASS FILTERS FOR ATTENUATING RF AMPLIFIER HARMONICS PART I

A DETAILED EXAMINATION, COMPLETE WITH NECESSARY DATA FOR THE CONSTRUCTOR

E. E. WETHERHOLD, W3NQN

FOR power levels below 100 watts, solid-state amplifiers are appearing more frequently in homebrew designs than in the past. As G. N. Fare, G3OGQ mentions in his recent *Rad Com* article (Reference 1), RF transistors have improved capability of coping with large VSWR and overheating, and their cost is now comparable to that of a valve. Although most home-brewers are familiar with the advantages of the solid-state amplifier, many are unaware of one major weakness — a much higher harmonic level than that compared to valve amplifiers. D. DeMaw, W1FB (former ARRL Technical Director) states in his recent *Sprat* article that the typical solid-state Class-C amplifier has a second and third harmonic current level that is only 10-13 dB below the fundamental frequency (Reference 2). Consequently, the addition of lowpass filters for each amateur band is necessary when using solid-state amplifiers to assure that the 2nd and 3rd harmonics are adequately attenuated.

There is little question about the need for applying lowpass filtering to the output of transistor RF amplifiers, but there is some difference of opinion as to the most suitable filter type to use. In the past few months, there have been several articles published by respected authors in which several different filter types were used for accomplishing the same objective. For example, in his July 1983 *Short Wave Magazine* article, I. Keyser, G3ROO, used a double-pi filter network in his "Whitfield" transceiver design (Reference 3), while G. Fare preferred a modified Chebyshev for his design (Reference 1), and D. DeMaw recommended the "half-wave" filter in his *Sprat* article on how to attenuate harmonics in QRP transmitters. My personal preference is for the 7-element Chebyshev capacitive input/output filter as discussed in several articles published over the past few years (Reference 4, 5, 6 and 7).

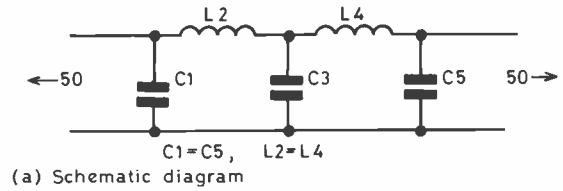
It seems that for such a relatively common application there should be a more consistent approach to the selection of lowpass filters for solid-state amplifiers. To simplify this selection, some of the currently used lowpass designs will be evaluated and compared in terms of ease of calculation, convenience of construction and suitability of performance. The most suitable designs will be precalculated for every amateur band and listed in a table for easy reference.

Desired Performance Characteristics of the Harmonic Filter

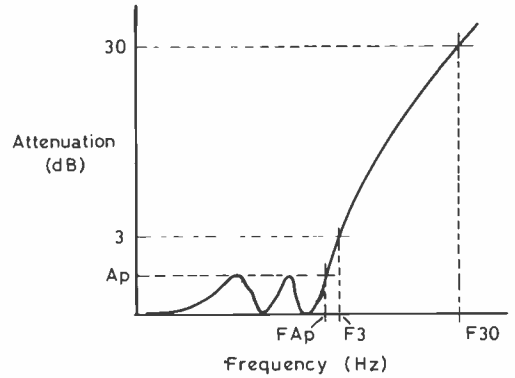
The criteria used in selecting suitable lowpass filters includes performance characteristics such as attenuation and VSWR, while ease of obtaining parts and assembly is also important. A commonly accepted harmonic level in commercial amateur transmitters is 45 dB below the fundamental (*see* Table 1, 2 and 3, p. 510, June 1983 *Rad Com*). Consequently, we amateurs should strive for a similar harmonic level. Since the unfiltered 2nd harmonic of the typical Class-C solid-state transmitter is already 10-13 dB below the fundamental, an additional 32 to 35 dB of attenuation is needed from the lowpass filter. Preferably, this amount of attenuation should be available at the second harmonic of a transmitter operating at the low end of any amateur band. The cutoff frequency of the filter must be just above the upper end of the amateur band. The filter attenuation must therefore have a slope of greater than 30 dB/octave in order to provide adequate attenuation over the entire amateur band of interest.

Specifying a suitable filter VSWR is not as easy as the selection of an adequate attenuation, but it seems reasonable that the VSWR be minimized. Since the smallest division on the typical VSWR meter is 1.1, it appears appropriate that the filter VSWR should not exceed this level. This is a somewhat arbitrary choice, but unless a more specific criteria can be proposed, let us assume that maximum VSWR of 1.1 is suitable. (In his 24 August letter to me, Fare suggests a maximum VSWR of 1.27.) A filter having a VSWR greater than 1.1 no doubt can be used, but since the basic function of the filter is to attenuate harmonics and not to increase VSWR, it appears more appropriate to use a design with additional elements if more attenuation is needed. For example, two more elements (one capacitor and one inductor) could be added to provide at least 12 dB per octave of additional attenuation. The two additional components are relatively inexpensive and the extra space required is small. Most of the lowpass filters published to date are of the 5-element variety, but perhaps this is because design procedures for the 7-element lowpass filter have not been available to the U.K. amateur. For example, design procedures for the 7-element ladder filter are not mentioned in the RSGB "Radio Communication Handbook". The 1983 ARRL "Radio Amateur's Handbook" does have a few normalized tables for 7-element filters, but it has no tables of precalculated 7-element filter designs.

The purchase of parts and the filter assembly can be considerably simplified if all filter designs require only standard-value capacitors. Many articles have been published containing tables of lowpass filter designs with standard-value capacitors (*see* References 4-13), and there appears to be no compelling reason to use any other type of design not having standard value capacitors. Preferably, the designs should use the more commonly available values in the 10%-tolerance group (10, 12, 15, 18, 22, etc.), but the



(a) Schematic diagram



(b) Typical attenuation response. The passband attenuation ripple amplitude (Ap) is exaggerated for clarity.

Fig.1 5 ELEMENT CHEBYSHEV LOW-PASS FILTER

Table 1. Design and Performance Data of 50-ohm, 80-metre Lowpass Filters

(A) Five-Element Filters

No.	Author and Publication Reference	Filter Type and Description	F-co (MHz)	C1,5 C3 (pF)	L2,4 (μH)	Atten. at 7MHz (dB)	VSWR vs. Freq. (MHz)
1	Keyser, G3ROO, *S.W.M.*, July 1983, Fig. 20, p. 258	Double-pi network	4.3[1]	750 1500	2.16 21T, T50-2 A_L = 49μH/10T	18.2 (9.1 @ 6MHz)	1.177 3.00 1.023 3.50 1.010 3.80 1.008 4.00
2	Fare, G3OGQ *Rad Com*, June 1983, Fig. 17, p. 506, 507	Modified Chebyshev	4.5[2]	820 1500	2.4 21T, T68-2 A_L = 57μH/10T	22.4	1.061 3.00 1.200 3.50 1.164 3.80 1.061 4.00
3	DeMaw, W1FB *Sprat*, Nr. 35, p. 6 Summer 1983	Half-wave	4.244[1]	750 1500	1.875	13.9	1.422 3.00 1.184 3.50 1.073 3.80 1.024 4.00
4	Wetherhold, W3NQN #45	Exact Chebyshev (on C-values)	3.838[3]	620 1300	2.695	19.8	1.073 3.80
5	From Table 2 #48		4.056[3]	560 1200	2.509	15.7	1.055 4.00

(B) Seven-Element Filters

No.	Author and Publication Reference	Filter Type and Description	F-co (MHz)	C1,7 C3,5 (pF)	L2,6 L4 (μH)	Atten. at 7MHz (dB)	VSWR vs. Freq. (MHz)
6	Wetherhold, W3NQN #5	Exact Chebyshev (on C-Values)	3.81[3]	510 1300	2.637 3.261	32.9	1.030 3.80
7	From Table 3 #7		4.13[3]	470 1200	2.434 3.012	27.0	1.035 3.70

Notes:

1. **The attenuation level at the cutoff frequency is not specified.**
2. **The listed frequency is the 3 dB cutoff frequency.**
3. **The listed frequency is the ripply cutoff frequency.**

capacitors should each have a tolerance of 5% or less. For example, the Mallory polystyrene type SX has a 5% tolerance at 630 volts while the type SXM has a 2.5% tolerance at 160 volts, and this is typical of polystyrene capacitors from most manufacturers. The 2.5% tolerance, 160V, capacitors are recommended for transmitters with power output less than 25 watts, while the higher voltage capacitor type is suitable for tansmitters having power outputs greater than 25 watts. Select the capacitor voltage rating based on the anticipated maximum transmitter power output and the VSWR of your antenna system, since these factors will determine the maximum voltage rating needed by the filter capacitors.

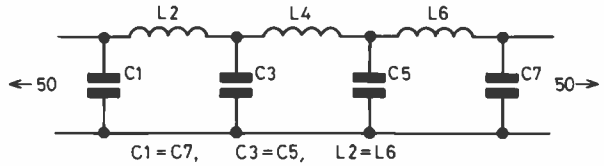
Comparison of Lowpass Filter Designs

The lowpass designs most frequently used for transistor amplifier filtering are of the 5-element type, and a typical schematic diagram is show in Fig. 1(a). This configuration is also identical to the modern filter type known as the 5-element capacitor input/output Chebyshev lowpass filter. The alternate configuration with inductor input and output will provide the same attenuation response, but the capacitor input/output configuration is preferred to minimize the number of inductors. Inductors usually have greater loss and are more costly and bulky than capacitors. The component identification in Fig. 1(a) will be used when discussing the various 5-element filter types. The typical attenuation response of the 5-element filter is shown in Fig. 1(b). The cutoff frequency (F-Ap) is commonly known as the "ripple cutoff frequency", and it is referred to as 'F-co' in the following discussion and tables when referring to the Chebyshev filter type. Figs. 2(a) and 2(b) show the 7-element Chebyshev filter schematic diagram and typical attenuation response. Again, the component and response designations are used later when discussing this filter.

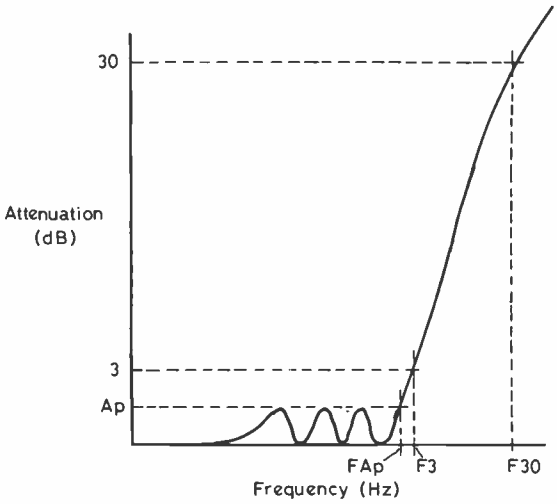
Representative examples of the previously mentioned designs by Keyser, Fare, DeMaw and the 5- and 7-element Chebyshev designs that I prefer are listed in Table 1. Each design is identified by the number in the left-hand column and is further identified by author, publication source and filter type description. Component values and performance data are also listed to allow comparison between the different filters. Additional data regarding the attenuation *versus* frequency are given in Fig. 3. Using this information, it should be possible to determine which filter type is most suitable for harmonic attenuation applications.

Criteria for Selecting Suitable Lowpass Filter Designs

The important criteria used for selecting suitable lowpass filter designs are (1) attenuation *versus* frequency, (2) passband VSWR, and (3) ease of construction. To compare the suitability of the various designs of Keyser, Fare, DeMaw and of my standard-value-capacitor (SVC) designs, a representative 80-metre design was taken from their articles and my tables, and these designs are listed for comparison in Table 1. For the SVC filter, two designs were tabulated for the five-element filter and



(a) Schematic diagram



(b) Typical attenuation response. The passband attenuation ripple amplitude (Ap) is exaggerated for clarity.

Fig. 2 7 ELEMENT CHEBYSHEV LOW-PASS FILTER (E 158)

two for the seven-element filter. Filters for the 80-metre band were selected for comparison because this amateur band has the widest relative bandwidth of the more frequently used amateur bands. Because of the wider relative bandwidth, it is more difficult to achieve high attenuation at the 2nd harmonic in this band as compared to the higher frequency amateur bands which have smaller relative bandwidths. (Relative bandwidth = Fb/Fm where Fb is the bandwidth of the band and Fm is the geometric mean of the upper and lower frequencies of the band.) In order to allow a simple comparison of the attenuation capability of all designs, a frequency of twice the lower end of the 80-metre band (2 x 3.5 MHz = 7.0 MHz) was taken as a common reference frequency. The attenuation of all designs was calculated at this frequency and listed in Table 1. The VSWR was also calculated, and the maximum values are listed for frequencies between 3 and 4 MHz. (Data for 3 MHz is listed because Keyser proposed to use his 80-metre filter for both the 3 and 3.5 MHz. bands: consequently, it is necessary to know the filter attenuation at 6 MHz and the VSWR at 3 MHz. Both Fig. 3 and Table 1 provide attenuation and VSWR performance data, respectively, at these frequencies.)

The component values given by the authors are also listed in Table 1. Since the inductance values were not specified by Keyser, the inductance of L2 and L4 was calculated from the winding information provided by the author. The inductance at 10 turns was obtained from a recent Micrometals Inc. catalogue (*see* Ref. 14). (From correspondence received after completion of Table 1, Keyser stated that the calculation of L2 and L4 inductance was based on an inductor reactance of 50 ohms at 4.3 MHz. Thus: L2(μH) = 50/(6.28*4.3) = 1.85μH. This inductance value is similar to DeMaw's but it is about 14% smaller that the value calculated from the data given by Keyser: 21 turns on a T50-2 core). In the case of the half-wave filter, the calculation procedure described by DeMaw in his *Sprat* article was used to get the inductance and capacitor values, except I lowered the cutoff frequency slightly so all the capacitor values would be standard. Unfortunately, the advantage of consistently having all standard-values for the three capacitors is not inherent with the half-wave design procedure, and it was only a coincidence that both C1,5 and C3 were simultaneously standard values. This will happen only when the C1 value is such that it produces the desired cutoff, and simultaneously has a standard value that when doubled is also a standard value. Examples of these special values are 100/200, 120/240, 150/300, 180/360, etc. The two five-element Chebyshev filters (Nos. 4 and 5 in Table 1) were selected from Table 2. Filter Nos. 27 and 29.

Table 2 consists of 81 five-element Chebyshev SVC filter designs all having a VSWR of less than 1.247. These designs were computer calculated from standard network synthesis equations. Each design is based on the unique combination of the capacitor value of C1 and the C3/C1 capacitor ratio that gives the listed F-co frequency and inductor value. The frequencies at the 3-, 20-, and 30-dB attenuation levels were also computer calculated and listed for each design. Because the increments of F-co from one design to the next are so small, virtually any desired cutoff frequency can be obtained by merely visually scanning the F-co column of the table and picking a design having an F-co nearest to the desired F-co. This procedure probably would be unacceptable to the professional filter designer, but it is quite acceptable for amateur radio applications. The seven-element filters (Nos. 6 and 7 of Table 1) were selected from Table 3, Nos. 5 and 7. Table 3 was computer calculated in a manner similar to that of Table 2.

Attenuation *vs.* Frequency and VSWR

Of the 5-element filter designs listed in Table 1, the design by Fare (No. 2) has the highest attenuation (22.4 dB) at 7 MHz, and the half-wave filter (No. 3) the lowest (about 14 dB). *See* Fig. 3 for a plot of attenuation *vs.* frequency over the 4.5-8 MHz range. If the half-wave filter cutoff frequency is slightly decreased from 4.244 MHz (the F-co used to calculate the component values), the attenuation at 7 MHz will be slightly increased without causing any significant increase in passband attenuation; however, the

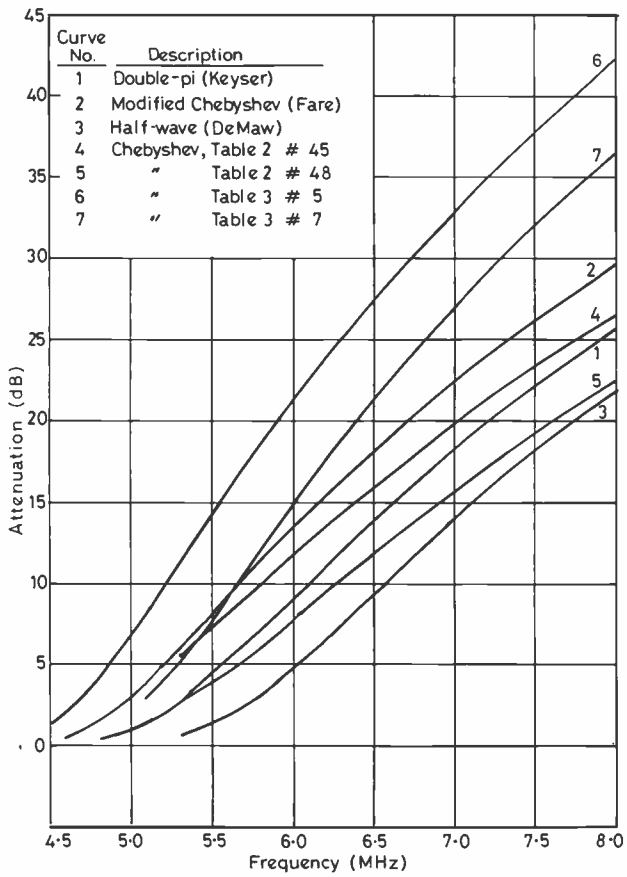


Fig. 3 Calculated attenuation vs frequency of filter designs in Table 1. (E 159)

No.	Frequency (MHZ) F-co	3-dB	20-dB	30-dB	VSWR —	C1,5 (pF)	L2,4 (μH)	C3 (pF)
1	1.016	1.208	1.651	1.998	1.212	3000	10.73	5600
2	1.101	1.319	1.808	2.191	1.196	2700	9.882	5100
3	1.039	1.370	1.944	2.379	1.085	2200	9.818	4700
4	1.146	1.408	1.950	2.371	1.155	2400	9.373	4700
5	1.127	1.496	2.125	2.602	1.081	2000	9.003	4300
6	1.256	1.541	2.132	2.591	1.157	2200	8.564	4300
7	1.054	1.619	2.379	2.940	1.028	1600	8.351	3900
8	1.232	1.646	2.344	2.872	1.076	1800	8.187	3900
9	1.388	1.700	2.352	2.857	1.159	2000	7.754	3900
10	1.169	1.756	2.570	3.172	1.033	1500	7.703	3600
11	1.275	1.771	2.547	3.129	1.057	1600	7.635	3600
12	1.462	1.824	2.541	3.094	1.135	1800	7.281	3600
13	1.430	1.939	2.773	3.401	1.068	1500	6.960	3300
14	1.541	1.970	2.768	3.378	1.109	1600	6.789	3300
15	1.761	2.071	2.814	3.402	1.238	1800	6.210	3300
16	1.315	2.101	3.108	3.848	1.022	1200	6.424	3000
17	1.481	2.117	3.065	3.773	1.046	1300	6.393	3000
18	1.754	2.189	3.049	3.713	1.135	1500	6.067	3000
19	1.887	2.250	3.078	3.728	1.206	1600	5.773	3000
20	1.506	2.337	3.440	4.254	1.026	1100	5.782	2700
21	1.700	2.361	3.395	4.172	1.057	1200	5.726	2700
22	1.868	2.403	3.382	4.131	1.104	1300	5.573	2700
23	1.753	2.634	3.854	4.758	1.033	1000	5.135	2400
24	1.985	2.671	3.810	4.671	1.072	1100	5.049	2400
25	2.193	2.736	3.811	4.641	1.135	1200	4.854	2400
26	2.402	2.836	3.862	4.671	1.227	1300	4.549	2400
27	1.892	2.872	4.210	5.200	1.030	910	4.709	2200
28	2.145	2.909	4.159	5.101	1.068	1000	4.640	2200
29	2.392	2.985	4.158	5.063	1.135	1100	4.449	2200
30	2.642	3.106	4.221	5.103	1.238	1200	4.140	2200
31	2.053	3.157	4.639	5.733	1.028	820	4.283	2000
32	2.362	3.201	4.574	5.611	1.068	910	4.217	2000
33	2.631	3.284	4.574	5.569	1.135	1000	4.045	2000
34	2.338	3.512	5.139	6.344	1.033	750	3.851	1800
35	2.628	3.557	5.082	6.233	1.069	820	3.794	1800
36	2.960	3.663	5.087	6.188	1.145	910	3.614	1800
37	2.705	3.959	5.763	7.104	1.039	680	3.418	1600
38	3.058	4.027	5.709	6.987	1.086	750	3.340	1600
39	3.381	4.143	5.732	6.965	1.159	820	3.182	1600
40	2.772	4.212	6.176	7.629	1.030	620	3.211	1500
41	3.135	4.264	6.101	7.485	1.067	680	3.166	1500
42	3.508	4.378	6.098	7.425	1.135	750	3.033	1500
43	3.885	4.562	6.195	7.487	1.241	820	2.816	1500
44	3.391	4.881	7.079	8.718	1.044	560	2.772	1300
45	3.838	4.978	7.024	8.585	1.097	620	2.695	1300
46	4.259	5.145	7.076	8.584	1.181	680	2.545	1300
47	3.607	5.279	7.684	9.472	1.039	510	2.563	1200
48	4.056	5.363	7.613	9.320	1.083	560	2.509	1200
49	4.550	5.543	7.651	9.291	1.167	620	2.372	1200
50	3.963	5.762	8.375	10.32	1.041	470	2.348	1100
51	4.391	5.842	8.308	10.18	1.079	510	2.305	1100
52	4.881	6.011	8.330	10.13	1.152	560	2.198	1100
53	4.398	6.343	9.204	11.34	1.043	430	2.133	1000
54	4.907	6.447	9.134	11.18	1.087	470	2.085	1000
55	5.380	6.616	9.165	11.14	1.154	510	1.996	1000
56	4.811	6.968	10.12	12.47	1.042	390	1.942	910
57	5.426	7.094	10.04	12.27	1.091	430	1.894	910
58	5.997	7.309	10.09	12.25	1.167	470	1.799	910
59	4.862	7.690	11.36	14.05	1.023	330	1.756	820
60	5.511	7.758	11.19	13.77	1.052	360	1.743	820
61	6.066	7.886	11.14	13.61	1.095	390	1.702	820
62	6.771	8.166	11.22	13.61	1.184	430	1.602	820
63	5.262	8.404	12.43	15.39	1.022	300	1.606	750
64	6.042	8.485	12.24	15.05	1.052	330	1.594	750
65	6.702	8.644	12.18	14.87	1.101	360	1.550	750
66	7.332	8.894	12.25	14.87	1.175	390	1.475	750
67	5.731	9.266	13.73	17.01	1.020	270	1.456	680
68	6.687	9.362	13.49	16.59	1.054	300	1.444	680
69	7.484	9.564	13.43	16.39	1.110	330	1.398	680
70	8.254	9.892	13.56	16.43	1.196	360	1.317	680
71	7.213	10.25	14.82	18.24	1.048	270	1.320	620
72	8.181	10.48	14.73	17.98	1.107	300	1.276	620
73	9.109	10.88	14.89	18.03	1.203	330	1.195	620
74	7.818	11.32	16.44	20.26	1.042	240	1.195	560
75	9.021	11.59	16.31	19.91	1.105	270	1.155	560
76	10.16	12.08	16.51	19.98	1.212	300	1.073	560
77	8.659	12.44	18.04	22.22	1.044	220	1.087	510
78	9.636	12.65	17.91	21.91	1.088	240	1.063	510
79	9.224	13.48	19.61	24.18	1.039	200	1.003	470
80	10.39	13.70	19.44	23.79	1.085	220	.981	470
81	9.851	14.71	21.50	26.53	1.034	180	.919	430
82	10.54	16.19	23.79	29.40	1.028	160	.835	390

Table 2. 5-element, 50-ohm, Low-Pass Chebyshev SVC-Filter Designs, Capacitive Input, 5% Capacitor Tolerance, Selected Max. VSWR = 1.247. *See* Fig. 1 for filter schematic diagram and typical attenuation response.

VSWR at 3.5 MHz would then be greater than 1.184. Although Fare's design has the highest attenuation of all the five-element filters, it also has the highest VSWR within the 80-metre band (1.200 at 3.5 MHz). A major disadvantage of Fare's design procedure is that the component values were obtained using a computer program that is not conveniently available to the reader. Thus, it is not possible to apply his procedure to obtain designs for other bands. Although Fare refers to his filter as a Chebyshev, it is not exactly so because the inductor value given by Fare does not agree with the correct inductor value of the standard Chebyshev design having the capacitor ratio of 1500/820. This lack of agreement can be confirmed by referring to Table 2, where Filter No. 43 has a calculated value of 2.816μH for L2 and L4 compared to Fare's value of 2.4μH. The incorrect inductance of 2.4μH has little noticeable effect on the filter performance, and this indicates that the five-element design is relatively insensitive to incorrect component values. The most significant effect on the filter performance is a slightly higher than necessary VSWR at 3.5 MHz. Although not important in this particular application. Fare's design procedure is not mathematically precise. An explanation as to how the procedure can be applied to find designs for other cutoff frequencies would be interesting.

The double-pi filter of Keyser provides a reasonable 18.2 dB attenuation at 7 MHz, and the VSWR over the 3.5 to 4.0 MHz range is less than 1.03. However, Keyser's plan to use this same filter for providing attenuation at the second harmonic of 3 MHz appears to be ill advised. At 6 MHz, this filter only provides 9 dB attenuation which is too low to be of much use. A separate filter for Keyser's 3 MHz band seems advisable if harmonics are to be adequately attenuated.

Except for Fare's design (curve 2, Fig. 3), all other five-element filters are within 3 dB of 17 dB at 7 MHz. This amount of attenuation is considerably less than the additional 32 to 35 dB attenuation that was initially proposed at the beginning of this article.

The most obvious conclusion to be drawn from Table 1 and Fig. 3 is that the five-element filter, regardless of type, has too little attenuation at the second harmonic frequency of 3.5 MHz. Consequently, it is advisable to use the seven-element instead of the five-element filter for attenuating harmonics of Class-C amplifiers, even if two more components are required. However, when the amplifier operational mode is Class-A or AB, the harmonic output will be 10 to 12 dB less that that of a Class-C amplifier. In this case, a five-element filter will be adequate.

to be continued

A SURVEY TO ASCERTAIN OPTIMUM ANTENNA HEIGHTS

H. A. ROHRBACHER, DJ2NN

Authorised Translation by
H. M. Lilienthal, F6DYG/DL7AH

Editorial note: this article was first published in the German magazine "QRV".

In the past few years, many hams have been able to erect their own towers; most of them carry rotatable beam antennas for the 10, 15 and 20m. bands. It is reasonable to assume that quite a number of the amateurs were faced with the everlasting problem of achieving maximum height without arousing undue criticism amongst their neighbours. It is also safe to say that their quest for the highest possible structure was accompanied by some technical problems usually rising in proportion with increasing heights. As a general rule, the layman has no idea of the stringent design and static requirements of a tower. What about the permissible windload? Does it need guy wires, and how many? Does a telescopic tower need to be lowered every time the wind velocity peaks above 20 m.p.h.? Very often, a "no good" feeling has remained after completion of an installation since no static proofs for the structure are required to be submitted to the authorities in many an area. To top it off, not all of the towers sold on the market today really satisfy the building codes of the verifying authorities on first application.

What are the minimum heights and other criteria to be met by short-wave antennas to satisfy all expectations for DX-contacts? The present survey tries to find an answer to these questions.

Related Parameters

Siegel and Ruedenberg [1, 2] fixed some time ago the theoretical parameters for calculating the effective antenna height and the closely related radiation resistance. These parameters presuppose somewhat idealised figures as to ground-conductivity and parasitics-free radiation space for the antenna. The average ham almost never encounters ideal conditions in that respect. He would rather orient himself by the height of the surrounding buildings, power lines or topographical features to form a general picture leading to a truly subjective decision.

Equipment and Antennas Used for the Survey

An alternative is offered by experimenting with different antenna-heights, thus determining the suitability of the antenna-location for DX.

Field-strength measurements have been conducted for over five years, using in succession two VK2AOU/DJ2UT Yagi beams of the types P-5 and P-6. At a distance of 2m. (6ft.) above both beams, two 20-element Cush-Craft arrays for both 2m. and 70cm. were installed. All antenna arrays were mounted on a common lift, running on a vertical rail fitted to a 24m. (73ft.) steel tower with an extension up to 30m. (91ft.) For technical reasons, the minimum attainable heights above ground were: HF beam, 2.3m. (7.5ft.); VHF array, 4m. (12ft.); UHF array, 6m. (18ft.). Other than that, the lift permitted placing the antennas for measuring purposes within minutes at any desired level. The feeder cables remained at their full length throughout the tests.

The antenna tower is placed well in the centre of a 3000 sq. metre (32,300 sq. ft.) property, 35m. (106ft.) away from a 9m. (27ft.) high dwelling house. Judging by today's living conditions elsewhere this is considered to be a fairly obstacle-free antenna location. In the direction of the front-lobes used for the test, the closest one and two-storey buildings are at a distance of 150m. (450ft.). Some 150m. (450ft.) beyond that point, there is a high-tension line. The QTH is in the centre of northern Rhenania, with the closest mountains about 80 km. (50 miles) away.

The measuring equipment for the survey consisted of two receivers, an HQ-180AE and a 75-S3C, a Rohde & Schwarz USVH selective micro-voltmeter and an R. & S. DPR attenuator. The latter was used in front of the receiver inputs. All data was obtained by reading the input levels visually and by tracing them for storage on a graphical plotter. Since the S-meter readings of both receivers diverged very much from the standard 6dB per S-unit calibration — especially in the lower S-unit areas — it was decided to feed the signals *via* the DPR-attenuator to obtain the same levels throughout. Both receiver front-ends were calibrated to similar sensitivities by means of a signal generator (R. & S. SMLR).

Timing of Readings

In order to eliminate distortions caused by QSB or variations in the propagation, all measurements were taken in rapid succession. Several readings were taken, noted (using a statistical procedure), averaged out and treated by eliminating both rare positive and negative peaks. Preference was given to DX-stations with continuous traffic, and distances of less than 5000 km. (3125 miles) were not considered. On the 15m. band, especially the amplitude modulated broadcast stations between 21450 and 21490 kHz were extensively used for signal-strength readings. The always very active stations on the 15m. amateur band like, for instance, LU6DZG, CE3CZ and PY7ALC ignored that we had selected them "secretly" to be our weekday standard signals. Most weekdays were blessed by a much lower average QRM level. However, commercial teletype stations — being somewhat less active at weekends — were trying their best to invite us to pick them as partners for our experiments.

On 20m. measurements were much more difficult. The beam was fixed on a south-westerly bearing. Sufficiently strong signals without fading came through from Central and South America only in the afternoons and evenings. A well identified French RTTY station in Guadeloupe as well as a few willing and able PY and LU stations offered their assistance during our measurements. On 10m. only stations from PY-land were the ones which acted as volunteers for the tests. Fadings bothered us most. There were especially the long and slow types of fading, running off with discontinuity. QSB-periods of less than five seconds were averaged out for acceptable results using several repeats.

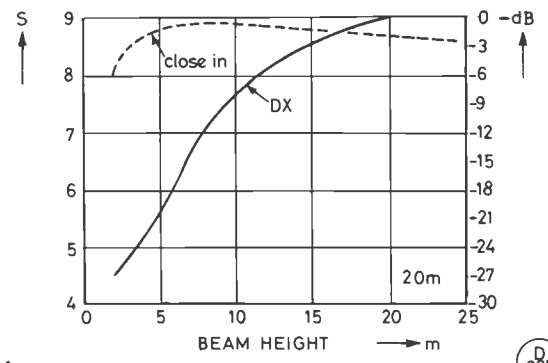


Fig. 1

The vehicle is the converted ambulance which houses the station of Ken Ellis, G5KW, one of the most dedicated U.K. six-metre operators; location was Arden Sawah Farm in West Cornwall. From left to right, Jim Sleight, G3OJI, his wife Clare, G6EVC, and Ken Ellis, G5KW. The antennas are various Yagis for 6m. and the HF bands.

photo: G3OJI

The graphical plotter offered a very welcome "off-line" analysis at a later quiet period. All "on-line" measurements, however, had to be terminated within half an hour in order to stay away from changing propagation conditions not allowing any comparisons. For that reason, it proved to be virtually impossible to carry out some all-band measurements with only one up-and-down movement of the antenna on its rail.

Discussion of Results

Results of the survey, obtained during the last few years from many averaged-out single measurements valid for the upper three HF-bands, as well as for the 2m. and 70cm., bands are shown in Fig. 1 to Fig. 4.

On the 20m. Band

The solid curve refers to the measured DX-stations. It begins at the minimum height of 2.5m. (7.5ft.) and climbs at the outset in an almost logarithmical manner. The rapid increase in antenna-voltage during the first half of the available tower height is rather striking. The further run of the curve shows, however, that the gain of antenna voltage begins to stagnate somewhat above an antenna height of 15m. (45ft.); as a matter of fact, between a height of 16m. (48ft.) and 25m. (75ft.), we "squeezed out" only 3dB more. A result like that was anticipated in as much as the beam enters above 16m. (48ft.) an area of rather flat radiation resistance nearing ideal matching conditions. It is interesting to note, that there was no more change in SWR above a height of 6m. (18ft.) above ground. From here on, it remained at 1:1.1 whereas it was 1:1.3 at an effective antenna height of 2.5m. (7.5ft.) coinciding with a tenth of a wavelength on 20m. At that minimum height, the actual antenna resonance turned out to be 280 kHz below the band.

The dotted curve on the drawings represents the results of the field-strength readings taken in the more immediate vicinity. They were obtained on an aperiodic dipole 4m. (12ft.) above ground at a distance of 75m. (225ft.). For that particular series of measurements, the beam was used as an active radiator, in contrast to the procedure applied on DX-signals. On account of the opening angle of its vertical lobe, the field-intensity of the transmitted signal decreased slowly above a height of 15m. (45ft.). The rather large maximum of the signal is located at a height corresponding to a half-wavelength. The curve of the field-strength in the immediate vicinity shows clearly that this type of survey has no real meaning as to the performance of the antenna on DX; it may give a hint on the formation of the lower part of the free space vertical diagram. Since actual ground conditions and conductivity play a dominating role in all close-in field-strength measurements, it is wise not to attach too much significance to their results.

Be it as it may, the VK2AOU-type beam had to be lifted up from 12.5 (37ft.) to 25m. (75ft.), in other words to twice the previous height, in order to yield *one* more S-point. This leads us to believe that the old argument of the Quad-fans, whereby only the Quad-antenna would produce the better signals at low actual heights, does not stand up to close scrutiny. Several years ago, DJ2UT still manufactured full-size Quads designed by VK2AOU which proved to be inferior in performance in comparison with

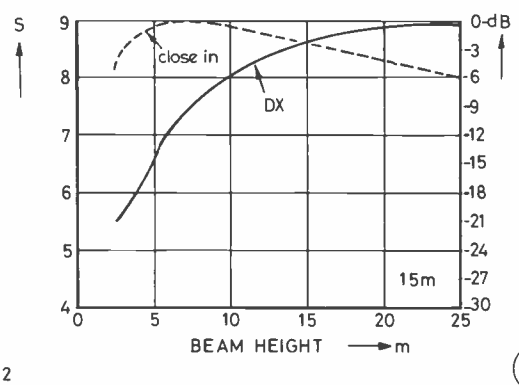


Fig. 2

D 998

the Yagi-beams off the drawing board of the same designer. Consequently, their production was abandoned. We do not know of any Quad being operational with any major communication links anywhere.

On the 15m. Band

The result of the investigation is similar to the one obtained on 20m.; however, the gain-curve between 15m. (45ft.) and 25m. (75ft.) of height is more flat. In order to gain *one* S-point, it was necessary to lift the antenna to a height of 25m. (75ft.). The overall gain-figure for very low operating heights between 2.5m. (75ft.) and 5m. (15ft.) is more favourable on the 15m. band. At heights of 3m. (9ft.) to 4m. (12ft.) the beam appears to be at a quarter-wavelength above ground. Thus, the effective antenna height — as compared to 20m. — is indeed more favourable. Interpreting the field-strength in the immediate vicinity leads one to assume that the elevation angle of the free space pattern on 15m. points up at a more acute angle. These findings, however, need to be looked upon with caution knowing that this particular angle is a function of the ratio between antenna-height and wavelength with its reference-point at about 17m. (51ft.) instead of 25m. (75ft.). Indeed, at 17m. (51ft.), the result is — 3dB, a reading only 1.5dB below the result obtained on 20m.

On the 10m. Band

The curve referring to DX has already a pretty well pronounced VHF-like character. We conclude that heights above 25m. (75ft.) would definitely yield a noticeable gain in field strength on this particular band. As an average, the gain is approximately 1 to 1.5 S-points per half-wavelength height-difference. An antenna height increased from 17m. (51ft.) to 25m. (75ft.) adds only 6dB, or just *one* S-unit to the signal. The measurements taken of the radiation-field in the immediate vicinity led us to conclude that there were two vertical patterns, or at best a slightly deformed pattern in the Z-axis. The close-in field-strength diagram obtained at a height of 12.5m. (37ft.) being the reference-point for 10m. read off a value of — 3dB, already typical for the 15m. band.

On the VHF/UHF Bands

Since the UHF and VHF antenna arrays were available throughout the investigation, it was decided to extend the measurements to include both 2m. and 70cm. This was easily done as there are two repeaters (R3 and R82) located by chance in the desired direction at a distance of 20 km. (12 miles). Nothing is more soothing than ever level-constant FM signals arriving at either 70dB or 95dB.

The diagrams in Fig. 4 were obtained by readings up to an antenna-height of 30m. (90ft.) and then extrapolated to 35m. (105ft.). The 70cm. array has a top-height of 30.2m. (92ft.), whereas the 2m. array ends at 28m. (85ft.). At the minimum height of 4m. (12ft.) above ground dictated by the lift, the curve for 144 MHz starts upwards. An old thumb rule, valid for these bands, is confirmed easily by the run of the curves for both bands,

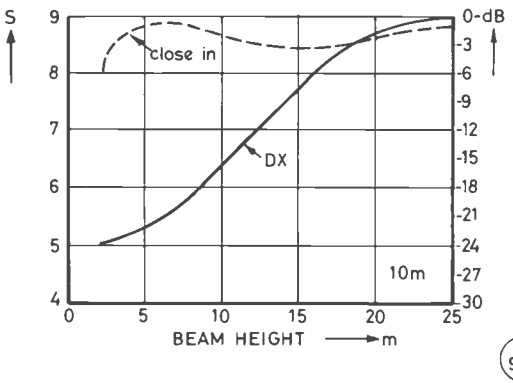


Fig. 3

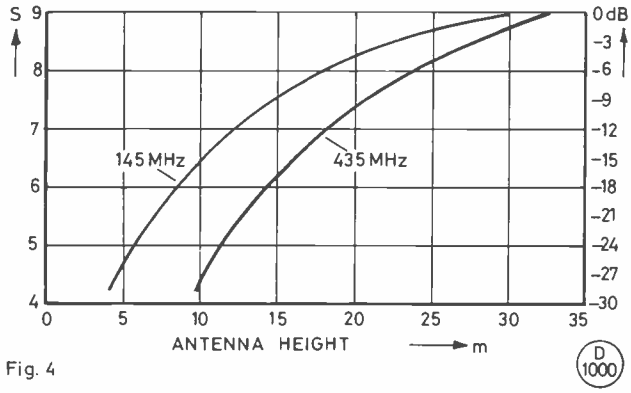


Fig. 4

i.e. doubling the antenna-height yields a gain of one more S-point. In actual practice, of course, there are limits to these empirically obtained rules as losses come obviously into play with increasing feeder cable length, flattening the curve at a certain level.

Conclusions of the Investigation

1. The VK2AOU/DJ2UT beam-antennas on 14 and 21 MHz obtained signals at *only one* S-point less when they were lowered from a height of 25m. (75ft.) to 12.5m. (37ft.). For traffic on 10m. (28.5 MHz) they needed to be lowered from 25m. (75ft.) to 17m. (51ft.) to produce a similar result. On 28.5 MHz the beams react with much more sensitivity to losses of actual height than on the other two bands.

2. For this type of antenna, and with due regard to the ratio of cost *v.* performance, the optimum antenna-height is around 17m. (51ft.) to 18m. (54ft.). Any extension above these heights would result in a noticeable increase in signal-strength only at some most unfavourable locations. Naturally, any increase of antenna-height beyond the optimum is an expensive endeavour.

3. Increasing the antenna-height from 2.5m (7.5ft.) to 10m. (30ft.) shows an almost logarithmical behaviour of the useful antenna-voltage compared to the height above ground.

4. Close-in field-strength measurements do not produce any significant evidence as to the optimum antenna-height.

5. The results obtained in VHF and UHF confirmed that even above 25m. (75ft.) a significant increase in signal-strength can be expected. The arrays for these bands should be mounted above the HF beam, although their feeder cables will be somewhat longer. Lower wind loads and better mechanical stability can be obtained that way.

6. A tower of less than 10m. (30ft.) is definitely disadvantageous for all bands under consideration. Compared to a height of 25m. (75ft.), losses of two to three S-points will have to be expected.

The survey unfortunately left open a number of questions, *i.e.*, information as to the vertical radiation pattern of the antennas. A new investigation, using the P-6 antenna, is under way and more data on the verticle field distribution will be available shortly.

References

[*1*] Dr. Ing. Schroeder, "Elektrische Nachrichtentechnik", 1. Band, page 510.

[*2*] H. A. Rohrbacher, DJ2NN, "Die Vertikalantenne", 1. Teil, *DL-QTC* 4/64, page 194.

[*3*] H. A. Rohrbacher, DJ2NN, "Allband-DX-Antennensystem mit Elevatormast", *QRV* 12/72.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

THE month in retrospect has been a real 'up-and-downer' as far as conditions go: from Ten wide open to even 7 MHz flat, and from the other end Top Band producing the ZLs — through to nothing. All the fun of the fair in fact! And, of course, this month has been the time to consider the impact of the autumn gales on aerials that weren't serviced during the summer!

All this has caused more correspondence, and so maybe we should go straight into the business and cut the cackle.

Ten Metres

Since it's his first time for some time, let G3ZPF (Dudley) open the batting; David is in the throes of moving house, and of course the whole transaction has been hung up in that wretched 'chain' — which leaves the prospect of putting up the poles in a foot of snow. Lucky David they call him! Ten CW has been activated from the present QTH on occasion, and yielded loads of Russians, locals, VE2FLE, KC1Q, EA9IE, Z21AV, and Europeans. Turning the mode switch to SSB and picking up the microphone resulted in another load of Russians, more local contacts, and PP5YC.

G4HZW (Knutsford) was out with G4SVV, operating as G4HZW/A from a site some 1500 feet a.s.l. during the RSGB 21/28 MHz contest, using a three-element Quad on 21 MHz and five elements on 28 MHz; the aerial was thirty feet up — at least for *most* of the time. The wind was pretty fierce up there and enough to snap the guys once or twice, but it couldn't shift the Land Rover nor the petrol-generator set! On Ten conditions were pretty good and the site and aerial combined to produce some big signals over the Pond, with G4HZW getting S9 plus from the Middle West. Some 600 stations were worked in twelve hours, but as there was a marked shortage of multipliers, Tony reckons to be well down the list. Sorting out the goodies, it came to 4M7QP, 4V2C, 5H3SG, 5Z4DE, 5Z4GM, KC7UU/5N23, 6W8HK, 6W8AR, 9H1L, 9U5IB, 9Y5WCY, 9Y4W, A71BH, C6ANI, several CEs, CN8ES, CP8EL, CX1FU, CX4BW, ED9CM, H5ABP, HB0AON, HC1HC, NP4Z, PJ2FR, PJ2MN, PJ7A, LU4DM, LU1BR, PY1NEZ, PY3NM, PY7ZZ, PY82WM, European Russians, UI8s, UM8, UA9s, all W call areas, all VE call areas, KH6IBA heard but not worked, TL8CK, TR8DX, VKs, VP2VDH, VP3VDQ, VP8AQA (Antarctica), VP8QS, VP9AD, VQ9JD, YB2SV, YS1OD, YV1TO, ZD7BW, ZS1CT, ZS4I, ZS5IV, ZS5YY, ZS6BPL, and ZS6XD. All of course, SSB.

Nice to hear again from G2HLU (Reading) who says he has obtained an R-600 receiver, partly at least with a view to putting in an appearance on Top Band as soon as he can get around to building a transmitter; but of course Harold has been using it to explore all those funny bands where there aren't any amateurs as well as Ten, and CB — with which he was not impressed! Another bit of cunning work between a pole and a tree has resulted in one of the inverted-V aerial ends rising somewhat — all that is needed now seems to be a similar wheeze to do the same at t'other end!

G2ADZ (Chessington) reports on his researches into the CW end of ten metres; Bill found it all topsy-turvy to expected form, open in the morning sometimes and dead by afternoon, and on other days dead all morning and opening in the afternoon! Even, sometimes, open from 1500 to 2200z. So Bill has used his spare time to have a peep whenever the chores have permitted. All continents have been audible on occasion, but there has been some evidence of one-way propagation. Bill suggests an eye be kept on the 28 MHz beacons; the VK ones seem to be around 28.258 to 28.265 MHz, and VS6TEN on 28.288 MHz seems to be received well. G2ADZ says he's never heard any JA beacons on the band and wonders if any exist.

Now to G2HKU (Minster, Sheppey); Ted has been rather busy with non-radio activities of late, and while he has looked at all the bands he hasn't spent much time on any one; and for Ten there is just one QSO, a QRP one with W4DHZ on CW.

G3NOF (Yeovil) says the band has been open quite frequently to North America, between noon and 2100z. The Russians have been noted in mornings and afternoons, but not a lot has been heard from Africa; during the day there has been short-skip to Central and Southern Europe, and around 1000z there has been the odd Pacific opening to include VK and JA signals. The Malpelo DX-pedition was heard with a good signal for several hours, and SSB contacts were made with AI2P/KP2, F0OV/FC, HB0AON, HC1HC, HK0TU, HK3NBB, K4IIF/KV4, KD6LQ, KG6JJH, KP4EQF, N7CHJ, NP2A, NP2Z, P47N (Sint Maarten), PP2ZDD, W7RM, WB6LED, VE6OU, VP2KBZ, VP2VDH, 3X4EX, 4V2C (Haiti), and 9K2BE.

G4LDS (Chelmsford) has a tale of woe about his tower and beam — the project was to add a third section to the tower and so rise another thirty feet, but Mr. Murphy decided to 'assist' and the Clerk of the Weather was feeling somewhat officious too . . . enough said! So, to keep things rolling while it was all being sorted out, an end-fed wire against earth was used, and this gave HB9BVL/5N0, W4SKO, KB8OR, G4ITL, N6ARR, K6UZ, A4XYM, G4KXL/DU1, various Ws, 5N23RTF, ZS6WB, PP2ZDD, K5IL, C13GCO, and a solitary CW contact with N2BHZ.

The ten-metre FM stuff seems to have had few mentions lately says GI4OCK (Bangor); Stewart has a converted CB set plus a little linear which puts out some twenty watts. During the second week of October Stewart seems to have had a ball, with contacts through the Virgin Is. repeater W1IBJ, and direct. One Russian, UK6HEC, plus WB8WKC, W3GYG, AI9U, KA4CMT, N4ISY, KF4HJ, plus small fry to the tune of some 24 QSOs, in a two hour spell on each afternoon of 8/9th.

Now we come to G6QQ (Hoveton), who is another who had a dabble in the contests; David tried a bit in the RSGB 21/28 MHz affair, the VK/ZL and the CQ WW, with of course some benfit to his countries-worked total, up by ten for the month! On Ten the cream was: KC8LL, WA1UUD, N8CQA, KJ3Q, W2LBB, WB3BBW, WA2ODS, KA1R, NE8T, and K1WJB. Non-W contacts included 4V2C, HK3NBB, VP2VDH, PYs, N4SF/P/6Y0, PJ7A, and HC1HC.

Snippets

The Malpelo expedition was definitely a 'biggie'; some 9000 contacts by one CW station, and 12000 by three phone stations. The weather wasn't all that kind and dropped the aerials for them sometimes and they couldn't get to the very top with the stations, although they did go to the summit unladen to prepare a helicopter pad for next time.

At the time of writing, BY1PK SSB activity should be going on, but it hasn't been audible as yet to your scribe. As for the latest Chinese station, BY4AA, it has been giving the QSL address as Box 205, Shanghai, and we note the operating is in the slow, methodical and full way, with name, QSL address, and location all being given in each QSO.

It seems that the XU1SS operation has been accepted as a legal one by the ARRL, to count for Cambodia; the reasoning

given being as tortuous as the politics of that troubled area.

ZL1AFH is now on from Kermadec, signing ZL8AFH — this apparently is the new prefix for Kermadec — and will be putting up aerials as soon as time permits. Operations from 5U7 are on the cards for January; KC7UU now says he will be there then, and there are buzzes going round that the Hensons may also be there. On the other hand, all hopes of a 70cm. operation seems to have folded as J28AZ has been heard saying "no chance".

There seem to be conflicting stories about the possibility of an operation by DJ6SI from Kingman . . . but the answer is a little easier, in that if your hear Baldur on from 9L1 around the end of November and into December — why then, he can't be at Kingman!

For those looking for Pacific DX, the word is that DL1VU started a longish swing across the area on November 17: KH2, KH0, KC6E, C21, T2, T30, T31, T32, 5W1, ZM7, ZK2 and ZK1. It sounds to be a mainly CW job, with the spot to monitor being 27 kHz up from the lower band-edge on each band, and 10100-10105 kHz in particular.

Silent Key

We were sad to hear of the death of G2BJY (Walsall) on October 3; we understand Geoff was actually operating when he succumbed to heart failure. Geoff was always a fine operator, and always used home-brew gear, whether on SSB or CW. In accordance with his wishes, his certificates and QSLs are with the writer, to be sorted into a display suitable for a special-event station; his current rig is also here awaiting transport to the Wireless Museum on the Isle of Wight. He will be missed in many ways, and by the writer more than most, as he was for long a *CDXN* contributor until his health began to deteriorate.

Top Band

In essence, quite a few got through to the ZLs in the earlier part of October; GD4BEG, G3RPC, GW3YDX, G4AKY, G3BDQ, GI3OQR, G3RBP are all known to have been heard in ZL, and we believe that they each made it into a two-way — all with some difficulty and misfires. Quite amazing how much 'one-way propagation' was to be noted with various stations being called and not hearing, or not able to hear the DX and sending loads of QRZ type noises.

G3BDQ (Hastings) just missed the deadline for last month with his first letter, recounting the story of his 9V1LO QSO which arose after his deciding to opt out of the HZ1AB pile-up which was "just like Twenty!" 9V1LO then worked G3RPB and was last heard working VS6DO, who was also heard. This would have been October 6, and on 8th GD4BEG reported to John that he had been called by ZL3GQ who was totally inaudible at G3BDQ. A point of interest which could well be noted is that G3BDQ runs the TS-530S with the 20dB attenuator button pressed *all the time* on Top Band, to keep the risks of home-made noises in the receiver to a minimum — and this, be it noted, with a receiver of good dynamic range. By October 13, it seems that the season for ZL was about over, at least in the eastern half of England, and by October 26 a one hour stint between 0550 and 0650 yielded nothing save a YU calling CQ! October 17 saw a QSO with DU1EJ, to add to the earlier ones with VK9NS and KH6DL — naturally the QSLs are awaited. FM7AR, a couple of Nigerians, and some Ws about summed it all up. In a final letter dated November 2, G3BDQ says he received his QSL from ZL2BT. He also reports JY8RF as being on the band.

Turning to *DXNS* we see that some other stations have been on the band: AE6U/TI2 has been heard, 5N8ARY is said to have peaked at well over S9, 7X5AB has been worked in U.K., 9K2BE is getting ready, VK9NS reports having heard G3RPB, G3SZA and GW3YDX, while CO2BG, 3D6AK, and some more questionable signals are mentioned.

G2HKU says he used SSB to work ED9CM, ED6MDX, PA0PN, 4X4NJ, 4U1ITU, OH2BH and HB9CI, while his CW reached out as far as RF6FFW, UA9CBO, EA3VY and 4X4NJ.

Using his home-brew all solid-state rig on SSB, into a home-brew vertical of 45 foot height centre-loaded, G3OUC (Newbury) has been sitting around 1840 kHz on SSB most evenings from about 2100z. One evening alone saw contacts with OH1XX, UK2RDX, LX1PD, EA2AOM, DL6MX, GI4NRE, GI4UHA, with EA8UUA, SV1DT and an SP station as gotaways.

A long letter from D. A. Whitaker — our man in Harrogate — indicates his concentration on Top Band during October. During the CQ WW contest, David says, some 70 countries are known to have been on using Top Band. A listing of David's logs for the month, by time of day is of interest: at midnight, EA9EU, EA8GL, 4X4NJ, UL7LCZ, 4Z4DX, EZ6GAW (= UG6); 0100z, 5N8ARY, UA9SJL; 0200z, HZ1AB, ED9CM; 0300z, 4Z4DX, 4U1ITU, HB0BHA; 0400z, NP4A; 0500z, CY0SPI, W5TZC (Arkansas), PJ7A, EA8AAU, NP4A, EA8YG, VO1HN, TI1C; 0600z, EA8AK; 0700z, TI1C. Later in the day we start at 1600z when 4X4NJ appeared at RS38; 1700z, HB0 and OH0; 1900z, RF6V; 2000z, UA9CBO, JY8RF; 2100z, EA8AUU, 4U1ITU, 5N8ARY, 7X5AB; 2200z, EA8XS, HZ1AB, Ws and VEs; 2300z, SV1DT, 4X6DK, EA8GL, Y22TO and DL6EAG/HB0.

Turning now to the invaluable contribution of W1WY, we have to report on the CW WW 160 shindig for 1982. This shows the CW section as being adorned by G3SZA as the top European trophy winner with some 174,087 points from 370 QSOs. World top score went to EA3VY with 218,467 points from 446 contacts, while the U.S. winner was WA2SPL. On the Phone front, the World winner was VE3CVX, U.S. winner WB3GCG, and European winner UR2RNA. Congratulations to all those who collected the silverware, and to all those who appeared in the listings; an enormous number of the OKs were evident both in the lists and in the check-logs.

Eighty

G3ZPF continues to potter around the CW end of the band, and David mentions W2BA — always around 3512 kHz — a questionable CU1AIZ, TO9OQ, OH0BA, VE1ZZ, PY2BW, VE1AST, and PP5WCY.

TOPS CW club members should note the club nets on 3508 kHz (3514 kHz as alternative frequency), 1400-1600 clock time on Wednesdays and Sundays. Look out for net control GW6AQ, and non-members welcome provided the net doesn't get unwieldy.

Now we have an entry from G4SXE (Burton-on-Trent) who operates with QRP. Two watts worked lots of Gs and in addition, GW4PQC, SM6KMD, LA2CF, ON6NW, DL7AAO, Y54UA, UK5WCA, PA0PAN, EI7EK, ON7GO, GW4NYX, PA0RHA, DH0LAH, and UB5ABY. The QSO with EI7EK turned out to be interesting as he was an Italian, Luigi, giving Brian his first EI contact; and as Brian speaks some Italian they were able to have a bit of a natter in that language.

The afternoons, when G2NJ (Peterborough) does his operating, have been much better of late, says Nick. He mentions G4RSV, Maureen, who had only been on CW for a week; they had a forty-minute natter and then she was called by G4MRJ in Ellesmere Port, who also complimented her on her operating. Perhaps the most interesting contact with the QRP rig was with PA3BFH/M one evening at 2100, only a few kHz from SM5BMK/MM, to provide scanners of the band with something a little out of the ordinary. Nick seems to alternate between his QRP rig at three watts and the Big Box at 50 watts for his contacts.

Forty

Conditions have been rather similar to the previous month's, says G3NOF; VK and ZL have been heard between 0630-0730z, South Americans around 2300z and Ws were heard near midnight. SSB contacts were made with CN8ES, FC9UC, IS0WON, RW9A, TI1C, UA1DZ, UK2AAL, UK2PCR, UK4FAV, UK5OAA, UK6LEZ, UQ2DGQ, UV3FD, VP2VDH, 4O2WCY and

4U1ITU.

G2HLU says most of his operating on the LF bands has been QRP, using his TS-520 wound down to two watts. Harold checked in to the morning SSB net, now transferred from 80 to 40m., and used QRP CW to work I1AEG as well.

Just a couple of contacts were mentioned by G2HKU; Ted made an SSB two-way with SU1RK, and the CW got right over to W7AM.

D. A. Whitaker listened on the band's SSB end, and his list includes, starting at 0500z, HK4FLT, VP2KF, CP1GOS; 0600z, 9Y4BA, ZK2RS, TI1C, NP4A; 0700z, VK9WCY, K6HNZ/TI2, YS9EW, UK1PGO (Franz Josef), CX1OA, VK9NS; later in the day we find the restart at 1900z, with JT1AO, VK3RF; 2000z, UK6VAF; 2100z, SU1RK, JA6CXX; and 2300z, PJ2FR.

New Bands

Some more attention to them this month; but first we have our apologies to make to R.N.A.R.S. stalwart G3JFF. Mike's letter should have appeared in the November issue, but latched on to some misbegotten paper-clip and ended elsewhere, until the luck of the filing-system brought it to light — sorry Mike! G3JFF, despite being a busy man, has managed to make some 43 countries talk to him on CW on 10.1 MHz; VKs in the morning, along with ZL, while at the same time the path to U.S.A. is still open, and Ws have been heard as late as 1030z. In the evenings there have been interesting signals from ZC4BI, HL1EJ, VP8ANT; and around dawn in VK, VK3MR is delighting the evening listener in U.K. All have been worked along, of course, with lots of 'small fry'.

A new reporter in G4TVF (Whitfield, Dover) who took up the hobby after a motor-bike accident landed him in a wheelchair. Dave seems to be coping pretty well with this disaster, with the aid of a five-band vertical, a modified CB whip for ten-metre FM, an Icom IC-720A and IC-251E, not to mention a Telereader for RTTY and BBC micro-computer. Dave has a bit of difficulty with his hands, but that doesn't stop him managing to send at up to 18 w.p.m. — albeit with the odd error. Now, having noted the dearth of reports on 10 MHz, G4TVF decided to do something about it, and loaded up the rig into the five-band aerial *and* the CB aerial together, and put out a CQ which netted WD4MDA, WA1OMM, DJ5KB, DL9MAX, DJ5BT and F5MA for a good start; G4BXI and DL7TA were also raised in the next couple of days.

Next we come to G4OWY (Weymouth), who offers the opinion that one of the reasons the band is not more used is that some of the commercial QRM does make it hard going — but as Ray says, lots more amateur activity would probably result in that position changing pretty rapidly. Ray is somewhat uptight — as indeed are many people — about the SSB users of 10 MHz, particularly the German ones who sit on the German and Florida beacons for their contacts. These clever lads, we feel bound to comment, may well end up losing us the use of the band altogether. Turning to nicer things, G4OWY says he has contacted with five watts RF output, G2ABC, G4PUG, G3YKP, G4OJF, G3RHI, GM3OXM, LJ2Z, LA8SF, LA5LBA, LX1PD, HB9EW, PA0EOE, PA3CZU, Y22TO, DL2MV, DF9NN, DF8IB, DL6ZZ, DK3AA, DL1SN, W2KXL, W2HBO, and a couple gotaway YBs.

Next we come to G8PB (Chichester) who used the band between 0700 and 0830z, to work ZM3RK, VK7RY, VK5LU, VK2AHM, W3GG, VK3MR (twice), VK3MJ, ZL1NW, K2MUB, W8EGB, KJ8L and WB1LDH, the last four between 1040 and 1140z; the rig is an FT-101ZD and the aerial an inverted-vee dipole.

Twenty

G3NOF seems to have lost interest in the band to a large degree. He notes the VKs and ZLs over the long path between 0600 and 0800, but adds that little Pacific DX was about; and in the afternoon, he listened to the Indian Ocean stations on the French net at 1600z, with F6BHY as 'MC'. Little listening was done after this hour. Don made his SSB go out to A4XVM, DF3NZ/ST2, FR7CY, K5GA/VP2V, KL7SE, I2GYH/IA5, TR8CR, VK4AI, WP4CBB, YI1BGD, 3B8FL, 3V8AS, 6C1AO and 9X5MH.

G2HLU didn't spend much time on the band either, but he did find the time to work ZS2RJ and BY4AA — the latter quite made his day, and he didn't have too long to wait in the queue either!

G2HKU used his SSB to work to IT9DED and ZL3FV, while CW accounted for FM7CW.

G4LDS, as already mentioned had troubles with his main aerials, and in the meantime used an end-fed bit of wire. That didn't stop him from QSO-ing W6PU, SU1RK (QSL *via* DL5JP), UA9YFG, K7AIM, VE7BCM, VE7ATP, AX7CC, AX7XX (who is ex-GI4AMX and a YL), VP8ANT, JX5DW and W2BOK.

Twenty CW for G6QQ meant ZL1WO, VK3VG, VK6VP, ZL2TX, ZL3FV, PW8EH, VP2KBZ and NP4A, plus small fry like east coast Ws and so forth.

Fifteen

Here we start with G3NOF, who didn't find the band as good as it was in September. There has been little long-path propagation to VK/ZL, JA, or the Pacific, but there have been short-path openings between 0900-1100 on some days. The Americans have been in evidence from 1100 till 1900 but with fade-out, the W6 stations peaked, but not strongly, around 1700, and around 1830 KH6WU was heard sometimes, while the Africans appeared between 1500 and 1800. The Malpelo expedition was audible between 1400 and 1800z. It added up to SSB contacts with AP2P, AX3BY, AX3KHI, AX3KMA, DF1JC/HBO, ED8VDR, FG7CO, G3AAE/VP9, HB0BHA, HB0BOE, HL1ALA, HZ1AJ, J28AG, JAs KB7CQ (Idaho), KH0AC, LA2WW/9L1, OD5SV, P29GO, PJ7A, TI1C, UF6FER, V3TV, VE4RP, VE7DG, VE7IG, VE7TG, several VKs, VK9ND, VP2VDH, VP9AD, VU83AUS, VU83BGS, WP4CBB, XE2SI, Y83ANT (Antarctica), YB0VM, YB0ZCE, YC2BSF, YJ8TT, ZB2HR/M, ZL2AMU, ZM1BQD, ZS1CT, ZS5NZ, 3D6AB, 3V8AS, 4V2C (Haiti), 6C1AO (= YK1AO), 6U1WCY (= ST2), 6Y5IC, 7X4BL, 8Q7AN, 9Y4RD/SU, 9Y4W, 9K2BE and 9K2EZ.

G4LDS says his linear is now progressing since he went to the local club's junk sale, where he picked up a suitable transformer for the screen volts supply for the enormous sum of twenty pence. However, with just the barefoot rig and impromptu aerial, Chris raised WB1FGS, WB6HJJ, W0HC, W7XY, JY9CL, JAs and G4KXL/DU1.

Fifteen seems to have been the preferred band for G6QQ, who offers VE7BDW, VK4ALV, AP2MQ, K6TE, VE7DFS, FG7BZ, PT7CAW, VP2VDQ, UA0AAZ, ZL2AWU, ZL2RE, V3EN, all on CW, plus a daffy of contest QSOs. CW with lots of Ws and VEs, JAs, ZS, 9K2BE, HK3NBB, LU8DQ, K6DDO, W1RRT/VP9, HH2VP, W6HAL, AF7F, and 3D6AK; SSB was enough for VP9AD, LU1BR, VK2PPW, JAs, PP2ZDD, JY9CL, PS7KM, ZS2GH. ND7E and KP4EY.

"CDXN" deadlines for the next three months:

January issue — December 8th
February issue — January 5th
March issue — February 2nd

Please be sure to note these dates

Finale

That, masters, is the lot for this time; thanks to all the reporters for their letters, and please keep them rolling. Deadlines are as indicated in the 'box' in the body of the piece, and we recommend early posting lest your letter gets snarled-up in the Christmas mail delays. Address as ever is: "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. And, since this is our last chance — all the best of everything for Christmas, and a Happy New Year.

THREE-ELEMENT QUAD FOR TWO-METRES

AN EFFECTIVE DESIGN USING SIMPLE CONSTRUCTION METHODS

J. V. MOSS, B.Sc., G4ILO

IF you look at the types of aerial in use on two-metres then you could be forgiven for thinking that people choose their 'skyhook' by what happens currently to be in fashion. It can seem as though everyone on 2m. FM is using a 'Slim Jim', while down at the sideband end it would appear that the 'in' thing is to have a Yagi made by *Tonna*. For those restricted to a loft aerial, or requiring something compact for portable use on SSB, the almost unanimous choice is an HB9CV or its close cousin, the ZL Special.

One type of beam has never had the popularity on VHF that it deserves, in spite of the existance of commercially produced models, and that is the Quad. Commonly used on the HF bands, the quad is capable of high gain for its size. Unlike the HB9CV, it does not need 'plumbers delight' all-metal construction, it is easy to make, easy to tune up and it is ideal for loft installation as it is relatively unaffected by the proximity of other objects.

The 3-element version described here is constructed using 'wood-and-wire' techniques. It is capable of about 6dB gain relative to a half-wave dipole, a front-to-back ratio of 15dB, and it should be possible to achieve an SWR of well below 1.5:1 across the whole two-metre band. For indoor use, where no weatherproofing is necessary, it should be possible to make the aerial for under £1.

The basic construction is shown in Fig. 1. The boom is a piece of timber of 20mm. or 1" square section, or greater, cut to 28" (711mm.) long. The reflector and director are inset by 1" (25mm.) from each end of the boom, with a reflector to driven element spacing of 14" (355mm.) and a driven element to director spacing of 12" (305mm.). The spreaders are fabricated from 5mm. or ¼" diameter wooden dowel, cut to the dimensions given in Table 1, two pieces of each length.

The boom should be drilled to take the spreaders, as shown in Fig. 2. A larger hole should be drilled through one of the edges of the square-section boom, at its mid-point, just behind the driven element, to take the mast — a piece of 10mm. or ½" wooden rod. Alternatively, the corners of the boom could be rounded off at this point and a normal type of aerial-to-mast clamp used. A round-section piece of wood such as a broom handle could be used for the mast in this case, this could also be used for the boom if the constructor is confident of being able to drill the holes for the spreaders accurately at right-angles into a curved surface.

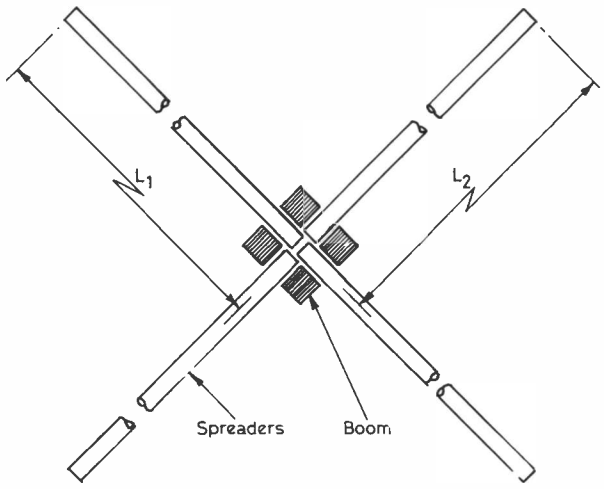


Fig.2. CROSS SECTION OF BOOM SHOWING ASSEMBLY OF SPREADERS (E 122)

One end of each spreader should be notched, using the corner of a file, or a sharp *Stanley* knife if you are careful, to retain the wire loops which will be fitted over them. The spreaders are then secured to the boom using *Araldite,* as shown in Fig. 2, the ends of the longest pair of spreaders of each four (L_1) meeting at the centre of the boom, the other slightly shorter pair (L_2) pushed in firmly against them, taking care to ensure that the notches at the outer ends are vertical. If the holes in the boom were drilled accurately and are a tight fit on the spreaders, then there should be no problem in ensuring that the spreaders remain at right-angles to each other and to the boom while the adhesive sets.

A block of two 'chocolate block' type wire connectors should be mounted on the mast 10" (254mm.) down from the top. This will be the feed point for the driven element.

Once the *Araldite* has hardened the boom asembly should be fitted to the mast. The wire for the three elements should be cut. About 84" (2134mm.) is required for the reflector, 80" (2032mm.) for the driven element and 76" (1930mm.) for the director. The wire size used is not critical; 18 s.w.g. tinned copper wire was used for the original version, which performed satisfactorily, however this wire was a little too stiff to get all the kinks out, and 22 s.w.g. was substituted, which could be stretched taut, and looked a lot neater.

For the reflector and director, the wire is looped over the spreaders and cut so that the ends overlap by about ½". The ends are then soldered together and the wire loop stretched to fit over the spreaders. For the driven element, the ends of the wire are connected to the terminal block on the mast.

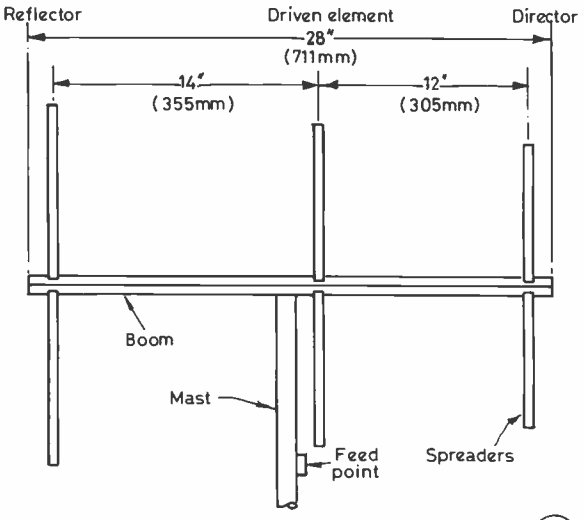


Fig.1 SIDE ELEVATION OF 3-ELEMENT QUAD (E 121)

ELEMENT	L_1	L_2
Reflector	14·9" 378 mm	14·8" 376mm
Driven El.	14·2" 361mm	14·1" 358mm
Director	13·4" 340 mm	13·3" 338mm

(E 120)

Table 1. LENGTHS OF SPREADERS FOR 3-ELEMENT QUAD.

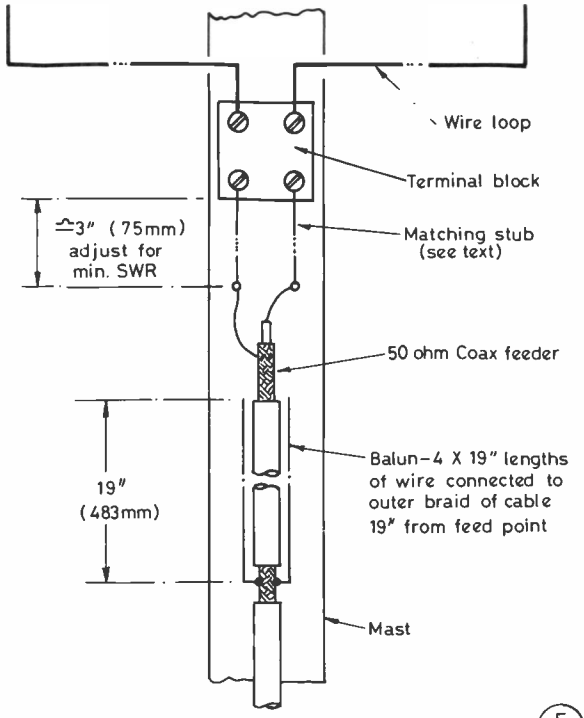


Fig. 3 DRIVEN ELEMENT, SHOWING METHOD OF FEED. (E 123)

If the quad is fed directly with 50-ohm co-axial cable, the SWR will be found to be high, about 2.5:1. The matching arrangement shown in Fig. 3 is therefore used. A 5" (125mm.) length of 300-ohm ribbon is attached to the end of the co-axial cable, the other end being attached to the terminal block. (If no 300-ohm ribbon is available then two 5" lengths of stout copper wire will serve equally as well.) Pick a clear frequency right at the bottom of the band and measure the SWR; this will probably be fairly high, so the stub should be shortened by a small amount, about ¼", and the SWR measured again. This process is repeated until the lowest possible SWR is obtained. The SWR of the author's aerial, measured across the whole two-metre band, is shown in Fig. 4.

The Quad is a balanced aerial, whereas co-axial cable is unbalanced, and so a balun is required in order to prevent radiation from the outside of the feeder, which can distort the radiation pattern and, perhaps more significantly, cause TVI. The simple balun employed is shown in Fig. 3 and consists of four quarter-wave lengths of wire connected to the outer braid of the cable at a point a quarter-wave down from the aerial feed-point.

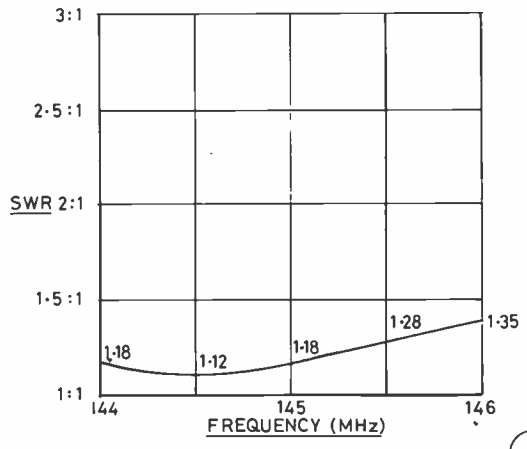


Fig. 4. 3-ELEMENT QUAD — SWR vs FREQUENCY. (E 124)

In order to do this it is necessary to cut away a small section of the outer insulation at this point. The far ends of the wire lengths are insulated, and the wires may be taped to the outside of the feeder for neatness.

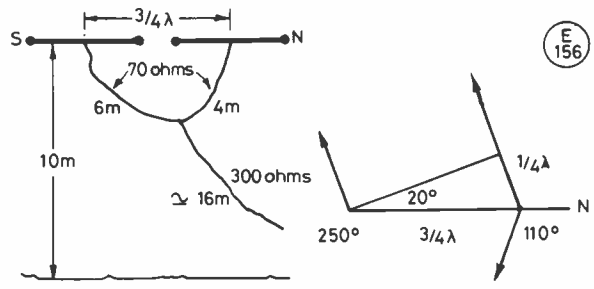
If the aerial is to be installed in the loft where it will be impossible to rotate it, then it should be pointed in the preferred direction. The beamwidth is fairly wide, and if previously only a vertical aerial has been available for occasional excursions onto SSB then the improvement in most directions should be very noticeable.

For outdoor or portable use, the wooden parts of the aerial should be given several coats of paint, not only to protect the wood but also to prevent any deterioration in performance which could occur when the wooden spreaders become wet. It will also be necessary, of course, to waterproof the feeder connection.

It is hoped that this article will encourage a few more people to try the Quad. There is certainly no other beam which will give the same gain for such a short overall length and small turning radius.

SKEWING THE POLAR DIAGRAM

ACCORDING to theory, two dipoles in line should give a useful increase in gain broadside. If, however, the tree which holds the 'garden end' is due south of the shack and the direction of interest is, say 249° (Peru) and not 270°, it is doubtful whether any advantage would accrue. A plausible solution which appears to work is shown in the sketch. Comments would be most interesting because, owing to the vagaries of the 15m. band and unknown variables affecting local propagation (trees, houses, soil conductivity, uneven terrain, etc.), results cannot be conclusive. Contact has been made with Peru, and good contacts with Israel, Cyprus (110°), Ukraine and South America. Nearer Europeans probably signify little, but two contacts with South Africa spoil the theory!



(E 156)

The two dipoles are half-wave centre-fed, with ¼-wavelength separation between the ends. The feed points are assumed to be about 70-ohm and, allowing ⅔ velocity factor for the 70-ohm twin feeder, roughly a half-wave is connected to each dipole (to minimise mismatching) to a common feedpoint. The feed to the south dipole is ⅛-wave longer and the north ⅛-wave shorter than the exact half, *i.e.* the dipoles are connected with 10m. of twin which is connected to the main feed (300-ohm ribbon) 1m. on the north side of the centre point. The twin feeders are connected in series to the ribbon to give a match. The intention is to give the north aerial a lead of ¼-wave over the southern one. Since the aerial centres are ¾-wavelength apart the polar diagram should be skewed $\sin^{-1}(⅓)$, or 20° to the south.

J. M. Osborne, G3HMO

CLUBS ROUNDUP

By "Club Secretary"

AS this is the last issue before the Christmas season, we take this chance to wish you all a very Merry Christmas and a Happy and Prosperous New Year. May your club grow and your programme put itself together perfectly!

The Mail

Abergavenny & Nevill Hall lead off this month. They have a Christmas Dinner on December 9, at the "Llanwenarth Arms", on the A40; tickets from the Hon. Sec. Normal meetings on Thursdays, in the room above Male Ward 2 at Pen-y-Fal Hospital. They also run an RAE course — details from the Hon. Sec.

December 20 is down for **Acton, Brentford & Chiswick** to have a debate on antennas. The venue, of course, is the Town Hall, High Road, Chiswick.

Another Christmas Dinner event is noted for **Axe Vale**, on December 2. As this is a limited-number affair, and on the normal meeting night, it seems that you should contact the Hon. Sec. — *see* Panel — if you are interested in making contact.

Bangor have their base at the Sands Hotel, Bangor, Co. Down, on the first Friday in each month, with GI4UUC giving his talk on power supplies. In addition they have a caravan well-equipped for operation as a demonstration station at public events, and it is in fact operated from GI8KZT, Gransha Road, Bangor on the third Friday of the month to provide an informal extra meeting-night. For the rest we must refer you to the Hon. Sec. — *see* Panel.

At **Biggin Hill** there is a surplus sale on December 13, at Biggin Hill Memorial Library, and the AGM is on January 24. After the AGM there seems to be a change in venue, to St. Mark's Church Hall, Church Road, Biggin Hill.

Bishops Stortford is to be found on the third Monday in each month at the British Legion Club, Windhill, for the main meeting. There is also an informal on the first Thursday of each month in the "Nag's Head" on Dunmow Road.

Leaving Bishops Stortford and heading east, one can continue to **Braintree** where the gang has its Hq. at the Community Centre in Victoria Road, next to the bus station, on the first and third Monday each month. December 5 is a talk on swept frequency testing by G3OLU, and on 19th they have the Christmas Party — entrance by ticket only, unfortunately.

The **Brighton** club has shifted its Hq. to the Seven Furlongs Bar at the northerly end of the grandstand complex at Brighton Racecourse. Light refreshments only will be available at the meetings, and those wishing something stronger after the meetings can adjourn to one of several nearby oases, to choice. However, we don't know anything about the meeting routine, for which we have to refer you to the new Hon. Sec. — *see* Panel for his details.

We come now to **B.A.R.T.G.** which is the one looking after the interests of the RTTY addicts, mechanical or electronic. For the details, contact the Hon. Sec. — *see* Panel.

A new entrant to this piece is **British Telecom HQ;** this one is for those who are BT and P.O. employees based in London, offering occasional meetings, a regular newsletter and other facilities, not to mention their regular net on Eighty. Details from the Hon. Sec. — *see* Panel.

Another new one is **Bromsgrove ARC;** formed back in May, they foregather at Rigby Lane School, Rigby Lane, Bromsgrove on the second Tuesday of each month. For December 13 they have a talk by G3RJV on QRP.

The other **Bromsgrove ARS** have a booking at Avoncroft Arts Centre on the second Friday of every month. For December, we are advised, they have their Christmas Party.

December 13 is the AGM for **Bury** at Mosses Community Centre, Cecil Street, Bury. However, they are available every week, as they have informals on every Tuesday of the month. More details from the Hon. Sec. — *see* Panel.

On December 2 the **Cambridge** crowd have their Christmas 'do' at Madingley Village Hall, and on December 16 they are back at Hq. for the informal. The normal venue is the Visual Aids Room, Coleridge Community College, Radegund Road, off Coleridge Road, Cambridge.

Cambridgeshire Repeater Group next; for details on their activities contact the Hon. Sec. — *see* Panel for his name and address.

Cheltenham have their Hq. in the Stanton Room, Charlton Kings Library, Cheltenham. December 2 is the AGM, and on 16th they are going to play skittles at "The Hobnails" — details from the Hon. Sec.

For **Chichester** there is a normal club meeting on December 6, with the club Christmas Social on December 15. Both in the Green Room, Fernleigh Centre, 40 North Street, Chichester.

Colchester Institute in Sheepen Road, is home to the **Colchester** club. They have a microprocessor project, with G6IAW on December 1, and on 15th they have the local St. John Ambulance to talk about their activities. December 10 is an extra, by way of the Annual Dinner at Wivenhoe House.

Down to the far west we head, to **Cornish,** where they are still gathering at the Church Hall, Treleigh, on the old Redruth By-pass, on December 1 for a "Visual Social Evening", to include photographs and transparencies.

Deadlines for "Clubs" for the next three months—
January issue—November 25th
February issue—December 30th
March issue—January 27th
April issue —February 24th

Please be sure to note these dates!

For the details of the **Crawley** meetings at Trinity Church Hall, Ifield, Crawley, we have to refer you to the Hon. Sec.

The **Cray Valley** letter tells us they have not yet finalised their activity for December 1, while 15th is a definite natter evening; although they don't say so, their Hq. is at Christchurch Centre, High Street, Eltham.

One club that seldom slips with the correct data is **Crystal Palace,** where the Hon. Sec. is careful to ensure we get all the needed 'gen'. They foregather at All Saints Parish Room, Upper Norwood, which is at the junction of Beulah Hill and Church Road, right opposite the IBA TV mast. On Saturday, December 17 they have a film show and social evening.

Now to **Dartford Heath D/F;** here they meet at the "Horse and Groom" on December 6, followed by one of their Sunday D/F Hunts on December 11. After that they have an EGM, also at the "Horse and Groom", down for December 21.

Every Wednesday evening the **Derby** crowd all head for 119 Green Lane, where they have the Top Floor for Hq. For December's details, we must refer you to the Hon. Sec. — *see* Panel — as for once their P.R.O. seems to have missed the deadline.

On to **Derwentside,** where the group still keep to their R.A.F. Association club Hq. in Consett on Monday evenings. As they had their AGM last time, they have no detailed programme at the time of writing, but no doubt something will have been sorted out. Details from the Hon. Sec. — *see* Panel.

On December 1 **East Kent** have a visit to Richborough Power Station arranged. For December 22 they have a cheese and wine party plus Grand Christmas Draw.

The main meetings for the **Exeter** club are at the Community Centre, St. Davids Hill, on the second Monday of each month. On all other Mondays they have informal gatherings at the Emmanuel Scout Hut, Okehampton Road.

Over to **Farnborough** where they have meetings at the Railway Enthusiasts' Club, 103 Hawley Lane, Farnborough, on the second and fourth Wednesday of each month; they have just put out their annual magazine, and a very fine reminder of the past year of the club it is.

At the **G-QRP Club** the prime interest is in low-power operating, with constructional work and aerials close runners-up. Details from the Hon. Sec. — *see* Panel for his details.

Southfields Junior School is the Hq. of the **Greater Peterborough** crowd, normally on the fourth Thursday of the month if the school is in session. For December we see they have booked December 15, for a get-together at "The Windmill" in Orton Waterville.

It is second and fourth Fridays each month for **Guildford**, at Guildford Model Engineering Society Hq. in Stoke Park; December 9 is a film night, and on 23rd it's "Party Time at the Club!"

Over to **Harrow**; this means Harrow Arts Centre, High Road, Harrow Weald, on December 2 for a practical and informal session, and December 9 for a surplus equipment sale, the first in the Roxeth Room and the latter in the Belmont Room. Meetings are normally every week, but we don't know what they are doing for the rest of the month, for which we have to refer you to the Hon. Sec. — *see* Panel.

At **Hastings** the main meeting is on the third Wednesday of each month at West Hill Community Centre. Every Friday evening at Ashdown Farm Community Centre they have a chat night; other evenings during the week are used, also at Ashdown Farm, for various other activities.

December 7 and 21 are informals at **Havering**; December 14 is a film show for which they have booked "The Aerial Circus" and "The Secret Listeners" while on 28th there is no meeting as their Hq. at Fairkytes Arts Centre is closed. The venue just mentioned is in Billet Lane, Hornchurch.

For details of the **Hereford** meeting-place we must refer you to the Hon. Sec. for the moment as their regular place is undergoing alterations; however we can say that they have a talk set up for December 2, and the Annual Quiz on December 17.

The **Ipswich** group have the second and last Wednesday booked at the "Rose and Crown", at the junction of Bramsford Road and the A45 Norwich Road; on other Wednesdays they usually have Morse classes, but this should be checked by a contact with the Hon. Sec. — *see* Panel. For this month, December 14 is a film show, and the club is closed on December 28.

If you want to know what's going on in EI-land, then **I.R.T.S.** is the club to get in touch with; the Hon. Sec. should know all that's going on in Eire, amateur radio-wise.

Quite a lot of news in the letter from the Hon. Sec. of the **Isle of Man** grouping. Between November 20 and December 17 they have GB0WCY in operation from the TT Race grandstand, Douglas, with multi-band operation and a special QSL card being sent out. The normal meetings are held on Monday evenings at the Keppel Hotel, Creg-ny-Baa.

In **Jersey** they have the Communicare Centre, St. Brelade, booked for December 14, when they have a tape-and-slide talk on aurora by G2FKZ.

If you use any of the repeaters in the Kent area, you should be a member of the **Kent Repeater Group.** Get all the details from the Hon. Sec.—*see* Panel.

Now Northern Ireland, and **Lough Erne**; the Club Hq. is at the Railway Hotel, Enniskillen, where they are to be found on the third Monday of each month. Programme details from the Hon. Sec.—*see* Panel for his details.

Exterior and interior views of the recent A.R.R.A. Amateur Radio Exhibition held at Doncaster Racecourse. In spite of the excellence of the venue, attendance was disappointing.

photo: G4TZQ

Every Friday the **Maltby** crowd head for the Methodist Church Hall, Blyth Road, Maltby, Rotherham, the start being at 7 p.m. Programme details from the Hon. Sec.—*see* Panel—or just trot along and find out for yourself!

The **Midlands** troops chose a rather 'fierce' weekend for their Birmingham Show event, when they had to spend most of the time holding the marquee down . . . and the same weather kept the visitors away in droves, too! Hard luck, but they will have something to talk about at the chat nights at Hq., 294A Broad Street, Birmingham. As for which evenings, for that we must refer you to the Hon. Sec.—or come on S17 and ask G8GAZ!

December 1 and 15 are the dates for **Mid-Sussex** at their Hq. at Marle Place, Leylands Road, Burgess Hill. For the first date they have a film/video show laid on, and the second date is down for the Christmas Social.

For the **Mid-Warwickshire** details we must refer you to the Hon. Sec. The venue is 61 Emscote Road, Warwick.

Turning now to **Nene Valley**, we can tell you they have a natter night on December 7, a talk on the Cambridge Repeater Group by G8HVV on 14th and a natter plus Christmas Buffet on 21st. All we don't know is which event will be where—"Dolben Arms," Finedon, or St. Mary's Scout Hall, Finedon. Still, we believe they

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YORK: K. R. Cass, G3WVO, 4 Heworth Village, York.

are close to each other so some exploration wouldn't take too long!

December 13 is the date for the Christmas Social at the "Globe Inn," **Newbury.**

Short meetings are on December 7 and 21 for **Norfolk** at Crome Centre, Telegraph Lane East, Norwich. December 14 is a visit to Anglia TV, and on 28th there is a New Year get-together. This programme may vary, depending on whether the TV visit date is changed, and the Centre is open on 28th, so we recommend a call to the Hon. Sec. to bring you up to date—his details are in the Panel.

Hi-fi techniques are discussed by G3TDZ at the **North Wakefield** meeting on January 5 at Carr Gate Working Men's Club, which is where you can find the group, on any Thursday evening. If you want to know about the December doings, you'll have to contact the Hon. Sec.—*see* Panel.

R.A.I.B.C. looks after the interests and aspirations of the blind and disabled who are interested in our hobby, whether licensed or listener. They also need some supporters and representatives, who are the folk who make it all happen. Details from the Hon. Sec.—*see* Panel.

R.A.T.E.C. is the short name for the Radio Amateurs Technical Engineering Club; they foregather every Monday evening at the British Legion, Moor Lane, Woodford, Cheshire; they also have associate members, we understand, who receive their bi-monthly journal, which is quite a good effort and, as its

Chesham & District A.R.S. has started a weekly construction evening for newcomers to 'homebrewing'. Instruction is given on the correct way to make a soldered joint, to how to make your own PCB. Nearly half the class consists of XYL's and the picture shows Ann Webber (left) and Shirley Hesketh, G4HES, on the first night of the course.
photo: J. Alldridge, G4UXA

name implies, full of articles on how to make things amateur radio.

December 20 is the Construction Contest for the **Reigate** group; find them at Constitutional and Conservative Club, Warwick Road, Redhill, in the upstairs meeting room.

There has been a change in the meeting routine for the **Rhyl** club; they now have the first and third Monday in each month at the 1st Rhyl Scouts Hut, Tynewydd Road, Rhyl, starting time being 7.30 p.m. We are promised a programme of the events before long.

Membership of the **Royal Navy** group is open to past and present members of the RN, the Merchant Navy, or of foreign navies; details from the Hon. Sec.—*see* Panel for his details.

The **Smiths Industries** club meets fortnightly at the Sports and Social Club House, Newlands, Bishops Cleeve. They are interested in having contacts with other clubs who may be holding meetings on the same evenings as themselves, namely alternate Thursdays. Their meeting on December 8 is down for a chat about aerials.

The latest issue of the **Southdown** newsletter is for very good reasons somewhat abbreviated this time, and one of the things to have to be omitted is the details of meetings. However, our card-index says they are to be found at the Chaseley Home for Disabled Ex-Servicemen, Southcliff, Eastbourne, on the first Monday in each month.

Wednesday evenings are club nights for the lads at **SE Kent YMCA**; Godwynehurst, Leyburne Road, Dover is the address. December 7 is a natter night, and on 14th they have a film on lasers. The Christmas Social is at the "Swingate Inn", near Guston, and on 28th they come back to life with a "Sunshine Special".

Spen Valley next, and here the venue is at Old Bank Working Men's Club, Mirfield, on Thursday evenings. December 8 is a talk on video cassette recorders, by G4OTL, and on 22nd they have a Christmas Social Evening.

December 6 is the **Stevenage** club Social Evening, and 13th they have a Constructors' Evening. That leaves December 20 for a natter night; all are at *TS Andromeda,* Fairlands Valley Park, Shephall View, Stevenage.

At **Stourbridge** they use "The Garibaldi" in Cross Street; December 5 in the informal, and on 19th they have the main meeting, details not finalised at the time of their letter.

Now we head for the region of **Stratford-on-Avon,** which in fact means the Control Tower, Bearley Radio Station, on the Henley-in-Arden Road. December 12 is an activity night on the air, with some test gear available. The next meeting is down for December 26, on which date you are advised to try out your rig—from *home!*

As our information is somewhat scarce, we have to ask you to contact the Hon. Sec. for details on the December meetings of **Surrey** at *TS Terra Nova,* 34 The Waldrons, South Croydon. His name and address appear in the Panel.

Sutton & Cheam write to say that they are in session on December 2 at Sutton College of Liberal Arts, for a talk by G4SQG on light bulb manufacture. December 23 is taken at Downs Tennis Club, and is the Christmas get-together.

The Grosvenor Club, Margate, is still the venue for **Thanet;** December 13 is the only meeting this month, and is the Christmas Social; the other date is cancelled as it would have fallen on December 27.

Now we head for the **Vale of White Horse,** which means finding the Canteen and Social Club, Milton Trading Estate, Milton, Abingdon, on the first and third Tuesdays, the latter being an informal.

It is time now to mention **West Kent,** where they have their main meeting at the Adult Education Centre, Monson Road, Tunbridge Wells, on first and third Fridays, with informals at the Victoria Road Drill Hall on the intervening Tuesdays; however we don't know how these arrangements will be modified for December, for which information we have to refer you to the Hon. Sec.—*see* Panel.

Westmorland have their meetings at the "Strickland Arms" in Kendal, on the second Tuesday of each month; more data from the Hon. Sec.—*see* Panel.

Worcester nearly missed the bus this time; however, we did get a brief note that they will be at the Oddfellows Club in New Street, on December 5 for a talk on CW operating by G3RGD. December 19 is taken at the "Old Pheasant" in New Street, for skittles and a Christmas party. For the rest, we hope that the Hon. Sec. is on the mend—his offering was by telephone as he had just come out of the bandage-works to find the deadline upon him.

Yeovil have G3MYM discussing the radar moonbounce equation on December 1, and on the 8th he will be talking about the effect of non-linearity on sine-waves. He's back again on 15th to talk about FETs, and on 22nd for 'skin effect'. However after Christmas, on December 29th he is allowed an evening off—and we hope someone buys him a drink for all his hard work!

Finally, the **York** crew: every Friday evening, at the United Services Club, 61 Micklegate, York—and if their letters are anything to go by, one of the most friendly clubs in the country.

Finis

Or, the end—at least for this month. Send your reports and news to reach us by deadlines shown in the 'box', addressed as ever to your "Club Secretary", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

Special Event Station

To celebrate 20 years of Hospital Radio Chelmsford, and to help raise funds for the service, GB4HRC will be operating on the HF bands over **January 16-26.** A special QSL card will be issued. Contact G4LDS (0245-269034, evenings) for further details.

Correction

In "Looking at Loops" (October issue, p. 413), the '14.5 ft.' dimension in Fig. 4 should be '16.5 ft.'

"A Word in Edgeways"

Letters to the Editor

Dear Sir — In the fuss about 'active' audio filters the magnitude of the service done to amateurs may not be fully understood. Ed Wetherhold, W3NQN, has found out how to use surplus telephone loading coils and done the necessary calculations to provide a narrow band audio filter for the CW receiver; he has also made the loading coils available to amateurs. Performance data for the filter, including a frequency response curve, are given. This is a job which, through the inconvenience or cost of making up the inductors, has been barred to most of that very small number of amateurs who are capable of doing the necessary calculations. Ed Wetherhold, in his article in the August issue, has changed all that.

The necessity of playing around with 'active' circuits to get a narrow band CW filter no longer arises. The letter by Steve Price, G4BWE, in the September issue says: "In answer to the argument regarding the publication of specific performance figures... I can only comment that I find the suggestion rather impracticable", and so on. If Mr. Price is unable to provide frequency response curves for audio frequency filters, as this would suggest, he doesn't have a leg to stand on.

Having put together one of the filters, it works — why not? — so may I thank Ed for all *his* works, and the excellent George Dobbs, G3RJV, for firstly giving G-QRP members a preview of W3NQN's activities in *Sprat*, and then taking on the distribution of the surplus loading coil assemblies. One does have a suspicion that all this CW-filter enthusiasm is in turning beautiful ready-made Japanese SSB receivers into something handier for CW reception; a consummation devoutly to be wished, as the late William would say?

Philip Short, G3CWX

Dear Sir — I am writing in response to your invitation in the September issue of *Short Wave Magazine*, following the letters by Ed Wetherhold, W3NQN, and Steve Price, G4BWE.

I have built the W3NQN filter and have compared it subjectively with the MFJ CWF-2 active filter, and also with the 500 Hz CW filter in my TS-520; besides putting the output of the '520 through the two outboard filters (connected in cascade so that I could switch instantly from one to the other and also, indeed, try them together), I also fed my R-600 receiver through them.

With the R-600, which has only an SSB filter, the W3NQN filter made (as expected) a dramatic improvement in reception of CW signals and, largely because of its better skirt selectivity, was much preferred to the MFJ filter.

The same held for the TS-520 using its internal SSB filter. Further, there seemed little to choose between the internal 8-pole 500 Hz CW filter of the '520 and the outboard W3NQN filter — quite a feather in the cap of the latter! But when the internal 500 Hz filter was switched in, extra selectivity when called for was preferably derived from the MFJ filter, *not* the W3NQN. I think this is because the W3NQN filter is not all that different in response from the 500 Hz internal filter, whereas the MFJ filter, though it has wider skirts, has a much narrower nose than either of the others.

I am not in the business of either knocking or plugging anybody's filter design. However, it must be admitted that W3NQN has a very effective design, and cheap too. But I think my limited experience described above bears out G4BWE's point that it is not possible to stipulate the 'best' filter for all applications, and my findings *re* the MFJ filter are very relevant to what G4BWE says about the K2TWK filter. I also appreciate G4BWE's sentiments concerning gain: the loss introduced by the W3NQN filter is indeed commendably small, but the gain of the MFJ filter puts it in a different category for 'feel'.

Harold Owen, G2HLU

Dear Sir — "Nowts as queer as RF", says Rev. George Dobbs, G3RJV, in the November issue of *Short Wave Magazine*.

Another useful Yorkshire saying for George would be: "hear all work all say nowt (use CW!), eat all supp'all pay nowt, if tha builds owt for nowt build it for thee sen". "Tie a knot in it lad" would help as well.

When I was a callow youth helping to bring the wonders of electric light to the wilds of Cleckudderfax, tying a knot in the live leads prevented a mix up. George has often written about the dangers of reversed polarity, and this is a simple way to identify the positive lead.

When recently licensed I wanted to make my first contacts with home-made gear, and achieved this on 80m. with an S.C.D. transmitter and a PCB-80 receiver — both George's designs and published in *Short Wave Magazine*. So now I am hooked on QRP and homebrew and have made many of G3RJV's projects.

Many thanks, George, for lots of fun.

Steve Ortmayer, C.Eng., M.I.Struct.E., G4RAW

Translator's note: "Cleckudderfax" means small semi-civilised settlements between Cleckheaton, Huddersfield and Halifax.

Address your letters for this column to "A Word in Edgeways", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

January issue due to appear on Friday, December 30th

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By the time this magazine goes to press the long awaited FT 757GX should be available from stock, but at this moment in time very few people have seen this model let alone tested it. However, we did have an opportunity to operate the receive side at the Friedrichhaven exhibition last June, and undoubtedly the FT 757GX is going to be the world leader in HF transceivers for 1984 at a price of £625.00 including VAT.

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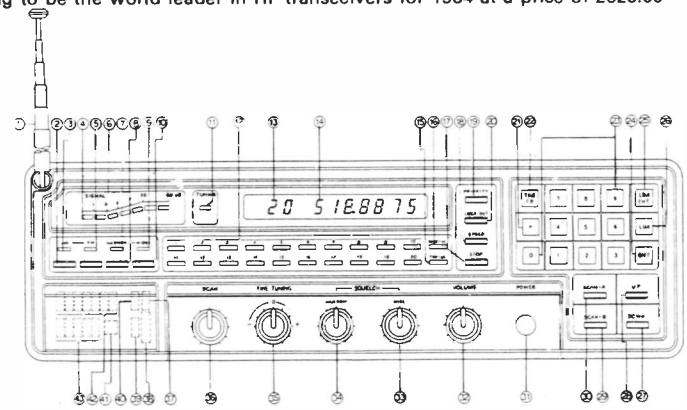

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* * *

Then there is the new AOR2001. Information on this model has been available for some time – again general coverage between 25 and 555MHz and considered excellent for the amateur market at approximately £300.00.

* * *

Last but not least – a briliant HF receiver from SONY. Most people will know of the SONY ICF2001 – but now they have excelled themselves with this new model, the ICF 7600D.
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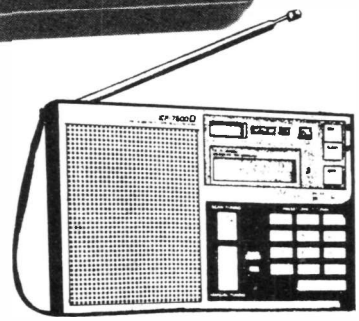
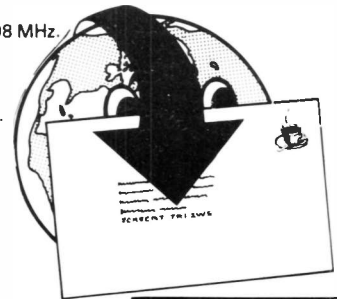


* * *

We notice with some satisfaction a comment by another advertiser which refers to our mention of a well known quotation which we attributed to Winston Churchill. We have been corrected by several readers that this quotation was originally made by Phineas T. Barnum, and we have since proved this to be correct from reference books.

Our thanks to Lowe Electronics for pointing out our error too – but Abe Lincoln never said it at all – *BUT* what is more important, however, is that *LOWE ELECTRONICS* read our advertisements.



Yaesu	Bencher
Trio/Kenwood	TET
Icom	Alinco
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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.*

38 BRIDGE STREET, EARLESTOWN, NEWTON-LE-WILLOWS, MERSEYSIDE (TELEPHONE: 092 52 29881)
Closed Wednesday at Acton and Monday at Earlestown, but use our 24-hour Ansafone service at either shop.

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