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2000

RadCom

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Volume 76 No 2 ♦ **February 2000**

The Voice of Amateur Radio

G3XWH questions nature of RAE

The IoM gets its first LF activity

Build a 10m FM Transmitter

Peter Hart reviews the SGC SG-231

FIRST In Amateur Radio

Waters & Stanton PLC

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Retail Mon. - Sat.
9.00am - 5.30pm

SAVE 1.8 - 52MHz 100W Auto ATU 51 Bandwidths

IC-756PRO

Phone

Real-Time Spectrum Scope 19.4% APR Available

- New DX Rig
- 5" Colour Screen
- 32 Bit DSP
- 51 Bandwidths
- RF Processing
- Voice Memory
- CW memory

The new IC-756PRO has arrived at Icom's top UK dealer. And of course you get best value from Waters & Stanton, whether it be part exchange, pre-sale or after-sale advice and technical assistance. This feature packed radio sets a new standard in HF operation and convenience and for the first time you can send and receive RTTY on the LCD screen. A new mode with no external boxes. Make no mistake, this is a very advanced transceiver, one that needs top dealer support that only comes from W & S. So give us a call and we'll send you the latest information.

KENWOOD TS-570DG 160 - 10m All Mode

£849

19.4% APR Available

or pay 10% Deposit and balance in 6 months Interest FREE

ICOM IC-746 160m - 2m All-mode

£1349 SAVE

The IC-746 offers 100 Watts of RF out on all bands from 160m to 2m. We rate it as one of the best value-for-money packages around.

YAESU FT-840 160 - 10m All Mode

£589 SAVE

The FT-840 offers 100 Watts of well engineered RF together with a receiver that can more than hold its own.

FT-90R Can you believe the size?

£325

The tiny dimensions of the FT-50R from Yaesu, are hard to believe. Yet it produces 50W on 2m and 35W on 70cm. Auto repeater shift on UK channels and switched 12.5 / 25kHz deviation, make this a number one choice.

YAESU FT-1000MP 160 - 10m All Mode

Super Discount Phone!

19.4% APR Available

It has stood the test of time and used by the worlds top DXers and DXepeditions. Its excellent receiver combined with its superior transmitted signal makes this a natural choice for the HF enthusiasts. AC and DC versions in stock.

SAVE ICOM IC-706IIG 160 - 70cm All Mode

19.4% APR Available

£989

or pay 10% Deposit and balance in 6 months Interest FREE

£1069 with switch mode power supply

Next Day Delivery £7.00

Shown above with PSU

The IC-706II G is the latest model of this classic transceiver. Great for mobile, portable or base use. Its got a great pedigree and offers 100 Watts on all bands up to 50MHz with 50 Watts on 2m and 20 Watts on 70cm. CTCSS encode and a lovely display with removeable front panel.

TUNE CONTROL Plugs into back of your IC-706. Now when you press "tune" you get 10W of RF for tuning up via manual ATU etc. A lovely idea that costs you only **£29.95** post £2.00

ICOM SAVE IC-Q7E

- 2m & 70cm Handheld
- 300mW Output
- CTCSS Encoder
- Rx. 30kHz - 1309MHz FM / AM
- 200 Multifunction Memories
- LCD Backlight & Timer
- Runs from 2 x AA Cells

Dual Bander Airband Receive!

Only 50pcs Available

W&S Exclusive Deal ~~£169~~

£119

YAESU FT-847 SAVE

160 - 70cm All Mode

or pay 10% Deposit and balance in 6 months Interest FREE

£1379 with switch mode power supply

£1349

Next Day Delivery £7.00

PRICE MATCH

The FT-847 has firmly established itself as a true all-band, all-mode transceiver. Loved by the VHF & UHF operators, and superb for satellite operation, it also offers great HF performance. We have sold more than any other dealer, which says a lot about our reputation and our price. Phone for free leaflet today. And remember, our stock is genuine UK, not modified overseas models!!

Price Increase - *We have had to increase the "847" price slightly. However, there is a further price increase likely - so now is the time to buy!!* ***BE WARNED***

YAESU FT-100 160 - 70cm All Mode

~~£1259~~ Phone

See RadCom Review

This this rig is the smallest all-bander available. We have used it extensively and it is absolutely great. Read Radcom's in-depth review and then come to us for the best deal around.

YAESU					
FT-840	HF 100W	£589.00	YF-114SN	FT-1000 2.0kHz Fil.	£84.00
FM Unit	For FT-840	£56.00	XF-117C	FT-100 500Hz Fil.	£98.00
YF-112C	FT-840 500Hz filter	£84.00	YSK-100	FT-100 Sep. Kit	£56.00
FC-20	Auto ATU	£199.00	**FT-3000M**	2m Mobile	£295.00
YF-114CN	FT-1000 250Hz Fil.	£84.00	VR-500	Scanner	£399.00
			FT-920AF	HF 100W	£1149.00

We will BEAT Competitor's Prices

On Genuine UK Stock

By up to £100

Wow! Complete Catalogue on **The Web!** **FREE**

Over 200 pages in colour.
Go to the section you need and Print It Out
GO NOW www.waters-and-stanton.co.uk

ADI AT-600 Dual Bander Airband Rx

£199

* 2m & 70cm Handheld
* 5W Output on 13.8V DC
* Full CTCSS & 12.5/25kHz Steps
* 110 Alphanumeric Memories
* 29 Programmable Functions
* DTMF Keypad & AM Airband
* Ni-cads & AC charger

Kenwood TM-700DE

NEW

£459

2m / 70cm Data Mobile

SAVE

Just arriving, this new model has built-in TNC, port for GPS, Data connector for SSTV, RTTY etc., CTCSS/DCS, Switchable TX/RX deciation, Dual receive, Wide receive option, Detachable head unit, 50 Watts on 2m, 35 Watts on 70cm, 200 memories, Alpha tag memo capability and a lot more. And who has the best price? - look no further!

Hoka Decoding Software

We are now the UK distributors. As used by governments, it can decode just about any form of data transmission. Simply connect between PC and Rx audio. Can be loaded on any number of PCs. This is a very advanced programme.

£349.95

C-150 2m Handy

£99.95

* 2m Handheld
* 5W Output on 13.8V DC
* 1750Hz Tone Included
* 25 / 12.5kHz Steps
* 20 Memory Channels
* Wideband Receive
* Uses 6 x AA cells (not inc.)

YAESU VX-5R

£330

* 6m / 2m / 70cm Handheld
* 5W Output on 13.8V DC
* CTCSS Encode / Decode
* 25 / 12.5kHz Steps
* Auto Repeater Shift
* AM Airband Receive
* Lithiun Cells & Charger

YAESU FT-50R

£220

* 2m / 70cm Handheld
* 5W Output on 13.8V DC
* CTCSS Encode / 1750Hz tone
* 25 / 12.5kHz Steps
* 30 Memory Channels
* AM Airband Receive
* Ni-cad Cells & Charger

SAVE C-408 70cms Handy

Normally £89.95

£69.95

CTCSS
Repeater Shift
Digital Display
12.5 / 25kHz Step
20 Memories
230mW Output
Uses 2 x AA

Offer Extended

NEW

CD-100 MULTICOUNTER

Reads Frequency & Codes

Range: 10MHz -1GHz
Memory: 100 Channels
Decode: CTCSS, DCS, DTMF, LTR.
Power: Internal ni-cad battery
Charger included

£379.95

KENWOOD TH-D7E

£299

* 2m & 70cm Handheld
* 6W Output on 13.8V DC
* CTCSS & 1750Hz Tone
* Built-in Packet Modem
* 200 Alphanumeric Memories
* DTMF Keypad & AM Airband
* Ni-cads & AC charger

ICOM IC-T81E

£309 Phone

* 6m / 2m / 70cm / 23cm Handy
* 5W Output on 13.8V DC (1w 23cm)
* CTCSS & 1750Hz Tone
* 12.5 / 25kHz Switched
* 124 Alphanumeric Memories
* Wideband Rx. FM WFM & AM
* Ni-MH Cells & AC charger

ADI AR-147

AM Airband Receive

£199

* 2m 50 Watt Mobile Airband Receive
* Full CTCSS Encode / Decode
* 81 Memories 25 / 12.5kHz Steps
* Keypad microphone & Mounting Kit

KENWOOD TM-V7E

£369

* 2m / 70cm Mobile
* 50W 2m, 35W 70cm
* Cear LCD Readout
* CTCSS & DTMF
* 8 Frequency Steps & 280 Memories
* Includes Microphone & Mounting Bracket

LINEAR AMP UK

British made Amplifiers with a Pedigree

Ranger 811H

£895

* 1.8 - 30 MHz. 800 watts output
* Drive: - 10-100W * Built in Power Supply

UK Discovery - Two Amplifier £1395
*144 - 146MHz *400 - 1KW Output
*Drive:-10-25W *Built-in Power Supply

UK Explorer 1200 Amplifier £1595
*1.8-30MHz x 100W-1300W Output
*Drive:-10-120W *Built-in Power Supply

GREAT VALUE

ICOM IC-2800H

In Full Colour!

£549 Phone

* 2m & 70cm Mobile
* Colour TV Screen
* Full CTCSS and 1750Hz Tone
* 50W 2m 35W 70cm

Includes FREE Remote head cable.

ICOM IC-207H

£369

* 2m / 70cm
* 50W / 35W
* 180 Memories and 7 Tuning Steps
* Detachable Head Unit / Clear Display
* Microphone, Mounting Bracket etc.

KENWOOD TM-G707E

£279

* 2m and 70cm
* 50W and 35W
* Full CTCSS
* 180 Alphanumeric Memories
* Detachable Head with Amber Display

YAESU FT-8100R

Phone

* 2m and 70cm
* 50W and 35W
* Wideband Rx AM & FM 208 Memories
* 7 Tuning Steps DTMF Remote Front panel
* Very compact, supplied with all hardware.

ICOM IC-2100H

£269 Phone

* 2m Mobile 55 Watts Output
* 50 Alphanumeric Memories
* Switched 12.5kHz and 25kHz Filters
* CTCSS and 1750Hz Tone

E & OE

Waters & Stanton

FREE MFJ Catalogue - Just Phone!

Beware of grey imports. All MFJ products should have serial numbers and UK Warranty cards issued by us.

MFJ

FREE CATALOGUE

Every Model Stocked

MFJ-969 300W ATU

£139.95

160 - 6m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Roller Coaster Tuning

MFJ-949E 300W ATU

£115.95

160 - 10m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Built-in Dummy Load

MFJ-948 300W ATU

£99.95

160 - 10m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Built-in Balun, 12v Illumination

MFJ-901B 300W ATU

£59.95

160 - 10m Wire, Coax or Balanced

MFJ-962D 1.5kW ATU

£198.95

160 - 10m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Roller Coaster Tuning, T-Network

MFJ-986 3kW ATU

£239.95

160 - 10m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Roller Coaster Tuning, Differential Tuning.

MFJ-989C 3kW ATU

£269.95

160 - 10m Wire, Coax or Balanced

Includes VSWR / Power Meter, Ant. Selector, PEP feature, Roller Coaster Tuning, T-Network

MFJ-9406X 6m SSB

£239.95

Get on 6m with this 10W SSB & CW Transceiver. Draws just 2 Amps max current. Includes microphone.

MFJ-9420X 20m SSB

£239.95

A 20m 10W SSB & CWt Transceiver. Draws just 2.2 Amps max. Supplied with microphone. Great value..

MFJ CW QRP Rigs

£189.95

5W CW Transceivers. 750Hz xtal filter and Semi QSK 1 Amp max..

MFJ-9040	40m CW QRP	£189.95
MFJ-9030	30m CW QRP	£189.95
MFJ-9020	20m CW QRP	£189.95
MFJ-9015	15m CW QRP	£189.95
MFJ-9010	10m CW QRP	£189.95

MFJ-914 Auto ATU Extender

£55.95

Extends the range of your internal auto atu. Having trouble with G5RV? Fit it between transceiver and antenna - MFJ-914 does the rest.

MFJ-260C Load MFJ-264 Load

£32.95

"N" model £39.95

300W max 1.5 - 150MHz

£49.95

"N" model £59.95

1.5 kW max 1.5 - 150MHz

MFJ-912 Ladder Feed Balun

£39.95

Connect between ladder feeder and coax and enjoy very low loss and all-band operation (when used with manual atu).

MFJ-418 CW Tutor

£58.95

The easy way to learn CW. Sends real QSOs or random characters. Clear LCD display

MFJ-1704 4-way Switch.

£49.95

Ideal for HF or VHF. This switch, fitted with SO-239 sockets, is ideal for antenna selection. Has earth centre position

MFJ Compact 3ft Loop Antennas

£299

A magnetic loop could be the answer to your antenna problems. Just 3ft diameter, they will accept 100W with ease. Just connect a single coax cable between antenna and the control box.

MFJ-1788	7 - 22MHz	£379.95
MFJ-1786	10 - 30MHz	£299.95

MFJ-259B Antenna Analyser

£169.95

This battery powered analyser will check the resonance and impedance of your antenna system in seconds. Make adjustments and watch the changes. Saves hours of work.

MFJ-1026 Noise Phaser

£124.95

Reduces local electrical noise by up to 3 S points

Simply insert between antenna and transceiver. Using a small "sniffer" antenna, just phase out the local noise to uncover the signals. Offered on our usual 10-day approval.

AL-811X 600W Amp

£679

The ideal way to get 6dB of improvement. Built-in cool running power supply and very economical 811A tubes make this a really popular model for UK Hams.

Professional Bandpass Filters

Guaranteed to cure out of band problems, these filters offer up to 50dB rejection, even just outside the band. 70cm model fitted "N" type sockets. 2m: SO-239 or "N"

DCI-145 2m **£89.95** "N" type **£99.95** DCI-430 70cm **£119.95**

WORLD RADIO TV HANDBOOK

£19.95

NEW 2000 EDITION

EVERY LISTENER NEEDS ONE

A complete list of the world's Radio and TV stations with transmission times and beam directions. Over six hundred pages.

Cushcraft

5 Band Compact Beam From Cushcraft

NEW MA5B Mini - Beam

£289.95

NEW

10 - 20m inc WARC bands
1.2kW 50 Ohm Feed
2 Elements on 10,15, 20m Dipole on 12m & 17m
Max element length 5.2m
Boom Length 2.2m
Turning Radius 2.7m
Weight 12kg

This mini-beam works! 5.2m Long.

***Peter Hart in RadCom November**, says - "The MA5B significantly outperformed my vertical on all bands" - - "MA5B was better than my main antenna on 10m" - - an excellent antenna" - - "one of the few five band beams offering modest gain" - - "should give years of trouble-free service" - - "excellent value for money." For copies of this review give us a call.*

Full Cushcraft range stocked - Check our Web Catalogue

Carolina Windoms

CW-80 Special

Just 66ft long yet covers 80m - 10m. It will out perform a G5RV and give lower angle of radiation because of the 10ft vertical section which is forced to radiate. It will handle 1.5kW

Carolina Windom 80 Special

£89.95

Just 66ft Long!

Other Models (all with low angle radiator stub)

CW-160	160 - 10m 171ft long	£105.95
CW-160S	160 - 10m 133ft long	£99.95
CW-80	80 - 10m 133ft long	£82.95
CW-40	40 - 10m 66ft long	£79.95
CW-20	20 - 10m 34ft long	£77.95

Power Supplies

SEC-1223

13.8V PSU

£99.95

23 Amps - 3.2lbs!

Back In Stock

Lighter than an IC-706 and about the same size! The **SEC-1223** switch mode power supply delivers 23 Amps at 13.8V Thermo fan cooled, it measures just 57 x 177 x 190mm. Will power all 100W rigs and can be changed for 115V AC

£89.95

Watson power supplies guarantee the very best performance and value for money. Tried and tested, they have been submitted for independent laboratory testing for safety and electrical performance.

W-3A	3 Amp fixed supply.	£22.95
W-5A	5 Amp fixed supply	£29.95
W-10AM	10 Amp variale supply	£59.95
W-25AM	25 Amp variable supply	£89.95
W-30AM	30 Amp variable supply	£119.95

Compact 10 Amp Switch Mode PSU

£49.95

The W-10SM is small enough to fit in a brief case. Measuring just 230 x 100 x 65mm, it's ideal for 50 Watt mobiles etc. Over voltage and current protection.

Order Details on inside Front Cover

Number ONE in Amateur Radio

Waters & Stanton

Order Details on inside Front Cover

Replacement Batteries

SAVE

		List	Ours
FT-50R			
NBP-40Y	6V 650mAh	£43.00	£27.95
RFNB-42	9.6V 1100mAh	£46.00	£29.95
IC-T8E			
NBP-200	9.6V 680mAh	£40	£25.95
NBP-199	6V 700mAh	£30	£25.95
TH-D7E			
NBP-39K	9.6V 600mAh	£45.95	£29.95
TH-22			
RPB-32	6V 600 mAh	£32.00	£21.95

Available around end of January 2000.

RF Metering

Avair AV-600 1.8 - 525MHz 400W

£59.95

VSWR and power meter. Reads RMS and PEP. The ideal all-band VSWR meter. Reads up to 400W (3 ranges)

Watson VSWR / Power Meters.

£49.95

Measure VSWR and RMS or PEP power. Large easy to read meter. 3 ranges: 5W, 20W and 200W.

W-220	1.8 - 200MHz	**£49.95**
W-420	118 - 530MHz	**£49.95**
W-620	1.8 - 525MHz	**£89.95**

144/ 430MHz Dual Band Yagi.

NEW

.142-146,428442MHz
.Single feed
.SO-239, 50 Ohms
.100W max power
.VSWR 1.1 -1.5:1
.Gain 10 dbi 2m
.Gain 13 dbi 70cm
.Boom length 114cm
.5 elements 2m
.9 elements 70cm
.Gamma match
.Weight 2.3kg

£79.95

Extremely well engineered 2m/70cm dual band Yagi. Can be mounted either vertically or horizontally. Each band has separate gamma match but single coaxial feed.

Watson Off-Air Frequency Counters

£59.95

High quality units supplied with antennas, ni-cad packs and AC chargers. They are very sensitive and may be used for near-field checking.

Hunter - 10MHz - 3GHz **£59.95**

FC-130 - 1MHz - 3GHz, switched gates, 16 segments. **£79.95**

Super Hunter - 10Hz to 3GHZ and with signal strength meter. **£149.95**

Antenna Rotators

£49.95

AR-300XL Lightweight

Ideal for VHF and UHF systems of small to medium size. Includes control box, motor and Brackets. Support masts sizes can be up to 50mm

YS-130 Medium Weight VHF

£79.95

Made in Japan, this rotator will support medium sized VHF arrays. The diecast motor housing will fit masts up to 40mm diameter. Includes motor, control box and brackets.

New Create RC5-1 Rotator

NEW £299.95

We are pleased to be able to offer one of the most popular rotators from japan. The RC5-1 will handle 3-4 element HF beams. It has a torque of 6kg (rotation) and 80kg braking. Uses 7-core cable.

Yaesu Rotators for HF Systems

G-450C	Smaller Tri-band Yagis etc.	**£379.00**
G-650C	Larger Tri-banders etc.	**£499.00**
G-1000C	4 element HF Yagis (cw with 25m cable)	**£559.00**
G-2800SDX	Really large HF Yagis	**£1229.00**
G-550	Elevation Rotator	**£309.00**
G-5500	Az/El Rotator	**£569.00**

We have extensive stocks of tower mounts, bearings and rotator cables. Phone if you need advice. Leaflets available.

Cushcraft HF Yagis - In Stock

Carriage FREE until 31/1/00

High quality DX Yagis. More Cushcraft Yagis are used in the UK than any other brand. Buy from W&S and be assured of long-term spares back-up.

A3S	10-15-20m 3 el. 4.27m boom 8.45m el. 2kW	**£389.95**
A3WS	12m, 17m 3 el. 4.27m boom 7.66m el. 2kW	**£299.95**
A4S	10-15-20m 4 el. 5.48m boom 9.75m el 2kW	**£469.95**
X7	10-15-20m 7 el. 5.49m boom 11.33m el 2kW	**£549.95**
X9	10-15-20m 9 el 8.53m boom 11.12m el. 2kW	**£799.95**
TEN-3	10m 3 el. 2.44m boom 5.49m el 2kW	**£139.95**
XM-510	10m 5 el 5.8m boom 5.6m el 2kW	**£249.95**
XM-515	15m 5 el. 7.3m boom 7.3m el 2kW	**£325.95**
XM-520	20m 5 el 9.75m boom 11m el 2kW	**£529.95**
XM240	40m 2 el 6.7m boom 13.3m el 2kW	**£469.95**

80/40/20m Dipole 50ft Long!

G3OJV 80-Plus-2 SpaceSaver

Approx 50ft long (Horizontal)
400 Watts PEP
Balun Matched
ATU not essential
50 Ohms Feed

Ideal for the small garden. Linear loading means efficient radiation. Can also be used as horizontal

£79.95

VSWR
Typecally 1,5:1
Bandwidth (2.5:1)
20m 350kHz, 40m 100kH,
80m 100kHz

No soldering, just assemble the elements, check the dimensions and fine tune per instructions. Unlike the G5RV, it self-resonates with low VSWR on all three bands. A unique design that offers LF operation from your back garden.

Garmin GPS-III Plus

NEW

With street map up-load feature.

All the familiar features of the old GPS-III plus more. Lower battery drain and the ability to up-load street maps into the memeory. Includes serial port data lead.
GPS-III P;us £329. UK street CD £69.95

Telescopic Masts

NEW

We are now able to supply a range of telescopic tiltover masts, glavanised to BS729. Heights available from 7.6m to 12m extended. Models for wall mounting or post mounting are included. The post mounted versions tilt-over and are supplied with a socket for mounting in concrete.. ***Phone or write for information.***

VHF/UHF Antennas

Base Station Fibre Glass

WVA-100	2m/70cm 2/4.5dB 1.09m	£29.95
W-30	2m/70cm 3/6dB 1.15m	£39.95
W-50	2m/70cm 4.5/7.2dB 1.8m	£49.95
W-300	2m/70m 6.5/9dB 3.1m	£59.95
W-2000	6m/2m/70cm 2.5m	£69.95

Mobile Antennas PL-259 bases

W-285	2m 5/8th foldover base	£14.95
W-77LS	2m/70cm 0.39m low profile	£18.95
W-770HB	2m/70cm 1.1m 3/5.5dB	£24.95
W-7900	2m/70cm 5/7.6dB 1.5m	£32.95
W-627	6m/2m/70cm 1.62m	£34.95

Mounts

W-3HM	Hatch / Boot Mount	£14.95
W-3CK	5m low loss cable kit	£18.95
W-ECH	5m RG-58 standard cable	£12.95
WMM&	Magnetic mount	£10.95
WAM-2	BNC window mount	£12.95

IR- 270 MONO PHONES

£34.95 £19.95

IR - 270

INFRARED HEADPHONES

Connects to your Receiver without need for long Cable.

Includes: 2 x AA cells, Ac Adaptor Connecting lead with 3.5mm Stereo plug and 1'4 Mono adaptor.

Double Your Life

Nexcell NiMH Cells

AA-Size 1350mAh

Twice the capacity of normal ni-cad cells and no memory effect. Ideal for handhelds and digital cameras. As supplied to the police.

4 x AA cell pack	£9.95
4 x AAA cell pack	£9.95
AC charger (4 x cells)	£9.95

Postage £2.00 any quantity.

Street Pilot

£469

In Stock

A dedicated GPS designed for car use. The new large screen has super back illumination with special night display. Complete coverage of the UK, and with the optional memory storage chip and street map kit, you can zoom into see actual streets.

CD UK Street Map for GPS-III Plus	**£69.95**
CD World Map for GPS-III Plus	**£69.95**
CD UK Street Map for Street Pilot	**£t.b.a.**
8Mb Memory chip for Street Pilot	**£t.b.a.**

Motorola Talkabout 200

PMR-446 New Low Price

£78

446MHz 500mW Handy
8 Channels
38 CTCSS Tones
3 Kilometres Range
3 x AA Cells Reqd.

Now you can use a 446MHz handheld without a licence. Ideal for a wide range of uses. The package provides everything you need for personal communications. Just add 3 x AA cells and you are on the air!

£149 pair

NEW

Every Street in GB on CD!

Search on Postcode or address

Try out: www.travelmanager.co.uk

£47.95 Post £2.00

Every street in Great Britain on one CD. Search by Postcode or address. Zoom in to A-Z style road maps, or zoom out to larger areas. Route planner shows graphic route plus text route instructions. Measure distances, edit symbols. Really amazing database for your laptop.
Order: Travelmanager

E & OE

HF TOP TEN

BUY NOW - PAY NOTHING UNTIL JULY

INTEREST FREE!

VHF TOP TEN

IC-756PRO
The only new HF Base designed for the millennium. HF + 6M 32 Bit DSP
RRP £2399 ● ML&S £2099
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £104.79 at 26.9%

IC-775DSPmkII
Still the only 200W base with DSP available.
RRP £2999 ● ML&S £2395
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £103.98 at 26.9%

IC-707mkIIG
Sold more than any other 'mini ham shack'
RRP £1249 ● ML&S £999
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £43.37 at 26.9%

TS-870S
Use one and you will see why we have so few used examples. 100W HF
RRP £1999 ● ML&S £1499
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £65.08 at 26.9%

TS-570DGE
Without question the most under priced HF DSP radio there is!
RRP £999 ● ML&S £899
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £39.03 at 26.9%

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RRP £2299 ● ML&S £1999
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RRP £1499 ● ML&S £1249
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RRP £1699 ● ML&S £1349
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RRP £1249 ● ML&S £959
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Or after July pay 36 x £12.55 at 26.9%

TM-G707E
Still the easiest to read mobile available, twin band and 50/35W
RRP £329 ● ML&S £299
Pay nothing until July then pay balance interest free!
Or after July pay 36 x £12.98 at 26.9%

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Excellent Dual Band Mobile with remote head
RRP £549 ● ML&S £389
Pay nothing until July then pay balance interest free!
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Pay nothing until July then pay balance interest free!
Or after July pay 36 x £16.02 at 26.9%

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- **NOTHING TO PAY FOR 6 MONTHS**
- **INTEREST FREE PERIOD OF 6 MONTHS**

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All examples do not include P&P.

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OR

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Front Cover:
The Point of Ayre Lighthouse on the Isle of Man. The first amateur LF activity took place from the lighthouse keeper's cottage last November. See this month's Lead Feature for the story of the DXpedition.

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RADIO SOCIETY OF GREAT BRITAIN

THE NATIONAL SOCIETY WHICH REPRESENTS UK RADIO AMATEURS

Founded in 1913 incorporated 1926. Limited by guarantee
Member society of the International Amateur Radio Union

PATRON: HRH PRINCE PHILIP, DUKE OF EDINBURGH, KG, KT

Membership is open to all those with an active interest in radio experimentation and communication as a hobby. Applications for membership should be made to the Subscriptions Department from which full details of Society services may also be obtained.

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Details of the Society's volunteer officers can be found in the RSGB Yearbook 2000.

Annual Subscription Rates

Home Corporate	**£38.50**
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Corporate (Senior Citizens) (Applications should provide proof of age at last renewal date)	**£29.50**
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The RadCom Leader

Shaping Our Future

WITH THE excitement of the Millennium celebrations now behind us, we can look forward to the challenges and opportunities of the New Year. For my part, I look forward to a year as the Society's President and have set myself three objectives for the year to come.

Firstly, I want to get closer to our members and hear more of their opinions and views. Whilst the Society, in forming its policy positions, will never satisfy all its members all the time, we do have a responsibility to both listen to our members' views and fully explain to them the reasons for the Society's position on key issues affecting the future of amateur radio. Many of you will have seen the item in last month's *RadCom* entitled 'Council on the March'. I hope that this year that my fellow Council members and I will be able to visit and speak at many radio societies around the UK.

Secondly, I want to work with Council, taking input from our members, in building the vision for the future of amateur radio in the UK and taking the next few steps to bring about that future. We know that we have to embrace change - the recent announcement about Internet connectivity is a typical example of this - but we must not be victims of change. We must shape and direct our own destiny.

Finally, I want to work further on finding the new blood for amateur radio. Later this year I also would like to see young candidates standing for Council, who bring fresh and challenging views about the direction of our hobby. We all tend to become more conservative as we grow older, and sometimes find reasons why things are too hard. The antidote to this is to bring new thinking, new attitudes and real constructive challenge into the direction of the Society.

So my hope is that you, our members, will join in these three objectives by:

- asking for a visit to your local club from me or a Council member
- actively entering into the debate with the Society as the year unfolds about the future direction for amateur radio
- considering taking an active part in the direction of the Society, be it as a volunteer in the many supporting roles, or even by standing as a candidate for the Council elections at the end of the year.

Most of all, we can each set ourselves the objective of helping someone into amateur radio this year. All too often I hear the complaint from SWLs and Novices that they have not been made welcome at the local club. Let's extend the helping hand of friendship to those who are at the threshold of a life in amateur radio – help them to understand, as John Clarricoats said in *The World at their Fingertips*, that amateur radio truly is "the greatest of all scientific hobbies".

Don Beattie, G3OZF, President.

RA Internet Linking Update

THE RADIOcommunications Agency has revealed some developments on the linking of amateur radio to the Internet. Firstly, on the linking of repeaters to non-amateur networks, it says: 'The RSGB's Repeater Management Committee will be responsible for the initial processing of applications. Applications must be made through repeater keepers who will be responsible for co-ordinating connections to their repeater so that maximum use can be made of this facility and to prevent unnecessary overlap. It is envisaged that for any repeater, one or two gateways will be authorised with a call sign made up of the repeater call sign/1, 2, 3…etc. …One area still under discussion is whether separate frequencies should be identified for the link or whether the established repeater input and output frequencies could be utilised. We welcome any input to this discussion.'

Secondly, on the linking of mailboxes, the RA explains that 'Existing SysOps will be able to apply for an extension to their Mailbox Notice of Variation to allow connection to non-amateur networks. Applications should be made to the RSGB's Data Communications Committee. …New applications for Mailboxes should request this additional facility if required'.

Finally, it says 'Applications may also be made for remote control of repeaters using non-amateur networks. These should be made to the RSGB's Repeater Management Committee'.

Comments on these first developments and on what further changes the Agency should consider in the next and later stages are invited at any time by e-mail to: amcb@ra.gtnet.gov.uk

Electromechanical Transmitter Resurrected for Special Broadcast

King's VLF Message Heard Across Atlantic

CHRISTMAS EVE 1999 was the 93rd anniversary of Reginald Fessenden's first radio broadcast of songs and music, which was achieved using a large mechanical alternator to generate the 100kHz RF carrier, a frequency which many regarded as being impossible for a mechanical system. The alternator, capable of an RF output of several kilowatts, was designed by Swedish-born Ernst Alexanderson. It was fitting that he should be amongst the entourage of King Gustaf V of Sweden as he inaugurated a similar station in Grimeton, Sweden, in 1925. Today, it is the only Alexanderson alternator transmitter in working order. On New Year's Day 2000, and the next day, a team of 70 people were there to ensure that "The Great Radio Station" was working on VLF again under its old callsign SAQ on a frequency of 17.2kHz using Morse code, to send a message on behalf of the present monarch, HM Carl XVI Gustaf, King of Sweden.

Above: Stellan Nilsson, head of SAQ, finds a melted wire on one of the aerial coils during a test transmission.

Right: Inside the transmitter hall, Bengt Dagas, former head of SAQ, controlled the transmissions.

(Photos: Alexander Benson)

Hitches

THE DAY'S events were not without problems. A wire on the massive aerial coil burned out during tests, and there were problems with the water-cooling pumps, but the veteran transmitter still coped with the present-day demands, and reception reports have been coming in to Grimeton from most of Europe and America.

IOTA 2000

A SYSTEM for recording contacts for the IOTA 2000 programme has been developed by Bengt Högkvist, SM6DEC. It contains an IOTA 2000 database in which records of contacts can be maintained and a cumulative record of achieved scores is generated. The system can be downloaded from the CDXC Web site (www.cdxc.org.uk). *Winzip* (which may also be downloaded from this site) should be used to unzip the files, so as to maintain the long file names.

Guides' Thinking Day

THE ANNUAL Guides' Thinking Day on the Air (TDOTA) takes place over the weekend of 19/20 February. A pack is available from RSGB HQ consisting of a list of participating special event stations and details of the countries that permit third party greetings messages during the event. Groups using a GX or similar prefix instead of a GB call are asked to inform HQ.

Hilary Takes a Rest

AFTER A VERY successful Presidential year and almost 20 years' continuous service as an officer of the Society, Hilary Claytonsmith, G4JKS, has decided to step down from her numerous Society commitments to concentrate on other interests and, in her words, "to enjoy normal amateur radio operation".

During her service with the Society, Hilary has been the driving force behind a number of major initiatives, not the least of which being the Novice licence, Project YEAR, the Young Amateur of the Year scheme, the introduction of the new A/B licence and the Novice licence enhancements. Hilary, in her role as Vice-Chairman of the EMC Committee, was also the main protagonist in pursuing the change of mind of the developers of Power Line Telecommunications.

Hilary's drive, enthusiasm and hard work will be sorely missed by the Society. We all wish her well in her retirement and thank her for her outstanding contribution to amateur radio within the UK and IARU Region 1.

Bid for Book

LAST DECEMBER the Society published *Amateur Radio - the first 100 years*, a limited-edition hard-backed book with over 220 large-format photographs. Each edition is numbered and the book is expected to be highly collectable. Now RSGB members have the exclusive opportunity to bid for one of the first copies off the press.

Book number one will reside in the National Amateur Radio Library at RSGB HQ, and number two is to be presented to the Society's Patron, HRH the Prince Philip. You could become the owner of number three.

As an offer to RSGB members only, we are running a postal sealed bid auction for this edition. If you would like to make your bid, simply write your callsign, RS number or membership number on a piece of paper, together with the amount of your offer (do not send any money at this stage), seal it and send it to: Book Auction, RSGB, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE. The minium acceptable bid is the members' cover price of £39.53. On **29 February**, all bids will be opened and the person offering the highest amount will be invited to send his/her payment, plus postage.

Polar Plods

SIR RANULPH FIENNES is hoping to raise over one million pounds for cancer research as part of his solo unsupported journey from the Canadian Arctic to the Geographic North Pole commencing in mid-February 2000. Ran will be pulling sledges that can sustain him without re-supply for the entire journey. He will not be racing any other expedition, as his progress will be slow – a polar plod!

Communications for Ran's Exel Logistics North Pole 2000 expedition will be controlled from the HF Long-Range Surveillance facility located in north-east Scotland, operated by Laurence Howell, GM4DMA.

Meanwhile, on the South Pole, five British women were attempting to be the first to journey to the South and North Poles as part of the M & G 'ISA Challenge'. On 23 December they were at 84.5 degrees south and in early January they had reached 87 degrees south. They are due to reach the South Pole by late January. Again, Laurence Howell is monitoring their communications. Polar temperatures are cold and getting colder as they climbed slowly up to the polar plateau. Their painstaking progress can be monitored on their web site www.isa-challenge.com

Notices of Variation

GAZETTE NOTICES dated 10 January were issued by the Department of Trade and Industry which give details of Notices of Variation covering *all* classes of amateur radio licence in the UK. In the light of the current interest in linking amateur radio with the Internet, one of the items clarifies this situation, and comes into force from 31 January. It reads: '… The Licensee shall not connect the Station to any non-amateur network, including the Public Switched Telecommunications Network, except with the written permission of the Secretary of State…'.

This means that from 31 January, connection between amateur radio and non-amateur networks such as the Internet will not be allowed, unless permission has been granted by the Secretary of State. This generally means a Notice of Variation (NoV) to your Amateur Radio Licence. Applications should be made to the RSGB Data Communications Committee or the RSGB Repeater Management Committee on 01707 659 015. Anyone wishing to do something *not* considered in this initial phase should send a proposal to the Radiocommunications Agency for consideration. Their details are: Amateur Radio Section, 10G/9D, Wyndham House, 189 Marsh Wall, London E14 9SX, telephone 020 7211 0158, or e-mail amcb@ra.gtnet.gov.uk

In short: from 31 January, any connections between amateur radio and non-amateur networks will **not** be covered by your licence unless you have a specific NoV covering such operations.

Ghana TV Reports Contest

NATIONAL TV NEWS in Ghana recently reported on amateur radio activities at a hotel in Elmina. The rather unusual event was a group of British and American radio amateurs setting up large numbers of antennas to take part in the CQ World-Wide CW contest. In Ghana, amateur radio is practically unheard-of, so there was much curiosity. The group of seven contesters (9H1EL, G3SXW, G3XTT, G4BWP, G4PIQ, KC7V, KF7E) had travelled to Ghana to operate as 9G5AA and made over 14,000 CW contacts during the 48 hours of the contest. The station consisted of seven computer-networked operating positions and 16 antennas, all installed temporarily in the hotel grounds, on the coast in central Ghana. Interviewed on television were Roger, G3SXW, and Ralph, 9G1RQ. This was a marvellous opportunity for the group to help spread the word about ham radio in a country where there are perhaps only a dozen current licensees. This interest was followed up by two FM radio stations who aired lengthy interviews with Don, G3XTT, and Roger.

Amateur radio was completely banned in Ghana for many years until 1994 and is yet to gain recognition as a worthwhile pursuit which brings benefits to the country. Along with other initiatives, it is hoped that the contest team stirred up some additional local interest during their visit. The operators looked forward to future visits and thanked the Ghana Amateur Radio Society and the Oyster Bay Hotel, Elmina for wonderful hospitality. Their warm welcome by the Ghanaian people was remarkable.

The HF room at 9G5AA, with operators KC7V, G4BWP and G4PIQ.

Millecom Update

FOR THOSE INTERESTED in contacting Project Millecom stations, please note that Army Cadet users have access to Services' equipment operating on *upper sideband only* for transmit and receive, so please take this into account when operating on 3.650MHz and 7.080MHz. The cadets will be operating from their unit headquarters, *not* from Youlbury Scout Camp.

During the Easter and Summer school holidays, the ATC, ACF and CCF will be operating field stations from camps throughout the United Kingdom. The Headquarters of the Royal Corps of Signals will be hosting a station at Blandford Camp, adjoining the Museum.

No Cards from 5A29?

FOR NO APPARENT reason, Mick Conlon, G0ZMC, is now in possession of some 100 QSL cards from the Libyan Special Event Station 5A29, operated by 5A1A. The package was damaged and delayed in the post, but Mick believes that no QSL cards were lost. If you worked 5A29 between 1 and 3 September 1998, make sure you have envelopes lodged with your QSL sub-managers. Alternatively, Mick will forward your card upon receipt of a SASE. He will retain the unclaimed cards for one month from publication of this edition before forwarding them to the RSGB bureau. G0ZMC is QTHR.

Kilve Court Course

THE TIME is rapidly approaching for registration for the course on radio techniques at Kilve Court in Somerset. The course is a practical one and is open to a wide range of age groups. It is suitable for radio amateurs, listeners, or anyone with an interest in radio. Candidates for the RAE will find the course to be useful revision. Participants will be able to transmit, thanks to the special callsign, GB2KRC, and instruction in operating techniques and radio regulations will be included in the timetable. Students will use a wide range of receivers to pick up High-Resolution Picture Transmissions (HRPT) from weather satellites.

Kilve Court is a Georgian house with modern extensions and facilities, situated in 25 acres of wooded grounds, 12 miles west of Bridgwater on the A39. Further information on this five-day course, which starts on 24th April, can be obtained from the Course Director, Adrian Dening, G4JBH, on 01288 331 113 (weekday evenings) or by e-mail to: 106471.620@compuserve.com

A selection of the satellite aerials at Kilve Court.

December VHF Award News

SIX METRES once again was the 'band of the month' with John Ridd, G8BQX (TN), tendering what has almost become an annual update. John's successful claim this time was for 25 squares which increments his total to 425 squares confirmed. John is one of only three stations to have claimed this number of squares, so does he run full legal power to a massive yagi array? Not at all! He has a fairly average station by today's standards - an FT-690 Mk2 and a 100W linear feeding a five-element yagi at 30ft. The QTH is 240ft ASL with sandstone hills within a few miles. Years of dedicated band monitoring and studying of the propagation conditions lie behind this score.

In almost the last gasp of the century, Geoff Dover, G4AFJ (LE), claimed his century of countries on six metres. Enclosing eight cards for the 'top-up', Geoff commented: "What a struggle it has been with the last few! The problem has been working them, not getting the cards".

Finally, a reminder that the new Standard and Senior Awards, which are based on UK postal districts, can be claimed from 1 January. Full details can be found on p48 of the *Yearbook 2000* and on the RSGB Web site.

Summary of Award Recipients for December

50MHz:

425 squares: G8BQX

100 countries (2-way): G4AFJ

Details of all VHF, UHF and Microwave Awards can be obtained on receipt of a large SASE from the Awards Manager, Tony Jarvis, G6TTL, QTHR, or on http://www.argonet.co.uk/users/tonyg6ttl/awards/awards.htm

Queries may also be sent by e-mail to vhf.awards@rsgb.org.uk

● Subscription Services Limited (SSL) is now known as Post Office Customer Management Limited, or POCM. However, cheques etc made out to SSL will still be accepted for some time.

EMC Committee Vacancies

DUE TO AN increasing workload, the EMC Committee activities are being split into two main areas of concern.

(a) The protection of the general EMC environment, to ensure that amateur radio in the UK has a future in an increasingly complex environment of domestic and industrial electronics. The Committee represents the RSGB on a number of national and international bodies concerned with EMC.

(b) The provision of the traditionally efficient service to members, including advice and support in dealing with EMC issues.

The Committee is inviting applications for a newly-created post of Membership Services Administrator. He/she will organise the co-ordinator scheme and handle all queries coming to the Committee from members or from HQ, using electronic communications where appropriate. Candidates should have administrative experience and, above all, must be diplomatic and tactful. Professional electronic/radio qualifications are not necessary, but a wide experience of amateur operation, particularly HF, and a practical knowledge of EMC problems are essential.

Since this post is seen as especially important to the Society, the appointment will be made by agreement between Council and the EMC Committee Chairman.

The Committee also has vacancies for ordinary full members. Applicants should have experience of radio and EMC, either from extensive amateur operation or from professional activities.

EMC Committee meetings take place six times a year, at RSGB HQ, Potters Bar, usually on a weekday evening. In accordance with normal RSGB committee policy, these posts are voluntary, but out-of-pocket expenses are payable.

Further information and a job specification for both posts are available from the EMC Committee Chairman c/o RSGB HQ or, preferably, by e-mail from EMC.Chairman@rsgb.org.uk

Request for RA Clarification

MRS HILARY Claytonsmith, while President of the RSGB, wrote to the Chief Executive of the Radiocommunications Agency, Mr David Hendon, asking if the Agency would remove the Morse requirement from the UK HF licence qualifications if it were to be removed at a future World Radio Conference. Mr Hendon was unable to give an official answer, because decisions of policy are in the hands of Ministers. However, he gave the personal opinion that "it is inconceivable that the Agency would maintain Morse code as a requirement once the international community had removed it". When asked if he would support a move towards an 'incentive-based' licensing structure, he expressed concern that "what was once an incentive to draw people onto the HF bands is rather working now as a disincentive to become involved in the hobby at all". Mr Hendon agreed that another form of licensing would need to be developed, but he added "…the form that this should take and the point of assimilation of existing licensees into the new system will need a lot of work if we are to get it right."

RSGB Telephones

DUE TO essential maintenance, telephones at RSGB HQ suffered some disruption on 14-17 January. We apologise for any inconvenience caused.

Campaign Change

PLEASE NOTE the revised dates for the Morse Campaign. The scheduled weekend meeting of 6/7 May is now to be held the following weekend, 13/14 May; the scheduled weekend meeting of 8/9 July will now be held on 15/16 July. These events are co-sponsored by the RSGB, Yaesu, Martin Lynch and Sons, and G3TUX, The QRP Component Company (The CW Centre). There will be further Morse Campaigns scheduled for the autumn.

Council Highlights

THE HIGHLIGHTS of the RSGB Council meetings held on 9 October 1999 and 27 November 1999 are as follows:

RA Update

The RSGB had received agreement from the RA to send out a 'flyer' with new licence documentation issued by the SSL. This would be drafted shortly.

Discussions were ongoing with the RA about amateur radio priorities for the year 2000. It was important that the Society should build on the strategy group structure that had been set up with the RA. It was expected that the RSGB would discuss such matters as High Power Permits and Bandplanning (the protection of the Morse and data sub-bands) with the RA.

The RSGB had been asked for input on the question of linking amateur radio with the Internet, following the RA Chief Executive's announcement on this matter. Deadlines were tight because the RA wished to make a formal announcement by Christmas 1999. An e-mail discussion group was therefore set up and a report was expected in early December.

Discussions were still on schedule to facilitate the introduction of 'club examination centres' and of taking the RAE / NRAE on demand.

Radio Today

The financial performance of *Radio Today* was improving and Council was keeping a close watch on the costs. It had increased its pagination with effect from the October 1999 issue and the results for that issue were one of the best since the RSGB purchased the title. Advertising revenue and circulation continued to grow.

Rallies and Conventions

The RSGB would be organising the VHF Convention at Sandown on 20 February, 'Hamfest 2000' at Hatfield House on 30 July and the International HF and IOTA Convention at Windsor on 13 – 15 October. A rally plan for the year 2000 would be set up, which would include an RSGB presence at the Elvaston Rally and the Scottish Amateur Radio Convention.

EMC Matters

It was agreed that influencing EMC legislation and standards in technical areas which might affect amateur radio privileges was an important issue for safeguarding the future of amateur radio. Council therefore resolved to appoint specialist consultants with the necessary technical and professional standing to represent the Society in these areas. As a first step, R Page-Jones, G3JWI, F Robins, G3GVM and D Lauder, G0SNO, were appointed as EMC Technical Consultants. Council would discuss the membership services role of the EMC Committee at a future meeting.

Although the matter of Power Line Telecommunications was settled for the present in the UK, the German national society, DARC, had requested the support of the RSGB because the issue was still being discussed in Germany. The RA's PLT Working Group had been broadened in scope to include xDSL as well as PLT and the RSGB was still attending meetings of the Working Group.

Membership Representation

Council discussed the RSGB Liaison Officer (RLO) system, and looked at ways of improving the effectiveness of membership representation. A new Regional Representation Scheme has been proposed to streamline the support available to the membership and to allow direct representation by individual clubs.

Society Organisation

In addition to the organisation of membership representation, Council would also review the management of the Society in general. A small team was set up to investigate the issues and prepare a paper for Council. It would look at the structure of the Society, the business aspects, membership liaison and external representation.

IARU Region 1 Conference

Council was briefed on the IARU Region 1 Conference by Malcolm Appleby, G3ZNU, Chairman of the RSGB IARU Region 1 Conference delegation. He reported that it had been a very lively conference, dominated by the issues of finance and the future of the Amateur Service. All the proposals submitted by the RSGB had been passed.

Concessionary Membership

It had been brought to the attention of the Society that it was acting outside the 1995 Disability Discrimination Act by offering free membership to the blind but not to the disabled. It was agreed by Council that the concessionary fee of £19.25 should be offered to the blind membership, to be effective at membership renewal commencing 1 January 2000.

QSL Bureau Manager

Mr John Hall, G3KVA, would be standing down as QSL Bureau Manager with effect from 31 December 1999. In future, the QSL Bureau Manager's position would be operated from HQ.

Founders' Trophy

Council voted that Geoff Bond, G4GJB, should be the recipient of the Founders' Trophy award for 1999.

Certificate of Appreciation

The introduction of a new Certificate of Appreciation, to be awarded where recognition of duties to the Society was due, was agreed by Council.

Financial Reports

Two months into the half-year there was a financial deficit, but margins should be back up with the *Yearbook 2000* and new titles which were to be published in the run-up to Christmas. The seasonal trend was that book sales take an upturn in the two months leading up to Christmas. It was planned to increase book sales further by targeting high-street bookshops in London and Glasgow. The forecast showed that the Society should break-even in the first half of the Financial Year. The departure of the Commercial Manager had been a blow, but a replacement would be appointed shortly.

All Change at the Bureau

AS MENTIONED in the Council Highlights, John Hall, G3KVA, has stepped down after almost ten years' service as the volunteer QSL Bureau Manager. Under John's leadership, the bureau has become the envy of every major amateur radio society world-wide and his QSL column in *RadCom* has been one of the most popular features of the magazine. Now that he has fully retired from running the bureau, John intends to pursue his first love of HF CW operation, so he will no doubt be adding to the workload of the bureau with his own cards!

John, who also served as our Company Secretary on a voluntary basis between 1991 and 1996, will be missed by everyone involved in the operation of the bureau, and not least by the HQ bureau staff and his army of QSL sub-managers.

Council recognised John's contribution to Society affairs when he was awarded the Founders' Trophy in 1995. We all wish him well and hope that he enjoys a long and peaceful retirement with many years of amateur radio operation ahead of him.

The management of the bureau will now be undertaken by the Headquarters staff. It is currently extremely busy with a throughput of around one million cards a year. The staff workload is expected to increase over the next two to three years, due to the increased HF operation brought about the impending sunspot maximum and the associated enhancement of HF propagation. The Society has recently increased the bureau staff to ensure that the current backlog will be cleared as quickly as possible.

John Hall, G3KVA, addressing the '100 Years of Amateur Radio' dinner in Leicester, September 1998.

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CK-3M4B .SO239...Base w/4mtrs 5D low loss coax c/w PL259 plug .£24.50 p&p £4.75
MG-4M ...Heavy duty mag mount/4mtrs 3.5D lo-loss coax/PL259 ..£19.95 p&p £4.75
RS-700 ...Gutter Mount fully adjustable.....£17.95 p&p £4.75
RS-730 ...Hatch/Trunk Mount fully adjustable.....£18.50 p&p £4.75
TBR .....Hatch/Trunk Mount standard model.....£14.95 p&p £4.75

COMET BALUNS

CBL-20000.5 - 60MHz 1kW 1:1.....£27.50 p&p £4.75
CBL-30 ...1.7 - 30MHz 1kW 1:1.....£21.95 p&p £4.75

COMET FILTERS

CF-30S...32MHz low pass filter, 150W CW.....£19.95 p&p £4.75
CF-30MR .32MHz Low pass, 1kw PEP.....£37.50 p&p £4.75
CF-50S...50MHz low pass filter, 150W CW.....£21.50 p&p £4.75
CF-50MR.50MHz low pass, 1kw PEP.....£37.50 p&p £4.75

COMET BAND PASS FILTERS

CF-BPF6 .50MHz band pass filter, 150W CW.....£42.50 p&p £4.75
CF-BPF2 .144MHz band pass filter, 150W CW.....£42.50 p&p £4.75

COMET DUPLEXERS

CF-416A ....144/430MHz SO239/PL/PL.....£27.50 p&p £4.75
CF-416B ....144/430MHz SO239/PL/'N'.....£28.50 p&p £4.75
CF-706 .....For IC706 & CA-HV 1.3-56MHz/75-320MHz.....£39.00 p&p £4.75
CF-360A ...1.3-30MHz/49-470MHz SO239/PL/PL.....£37.95 p&p £4.75
NEW! - Ideal for IC-706 IIG & CA-UHV
CF-530 .....1.3-90MHz/125-470MHz SO239/PL/PL.....£39.95 p&p £4.75

COMET TRIPLEXERS

Comet CFX-431A 144/430/1200MHz 'N'-'N'- PL -'N' socket ....£46.00 p&p £4.75
Comet CFX-514N 50/144/430MHz PL - PL - N SO239 socket ..£47.95 p&p £4.75

ANTENNA SWITCH

Comet CSW-40M 4 way 'PL' coaxial switch DC 800MHz 1kW SSB ....£49.00 p&p £4.75

ICOM 756 PRO

NEW!
Icom's LATEST SUPER RIG!
~~£2499~~ £2099
£8 p&p

YAESU FT-847

- 70cm - Top Band All Mode
- Super 'Cool Blue Display'
- Wide Coverage RX

~~£1499~~ £1349
£8 p&p

YAESU FT-1000MP

FEW ONLY AT £1799
£8 p&p
Still the TOP DX's CHOICE

KENWOOD TS-570DGE

- Brilliant 100W HF
- Easy to use Menu System
- Incredible DSP System

~~£899~~ £849 £8 p&p

YAESU FT-100

NEW!

- 70cms - Top Band
- Incredible Compact Size
- Use with ATAS Antenna for easy tuning

~~£1259~~ £999 £8 p&p

ICOM IC-706 MkIIG

- 100W HF/6 + 50W 2M + 20W 70cms
- Quick release front panel
- Superb DSP noise reduction

~~£1195~~ £989 £8 p&p

PALSTAR KH-6

NEW LOW PRICE!

- 50 - 54MHz
- 4W RF out (12V) 2W RF out (9V)
- UK Repeater offsets
- Intelligent Power Save circuit
- CTCSS Encode/Decode
- Scan functions
- Memory recall
- C/W 8 cell AA battery case *(batteries not inc)*

~~£159~~ £99
£8 p&p

OPTIONAL EXTRAS

KH6/BC .....Empty Battery Case.....£8.95
KH6/DA.....Slide on DC Adaptor.....£7.95
KH6/HF .....Flexi Hi-Gain Antenna.....£12.95
KH6/NP.....NiCad Battery Pack.....£29.95
KH6/CC .....Soft Carrying Case.....£9.95
KH6/CP .....Cigar Adaptor PWR Lead.....£8.95

PRICE MATCH

- HF SmartTuner SG-230 £329 £8 p&p
- 500W Mobile Power Amp ~~£995~~ £799 £8 p&p
- SG-231 HF - 50MHz SmarTuner £349 £8 p&p
- SG-237 HF - 60MHz SmarTuner £289.95 £8 p&p
- SG-237 PCB Unit £219.95 £8 p&p

CUSHCRAFT

VERTICALS

R6000....6, 10, 12, 15, 17, 20m.....£299.95
R7000....10,12,15,17,20,30,40m...£369.95

HF MULTIBAND BEAMS

MA5B ..New Mini Beam £289.95
X7.....10,15,20m 7 el.Yagi ..£499.95
A3S.....10,15,20m 3 el.Yagi ..£389.95
A3WS..12, 17m 3 el. Yagi.....£299.95
A4S.....10,15,20m 4 el.Yagi ..£469.95
A743 ...30, 40m kit for A3S ...£129.95
p&p £10 on each item * £12 p&p on each item

HF ROTARY DIPOLES

D3W ....12,17,30m Dipole.....£199.95
D40 .....40m Dipole..£229.95 £199.95

6 METRE ANTENNAS

A505S .6m 5 el.Yagi 10.5 dBi £149.95
A506S .6m 6 el.Yagi 10.5 dBi £249.95
ARX6 ....6m Ringo ranger 7.3m 5.5 dBi £199.95
AR6.....6m Ringo 3.1m 3 dBi.....£59.95
p&p £8 on each item

Low Loss Coax SPECIALS

SIVA MINI RG-8
Low loss small diameter cable

LOSS PER 10 MTRS FREQ	LOSS
28MHz	0.39dB
50MHz	0.86dB
100MHz	1.28dB
400MHz	2.82dB

PRICE PER METRE £0.45
100 METRE DRUM
CLEARANCE PRICE
~~£45~~ £29
£6 p&p

YAESU Rotators

G1000C HEAVY DUTY
C/W Control Box & 25 Cable....£559*
G650C MEDIUM DUTY
C/W Control Box & 25 Cable....£499*
G450C LIGHT DUTY
C/W Control Box & 25 Cable £379*
*£10 p&p on all Yaesu rotators

SCANMASTER HF2

Remote 2 Way Antenna Switch
Freq: .....(0 - 475MHz)
Power:.....1kW PEP
PL259.....£39.95
'N' Type.....£41.00

NEW!

Yaesu VX-5R

- 50 - 144 - 430MHz
- Wide Band Receiver
- Ultra Rugged Construction

SPECIAL £299 £8 p&p

Kenwood VC-H1

- For SSTV Pictures
- Send on most rigs
- Built in camera

CLEARANCE PRICE
~~£399.95~~ £245 £8 p&p

SGC 2020

£599
£8 p&p
PORTABLE HF TRANSCEIVER

Yaesu FRG-100

~~£489~~ £399
£8 p&p
- Covers 50kHz - 30MHz
- FM Option plus *LOTS MORE!*

DAIWA SWR/Power Meters

DAIWA CN-801

1.8-200MHz Power Rating 1.5kW (1.8-60MHz) 1kW (144MHz)
£109.95 £6 p&p

DAIWA CN-101L

1.8-150MHz Power Rating 1.8-60MHz 2kW 1kW (144MHz)
£59.95 £6 p&p

DAIWA CN-103LN

140-525MHz Power Rating 200W (140-525MHz)
£64.95 £6 p&p

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- Simply divide the price (including carriage) into 3 equal payments.
- Write 3 cheques dated in consecutive months starting with today's date.
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- Post them to us, enclosing your name & address & we will (subject to status) send your goods immediately.

Lead Feature

LF DXpedition to the Isle of Man

*By Graham Phillips, G3XTZ**

IN AMATEUR RADIO terms the 136kHz band is brand new. Many of our present High Frequency allocations hail from the 1947 Atlantic City Conference. The 21MHz band was added in 1952 and the 10MHz, 18MHz and 24MHz bands were released in 1979. In 1997 the 73kHz band became available, but only to those who applied for a special Notice of Variation. Because of the great difficulties involved in persuading an average size of antenna to radiate a reasonable signal, very few amateurs have attempted transmit operation on 73kHz and the band will be withdrawn in June 2000.

A NEW AMATEUR BAND

ON 25 JANUARY 1998 the 136kHz band was made available to UK stations, with the possibility that many more countries would eventually gain access. The band is only 2.1kHz wide, so fairly slow CW is the main operating mode. Initial activity was rather low, but some stations transmitted 'beacon' Morse signals and this allowed others to develop receive capabilities. It was quite exciting; I remember a telephone call from PE1ABR to say that he was receiving my signal across the North Sea!

FIRST IDEA

OVER THE FOLLOWING two years, other countries have gradually appeared on the band. In October 1999, David Bowman, G0MRF, realised that one of these countries had the 136kHz allocation, but no operation - the Isle of Man.

David contacted myself and Dave Pick, G3YXM, and the idea of an LF DXpedition began to take hold. We met at the HF (LF?) Convention in Windsor, and finalized most of the details. Most LF activity is at weekends, so we planned to travel on a Friday, operate Saturday and Sunday, and return on the Monday. David discovered that the lighthouse at The Point of Ayre was available as a holiday destination during the winter at an affordable price. The picture of the lighthouse showed that it was adjacent to the accommodation, the lighthouse keeper's cottage, and we had visions of borrowing the handrail, 30 meters high, to hang our wire aerials from. The lighthouse is a very impressive structure, designed and built in 1815 by Robert Stevenson – the Grandfather of author Robert Louis Stevenson. It is situated in 17 acres of private grounds - perfect for the size of aerials that we had in mind! The Point of Ayre is a wide, low, flat promontory at the most northerly point on the island.

PREPARATIONS

THE COTTAGE AND ferry were booked for 19 to 22 November and we started preparations. It is a well known phenomenon in home-built LF transmitter circles that FET power amplifiers are prone to self-destruct (at one time I was averaging one QSO per set of four output devices), so we took four separate transmitters. We also had three receivers, five power supply units, a frequency counter, DSP audio filter, DDS signal generator, two laptop personal computers, three electronic keyers, two straight keys, three kites, several aerial tuning variometers, thermocouple current meters, SWR indicator, radiocode clock, miles of wire, three 15mm copper pipes, bundles of aerial mast sections, guy wires, guy pegs and loads of tools. We even managed to take some clothes, but had to leave the kitchen sink – it wouldn't fit in the car!

HEADING OFF

I LOADED MY PILE of equipment into the car on Thursday 18 November and set off from Ashford, Middlesex at 06.30 on the 19th to collect David, G0MRF, with his equipment from nearby Whitton. David had just started drinking a cup of coffee when I arrived, and after we had loaded his equipment and set off on the trip to King's Heath near Birmingham, he brought the almost full cup with him whilst I tried to avoid as many potholes as possible; no time wasting on this expedition! We arrived at Dave's, G3YXM location at about 09.45 and loaded our equipment into his very spacious MPV. He had spent the morning wheel-barrowing equipment from his radio shack to the bottom of the garden and loading his car. By the time our equipment was also installed, we just about had three seats left. The trip to the Heysham ferry was fairly difficult, but we arrived with time to spare, had a snack, and boarded the ferry, sailing at about 14.15. The crossing was uneventful, rather an anti-climax after stocking up with travel sickness pills, and we docked in Douglas well past sunset.

There was no shortage of gear in the shack.

IN A FOREIGN LAND

WE SET OFF northwards along winding country lanes, and finally saw the lighthouse in the distance. The accommodation seemed excellent, with all modern conveniences, but when we enquired about access to the lighthouse we realized that we might have difficulty using it as a skyhook. The lighthouse was automated and the maintenance engineer with the key was not on site. After unloading the car and setting up the shack, another problem arose - the sash windows had been recently painted, in the shut position! It was impossible to open any of them as an exit for the aerial feed.

FIRST OPERATION

UNLOADING THE CAR left room to set up Dave's portable station, a TS-850 for receive and a home-made 12 volt transmitter. We saw a signpost saying 'To the Shore' and drove down an unmade road towards the sea. At the end was a small car park by a pebble beach and while Dave raised the aerial with one of his Delta kites, David and I unrolled what seemed like miles of wire down the beach and threw it, complete with a length of copper pipe into the sea.

The kite flew very well, and after a quick tune-up Dave sent a quick CQ as GD3YXM/P on his trusty old straight key. Suddenly the 136kHz band sounded like the bottom end of twenty meters, about six stations all calling at once. The first QSO was with Reino, OH1TN, followed by SM4DHN, G4GVC, SM6PXJ and G6RO in quick succession. He transferred the key, and GD3XTZ/P appeared for the first time. I had contacts with G3XDV,

* *Christmas Tree Cottage, 27 Stanley Road, Ashford, Middlesex TW15 2LP.*

MM0ALM, OH5UFO and PA0BWL. David, using his call GD0MRF (without the /P, since he had arranged this with the authorities) then had more contacts.

Later, the aerial current mysteriously dropped; we seemed to have made contact with all stations on the band, and so we landed the kite. Upon reaching the shore to recover the earth, the strange case of the vanishing aerial current was solved; the tide had receded, leaving our earth rod high and dry! We departed for the cottage, pleased with our first day's operation.

GD3YXM retrieves an extremely bedraggled kite from the sea.

GD0MRF adjusts the ATU.

Toothbrush insulator at the end of the 200m-long antenna.

THE SHORT-WIRE AERIAL

THE ALARM WOKE us at 07.00, and after coffee and toast we saw what could be done about a fixed aerial without the lighthouse. Dave had brought a 13-metre portable aluminum mast, and if located at the top of the steps leading to our first floor entrance, we could raise one end of the aerial to about 18 meters. A disused, 10-metre high foghorn tower was about 250 meters along the coast, and proved very easy to catapult a nylon cord across. The resulting aerial was around 200 meters long, insulated from the cord over the foghorn by means of Dave's patented 'old toothbrush' lightweight insulator. An earth wire ran from the ATU at the top of the stairs to the sea about 200 metres away. David attempted to hammer the copper pipe into the pebbles just below the water line and got slightly wet! Back at the cottage, we ran coax cable from the shack to the front door, located the variometer system just outside, resonated the aerial, and listened. The whole band was covered in electronic hash emanating from the lighthouse. Luckily, Dave had a folding loop receive aerial which he located about 50 meters away from the lighthouse, and we finally heard something. We made a quick call, and worked GW4ALG, G3GRO, G6NB and EI0CF for two new countries. Faint with hunger, we departed for Ramsey.

We spent a few hours purchasing provisions and enjoyed a proper meal in a restaurant before returning to the Point of Ayre to get the station ready for David's 73kHz exploits on Sunday. After dark, we returned to the shore car park, installed the earth and launched the kite. Again we had contacts including IK5ZPV, I5MXX, DK8KW, G3LDO and GD0MRF (David was rather strong, operating from the cottage station about 500 meters away, and gave us a good report!). Returning to the cottage, the station was adjusted for 73kHz, and GD0MRF tried for a QSO with G3LDO. Using a laptop computer with Spectrogram software, we saw Peter's signal quite well, but our signal faded with him before we completed the QSO. We arranged for another attempt on Sunday morning. The 136kHz station was put into beacon mode overnight, hopefully for trans-Atlantic reception, and we retired, again pleased with the day's achievements.

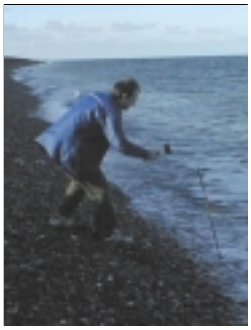
SUCCESS ON 73kHz

ON SUNDAY morning David, GD0MRF, finally managed the 73kHz QSO with Peter, G3LDO, and increased the two-way record on this band to 480km. After the first year of operation on 73kHz, this record stood at just 120 metres! Another signal appeared on the screen, and was identified as Mike, G3XDV. Once again the QSO could not be completed, so it was arranged to try again at 22.00.

BACK TO THE BEACH

WE ADJOURNED to the shore again, choosing a location where we could have a shorter earth lead, and managed to launch the earth pipe further out to sea. A second earth wire was laid for good measure and the kite flew well, the wind taking it out over the sea. This 136kHz operation added GI3PDN, DJ5DI, DJ5BV, PA0SE, PA2NJN and several G's to the list. During this time, the wind became erratic, dropping the kite near to the sea, and caused much QSB. The kite finally dived into the sea and had to be very slowly pulled to land. After re-launching and transmitting, the aerial wire immediately fell from the sky, the kite fluttering down some time later. We had failed to realize that the string that joined the kite to the aerial wire was still wet, and as soon as RF power was applied it burnt through. After lunch we had a final spell with the kite aerial, but the wind was unpredictable, breaking one of the kites. Static was also building up on the aerial, leading to the game of 'chicken' to see who would connect the aerial to the variometer. A democratic decision was made - we packed up and headed for a pub! Ramsey seemed completely deserted at 18.30 on a Sunday evening, but David knew of a hostelry at Belaugh Bridge. We spent a pleasant evening there, returning for the schedule with G3XDV. This time signals were better and another 73kHz QSO was entered into David's logbook. At 23.30 the 136kHz beacon was activated for the night.

GD0MRF attempting to stay dry while he hammers an earth rod into the shingle.



The foghorn tower was ideally suited to support the far end of the 200m-long wire antenna.

THE LAST DAY

IT RAINED overnight, but was dry by morning. A strong wind had stretched the aerial wire and was blowing it sideways. David worked GI3PDN for a final QSO and we took the aerial down, packed up the station and shoehorned it into the MPV. We spent the day touring the island, driving around the TT circuit (*not* at normal lap-speed) and had a long lunch at another pub. The ferry crossing was again very calm and we arrived back in Kings Heath at about 01.30 on Tuesday morning. After transferring equipment to my car, driving back to London, dropping David off with his gear, I arrived home at 03.45. I slept well!

EPILOGUE

WE HAD A great time, immediately agreeing that if a suitable destination appears, we would make another trip.

I would like to thank David, G0MRF, and Dave, G3YXM, for the adventure, and all the LF operators who made the expedition worthwhile. ♦

NATIONAL VHF

SUNDAY

10.30 - 5.00 AT SANDOWN

Year 2000 Lectures

Lecture Stream A - Claremont Suite

2nd Floor

12.00 - 12.50	Amateur Radio Direction Finding
13.00 - 13.25	Opening Ceremony and VHF Committee Awards
13.35 - 16.00	VHFCC Awards followed by a series of short contest related talks.

Lecture Stream B - Ardross Suite

1st Floor

12.00 - 12.50	6mtr Group AGM
13.00 - 13.25	Opening Ceremony - Claremont Suite**
14.00 - 15.00	6mts from Equitoral Guinea - Speaker Alan Isaachen - 3C51
15.00 - 16.00	Myths & Legends - 50 Mhz Propogation for the millenium - Speaker Dr Steve Reed - GOAEV

Lecture Stream C - Eclipse Bar

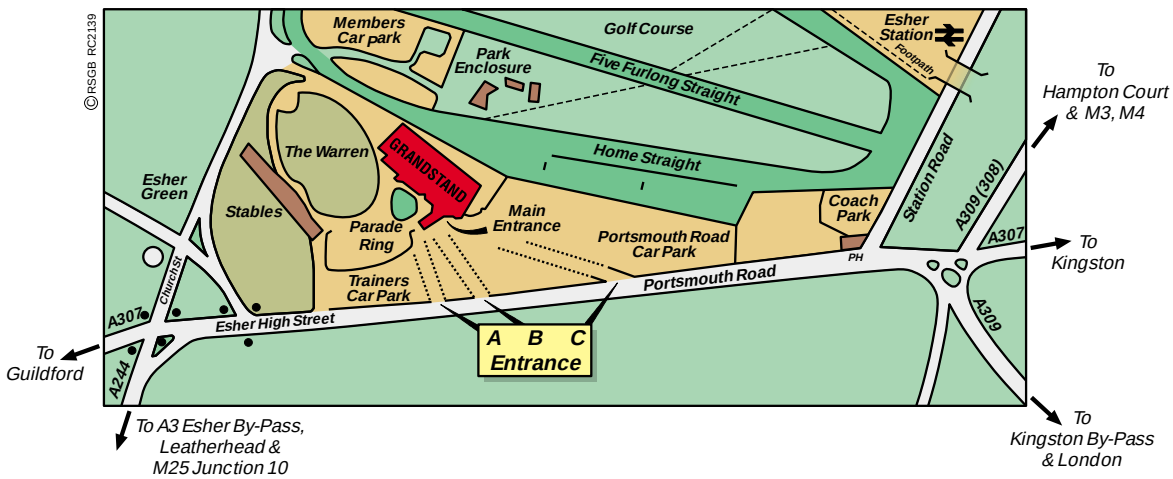
Ground Floor

12.00 - 13.00	Microwave Operating and Contests on 10GHz - Speaker Peter Horbaczewskyj, G4ZXO
13.00 - 13.25	Opening Ceremony - Claremont Suite**
14.00 - 15.00	Developments in Solid State Microwave Power Amplifiers - Speaker Charlie Suckling, G3WDG
15.00 - 15.30	DX Operating on 1.3/2.3GHz - Speaker John Quarmby, G3XDY
15.30 - 16.00	Modifying PCS PAs for 2.3GHz - Speaker Sam Jewell, G4DDK

** No other group activity during this period.

This Years Event

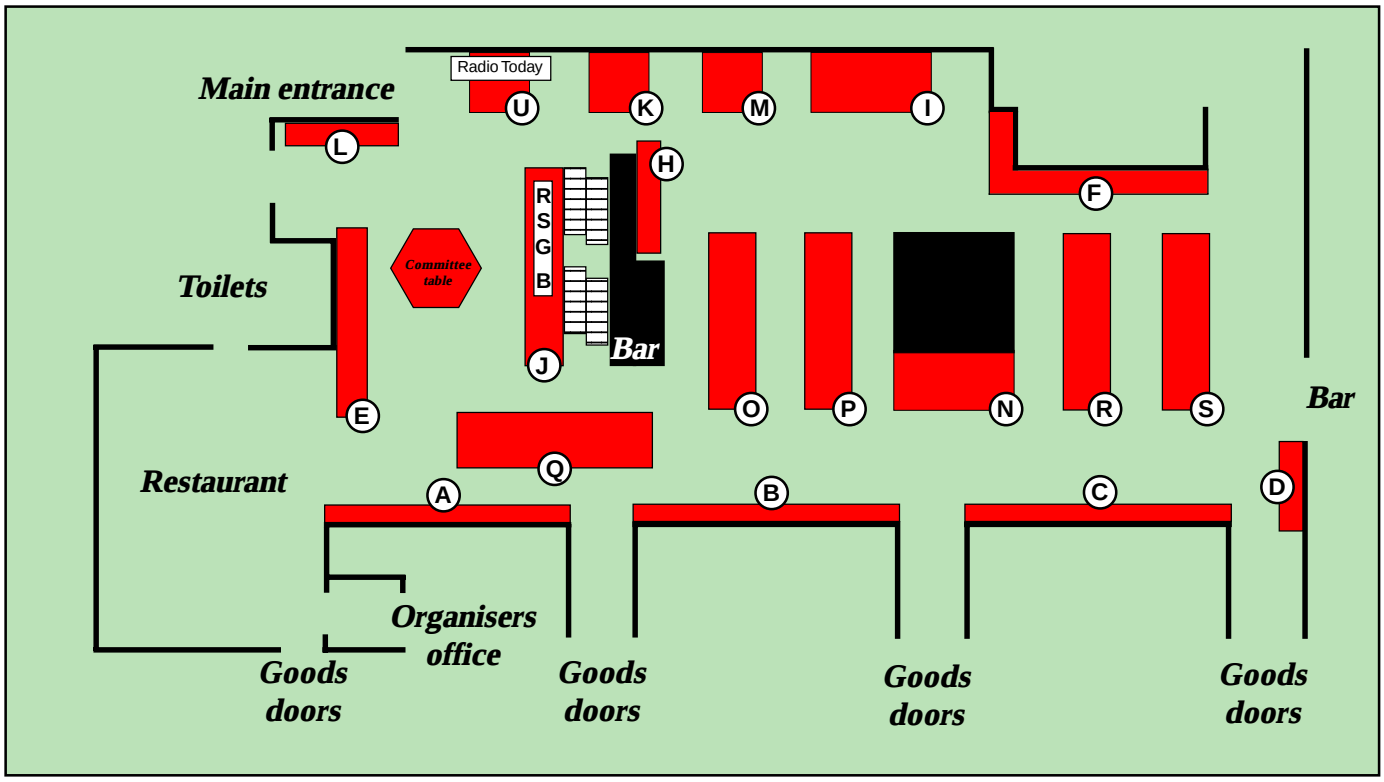
- **Comprehensive Trade Exhibition**
  - New Products with many large stands
  - Used Products
  - Club Stands
- Specialist RSGB Committee Stand
- **Free Admission**
  - Any Cadet or Youth Organisations are welcome to attend free of charge to encourage amateur radio across the age groups
- Trophy presentation of VHF committee awards



CONVENTION 2000

20th FEBRUARY

PARK RACECOURSE



This Years Event

- **Three** interesting Lecture Streams including:
  - 6 meters from Equatoral Guinea
  - Amateur Radio Direction Finding
- **RSGB** Book stand
  - Books from around the world from RSGB, ARRL and many other authors
- **Radio Today** Stand
  - A major feature on converting **very low cost** police hand helds to 2 meters
- Admission
  - Charges are held for yet another year at £3 for adults and under 14's free

VHF CONVENTION EXHIBITORS

Exhibitor	Block	Exhibitor	Block	Exhibitor	Block
Agile Tools	K	Martin Lynch & Sons	O	SGS Electronics	A
Armscroft Communications	M	Microware	C	Solid State Electronics	S
Barenco	Q	Moonraker	P	Strikealite	C
BEC Distribution Ltd.	B	Music Maker	R	Sycom	A
British Amateur Television Club	C	Officeland	Q	Thames Valley ARTS	N
Carrs Electric	P	Pennyfarthing Video	S	The Arcade Shop	S
Charles Covey	C	Poole Logic	R	Timestep	M
Combitek	Q	QRP Component Co.	Q	TLX Electrical Ltd	S
Communications PMR	H	**Radio Society of Great Britain**	J	Transworld Satellite	K
Computer Junk Shop	R	**Radio Today**	U	UBM London	B
Dorking & District Radio Soc.	N	RAFARS	G	UKSMG	R
J. Adamson	S	RAIBC (Free)	G	Waters & Stanton	I
J. Dosher	P	Rakewell	P	WH Westlake	G
Jaytee Comms.	S	Remote Imaging Group	M	Worked All Britain	G
Loutronics	F	Sandpiper Communications	C		

Amateur Radio Into The New Millennium

*By Bob Treacher, BRS32525**

WHEN M2000A HIT the bands for the first time at 1158GMT on 31 December 1999, it represented the culmination of eighteen months intensive planning for a twelve-man committee of the Cray Valley Radio Society (CVRS). Hundreds of e-mails had been exchanged, fourteen committee meetings had been held and there were even opportunities to discuss M2000A business over the occasional pub lunch!

MILESTONES

THERE WERE SOME important events in the months leading up to December – we received permission from English Heritage to establish the station at Ranger's House on Blackheath, obtained approval to use the very special callsign M2000A from the Radiocommunications Agency, were successful in obtaining grant aid totalling £7,000 from the Millennium Experience Awards for All scheme and the London Borough of Greenwich Celebration Fund, secured planning permission from Greenwich Council for the erection of three towers (2 at 70 feet, 1 at 40 feet) to support the antennas, our website <www.qsl.net/m2000a> designed and run by Steve Smith, G0TDJ, went 'live', and Lord Rix, G2DQU, kindly agreed to be our guest of honour at our 31 December launch.

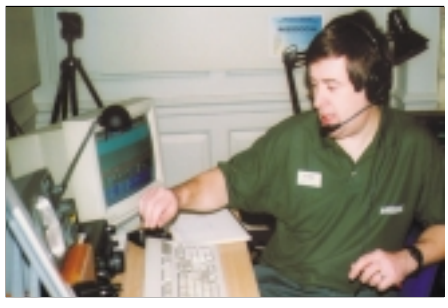
Bob Treacher, BRS32525, with Lord (Brian) Rix, G2DQU, at one of the static displays.

G2DQU cuts the cake.

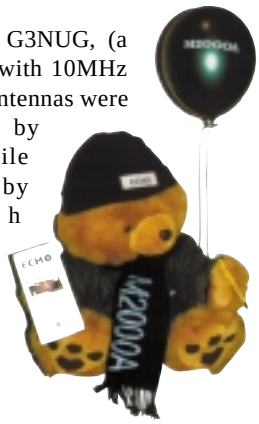
ANTENNA PARTY

MONDAY 20 December dawned cold and frosty. Temperatures of -6°C were registered as ten CVRS members made their way to Ranger's House before sunrise to begin the major job of assembling seven Yagi antennas for HF and VHF and erecting the three towers. South Midlands Communications had kindly sponsored the event by providing five antennas – a Create AFA40 7MHz 2-element beam; a Create CY103 28MHz 3-element beam; a Cushcraft 154CD 21MHz 4-element beam; a QTEK211E 11-element 2m beam; and a QTEK65E 5-element 6m beam. Other antennas were provided by Dave Lawley, G4BUO, (a Hygain TH5) and Neville Cheadle, G3NUG, (a Cushcraft A3WS with 10MHz extension). The antennas were to be supported by three M80 mobile towers, loaned by Strumech Versatower, South Midlands Communications and Chris Swallow, G3VHB. Therefore we were well-equipped to erect a substantial antenna farm.

Mark Haynes, 2E0APH, Young Amateur of the Year, indicates his approval of the setup.



Dave Lawley, G4BUO, makes sure that ZL6A is ready for the midnight (New Zealand time) sked.



The M2000A station mascot.

THE VENUE

RANGER'S HOUSE is a 17th Century villa standing on the edge of Greenwich Park. It is situated on the Greenwich Meridian and has a garden area to the south east and a tarmac area to the north west. The tower to support the 7MHz, 21MHz and WARC bands antennas was earmarked for the garden area (together with a dipole for 3.5MHz). As the tower was in a garden environment, guying was to be by traditional 4ft stakes driven into the grass. However, the guying arrangement for the tower located on the tarmac area was altogether different. Through the good offices of Bronzeshield, a local crane company, three 2-ton steel blocks were positioned by crane. These provided the guying positions for the tower which would support the TH5 and the 28MHz Yagi. The VHF antennas were to be supported on a 40ft tower which was to be un-guyed. All the antennas had been partially pre-assembled, which saved a great deal of time - even so, the antenna assembly and tower erection took two days to complete, due to a number of factors, including snow on the second day and the shortness of daylight. Coax and rotator cables were provided by Nevada Communications and Neville Cheadle, G3NUG. Once the antennas were in place and the towers raised to their desired height, yards and yards of cable was routed into the M2000A shack.

STATION ASSEMBLY

ALL THE TRANSMITTING equipment was provided by Icom UK. They have provided an IC-756PRO and IC-PW1 Linear Amplifier, two IC-746s, an IC-775DSP and an IC-

93 Elibank Road, Eltham, London SE9 1QJ.

One of the 70ft towers, supporting HF beams.

706MkII. A great deal of work was carried out - supervised by HF Manager Dave Lawley, G4BUO - to install foolproof switching to avoid inter-station interference and to ensure that the need to switch antennas between stations was kept to a minimum.

LOGGING

LOGGING AT M2000A is by Turbolog. The logging program forms part of a packet radio based network and is linked to a server located away from the five operating stations. QSOs are sent automatically to the server as they are made. The server is also connected to the Packet Cluster and relays DX spots to the logging PCs.

The DXserver was originally conceived as a way of bringing together the logging operations of a major DXpedition with minimum disruption to the operators and with maximum security. It was successfully used on the 1998 Spratly Island DXpedition, where over 65,000 QSOs were logged in 12 days of operation. DXserver has been further developed by John Linford, G3WGV, for use at M2000A. It offers:

- Automatic collection of QSOs
- Various statistical analyses
- Talks, announces and WWVs, precisely as per Packet Cluster
- Maintainining DXpedition system time on all connected PCs
- Capability of uploading to the Internet using the QSO format devised for the VK0IR DXpedition
- Packet Cluster connection and forwarding of DX spots to the logging stations
- Support for a monitor display showing current activity in a format that can be understood by the public.

At the end of each day's operating, an ASCII data file containing callsign, band and mode only is sent to Richard Everitt, G4ZFE, who adds the QSO data file to his search engine on the Internet, so that anyone with Internet access can interrogate the data to 'see if he is in the log'.

EXHIBITION

WHILE THE RADIO station was being assembled, Ian Connor, G7PHD, was busy with Steve Smith, G0TDJ, and others establishing a static and 'hands-on' exhibition, charting amateur radio from Marconi to the present day. A commercial company, Display Colour Ltd, has provided professional 3ft x 2ft display boards, and both the Society and Gerald Wells' radio museum provided exhibits of radio from the early 1900s. To demonstrate the contrast between the early 1900s and today, the latest semiconductors and microprocessors are displayed side by side. In addition, the exhibition features the latest Geoclock software, Icom IC-PCR1000 computer-driven communications receiver and the latest Arcam broadcast receiver. There is also a Society bookstall.

THE LAUNCH

THE EVENT WAS launched at 1030Z on 31 December. Apart from Lord Rix, others present were the Mayor of Greenwich Cllr John Fahy, the Deputy Mayor and the Deputy Leader of the Council, Hilary Claytonsmith, G4JKS (1999 RSGB President), Don Beattie, G3OZF (2000 RSGB President), Mark Haynes, 2E0APH (Young Amateur of the Year), plus representatives from Icom UK and South Midlands Communications.

After short speeches by Philip Davies (English Heritage's Director for London), Lord Rix, The Mayor of Greenwich and myself (as Chairman of the project), a champagne reception was enjoyed before Lord Rix made the initial contact with ZL6A in Wellington at 1100Z (midnight in ZL) during which Millennium greetings were exchanged between amateurs in New Zealand and England. Lord Rix passed and received Greetings Messages to and from IHC (Mencap's sister organisation in New Zealand), and Hilary Claytonsmith, G4JKS, sent and received greetings messages to and from NZART.

Once all stations were operational at M2000A, a sked with 9G0ARS in Tema, Ghana was completed. During this QSO, the Mayor of Greenwich sent and received greetings messages with the Leader of the Tema Municipal Council (the London Borough of Greenwich and Tema are twinned - Tema being the only town on the 0° Meridian to the south of Greenwich).

THE FIRST HOURS

ALTHOUGH THERE was some M2000A activity prior to the sked with 9G, the conclusion of the sked marked the beginning of two month's intensive activity from M2000A. The first full hour of activity saw M2000A active on 14MHz SSB, 7MHz CW and 10MHz CW. Colin Thomas, G3PSM, had a particularly successful time on 10MHz, logging 160 stations in little over an hour. G4BUO on 14MHz SSB and Steve Muster, G4UOL, on 7MHz CW boasted equally impressive statistics. On VHF, too, the callsign was proving popular, with over 150 QSOs soon accounted for on 50 and 144MHz.

There were 20 operators at the station during the first few hours of activity, including G3JJZ, G3SXE, G3WGV, G4AOJ, G0TDJ and 2E0APH – and everyone was able to have at least 30 minutes operating time. Some of the pile-ups had to be heard to be believed. Most of the QSOs in the first few hours were with Europe, but all continents had been worked within the first hour and over 500 Stateside callsigns were in the log by the time the HF bands closed. We contacted 17 special Millennium stations in the first 13 hours of operation, including HS2000, YR2000, ER2000D, WY2000, K3Y, W1K and W2M.

A number of visitors came to M2000A in the few hours following the launch, ie before Ranger's House was closed to the public for the day. Once the public had left, the M2000A operators really enjoyed themselves and by 0000Z - only 13 hours into the event - we had amassed 2,612 QSOs – well on our way to the 50,000 target which we had set ourselves. At midnight we had a superb view of the thousands of fireworks that were let off from all over London to mark the start of the new Millennium. The whole day had been a truly magnificent experience and the M2000A team are hopeful of further successes in the two months of activity to 29 February. ♦

Text of the NZART message

"New Zealand is in a special position by arriving into the new Century before others. Amateur radio is also special, in that it is a hobby of communicators. It is through this communication with amateurs of other countries and different cultures that our participants are greatly enriched.

"In 1924 a special milestone was established, when Frank, Z4AA, contacted Cecil, G2SZ, on 18 October, for the first ever two-way contact half way around the world, between New Zealand and England.

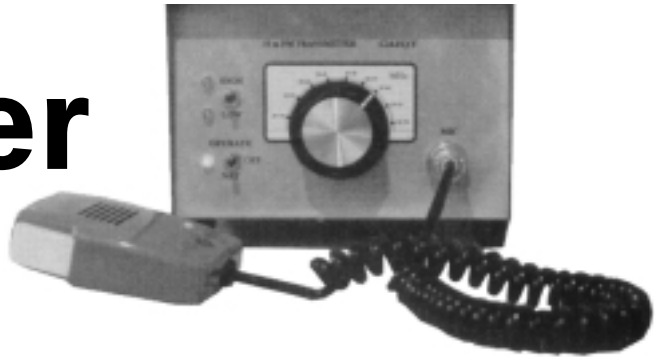
"Today a milestone is being established again with this special contact, between two points as distant as they can get on our world, for the first time in the new Millennium.

"On this occasion, I send you very special greetings from all New Zealand operators to the operators of your country. We look forward to the continued spirit of international co-operation between our countries and to working closely together in the international arena within the IARU.

"Best wishes to you for your country's transition to the year 2000, and may all enjoy the celebrations and the ongoing fellowship."

Alan Wallace, ZL1AMW.
President, NZART.

A 10m FM Transmitter



*Part one, by Ian Liston-Smith, G4JQT**

ANYONE STRAYING into the 27MHz CB channels while listening around the bottom end of 10m might be surprised at how many non-UK CB stations are audible when our adjacent band appears to be closed. The obvious answer to this is that the 10m band is not closed, just empty. This is a shame, since such a large amateur allocation deserves more use. Even when the band is truly closed, it is ideal for local contacts!

Now that solar cycle 23 is about at its peak, 10m is open for longer and longer as the F2 critical frequency supports propagation on this band. Sporadic-E is common here too (particularly in the early summer, regardless of solar activity) where 'short skip' contacts around Europe are quite frequent.

Being a bit of a 'home-brew top-band AM duffer', I thought it was high time I explored the comparative vastness of 10m. This circuit - block diagram in **Fig 1** and full circuit diagram in **Fig 2** - is what I eventually developed. It follows conventional RF design practice, as illustrated in publications [1, 2].

This transmitter can be used with any HF receiver that has an FM discriminator, or even a scanner. Although the performance of scanners at HF usually leave something to be desired, their performance at the top end of HF (with a decent antenna) is generally quite good. The receiver input passes through the low pass filter, thus preventing most strong non-amateur signals from affecting the scanner's wide-band RF stages. With full PTT transmit/receive changeover incorporated in the transmitter, no separate manual switching is required. Operating split-frequency to access 10m repeaters is also possible, as you will be using a separate transmitter and receiver.

THE CIRCUIT

OUTPUT FROM THE microphone pre-amp is given some pre-emphasis, clipped and filtered before being amplified again by TR2 and applied to the Varicap diode D3. RV1 sets the deviation.

The VFO is a conventional Colpitts type, but as the frequency is relatively high for a free-running oscillator, some care must be taken to minimise drift. This includes the usual precautions of using a low stabilised voltage to the circuit, good quality capacitors and inductors, a buffered output and mechanically robust construction in a screened enclosure. Having said that, absolute oscillator stability in an FM transmitter (or receiver) is nowhere near as critical as with SSB or CW.

A ready-made screened variable inductor of about 5µH for L3 can be used, but I found that the ones I tried had poor temperature/inductance characteristics when used at these frequencies. L3 is therefore wound on an 8mm threaded former. The measured drift on the prototype was about 500Hz over 30 minutes from switch on - quite acceptable for FM.

Another aspect of the VFO that I had to be aware of was to ensure that none of its harmonics lay in or near the transmitter's output frequency. The VFO frequency was also determined to some extent by the availability of cheap ready-made crystals and is why the oscillator range 10.868 to 11.268 MHz was arrived at. The selected crystal (18.432 MHz) is a readily available 8080A microprocessor type. Nevertheless, any crystal of about this frequency will be satisfactory, providing the altered VFO range and its harmonics are considered.

The mixer uses one of the ubiquitous NE612 linear ICs, and this section of the design was modified from the '14 MHz CW Transceiver' project published in *RadCom* September 1988 by George Fare, G3OGQ. The band-pass filter following the NE612 selects the sum of the crystal and VFO frequencies.

The output of the BPF is then applied via the drivers TR5 and TR6 to TR7, the VN66 power FET. During transmit, RL1 routes the RF through the LPF to the antenna. Other contacts in this relay short the receiver's aerial input to earth via a 51Ω resistor. If the receiver has a proper a mute facility, these relay contacts could be used to operate this instead. For extra receiver front-end protection, you might want to add a pair of parallel but reversed 1N4148 silicon diodes across this resistor or the receiver's aerial input socket.

If more power is required, the 20W PA is switched in by RL2.

Some of the relay switching is an embellishment which could be dispensed with and replaced with conventional switching, but the ease of use when combined with the PTT circuit makes it worthwhile.

If the circuit is examined closely, you will see that the VFO is kept running at all times via its supply voltage 'A', straight from the 12V input. This is to help ensure frequency stability, which would suffer if it were switched off between 'overs'.

The 12V supply marked 'B' is fed to the microphone pre-amp, driver and PA stages. This is removed from the circuit in the

48 Swansea Road, Reading RG1 8HA.
E-mail: ian@wireless-sparks.freeserve.co.uk

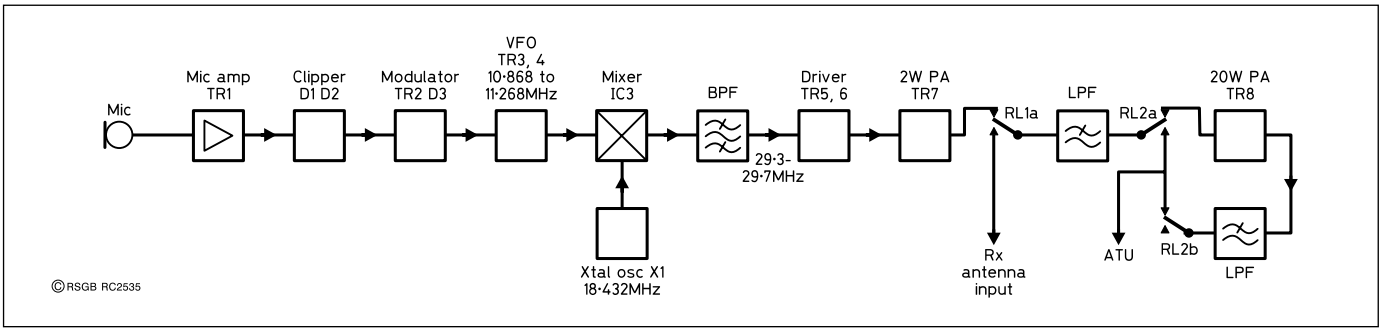


Fig 1: Block diagram. Because the final frequency involved is rather high for a free-running oscillator, a mixer VFO is used. This makes the circuit more complex, but it gives greater frequency stability.

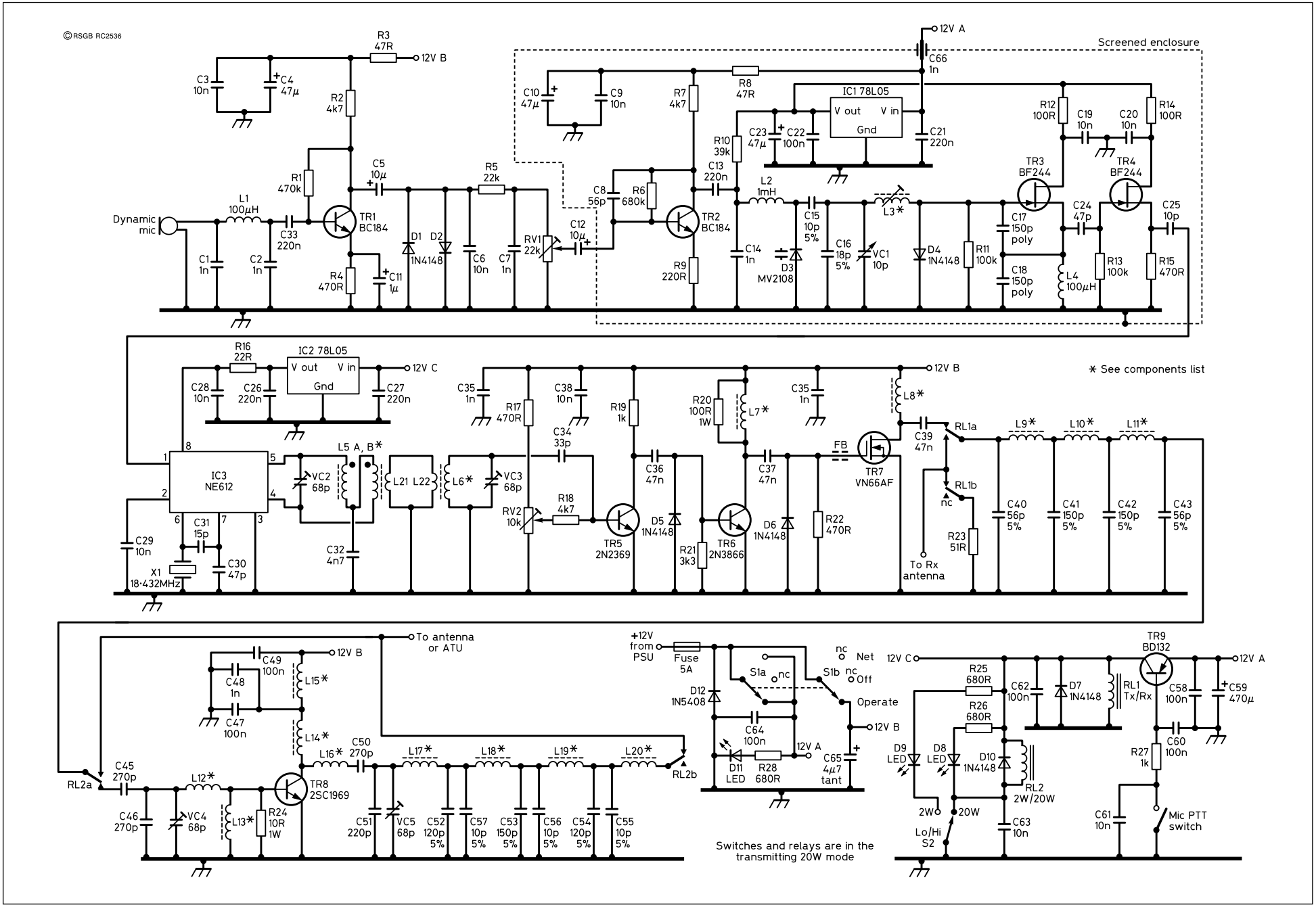


Fig 2: Circuit diagram. The transmitter can be built with or without the 20W PA stage.

COMPONENTS

Resistors
(½watt metal film, unless otherwise staed)

R1	470k
R2, R7, R18	4k7
R3, R8	47R
R4, R15, R17, R22	470R
R5	22k
R6	680k
R9	220R
R10	39k
R11, R13	100k
R12, R14	100R
R16	22R
R19, R27	1k
R20	100R 1W
R21	3k3
R23	51R
R24	10R 1W
R25, R26, R28	680R
RV1	22k potentiometer
RV2	10k potentiometer

Capacitors
(disk ceramic, unless otherwise stated)

C1, C2, C7, C14, C35, C48	1nF
C3, C6, C9, C19, C20, C28, C29, C38, C61, C63	10nF
C4, C10, C23	47µF 25V electrolytic
C5, C12	10µF 25V electrolytic
C8	56pF
C13, C21, C26, C27,	220nF
C15, C55, C56, C57	10pF 5%
C16	18pF 5%
C17, C18	150pF polystyrene
C22, C47, C49, C58, C60, C62, C64	100nF
C24, C30	47pF
C25	10pF
C31	15pF
C32	4.7nF
C34	33pF
C36, C37, C39	47nF
C40, C43	56pF 5%
C41, C42, C53	150pF 5%
C45, C46, C50	270pF
C51	220pF
C52, C54	120pF 5%
C59	470µF 25V electrolytic
C65	4.7µF 25V tantalum
C65	1nF feed through
VC1	10pF variable
VC2, VC3, VC4, VC5	68pF trimmer

Semiconductors

TR1, TR2	BC184
TR3, TR4	BF244
TR5	2N2369
TR6	2N3866 with clip-on heatsink
TR7	VN66AF with insulating kit
TR8	2SC1969 with insulating kit
TR9	BD132
IC1, IC2	78L05
IC3	NE612 or NE602
D1, D2, D4, D5, D6, D7, D10	1N4148
D3	MV2108 Varicap
D8, D9, D11	LED
D12	1N5408

Inductors

L1, L4	100µH wire ended
L2	1mH wire ended
L3	5µH (approx 45 turns 28 SWG on approx 8mm diameter threaded former). A suitable former and slug are available from: Kanga Products, Tel: 0115 967 0918 www.kanga.demon.co.uk)
L5A, B	6 turns of 28SWG bifilar wound on T37-6 core
L6	14 turns of 28SWG on T37-6
L7	12 turns of 28SWG on FT37-63
L8	8 turns of 28SWG on FT50-63
L9, L11	9 turns of 28SWG on T50-6
L10	10 turns of 28SWG on T50-6
L12	4 turns of 20SWG 8mm diameter self supporting
L13	3 turns through ferrite bead
L14	9 turns of 20SWG 4mm diameter self supporting close wound
L15	10 turns of 28SWG on FT50-63
L16	6 turns of 20SWG 8mm diameter self supporting
L17, L20	6 turns of 20SWG on T80-6
L18, L19	9 turns of 20SWG on T80-6
L21	2 turns over L5
L22	1 turn over L6

Miscellaneous

RL1, RL2	12V relay (GU36P)
S1	DPDT toggle with centre off (FH05F)
S2	SPDT toggle (FH00A)
F1	5A, with holder
X1	18.432MHz (FY84F)
Ferrite bead to go over gate lead of TR7	(type not critical)
VFO case, 4in x 2.5in x 2.5in (LF12N)	
Main case (XB67X)	

Most components are available from Maplin Electronics (Maplin reference numbers are shown in brackets where appropriate)

All toroidal windings should be wound closely and then gently stretched to cover 2/3 to 3/4 of the circumference.

'Net' position. However, in this mode there is sufficient signal from the mixer to provide a carrier to use for netting.

When the PTT is closed (putting an earth on the base of TR9 via R27), TR9 conducts, operating RL1 and also applying volts 'C' to the mixer. As volts 'A' and 'B' are already at the microphone pre-amp, driver and PA, the output from the mixer is amplified by the subsequent stages. If the switches are wired as shown, D11 will illuminate when volts 'A' are applied. The 'High/Low' switch operates RL2, and when the PTT is closed, D9 will illuminate for the 2W output, and D8 for the 20W output. These LEDs may be dispensed with if you don't want them.

Observe the polarity of all ICs, diodes and electrolytic capacitors. Check the lead-outs of transistors, as occasionally different manufactures of the same type use different lead configurations.

To allow for various formers, plenty of space is allowed for L3 on the PCB. As with similar VFOs, to lessen temperature-induced drift, the coil should be wound so that the VFO frequency is correct when the ferrite core only just enters the windings.

Observe the winding polarity of L5A and B. The dots on the circuit diagram all show the same 'end' of the windings. Windings A and B are in series in the same direction, and are connected to C32 where they join. The top of L5A is connected to IC3 pin 5 and the bottom of L5B is connected to IC3 pin 4. The coupling coil L21 is wound over L5 and its matching winding L22 is wound over L6.

Before connecting to the receiver, check that the RF output and aerial connections go to the correct sockets!

REFERENCES

[1] *Radio Communication Handbook* - 14MHz CW Transceiver
[2] *ARRL Handbook* - Low Pass Filter Designs ♦

To be continued...

SPECIFICATION

Supply:	13.8V (11 - 15V)
Frequency:	29.3 - 29.7MHz
Modulation:	FM
RF output:	2W or 20W
Harmonic output:	At least 60dB below fundamental
Other spurii:	At least 43dB below fundamental
Rx/Tx changeover:	PTT operated relay with Rx muting
Output filtering:	7-element LPF on both power levels

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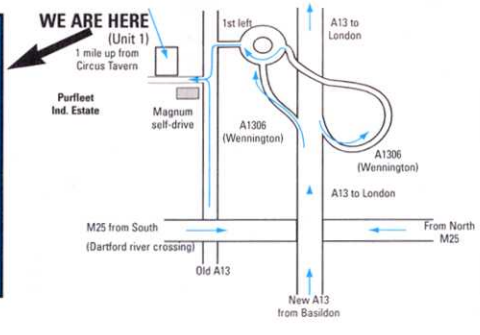

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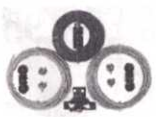

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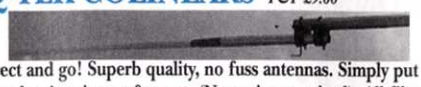
QT-40 19ele 23cm yagis boom length 1.5m gain 16dBd (n-type) ..... £69.95 + P&P £10

Q-TEK COLINEARS *P&P £9.00*



Erect and go! Superb quality, no fuss antennas. Simply put together in minutes & erect. (No tuning required). All fibre glass & stainless fittings.

QT-100 GF 144/70, 3/6dB (1.1m)	£39.95
QT-200 GF 144/70, 4.5/7.2dB (1.7m)	£54.95
QT-300 GF 144/70,6.5/9dB (3m)	£69.95
QT-500 GF 144/70, 8.5/11dB (5.4m)	£125.95
QT-627 GF 50/144/70, 2.15/6.2/8.4dBi gain	£69.95

ACCESSORIES *P&P £3.00 on the following*

TSA-6001N	Duplexer (+Coax) 2/70 (N/N259)	£24.95
TSA-6003	Duplexer (Coax) 2/70 (PL/259's)	£19.95
MX-2000	Triplexer (6/2/70) (Coax)	£56.95

MOBILE ANTENNAS *£6.50 delivery*

TSM-1612	6/2/70 (2.15/6/8.4dB) 2.1M	£54.95
DB-7900	144/70 cms, (5/7.6dB) 1.5m	£29.99
DB-770M	144/70 cms, (3/5.5dB) 1m	£24.95
DB-1304	144/70 cms, (2.15 /3.8dB) .41cms	£19.95
DB-EL2E	144MHz,⅜ths, 4.5dB (1.8m)	£29.95
DB-285	144MHz, ⅜ths, 3.4dB (1.3m)	£15.95
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MT-1301	H/Duty Mag Mnt + Coax Top Quality	£24.95
MT-3302	H/Duty Hatch/Trunk Mnt Top Quality	£24.95
CF-BPF2	2m band pass filter	£49.95
Q-Tek	6m band pass filter	£42.95

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Hard drawn	£13.95 P&P £5
Multi-Stranded (Grey PVC)	£9.95 P&P £5
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Copper earth rod (4ft)	£13.00 P&P £6
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6.1 Balun		£24.95 P&P £2
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80 mtrs	Traps	(a pair) £25.00 P&P £4
10 mtrs	Traps	(a pair) £25.00 P&P £4
15 mtrs	Traps	(a pair) £25.00 P&P £4
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1kw Handling

Q-TEK DL-1000

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SSP ~~£89.95~~.

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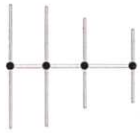

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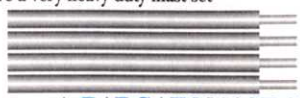

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2" Dia	£12.50 per metre		*Delivery £10*

NB. We can only deliver 3m lengths

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30m pack (3mm dia) winch wire	£16.00 P&P £4

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18"	T&K Brackets	£18.00 P&P £8
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8 nut universal clamp (2" - 2")		£5.95
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Be protected this summer! In-line lightning surge arrester. (Gas discharge type). Replaceable fuse.

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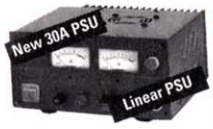

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GC-065	2" thrust bearing	£48.00
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RS-402	125-525MHz (200W) £59.95	£49.95 P&P £5
RS-101	1.8-60MHz (3kW) £79.95	£69.95 P&P £5
RS-40	144/430MHz Pocket PWR/SWR Meter (200W) (SO239)	£34.95 P&P £1
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CX-201 'N'	2 way (N-type)	£24.95

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Hanging type earphone with boom mic & PTT. Fits Kenwood, Alinco, Yaesu or Icom.

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This Ear/Mic comes with an "over the ear" earpiece as EP-300

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Superb quality.

NB–30W 2M FM handheld

amplifier 2-5W input. 30W output (for 5W ip). Turn your handheld into a mobile for under £50

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REGULAR-GAINER RH-770

21cm flexible whip that has 2m + 70cm transmit and wideband receive.

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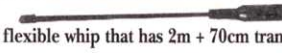
SUPER-GAINER RH-9000



40cm flexible whip that has 2m + 70cm transmit and wideband receive.

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Matches all hand helds. Can be worn on the belt or attached to the quick release body holster.

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Waterproof case for handheld.....£10.00 P&P £1

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A fully adjustable desk top stand for use with all handhelds. Fitted coaxial fly (FAI) with BNC & SO239 connectors

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QS-200 Air vent holder for hand-helds with belt clip. ...£9.99

EP-300 Deluxe over the ear earpiece.

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Repeater Planning for the New Millennium

*By Roger Jones, G3YMK**

THE FIRST UK amateur Repeater, GB3PI, was licensed in 1972 operating from a site near Cambridge. There are now over 300 repeaters licensed or proposed on bands from 10m to 3cm. Each is built and operated under individual Notices of Variation, issued by the RSGB on behalf of the Radiocommunications Agency to designated 'keepers'. Installation of well-sited unattended transmitters demands high levels of engineering skill and quality, often in challenging circumstances. The cost of providing and maintaining the repeaters is the responsibility of the keeper and usually a local group is formed to support the installation.

When GB3PI was first commissioned, amateur activity was very different from that of today. A few pioneers were dedicated to mobile operation on VHF, but ranges were somewhat limited and activity sparse. Some ex-PMR equipment was available for conversion to amateur use and this was mainly AM. The bandplans were based on geographical segmentation and channelisation was in its infancy with the introduction of imported transceivers based on American standards. It was not until 1973 that a bandplan based on 25kHz channel spacing was introduced in the upper section of the 2m band. There was considerable resistance to this at first, but as more repeaters were commissioned and NBFM techniques were improved, there was soon a general acceptance that times change.

PROGRESSION

IN 1976 A BATCH of twenty 70cm speech repeaters was licensed after the first proposal in 1974. Ex-PMR equipment was becoming easily available as the professional users changed equipment. Vast improvements in receiver performance made VHF and UHF mobile operation very popular and the repeaters were established as an important tool for mobile operation. Indeed, simplex operation increased as more amateurs 'met' on repeaters and changed channel if they were within simplex range. An experimental pilot-tone SSB repeater, GB3SF, was licensed in 1978 on 2m. The days of 'plug and play' VHF mobile operation had truly arrived.

The first UK amateur television repeater, GB3GV, was licensed in the 23cm band in 1985 and this was followed by a number of other special mode repeaters. Packet radio gained popularity in the mid 1980s and store-and-forward AFSK packet 'digipeaters' placed pressure on spectrum which required further bandplan revisions (the Data Communications Committee deals with the packet radio network).

ROLE OF THE RMC

THE RMC IS a full committee of the RSGB, with responsibility to set and agree specifications in accordance with the Radiocommunications Agency, check new proposals prior to forwarding to the RA, issue NoVs on behalf of RA, monitor technical compliance, and deal with abuse in conjunction with the RA and AROS. In addition, it consults with other interested bodies and RSGB committees regarding matters of mutual interest. It keeps repeater keepers informed regarding news, specifically regarding repeaters, by circulation of an occasional *Repeater Report* newsletter. This is sent to all keepers, regardless of whether he/she is an RSGB member or not. This is also freely available to all by means of the committee's web pages 'RMCWEB' (http://members.aol.com/rmcweb/brief.htm), maintained by Colin Dalziel, GM8LBC.

COMMITTEE ORGANISATION

CHAIRED BY Carlos Eavis, G0AKI, since October 1998, the committee consists of a member from each RSGB Zone, designated a 'Zonal Repeater Manager'. See **Fig 1** for the structure and **Table 1** for the members. As members move on, each post is advertised in *RadCom* and on GB2RS in accordance with the *RSGB Green Book*. In addition to their Zonal duties, several managers take on a second role such as Vice Chairman, Proposals Manager, Publicity Officer, etc. There are also a few technical specialists as members for dealing with particular facets such as television. In order to gain as wide a view as possible, a number of corresponding members also serve on the committee.

Committee members make themselves available to speak to clubs and repeater groups in their zone, and have stands at major rallies throughout the UK, where users can discuss directly with representatives of the RMC.

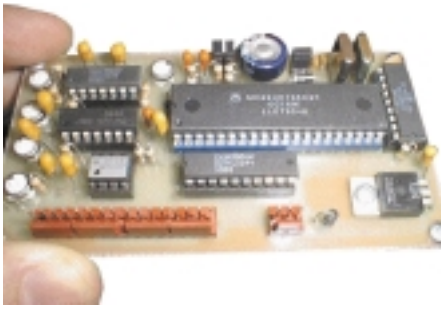
WHERE ARE WE TODAY?

FROM PEAK ACTIVITY during the late 1980s to the early 1990s, speech repeater use has declined but is still remarkably popular. The reasons are many and various, and tend to be cyclical. It is interesting that if a repeater is taken out of service, even though it might not be heavily used in itself, activity in that area

Tuned cavities are essential items of equipment for a repeater. They place a deep notch in the receive path, so that the co-sited transmitter doesn't break through into it.

PHOTOGRAPH BY TONY BAUGHAN, M0AVP, OF THE CARADON HILL REPEATER GROUP.

* *Millfield House, Alton Lane, Four Marks, Hants GU41 5AL.*



Typical modern speech repeater logic board.

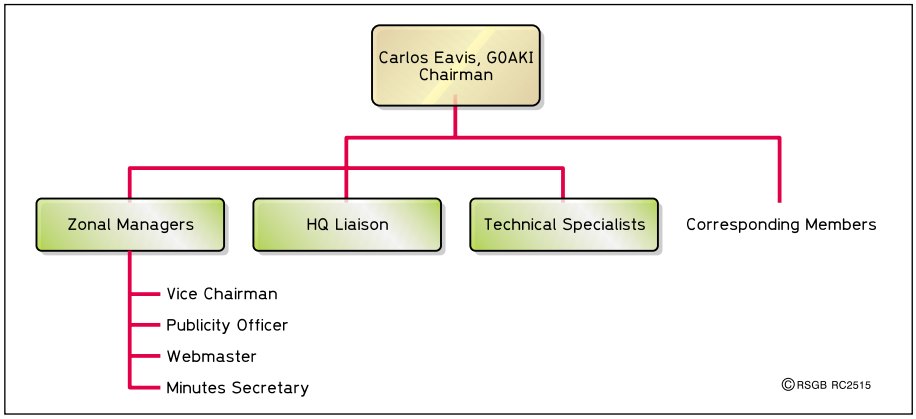


Fig 1: The structure of the Repeater Management Committee.

RMC MEMBERSHIP 2000

Carlos Eavis, G0AKI	Chairman
Dave Wilson, G7OBW	Zone A RMC Manager
Alan Marwood, G8SSL	Zone B (East) RMC Manager
Bill Mahoney, G3TZM	Zone B (West) RMC Manager and Vice Chairman
Tony Horseman, G0MBA	Zone C RMC Manager
Roger Jones, G3YMK	Zone D RMC Manager & Publicity Officer
Mark Lewis, GW7KDU	Zone E RMC Manager
Terry Barnes, GI3USS	Zone F RMC Manager (Corresponding)
Colin Dalziel, GM8LBC	Zone G RMC Manager and Proposals Manager (RMCWEB Master)
Graham Shirville, G3VZV	TV Specialist
Fergus McGilp, G8URB	Technical Support
Fiorina Sinapi, 2E1EJL	HQ Liaison

Table 1: The members of RMC.

generally reduces overall. One conclusion that might be drawn from this is that the presence of a repeater brings together local amateur communities, which in itself breeds further activity.

Several repeaters established some twenty years or so ago are now in the care of new keepers and the equipment is sometimes getting somewhat dated and less reliable. Costs of maintaining repeaters are soaring. High site owners such as CTI and NTL have tolerated amateurs over the years and accommodated them at peppercorn rentals, but now find themselves under pressure from other customers to maximise the sparse resource on masts and towers. Amateur installations still enjoy substantially discounted rental on these sites and the RSGB has negotiated a 7-year phasing-in of price increases. However, even the first increase is too much for some groups to bear and a stark choice has to be made of either closing down the repeater or finding another site. In some cases sites have become available that are easier to maintain (hence costs are reduced) and coverage is almost unchanged. For groups who need to move their equipment because of site loss, the RMC has agreed a 'fast track' procedure with the RA. The time taken to approve such moves still varies, but it is considerably less than the time needed for a completely new application.

In 1996 the IARU Region 1 meeting in Tel Aviv recognised that there was considerable pressure on the FM portion of the 2m band and recommended a change to 12.5kHz spacing and specification on 1 January 2000. Recognising the difficulties this would present to some repeater groups, the RMC negotiated an extension of the deadline to 30 June 2000 for those groups needing more time. The move is bound to be unpopular with some users and keepers, but it also gives us the opportunity of establishing more repeaters to fill present pockets of poor or non-existent 2m repeater coverage. Whilst the RMC originally also proposed that the 12.5kHz specification should be applied to 70cm, feedback from keepers and users was such that it was seen as unnecessary at present. Modern commercial dual-band equipment has switchable transmitter deviation levels, and there is a degree of backward compatibility.

New proposals average about three per month and are passed through to the RA as soon as possible after consulting with other groups, RSGB committees and other organisations in order to achieve any necessary compromise solutions. The RMC Zonal Representatives try to keep groups informed regarding progress of their proposals, often visiting and discussing the application in person. The most common cause of delay is incomplete documentation; it is essential that all paperwork be provided before the RA will accept any application.

WHAT OF THE FUTURE?

ANALOGUE SPEECH repeaters will be around for some years yet. Equipment is easily and cheaply available that gives good performance when assisted by repeaters. There will undoubtedly be change and it cannot be long before digital techniques start to be used for speech and television operation by amateurs. A gaze into the crystal ball shows the fog to be slowly clearing. Bill Gates of Microsoft® was quoted recently as saying we probably over-estimate the march of progress in the next two years, but consistently underestimate the next ten years' developments. That probably applies equally to the repeater network.

The RMC is particularly keen to solve the problem of demands for 2m units by taking advantage of the IARU changes. New channels are now available and this has freed-up some long overdue proposals to become a reality. There might be some advantage in moving the frequencies of some of the existing units on 2m, where mutual interference is experienced. Repeater linking or clusters of low power units may be a way of emulating the coverage of previous high site units.

There are many other possibilities and the RMC would like to solicit the views of all groups and users so that a comprehensive but flexible strategy can be developed for the dawn of the new millennium. We know we cannot satisfy everybody, but we are determined to encompass the aspirations of all radio amateurs wherever possible.

If you would like to make any suggestions or observations to the committee, this can be done by writing to Carlos Eavis; RMC Chairman, at RSGB HQ or via e-mail to our website, RMCletters@aol.com

A future article will summarise the responses and detail the strategy being adopted by the committee. ♦

The cost of high sites is becoming prohibitive for most repeater groups.

RadCom Helplines FOR MEMBERS

● Den, VK5LS (formerly G3AIS), would like to make **contact with a former colleague**, someone with a G3A-series callsign, who was employed by **Multitone** in about 1946/47. The person concerned lived in or around Morden, Surrey. E-mail: websel@netspace.net.au

● Clive, M0BGA, is looking for a copy of the manual, circuit diagram and servicing information for the **Telequipment DM64** oscilloscope. Also, a copy of the manual and operating instructions for the **Kenwood AT-230** antenna tuner. M0BGA, *not* QTHR. Tel: 01637 875848.

● Bob, G0NFO, is looking for a copy of the operating manual and circuit diagram of the **Sommerkamp FT-690 Mk1** transceiver. G0NFO, QTHR. Tel: 01562 754296. E-mail: bob@g0nfo.freeserve.co.uk

● Nicolaus, PP8DA, is looking for a copy of the circuit diagram and information on the **Tokyo High Power HRA-2** VHF pre-amp. E-mail: nsallay@internext.com.br

● G1BLA is looking for an **adapter/program** that will enable him to connect a Yaesu FRG-7700 receiver to his Packard Bell Pulsar 21H computer, and enable it to read and print Morse code. G1BLA, QTHR.

Helplines is a free service to members. Requests for help are published in the order they are received. We regret it is not possible to provide an undertaking of when any submitted request will be published.

DSP-10 Multimode 2m Transceiver Kit

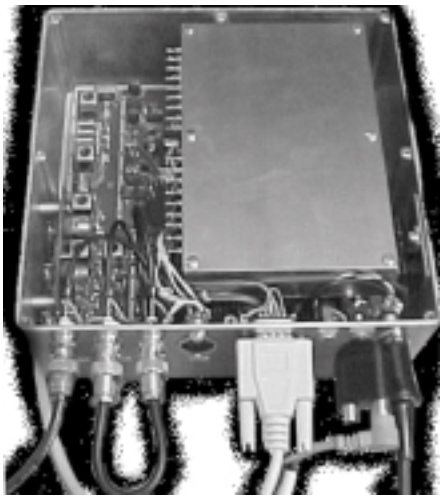
*An overview, by Simon Lewis, GM4PLM**

DIGITAL SIGNAL Processing (DSP) is becoming a familiar term when discussing modern commercial transceivers, but they have been around in standalone units for much longer and their use for weak signal work is well proven. DSP filter units like the DSP-9 have revolutionised weak signal modes, giving the operator the few dB extra in signal/noise ratios that can make all the difference. DSP has also made its mark in HF units like the Kachina HF transceiver, which uses a PC to drive the radio using a 'virtual' front panel on the PC screen. These new ideas promise to introduce a whole new world of DSP, PC driven commercial transceivers that are vastly different from the traditional transceiver we have seen.

As my interests lie in the microwave region, I was very excited to hear of a new project from the USA called the DSP-10. This concept VHF transceiver was being contemplated for sometime, but has now been redesigned and released as a working unit and part kit.

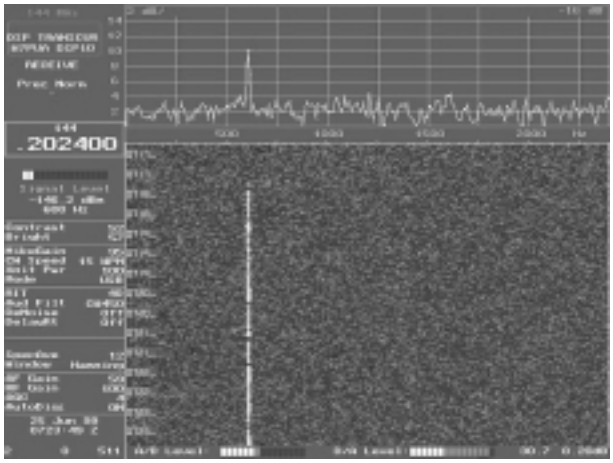
DESIGN CRITERIA

THE DSP-10 HAS been designed by Bob Larkin, W7PUA, and is intended to explore the use of DSP as the IF and AF processing of a transceiver. The primary application is weak-signal work on the bands above 144MHz. The transceiver also operates at 144MHz directly as presently built and can also be used on that band. Transverters are used ahead of the transceiver for the higher frequencies, allowing operation up into the microwave range. The control and the front panel for the transceiver is any PC running DOS and having VGA graphics. A Windows® application will be available shortly. The keyboard controls the transceiver. Status information, along with spectral and signal strength displays, is displayed on the screen. Audio comes from the DSP, not the PC, so no internal sound card is required.



Inside a built-up DSP-10.

Background for this project is available in the articles 'The DSP10 - An All-Mode 2-Meter Transceiver Using DSP I-F and PC Front Panel', published in *QST* Sept, Oct and Nov 1999, and 'A DSP Based Transceiver for UHF and Microwaves', published in *1996 Microwave Update* and available from the ARRL. The latter paper and some other background material are also available at http://www.ao.com/~gnome/



DSP-10 computer display.

CONSTRUCTION

THE TRANSCEIVER hardware is built on one PCB and connects to the DSP unit by a small cable. The DSP unit is a proprietary unit from Analog Devices and is available ready built. The software for the DSP is uploaded from the PC and easily available from the Internet. The RF hardware is almost standard, giving a VHF low power transceiver, but the DSP unit has been tapped into the IF and AF stages allowing for full DSP processing of the received and transmitted signals. Currently the unit is only low power (around 20mW out), but a higher power PA is under construction and should be available shortly. There is comprehensive tune-up included in the construction details.

The control panel for the radio is very comprehensive and allows every radio function to be controlled/adjusted. All the normal functions are there, AF/RF gain, RIT, VFO selection and tuning, RIT and microphone gain, etc. A variety of DSP functions are also controllable and a built-in CW keyer is also included. The screen display can be altered and can show either a waterfall or a spectrum analyser type display. An S meter is also included, calibrated in dB.

Although the DSP-10 can operate as a standalone VHF transceiver, it was intended as a transverter driver, and a number of the functions are dedicated to this use. RF power can be altered from the operating panel, the frequency display can be forced to show the band in use, eg 1296.xxxx, and the hardware can switch between different units. Hardware lines for PTT control and antenna relays (suitably sequenced) are also included. For the dedicated EME user, sun and moon tracking functions are also included and are shown on-screen if required. For narrow-band weak signal working stability is of the utmost importance, especially when bandwidths in tens of Hertz are being used. A high stability 10MHz oscillator input is available, if you have one available. A high performance on-board oscillator is also provided.

SETUP

ALL THE transceiver set-ups and configurations are software coded in a config file which is run on start-up, allowing the user to put the unit into the required state at initial switch on.

FINALE

ALTHOUGH THE DSP-10 is not yet available as a full kit, a quality PCB and full documentation is available from the USA. I have a kit on order and will be building it over the next few months, so in due course I intend to follow-up this article with another, including some building information and experiences on the air.

Overall, the unit looks very promising and has some useful facilities and functions that should increase our weak signal capabilities. The ability to analyse incoming signals using DSP techniques may reveal as yet unknown propagation methods using remotely-sited beacons and long-term monitoring projects. I am sure the extra filtering and functions of the DSP-10 will be of use to many operators who haunt the VHF and up spectrum, operating a variety of modes. ♦

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The Crawley Power Meter

*Final part, by Derek Atter MIEE, CEng, G3GRO**
*and Dr Stewart Bryant BSc, PhD, DIC, MBA, FIEE, CEng, G3YSX***

IN THE FIRST part details were given of how the method of measuring power was decided upon. This was followed by two versions of the project, one employing a digital display and the other employing a meter movement.

In this part we will provide details of how well it worked, plus some supplementary information.

RESULTS

THE PERFORMANCE of the meter was evaluated by using it to measure the output of an Adret 730A signal generator. This signal generator is unusual in that it has a maximum power output of 23dBm at frequencies up to 180MHz. A calibration run was made with 17dBm (50mW) output over the frequency range 1 to 180MHz at 0.5MHz intervals. **Fig 6** shows both the indicated input power and the error in this value (multiplied by ten to get it to a satisfactory scale). These measurements show that the RF head is accurate to with ±1dB (±20%) up to 180MHz.

To investigate the HF response of the power meter further we measured the power output of a Marconi TF 2015 signal generator. This instrument covers 10 to 520MHz, with a maximum output of 800µW. We first calibrated the output level of this signal generator over the range 10 to 360MHz using an HP435A power meter. We then measured its output at 10MHz intervals up to 360MHz. **Fig 7** shows the error in the measured frequency for the internal and the external heads. Our results showed that both power heads were within 1dB of each other and had less than 1dB total error at all frequencies up to 280MHz. A third head using two bulbs instead of one bulb and a resistor produced similar results, although the 1dB HF cut-off occurred about 40MHz lower in frequency. This showed that the RF measuring heads were reproducible and capable of covering most of the VHF spectrum.

The dynamic range of the power meter was checked at 10MHz using the Adret 730A signal generator. **Fig 8** and **Fig 9** show the measured vs actual power and the error in the measurement (multiplied by ten) on the 200mW and 20mW ranges respectively. On the 200mW range the readings were correct to within 1dB between 0dBm and 22dBm (1mW and 160mW respectively), and were within 0.5dB for most of this range. At the low power end of the measurements, the increased error was due to having insufficient significant digits on the DVM. The response of the 20mW range was found to have a negligible error down to -5dBm, rising quite sharply to 1dB error at -9dBm (300µW and 125µW respectively). To achieve accurate measurement at these lower power levels it was necessary to compensate for offset drift by recording the meter reading without RF before and after the power measurement and averaging the results. These results show a dynamic range in excess of 30dB for an error of 1dB Attenuators can be used to extend the range to higher powers. Extending the range to lower powers would either require significant analogue design effort to reduce the bias power drift or the use of a dynamic compensation approach.

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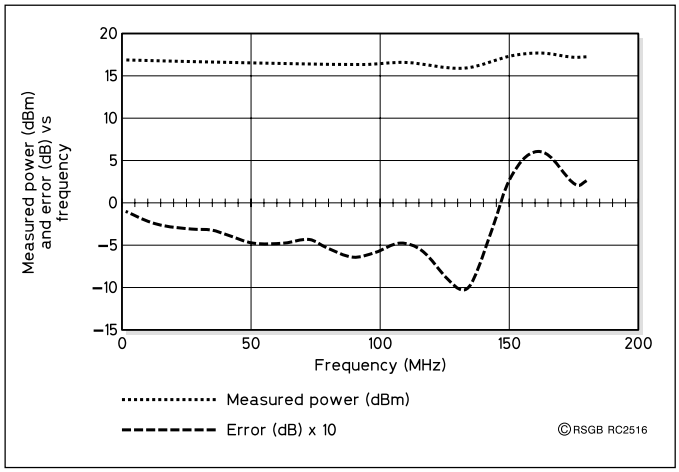


Fig 6: Measured power (dBm) and error (dB) vs frequency with 17dBm input.

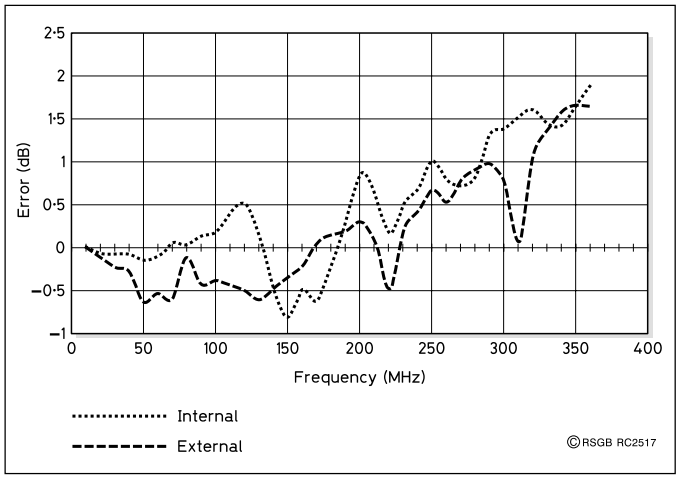


Fig 7: Error (dB) vs Frequency (MHz) for internal and external power measuring heads at approximately 800µW input power.

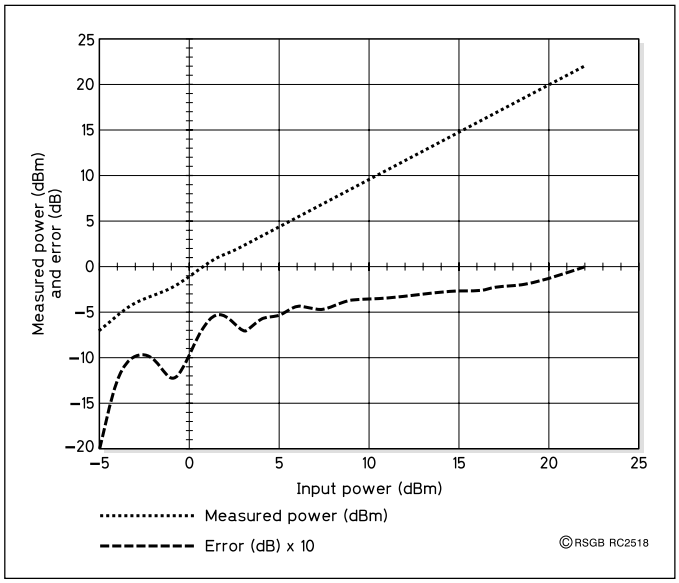


Fig 8: Measured vs Actual Power at 10MHz on the 200mW range.

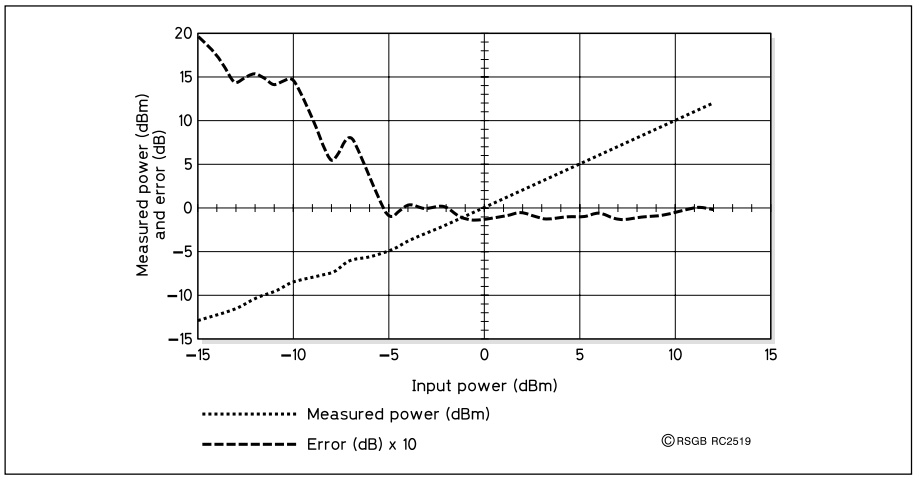


Fig 9: Measured vs Actual Power at 10MHz on 20mW range.

CONCLUSION

THIS ARTICLE HAS described the design and construction of a linear reading power meter capable of measurement in the range -9dBm to +22dBm (125µW to 150mW) with an accuracy about of 1dB (~20%). The instrument has a frequency response flat to within 1dB up to 280MHz. We have also shown how to calibrate the power meter with an ordinary digital multimeter.

ACKNOWLEDGEMENT

WE WOULD LIKE to thank all the members of the Crawley Amateur Radio Club for their help in developing these ideas. Particular thanks are due to G0SQF for his suggestion of using a two-bulb approach and to G3VJM for the photographs of the equipment.

APPENDIX 1

LINEARITY APPROXIMATION

The key components of the RF power-measuring head are shown in **Fig 10**.

When the power measuring bridge is balanced $R_b = 100\Omega$, and $V_b = V/2$. When the RF input power is zero, the power dissipated by the bulb (P_b) is given by:

$$Pb = \frac{\left(V/2\right)^2}{100} \times 1000\text{mW} = 5/2\, V^2\text{mW}$$

When RF power is applied to the bridge, half of it is dissipated in the 100Ω resistor, and half in the bulb. This RF power heats the bulb and reduces the DC power needed to heat its filament to the temperature at which its resistance is 100Ω to P_b'. The voltage across the RF head is thus reduced by ΔV to (V-ΔV). From this, it follows that:

$$\begin{aligned} P_{rf} &= 2(P_b - P_b') \\ &= 2\left(5/2\, V^2 - 5/2\,(\text{V} - \Delta V)^2\right)\text{mW} \\ &= 5V^2 - 5V^2 + 10V\Delta V - 5\Delta V^2\text{mW} \\ &= 10V\Delta V - 5\Delta V^2\text{mW} \end{aligned}$$

For small RF power levels ΔV is small and ΔV^2 tends to 0, and can hence be ignored, hence:

$$P_{rf} = 10V\Delta V\text{mW}$$

To demonstrate the validity of ignoring the term ΔV^2, consider the case of a head that has V = 9.61volts. The worst case on this instrument occurs at 200mW, where the instrument overestimates the power by 29mW. This corresponds to an error of about 0.6dB, ie 14%.

Note that 10V is a constant and thus ΔV varies linearly with the input RF power. V can be measured directly with a DVM when no RF power is applied, and the coefficient

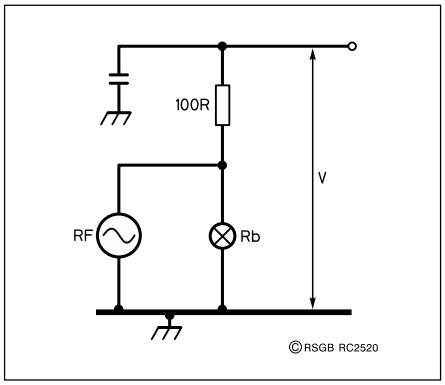


Fig 10: Key components of the RF power measuring head.

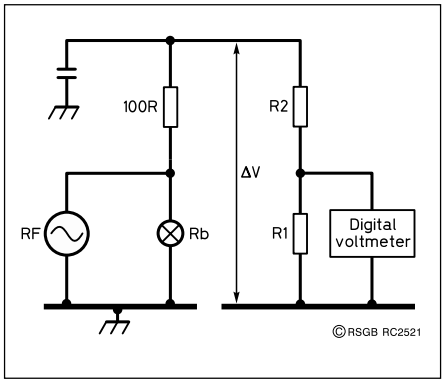
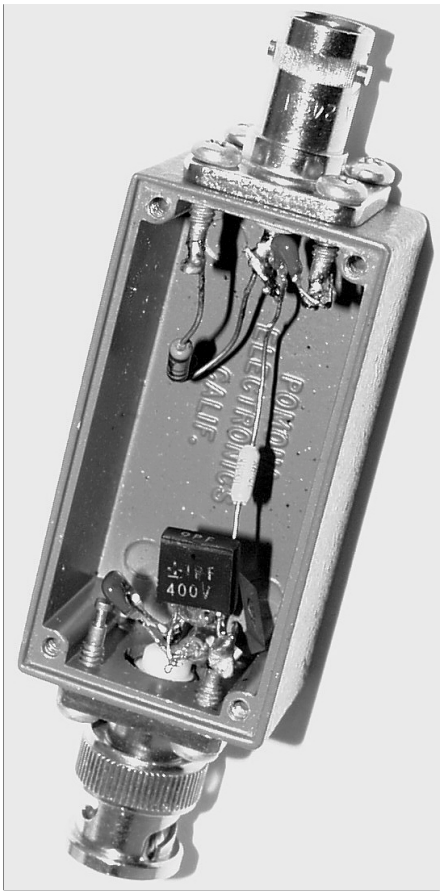


Fig 11: Scaling the output of the RF power head.



Internal view of the earlier two-bulb external RF head.

10V can thus be calculated. Measuring V is all that is required to calibrate the RF head so that P_{rf} can be measured directly on a linear scale voltmeter.

The RF power meter is 'zeroed' by setting a voltage reference to V (**Fig 11**), the voltage applied to the RF head to achieve balance when no RF power is applied. The voltage difference between the voltage applied to the RF head when RF power is applied, and the reference voltage (V) is ΔV. The voltage measured by the DVM is given by:

but given that

$$P_{rf} = 10V\Delta V\text{mW}$$

$$V_m = \frac{P_{rf}}{10V} \times \frac{R_1}{(R_1 + R_2)}$$

Rearranging, the required ratio of $R_1/(R_1+R_2)$ is:

$$\frac{R_1}{(R_1 + R_2)} = \frac{10VV_m}{P_{rf}}$$

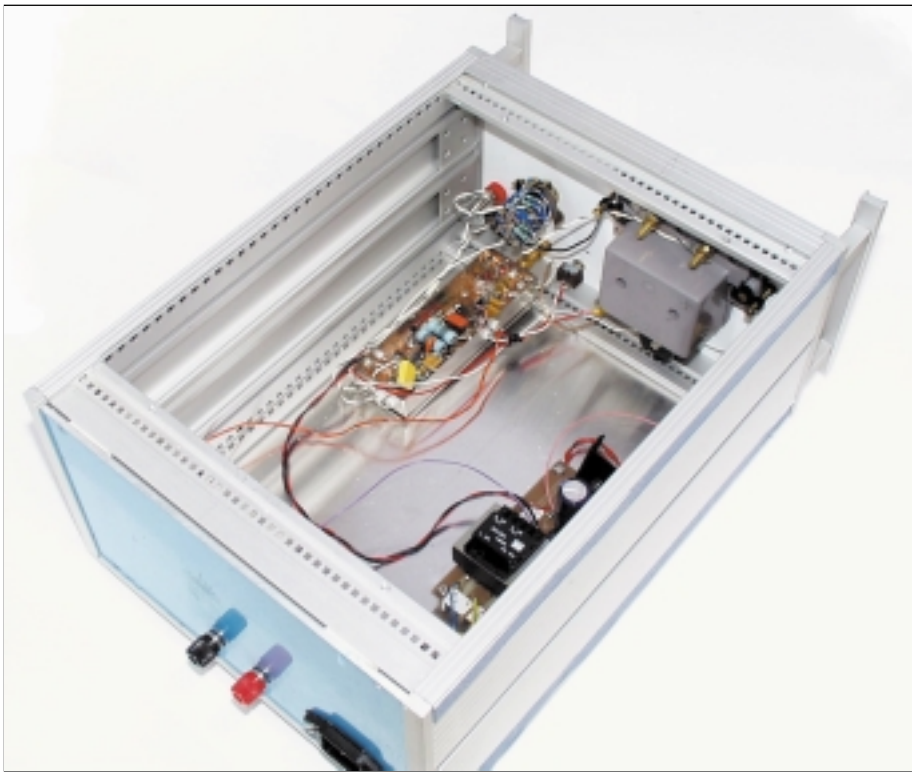
For a full scale of 200mV, corresponding to 200mW, and a zero RF bias voltage of 9.61V at the RF head (in the author's RF head), the ratio of $R_1/(R_1+R_2)$ = 0.0961. Similarly, for a full scale power of 20mW, $R_1/(R_1+R_2)$ = 0.961.

Power (dBm)	Power (mW)
23	200
20	100
17	50
15	32
13	20
10	10
7	5
5	3
3	2
0	1
-3	0.5
-5	0.3
-7	0.2
-10	01
-13	0.05
-15	0.032

Table 1: Power expressed in dBm.

Error (dB)	Error (%)
1.4	38
1.2	32
1	26
0.8	20
0.6	15
0.4	10
0.2	5
0	0
-0.2	-5
-0.4	-9
-0.6	-13
-0.8	-17
-1	-21
-1.2	-24
-1.4	-28
-1.6	-31

Table 2: Percentage error expressed as dB.



Internal view of the analogue version of the Crawley Power Meter.

APPENDIX 2

THE USE OF dB AND dBm

The use of decibels as a measure of relative power is familiar to the vast majority of radio amateurs. The output power of an amateur transmitter must be recorded in dBW, or decibels relative to 1 watt. In this feature we use the term dBm to mean power relative to 1mW into 50Ω. This is a standard unit of power used in professional circles to specify the output of signal generators and other low power devices. Although the Crawley Power Meter indicates the measured power directly in mW, it is convenient to use dBm to describe its performance. This is because the use of dBm allows us to display the linearity and accuracy over a wide dynamic range. For reference, **Table 1** shows the relationship between dBm and power and **Table 2** shows the relationship between decibels and percentage error in the reading.

REFERENCES

[1] *Fundamentals of RF and Microwave Power Measurements*. HP application note 61-1A, available from the applications note library at http://www.tmo.hp.com

[2] 'Simple Practical RF Detectors', p12-4, *The VHF/UHF DX Book*, edited by Ian White, G3SEK.

[3] 'The Microwatter', by Denton Bramwell, K7OWJ, *QST* June 1997; or 'RF Millivoltmeter', p12-5, *The VHF/UHF DX Book*, edited by Ian White, G3SEK.

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[5] Yearbook of the Institute of Radio Engineers 1931, p100. Tentative suggested methods of testing and rating radio transmitters and antennas.

[6] 'Accurate RF Power Meter for the HF Bands', Ian Braithwaite G4COL, *RadCom* December 1985.

[7] 'G4COL's simplified RF Power Meter', Technical Topics, *RadCom*, May 1986.

[8] 'Accurate Low Power RF Wattmeter For High Frequency and VHF Measurements', by James Bowen, WA4ZRP, *Ham Radio*, December 1977.

[9] Classically, a meter's internal resistance is measured by applying a voltage to the meter to achieve full-scale deflection, and then adjusting a series resistor to achieve 50% deflection. At this point the meter's resistance is equal to the series resistance. The series resistance is then measured with an ohm-meter. Modern DMMs however pass so little current through the movement that they can be used to measure the resistance directly, without damaging the meter movement. ♦

Crawley Power Meter with analogue readout, shown with its external RF head.

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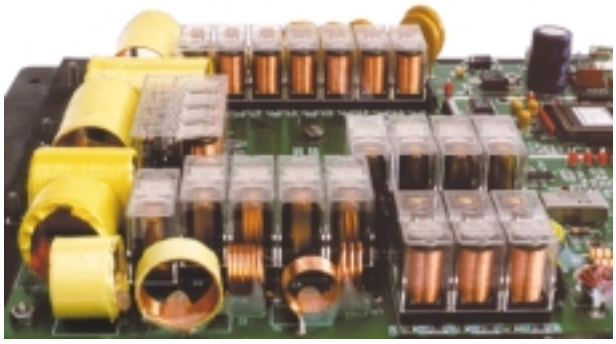
SGC SG-231 Smartuner

*Reviewed by Peter Hart, G3SJX**



The relay-switched matching network components.

TO ACHIEVE the full output power from your transmitter, your antenna and feeder system must present a good match to the transmitter's design load impedance (normally 50Ω**).** Where this is not the case, some form of matching/tuning unit is needed. There are fundamentally two types of tuner which are used at two separate and distinct places in the antenna system.

The transmitter is normally connected to the antenna using a length of 50Ω unbalanced coaxial feeder cable. In the first situation, where the antenna itself does not have a 50Ω unbalanced feed impedance, an ATU should be used at the antenna to provide a good match into the feeder cable. In this situation, the antenna can be a wide range of end-fed wires, doublets, whips, loops, etc, and the ATU can provide a match over a very large range of impedances.

In the second situation, the antenna may be a commercial beam or trapped vertical with a nominal 50Ω impedance. However the VSWR can frequently rise to 2:1 or more, particularly at the band edges and in the case of most beams on 20m or trapped verticals on 80m the bandwidth is often determined by the VSWR limit which can be tolerated. Semiconductor power amplifiers by the very nature of the technology involved only deliver optimum results when closely matched to their design load impedance (50Ω). Protection circuitry is normally also included to reduce power as the load VSWR increases. The net result is that the power output of many radios can be down by as much as a half at 2:1 or down to a quarter at 3:1 VSWR. The answer to this situation is to use a 'line flattener' style of tuner. Most medium and high end radios incorporate this type of automatic tuner these days, usually allowing full power to be delivered into VSWRs up to 3:1 and possibly more.

Note that valve amplifiers generally use LC (π) networks with variable tuning and loading, which allows full power to be achieved with a variety of load conditions. Although such an arrangement may allow effective tuning over a fairly wide range of impedances it is not good practice to rely on this. Departures from the nominal 50Ω design impedance will result in higher currents or voltages (or both), which may result in overstressing the PA tuning components and consequent overheating or flashover. Similarly, using coaxial feeders at high VSWR will result in extra cable loss and in the extreme can also result in overheating or breakdown of the cable.

* *The Willows, Paice Lane, Medstead, Alton, Hants GU34 5PR*

These two different types of tuner are not generally interchangeable. The 'line flattener' type is not normally suitable for end feeding random wires and the true ATU does not normally like driving coax. Most of the principal transceiver manufacturers provide automatic 'line flattener' tuners for their products, either built-in or as internal or external accessories. Although there are several general purpose ATUs available from a number of manufacturers, there are very few automatically tuned versions which are particularly useful for remote tuning end fed wires and whip antennas. SGC has a range of such ATUs and the SG-231 was obtained for review.

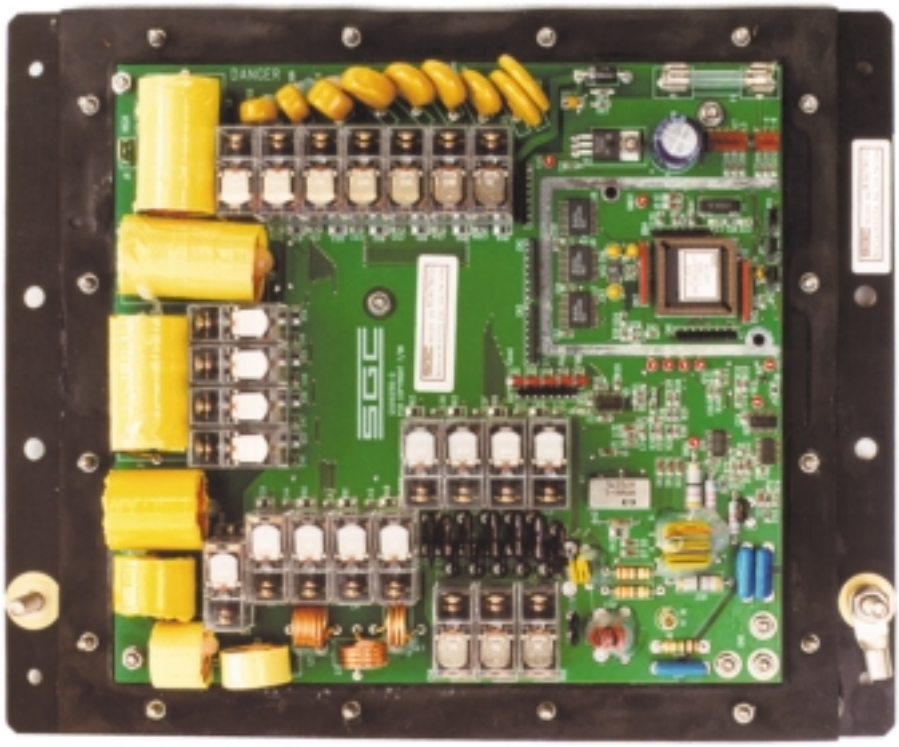
SG-231 SMARTUNER

SGC IS A long-established US company specialising in HF SSB products for government, commercial and marine use. Amongst their products familiar to the amateur market are the SG-2020 QRP transceiver, SG-500 linear amplifier and a range of automatic ATUs.

The SG-231 is an automatic ATU covering the frequency range from 1 to 60MHz and with a power rating of 100W PEP maximum. On continuous CW the power rating is less, but there is some disagreement between the manual (50W), data on the website (60W or 75W) and that printed on the case of the ATU (100W). I imagine that this is a thermal limitation of the ATU components at the highest ambient temperatures (70°C), and so I would guess that 100W of keyed CW (Morse) or even RTTY with short transmissions would not be a problem.

The ATU senses the incoming RF power and adjusts the tuning elements accordingly. It needs 3W minimum - hence is suitable for QRP operation - and will tune effectively on SSB voice as well as carrier-based modes. It cannot be tuned without an RF source, so is not suitable for the SWL.

The ATU is constructed on a thick black anodised aluminium baseplate with an ABS plastic cover fitted with a rubber sealing gasket. The overall size is 29 x 24 x 4.4cm and it weighs about 1.6kg. Antenna and ground connections are made to screw terminals; an SO239 socket is provided for RF input and an



Inside the SG-231, showing the relay-switched matching network and control circuitry

8 pin connector for power and control cabling. The whole assembly is well weatherproofed and claims to withstand submersion in 2ft of water for half an hour.

The tuner requires a nominal 13V supply at 0.9A maximum. No other control is needed, everything else is automatic, but a number of additional control lines are provided for optional features such as monitoring when tuning is complete, locking the settings and forcing a reset.

Electrically, the SG-231 uses a Pi network with input and output shunt capacitors and a series inductor. In most cases during the tuning process this reduces to an L network where either the input or output capacitor reduces to zero. This is the condition which results in minimum loaded Q and hence the widest bandwidth and lowest losses. The zero capacitance arm is the lower impedance side of the network. Unlike most auto-tuners, which use stepper motor-controlled variable capacitors, the SGC tuners use banks of relay-switched capacitors and inductors to switch values in a binary sequence (1, 2, 4, 8, etc). 128 different input capacitance values are available from 7 switched capacitors, 64 output capacitance values from 6 switched capacitors and 512 inductance values from 10 switched inductors, giving a total of 4 million different tuning combinations by suitable manipulation of the 23 relays.

Tuning is controlled by a microcontroller and the settings are stored against frequency in non-volatile EEPROM memory. Up to 170 different frequency settings can be stored with a finer resolution at the lower frequencies than at the higher end. A number of sensors measure forward power, reverse power, phase, impedance and frequency to control and steer the tuning process. Initially whenever RF power is detected, the memory is checked for tuning data relevant to that frequency and the appropriate relays are set. If this gives a VSWR less than 2:1 then tuning is accomplished in as little as 20ms. If the VSWR is greater than 2:1 or there is no appropriate data in memory, then a full tune is initiated which will take several seconds. An internal jumper can be set to disable the tune from memory function.

When power is first applied, the ATU will default to the through condition, ie the shunt capacitors are switched out and the series inductors are shorted. Switching the power off and then on again will always return to this start-up condition. Note that with the ATU un-powered all the relays will be open, leaving the maximum inductance in series with the antenna path (there is no separate relay to provide a bypass function). As supplied, the ATU will hold the tuning settings on both receive and transmit. An internal jumper can be set to default to the through condition on receive, which is really only of use for crossband duplex working.

Although the SG-231 will operate with any suitable radio, specific interfacing is provided via the 8-pin control connector for the Icom IC-706 and Alinco DX-70. This allows the 'TUNE' buttons on these radios to activate the ATU and report tuning status on their displays.

INSTALLATION

THE SG-231 IS provided with a very comprehensive 68-page instruction manual. It describes in great detail installation of the ATU in virtually every conceivable situation, including vehicles, boats, aircraft, roofs etc. The ATU will match whip antennas and end fed wires, loops, and doublets, but will not match into coax fed systems. The minimum antenna length is 7ft on 3.5MHz or 20ft on 1.8MHz, but take precautions for the very high voltages which exist on such electrically short antennas. There is essentially no maximum length, although small tuning holes may be experienced in some situations which can be resolved by slightly altering the antenna length. The manual emphasises the importance of providing an effective ground or counterpoise connection.

Even more information is available on the SGC website at http://www.sgcworld.com including a 36-page booklet on stealth antennas, 150-page HF User's guide, 85-page mobile guide and all the product manuals.

PERFORMANCE CHECKS

I CHECKED OUT the ATU initially with a 100 watt mains light bulb as an antenna load. This showed that the losses in the ATU were fairly low, with no undue heating of any of the internal components. A light bulb is actually a rather awkward load for an auto ATU, as its impedance varies considerably with temperature and hence tuning. A 100W bulb shows an impedance of about 500Ω at full power but only 50Ω when cold. Further checks were made with an end fed wire antenna starting at 6ft length and increasing in stages to 200ft. The minimum matchable lengths were according to the specification and I experienced no problems with achieving a reasonable match under any condition across all bands from 1.8 to 50MHz.

Tuning results in a clattering of relays and the time to achieve an on-tune condition varied from about 1-2sec on 14MHz and above, increasing on lower frequencies to around 7-10s on 3.5MHz and 10-15s on 1.8MHz. Tuning from memory was very fast. A full retune would generally result in the input VSWR settling between 1.1 and 1.6. There appeared to be only one memory location allocated for each band above 10MHz, perhaps 50-100kHz intervals on 3.5MHz and 25-50kHz on 1.8MHz, but it was difficult to come to a precise conclusion.

Bottom end, showing the coaxial input socket and the control cable socket.

The housing has holes provided to enable the user to mount the unit on a wall or, using exhaust type clamps, to a post.

Particularly with short antennas, where the VSWR changes quite rapidly with frequency, the VSWR could rise in excess of 2:1 before a retune was initiated or another memory recalled. In this situation it can be useful to force a retune. This can be done via two of the optional feature lines on the control cable. First ground the lock line (white), then momentarily ground the reset line (blue) and then release the ground on the lock line. This will result in retuning on each new frequency segment and resaving of the tuning data. Momentary grounding of the reset line will then return to normal operation. It would be a simple task to construct a small box with the necessary switches and the opportunity could also be taken to include an indicator to show the tuned status. SGC do provide an accessory to do this function, the Smartlock Pro, but it is not currently available in the UK.

CONCLUSIONS

THE SG-231 IS A useful and effective auto ATU for remote-tuning virtually any end-fed whip, wire or loop over the frequency range 1 to 60MHz. It is rated at 100W PEP and sells in the UK for around £350. A lower cost ATU, the SG-237, is also available but has coarser tuning steps. Also in the family is the SG-230, rated at 200W PEP, but it does not cover 50MHz.

ACKNOWLEDGEMENTS

THE TUNER WAS kindly supplied for review by Nevada of Portsmouth. ♦

inpractice

by **Ian White,** G3SEK*

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AMPLIFIER LINEARITY

WHAT IS THE 1dB compression point of a linear amplifier? Is there a relationship to its intermodulation levels?

IN AN IDEAL linear amplifier, the output signal is a perfect copy of the input signal, only larger - but everything has its limits. There will always be some level of distortion, which results in intermodulation products, and also there's a limit on the power output available. **Fig 1a** shows the ideal relationship between input and output power levels, which is a straight line. The slope of the line is the power gain, in this case times 10 (which is 10dB). However, although you see a good straight line at lower input/output levels, the available output power rolls off at higher levels. The shortfall between the ideal straight line and the real-life line represents 'gain compression', ie progressive loss of gain at high output. The point where the shortfall amounts to 79% of the ideal - in other words, where the available output is 1dB down on the ideal - is called the '1dB compression point'. In Fig 1a this occurs where the output, which seemed to be heading for 1000mW on the basis of small-signal measurements, actually rolls off to 790mW. The 1dB compression point is easier to see in **Fig 1b**, where we plot the upper part of the transfer characteristic on a decibel scale. Again, the ideal is a straight line, but instead of having to calculate percentages we can simply look for the point where the real-world line diverges by the height representing 1dB.

The 1dB compression point is easy to measure, by plotting output power against input power, and it is an industry-standard way of indicating the maximum output at which the amplifier can be expected to behave in a reasonably linear way. However, this is a very crude measure of linearity because it pays no attention to the actual levels of distortion products that accompany the output signal.

For a single-tone (pure carrier) input, the only distortion products will be harmonics, which are easy to filter out. However, for a more complex signal such as speech, which contains many different frequency components, there may be in-band distortion products that cannot be filtered. When two signals at frequencies F1 and F2 pass through an amplifier that is not perfectly linear, intermodulation produces three sets of new frequencies:

- Sum product (F1 + F2)
- Second harmonics (2F1, ie F1 + F1) and likewise (2F2)
- Difference product (F1 - F2) or (F2 - F1).

This is called 'second-order' inter-modulation, because the products were created by adding and subtracting two frequencies. If F1 and F2 are close together, eg frequency components of the same speech signal, the second-order intermodulation products (IPs) will be either up in the second harmonic region or down at LF. Even a very simple filter will reject these signals, because they are widely spaced from the wanted output. However, if the two input signals are increased in amplitude, another set of IPs will appear. These are the third-order products, so called because they involve the combination of three signals. These three signals can be totally independent, or they can be generated by two parent signals, counting one of them twice. Since these two frequencies can either add or subtract, the full range of possible third-order IPs includes:

- Third harmonics (3F1) and (3F2)
- Sum products (2F1 + F2) and (2F2 + F1)
- Difference products (2F1 - F2) and (2F2 - F1).

Again, the harmonics and sum products

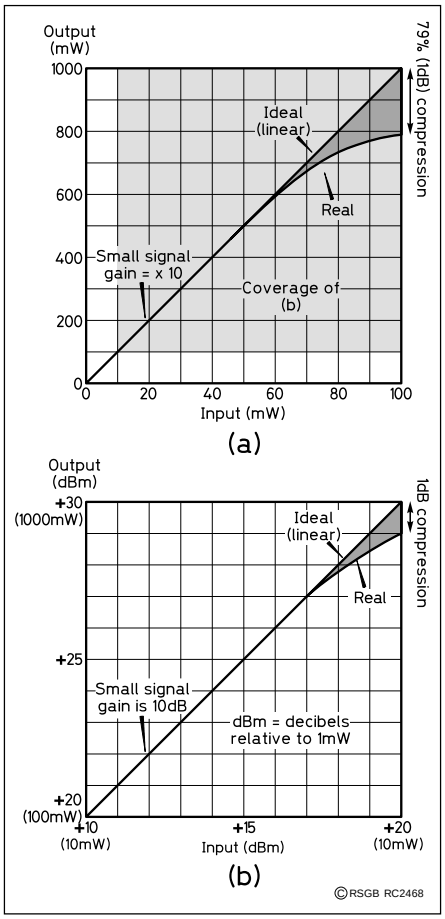

Fig.1: Gain compression reduces the available output from an amplifier at higher input power levels. (a) Linear scale, showing 1dB (79%) compression. (b) Upper part of Fig 1a on a decibel (log) scale, again showing 1dB compression.

are easy to filter out, but with third-order distortion the difference products fall right next to the parent signal. These products can only be controlled by avoiding creating them in the first place. You have to rely on the linearity of the amplifier and careful control of the input drive level.

There are also higher orders of intermodulation distortion, and the general relationship is that even-order IPs are solely in the harmonic region (sum products) or at LF (difference products), while some of the odd-order IPs will always fall close to the output signal. For example, **Fig 2** is a spectrum analyser screen showing a collection of odd-order IPs generated by two equal input signals of 14.249MHz and 14.251MHz, which might be a two-tone test signal or two instantaneous components of an SSB speech signal. There are several things to note about this display. The two parent signals are at the centre and reach the top of the display. The next two largest signals are the third-order products on 14.247 and 14.253MHz (respectively 2F1-F2 and 2F2-F1) and these are 20dB down on either parent signal. These are followed by an equal pair at 14.245 and 14.255MHz, which are the fifth-order products (respectively 3F1-2F2 and 3F2-2F1), then the pairs of seventh- and ninth-order products.

Although these higher-order products tend to become progressively lower in amplitude, there are bound to be lots more of higher orders still, spreading off the screen and across the band. Higher-order IPs have another unpleasant characteristic: they increase much faster than lower-order products. For example, third-order products will increase by 3dB for every 1dB increase in the parent signals; but 17th-order products will increase by 17dB! This means that high-order IPs can appear very suddenly with only a very slight amount of overdriving of the input signal, generating the characteristic crackling sound of 'splatter' spreading across the band.

So how do the intermodulation levels relate to 1dB compression? Not very directly, because compression is a single-signal problem while intermodulation by definition involves multiple signals. However, there is a relationship, which you can see by returning to Fig 1a and looking at the shape of the real-life input-output characteristic. It's a theorem of mathematics that any *x-y* curve can be represented by a power series of the form:

$y = ax \pm bx^2 \pm cx^3 \pm dx^4 \pm$ etc

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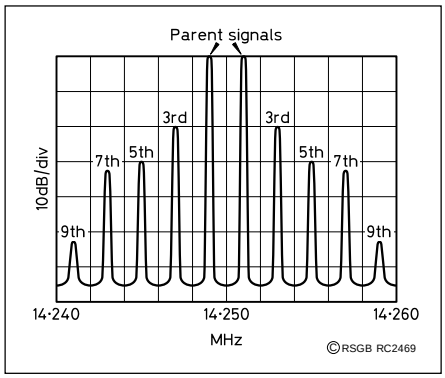

Fig 2: Spectrum analyser display of two parent signals and their odd-order intermodulation products.

where *b* is called the second-order coefficient (because it goes with *x* to the power 2), *c* is the third-order coefficient, and so on. The ± signs reflect the fact that these coefficients can be either positive or negative. In Fig 1a, we can say that the output power P_{OUT} is related to the input power P_{IN} by:

$$P_{OUT} = aP_{IN} \pm b(P_{IN})^2 \pm c(P_{IN})^3 \pm d(P_{IN})^4 \pm \text{etc}$$

Here, *a* is simply the linear (small-signal) gain, which we said was 10 in this example. *b* is the second-order coefficient, and governs the level of the second-order IPs. Likewise, *c* governs the level of the thirds, and so on. In principle, if we could plot an input-output curve and determine all these coefficients by curve-fitting, then we could also calculate the levels of IPs at various levels of drive. In practice, curve-fitting isn't easy to do with great accuracy, but this mathematical way of looking at the problem is worthwhile for the insights that it produces. First, it shows why any circuit will behave in a linear manner if the input power is low enough. If P_{IN} is small, then the terms involving $(P_{IN})^2$ and higher powers will be progressively very much smaller; so the only important term in the transfer characteristic for small signals is the simple linear relationship:

$$P_{OUT} = aP_{IN}$$

When P_{IN} increases, the higher-order terms begin to grow more rapidly than the linear term - and the higher the order, the faster they grow. That's why the high-order IPs increase dramatically with P_{IN}. In effect, the amplifier is acceptably 'clean' below a certain threshold in drive level, above which it produces copious amounts of wideband splatter which you only hear when speech peaks drive the amplifier above the threshold.

Another useful insight is that lower-order terms are responsible for gentle curvature along the whole length of the transfer characteristic, but any sharp kink indicates significant higher-order terms, and thus the potential for high-order intermodulation if provoked. For example, a class AB valve amplifier may have a sharp kink in its P_{IN}-P_{OUT} transfer curve where the valve is driven into grid current, and this will inevitably be associated with high-order intermodulation distortion, ie wideband splatter. When we control this distortion by careful selection of the valve and design of the power supplies, what we're actually doing is reducing the sharpness of the kink, and hence reducing those high-order terms and their potential to create intermodulation distortion.

Returning finally to the 1dB compression point, we can now see that although it's easy to measure, it is also a function of the entire power-series representation of the transfer curve. Therefore, it's clear that we can't expect any simple relationship between that single measurement and the complicated patterns of intermodulation distortion. I'm sorry there is no simple answer... but at least you can now understand *why* that's so!

CLEANING SILVER

HOW CAN I remove tarnish from silver-plated components such as connectors?

THERE ARE A number of good ways to bring tarnished silver plating up like new. The cheapest way is to place the components in a dish lined with aluminium foil, and pour in a hot, concentrated solution of ordinary baking soda (sodium bicarbonate). The dark-coloured tarnish (mostly sulphide) is electrolytically transferred to the aluminium foil, which you can throw away. Obviously the electrolytic option requires that all the silver-plated parts are in contact with the aluminium foil to complete the circuit, and not all parts of the surface may be cleaned equally. A more expensive option that avoids these problems is Goddard's Silver Dip, which is sold in many hardware stores and supermarkets. Simply dip small components into the jar, or paint the solution on to larger components. With either method, brushing with a stiff-bristled brush while the components are still under the solution will help to dislodge heavier corrosion. Silver Dip will also clean the hidden surfaces of sliding contacts, which the electrolytic method may not reach. Move the contacts to help get the solution into the crevices.

After cleaning, rinse the components with de-mineralised water (water from a new water filter is OK) and make sure that all crevices and hidden surfaces are washed free from the cleaning solution as well. Finally, shake and blot to remove the rinse water, and let the components dry in the airing cupboard. With some components, you can speed the drying by rinsing with isopropyl alcohol, but that may affect the rubber seals in BNC and N plugs (as well as releasing flammable vapour). In the case of variable capacitors with ball bearings, you should have de-greased the bearings before cleaning, and afterwards you should replace the grease with a contact lubricant such as Electrolube SGB, or WD-40 (as recommended by G3LCS in the September 1999 column).

PLUMBING MASTS

IS THERE AN easier way than an ordinary spirit level to determine whether a most or tower is plumb vertical?

FOR TUBULAR MASTS and square ground posts, a special post level is a handy gadget (**Fig 3**). This consists of two spirit levels at right-angles, mounted on a plastic V-block that clamps against the post. The advantage over a normal spirit level in 'vertical mode' is that you can check left/right and front/rear alignment at the same time. Triangular lattice towers are rather more difficult, especially if the bracing interferes with laying any kind of level up the side of a leg. For a tilt-over tower, you can make sure that the ground post is plumb, and then the rest of the tower should follow. For a wall-mounted lattice tower, you may need to use a plumb-line dropped from a small bracket at the top so that it runs alongside one leg of the tower (but without actually touching it). ♦

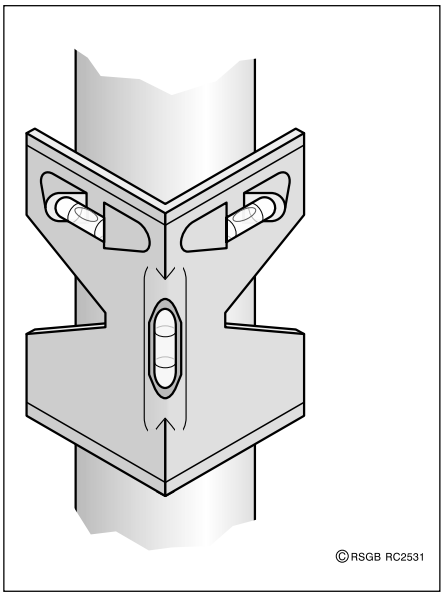

Fig 3: Two-directional post level for round or square masts and ground posts (eg RS 288-3908). The third tube is for levelling horizontal pipes or rails.

If you have new questions, or any comments to add to this month's column, I'd be very pleased to hear from you by mail or E-mail. But please remember that I can only answer questions through this column, so they need to be on topics of general interest.

The Future of Amateur Radio Examinations

A personal view, by Richard Horton, G3XWH*

G3XWH goes through a pre-flight check of his plane.

AT A RECENT C&G Advisory Group for the RAE and NRAE, statistics were given of the entries for the May 1999 RAE - a total of 722 UK candidates. Compare this to May 1993 and we see a reduction of 65%. Going back ten years earlier gives a reduction of 88%!

Do such reductions in the number of prospective entrants to the hobby really matter?

MYTHS & MORE MYTHS

WARNING SIGNALS of the decline have been sounded in several quarters in recent years, but what has actually been *done* to make a significant impact? Certainly much debate has taken place, but no clear direction seems to have emerged. Might this be partly due to the chant of 'dumbing down' that we hear? References are often made to multiple choice exam questions v prose response.

Surely it was much more difficult to obtain an amateur radio licence in the early days, the 1920s. Weren't most amateurs highly technical people then who designed their own equipment, even if they didn't have to take an exam to be awarded a licence? Here is an extract from a *Wireless World* article of 1922, written by Hugh S Pocock. "Anyone who wished to conduct experiments in wireless applied for an experimental licence through the General Post Office, and obtained it with very little difficulty. . . One cannot help feeling that a great number of these applicants, with perhaps a little knowledge of wireless, do not, at any rate at the moment, desire to conduct actual experimental work, but on the other hand they do wish to have the facilities given them for constructing their own apparatus."

But at least the introduction of the RAE (post WWII) saw the introduction of an exam which was much harder to pass than today's multiple choice exam, didn't it?

As a schoolboy in the 1960s I became an SWL and entered the RAE without attending any classes. A week before the exam I took a day off school to study the *RAE Manual* for the first time, and passed. This was not due to any exceptional ability on my part - simply that the exam was quite straightforward to anyone who had some basic maths and had spent time listening to QSOs on the bands.

THE KEY TO SUCCESS

THE SWL apprenticeship served us well until this decade. Communication was expensive and exclusive. To join this attractive activity we had to suffer the syllabus of the RAE and wait for an exam opportunity. Mobile phones and the Internet have changed this for ever. Is it *really* sensible to believe that we can put the clock back? Why then do we expect the methods for recruitment of the past to continue to work?

RADICAL CHANGE

MY CURRENT school RAE class started with a record number of students, fourteen YLs aged 14 to 17, but why? Because a decision had been taken to *motivate* them to start the course.

Amateur radio has made our school world famous on a few occasions, especially for its contacts with Mir and the US Space Shuttle. Our students who have put the hobby down on their UCAS forms have invariably found that they are quizzed on this and hence stand out from the crowd. The word soon gets around that perhaps a tricky technical exam can lead to an interesting and unusual pastime. But what is the greatest detractor to motivating people to take up our hobby - the RAE / NRAE syllabus?

SOMETHING DIFFERENT

IN 1990 I took up a new hobby - recreational flying. The minimum course of instruction is 43 hours, not dissimilar to the time taken for many to study for the RAE. I was hooked when given a trial lesson and the instructor handed the controls to me after only ten minutes in the air! If I had been told that I would have had to study for the whole course without being able to pilot the plane I doubt I would have had the motivation to continue. Would *you* be happy for the granting of a PPL to someone who had studied the theory of flying but never been allowed to pilot the plane until the end of the course? But this is just what we do with amateur radio!

In a PPL course, the whole ethos is to make you a safe and competent pilot by experience and practice. Not only do you pilot the aeroplane almost the whole time under the supervision of your instructor, but you must do at least 10 hours solo fight without an instructor present to qualify. In such a safety-conscious activity as flying, if a student pilot can be trusted to 'go solo', never mind take control of the plane, why is this a total impossibility with amateur radio? We are not talking here of greetings messages, this is *not* training in station operating. What do you think the difference in motivation would be if amateur radio courses could be presented as a practically-based exercise in safe and competent operation, plus essential EMC and radio theory?

As well as the practical course, pilots must also take examinations - all multiple choice - in the essential but basic theory of safe practice. These carry a 70% pass mark, but the question bank is available - on the premise that if you can answer all the questions set - you have the knowledge to navigate and pilot the aeroplane safely. Surely if the CAA are happy with this ethos, the RA ought to be prepared to consider a similar licence route?

DECISION TIME

IF WE REALLY are to a make a significant change to the health of the hobby in the 21st century - is not action needed *now*? I have spent several years trying to convince my colleagues that radical initiatives such as the STELAR teachers' RAE programme are worth supporting with concrete action and funds, but with limited success. Has the time come to demonstrate to the RA et al. that the majority opinion amongst UK amateurs is that the hobby is too valuable to lose via apathy? If you agree that the RA should seriously consider a new initiative to reform the current RAE & NRAE syllabuses to turn them into practically-based courses where operation under supervision during training is a positive *requirement*, then register your opinion by an e-mail to g3xwh@amsat.org or fax on 01423 871027.

Please do take a minute to register your opinion - whether it is for or against such a change - apathy is our worst enemy. ♦

The opinions expressed in Speakers' Corner are not necessarily those of the RSGB or Council

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Newcomers' News

*News and Comment from and for Amateur Radio's Newcomers. Compiled by Steve Hartley, G0FUW**

SINCE I AGREED to take over *Newcomers' News*, I have been on the lookout for items of interest to include and several readers have already been in contact with information and contributions. Keep the news coming and send any contribution to the address at the foot of the page or via e-mail to newcomers@rsgb.org.uk Photographs, diagrams or special QSL cards are particularly welcome.

NOVICE CONSTRUCTION

OVER THE LAST two years there has been much debate about what projects Novice students should build. *The Novice Students Handbook* written by John Case, GW4HWR, describes a simple Medium Wave receiver (the MWRx) built using the little ZN414 integrated circuit together with an audio amplifier made from three discrete transistors. In 1997 Ferranti, who manufactured the ZN414, announced that they had discontinued its production and the project seemed doomed.

In all his newsletters since the Ferranti announcement, Phil Mayer, G0KKL, who was the Project YEAR co-ordinator until recently, asked for views on what project should replace the MWRx and I know a number of instructors replied.

That said, several component suppliers are still advertising the ZN414, so stocks must have been better than we feared; Kanga Products are offering a replacement IC, the MK484. It seems that novice students can still build the MWRx after all! Do you have any thoughts on the subject? If you are a Novice Instructor, what do your students build? If you have recently completed a Novice course, why not let me know what you made and whether you found it useful or not?

Tracy Hartley, G0FUW Junior Operator, 'short-wave listening' on the ZN414 Novice Medium Wave Receiver - see 'Novice Construction'.

MORE RAE PRACTICE

LAST MONTH I mentioned the RAE practice software by Murray Ward, G3KZB, and this month I would like to draw your attention to another excellent study aid for those preparing for the Radio Amateurs' Exam. Some readers will already be familiar with the books written by Ray Petri, G0OAT, but the revision of his *End of Course Test Papers* book seems to have gone more or less unnoticed.

In May 1998 the City & Guilds Institute changed the format of the RAE by combining the two papers into one examination and shifting the emphasis of the questions slightly. The changes meant that many of the standard textbooks on the subject needed revision, including the RSGB's own *Radio Amateurs Examination Manual*, now in its sixteenth edition.

Petri's revised *End of Course Test Papers* book contains 10 complete test papers in the revised RAE format and is designed for self-testing or group use. Not only are the correct answers given at the end of each paper but they are explained in Ray's straight forward, easy to understand fashion. Whilst these papers do not contain actual City and Guilds questions, the format is the same and the learning points are entirely relevant. It most certainly is an extremely useful book for those preparing to sit the RAE.

FIRST CONVENTION VISIT

A LITTLE WHILE ago I was given a copy of a newsletter from the Trowbridge Amateur Radio Club. The eight page newsletter, *Frequency*, gives details of forthcoming events, a report on local RAE & NRAE training, the results of the club's tenth annual 144MHz foxhunt and an interesting article by Jan Verduyn, G0BBL, about his visit to the 1999 Dayton Convention with other members of the Trowbridge club.

Jan, G0BBL, Erle, G3BJC, and Steve, G0XAR, had decided to visit Dayton to see what all the fuss was about. Jan reports that Dayton is a BIG, BIG event, with over 3500 stalls in the flea market alone! As well as attending the convention and delivering a presentation on their QRP2000 project, they helped George Dobbs, G3RJV, to man the G-QRP Club's stand, recruiting some new members and selling club kits and books. I expect they needed a rest when they returned to the UK!

I remember thinking my first rally at Belle Vue, Manchester was enormous, but it seems the Trowbridge gang have gone one better! Do you have any tips for newcomers making their first visits to rallies or conventions?

INSPECTOR MORSE?

SLOW SPEED contests are held every year to allow those who are new to CW, or those who prefer to take their time over a QSO, to take part in a 'fun' contest. Last year my predecessor Esde, G0AEC, reported that some stations taking part in the contests were refusing to send slower (QRS, for those still learning the Q-code), defeating the object of the exercise.

Alan Oatey, M0AVN, has written suggesting that volunteer 'policemen' should be appointed to enforce the 'slow Morse' rules. What he is proposing is that a number of stations, or indeed short wave listeners, should listen in to the contest and note any station operating at too great a speed. Their check logs would then be used by the contest co-ordinators to penalise, or perhaps disqualify the offending entrants.

Personally, I can see problems in judging the exact speed of sending and getting enough volunteers to cover the whole of the contest area. A matter for the Contest Committee perhaps? Are there enough stations willing to QRS? What do you think? Do you know where to find easy-to-read CW for newcomers?

JACK'S PROGRESS

THE PHOTOGRAPH in last month's column included Jack, 2E1HGN. Since then Jack has successfully attended the *Morse Campaign* weekend at RSGB headquarters and is now the proud holder of 2E0AUL. Jack was the youngest at the camp but was not at all perturbed by that. He also took time out from his Morse classes to operate in the RSGB shack under supervision, working into New Zealand. Well done Jack - M5 next, perhaps? ♦

Spread The Word!

Send your news and colour photos to: Steve Hartley, G0FUW, QTHR

**5 Sydenham Buildings, Lower Bristol Road, Bath, BA2 3BS.*

Down To Earth

An Introduction to SIDs

By Gwyn Williams, G4FKH *

SUDDEN IONOSPHERIC Disturbances are a well-documented phenomenon associated with solar flares. You cannot discuss one without involving the other. Thus, SIDs can be introduced in the following way.

The solar flare serves as a useful indicator of solar activity, since more occur when the Sun is more active. They also have direct consequences for the ionosphere. In 1937, J H Dellinger recognized that fadeouts in high-frequency radio propagation were the result of abnormally strong absorption in the ionosphere, occurring at the same time as a solar flare. The fadeout had a rapid onset and a typical duration of tens of minutes, like the visible flare. Because they begin suddenly, all the immediate effects of a solar flare are known as Sudden Ionospheric Disturbances (SIDs). For a long time the absorption effect discovered by Dellinger was called the 'Dellinger fade', but is now generally termed the Short Wave Fadeout (SWF) [1]. SWFs only effect the sunlit side of the earth.

The nature and timing of the SWF immediately provide two clues to its nature. The simultaneous nature of the fadeout and the visible flare shows that the cause is electromagnetic and the occurrence of radio absorption indicates that the electron density in the D-region has been increased. When it became possible to measure hard X-rays from rockets it was observed that they intensified by several powers of ten during a flare; thus the SWF is now attributed to the X-rays emitted from the flare.

In fact there are a wide range of ionospheric disturbances, as summarized in **Table 1**. Though the effects are most marked in the D-region, E- and F-region effects can also be detected. The electron content, governed mainly by the F-region, is increased by a few percent. The range of effects shows that a considerable band of the spectrum is enhanced. Moreover, there is some difference of timing: extreme ultraviolet (EUV) radiation and the hardest X-rays tend to be enhanced early in the flare, whereas the softer X-rays last longer and correspond more closely with the optical flare.

All SID effects cover the whole of the Earth's sunlit side and are essentially uniform except for a dependence on the angle of the Sun to the horizon (ie when the Sun is directly overhead it is at 90° and when at the horizon 0°). Even flares that are not observed visually can be detected by their ionospheric effects and some properties of the flare deduced.

SOLAR FLARES

A SOLAR FLARE is a sudden brightening of a small area of the Sun's photosphere, which is the part of the Sun that can be seen (see **Fig 1**). This may last between a few minutes and several hours. Flares are classified on a scale of 1 to 4 according to the area of the brightening when the Sun is viewed in Hα light (656.2 nm wavelength). In addition, very small brightenings are designated 'S' for 'subflare'. Flares tend to develop near the long lasting dark areas, called sunspots, and the regions of enhanced Calcium-K and Hydrogen-α emission, known as 'plages'.

Flare activity and its resulting radiation may vary extensively from hour to hour. The short-term activity, which may be related to short-term HF effects, is correlated with SIDs, and are closely related to other solar features which are responsible for certain geomagnetic substorm phenomena, enhanced auroral activity and ionospheric storms. Flares are classified similarly, but another optical designation provides an indication of the brightness: 'F' is faint, 'N' is normal, and 'B' is bright. The most important flare classification for association with ionospheric effects is the flare strength as measured in the X-ray band. **Table 2** shows the X-ray classification in the 1-8 angstrom band (0.1-0.8nm).

The number of X-ray flares observed during solar cycle 21 totalled 172. About ten times more optical flares were observed than X-ray flares. More X-ray flares were observed following sunspot maximum than at the peak itself. **Fig 2** shows that flare activity and storm occurrence were not strongly correlated with sunspot number, at least during solar cycle 19. Definitive patterns linking sunspot activity with ionospheric storms or solar flares (and thus SIDs) have been elusive, since observable relationships seem to vary from cycle-to-cycle [2].

IONOSPHERIC RESPONSE

SIDS CONSTITUTE those events which arise as a result of the atmospheric interaction with electromagnetic flux from solar flares. We recognize that the Sun is the ultimate source for a large variety of ionospheric and magnetospheric effects. Many of these are of some importance in HF working, while others are only of marginal interest. There are many types of SID which are observed, and many are only of importance to long wave systems or have limited diagnostic application. At HF the most important form is the SWF, although a relatively small and

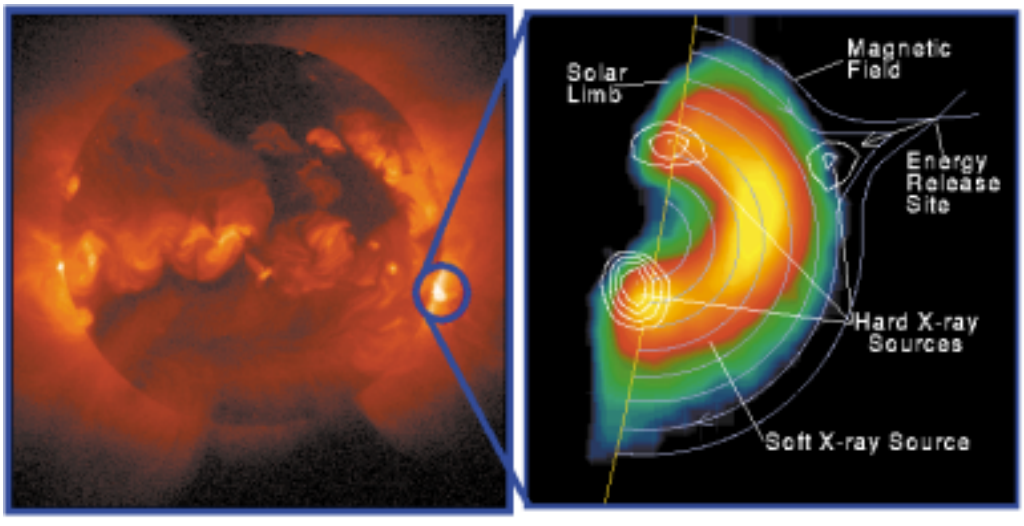

Fig 1: Yohkoh X-ray image of a Solar Flare, combined image in soft X-rays (left) and soft X-rays with hard X-ray contours (right).

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	Technique	Effect	Region	Radiation
SWF (Shortwave Fadeout)	HF radio	Absorbtion propagation	D	Hard X-rays 0.5-0.8 Å
SCNA (Sudden Cosmic Noise Absorption)	Riometer	Absorbtion	D	Hard X-rays 0.5-0.8 Å
SPA (Sudden Phase Anomaly	VLF radio propagation	Reflection height reduced	D	Hard X-rays 0.5-0.8 Å
SEA (Sudden Enhancement of Atmospherics)	VLF Atmospherics	Intensity enhanced	D	Hard X-rays 0.5-0.8 Å
SFE ({magnetic} Solar Flare Effect)	Magnetometer	Enhanced ionosphereic	E	EUV & soft X-rays
SFD (Sudden Frequency Deviation)	HF Doppler	Reflection height reduced	E & F	EUV
- (Electron content enhancement)	Faraday effect	Content enhanced	F	EUV

Table 1: SID phenomena.

sudden enhancement in the F2 layer critical frequency (f_oF2) may also be observed. The SWF that affects the entire sunlit ionosphere is by far the most important form of SID. An X-ray flare generates a significant increase in D-layer ionization content with a temporal pattern, which mimics that of the flare itself. This results in an increase in the product of the electron density and the collision frequency. Put simply, the definition of collision frequency is just the number of collisions that one particle makes with others in one second. It is the growth of this product which accounts for the absorption of HF signals.

GEOMAGNETIC STORM

A GEOMAGNETIC storm develops as the direct result of the energy transferred from the solar wind to the magnetosphere in a series of substorm events. We can regard the geomagnetic storm as being composed of two parts:

1. An initial (short-lived) positive phase associated with an increase in the horizontal component of the magnetic field, which is followed shortly by enhanced auroral displays, and

2. a main negative phase (or bay) in the horizontal field intensity which may last for several days.

The initial phase is associated with short-lived enhancements in electron concentration at atmospheric heights, while the main phase is associated with large-scale decreases in electron concentration. By monitoring the total electron content of the ionosphere we can see how an ionospheric storm is almost a one-to-one mapping of the geomagnetic storm-time profile. Since f_oF2 is of fundamental importance in sustaining ionospheric skywave propagation for long-haul HF communications, an ionospheric storm may have a substantial negative influence on performance within a designated communication zone.

IONOSPHERIC STORM

GEOMAGNETIC storms have their origins in the magnetosphere. Their association with the auroral zone and some insight into the ionospheric response have been mentioned. What we now need to mention are the effects which ionospheric storms have on certain HF system parameters, including the Maximum Usable Frequency (MUF).

The ionospheric storm is the ionosphere's response to a geomagnetic storm, and it may be the most important solar-induced phenomenon from the point of view of HF propagation impact. Ionospheric storms are known to introduce substantial and lasting decreases in F region electron concentrations, which have the effect of reducing the availability of the upper portion of the HF spectrum. This is true even during the daytime.

At mid-latitudes the ionospheric storm signature is one in which the F region ionization momentarily increases in the dusk section following Storm Commencement (SC), after which it decreases dramatically. The initial short-lived enhancement is observed in f_oF2 records and is correlated with the initial positive phase of the geomagnetic storm. The main phase of the geomagnetic storm is correlated with an attendant f_oF2 decrease. This reduction in f_oF2 may last for a day or longer. It is thought that the initial enhancement in f_oF2 is a result of electrodynamic forces and the long-term f_oF2 reduction with ionospheric heating.

An enhancement in the MUF is observed to occur within the first 12 hours of a Sudden Storm Commencement (SSC), in step with the initial positive phase of the associated geomagnetic storm, but it lasts for only a few hours. The major effect is associated with the main phase condition, during which time the decrease in MUF may exceed 10% of the undisturbed MUF for about 24 hours, depending upon the season. This effect starts roughly 12 hours after a SSC and may persist for several days.

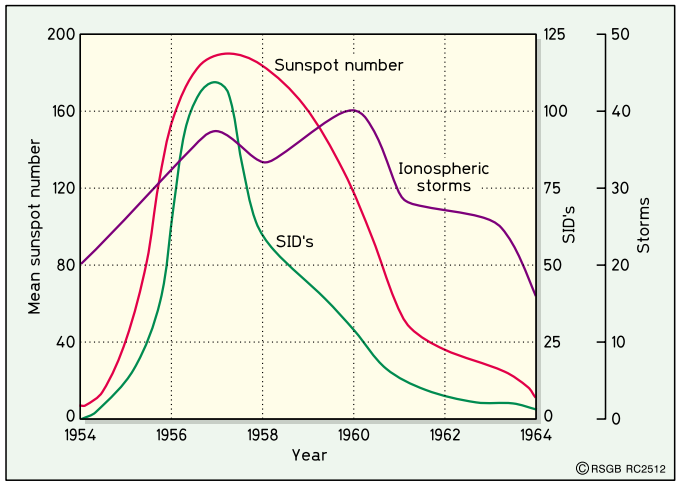


Fig 2: Comparison of sunspot number, the number of ionospheric storms, and the number of SIDs for solar cycle 19.

Class of X-ray flare	E, Flux level at 1AU
C	10-6 < E < 10-5
M	10-5 < E < 10-4
X	E > 10-4

Table 2: Classification of X-ray flares. The X-ray flux is referred to that value which would be observed at 1AU (the earth's distance from the sun). The units are in watts per square metre.

CONCLUSIONS

A SID IS A phenomenon that is a direct consequence of a solar flare. The effects are numerous and have far-reaching consequences on HF propagation. These effects include SWF (of prime importance and most disruptive), sudden enhancement of atmospherics and sudden frequency deviations, to name just a few. The lengths of disruptions vary, as do the number of occurrences per solar cycle. Research into this cause and effect cycle is still taking place, particularly the correlation of SIDs to other solar phenomenon.

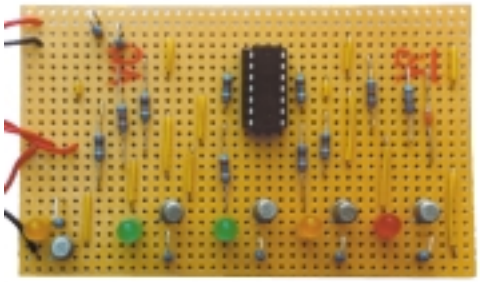
REFERENCES

[1] J K Hargreaves, *The Solar-Terrestrial Environment*, Cambridge University Press, 1992.

[2] John M Goodman, *HF Communications – Science and Technology*. ♦

A Colourful Voltage Monitor

By David Clark *



The components laid-out on stripboard. The monitor could be put into a project box or the LEDs mounted remotely, if desired.

PROBABLY THE most common unit used in electrical, electronic and radio engineering is the volt, which is a measure of the amount of energy associated with the electrical charge of electrons at a particular point. One volt is defined as one joule of energy per coulomb of charge, and there are two main situations where it is encountered. The first is where a voltage is 'dropped', for example across a resistor, and this is a measure of the energy lost as a current flows (ie electrons move) against that resistance. This is usually referred to as Potential Difference, or PD. The other is where a device gives energy to the electrons, and 'drives' them, in the form of an electrical current, around a circuit, for example a signal generator or a battery. In this case the voltage is usually referred to as the Electro-Motive Force, or EMF. So when measuring the voltage of a battery we are measuring how much energy the battery is capable of giving to the circuit of which it is part. As the energy stored in the battery is used up, its output voltage falls, an indication of the falling amount of energy available to 'drive' the electrons. Often the degree to which a battery has been 'used up' is of more interest than the actual voltage output, and in this case an indication of a voltage 'range' is more useful.

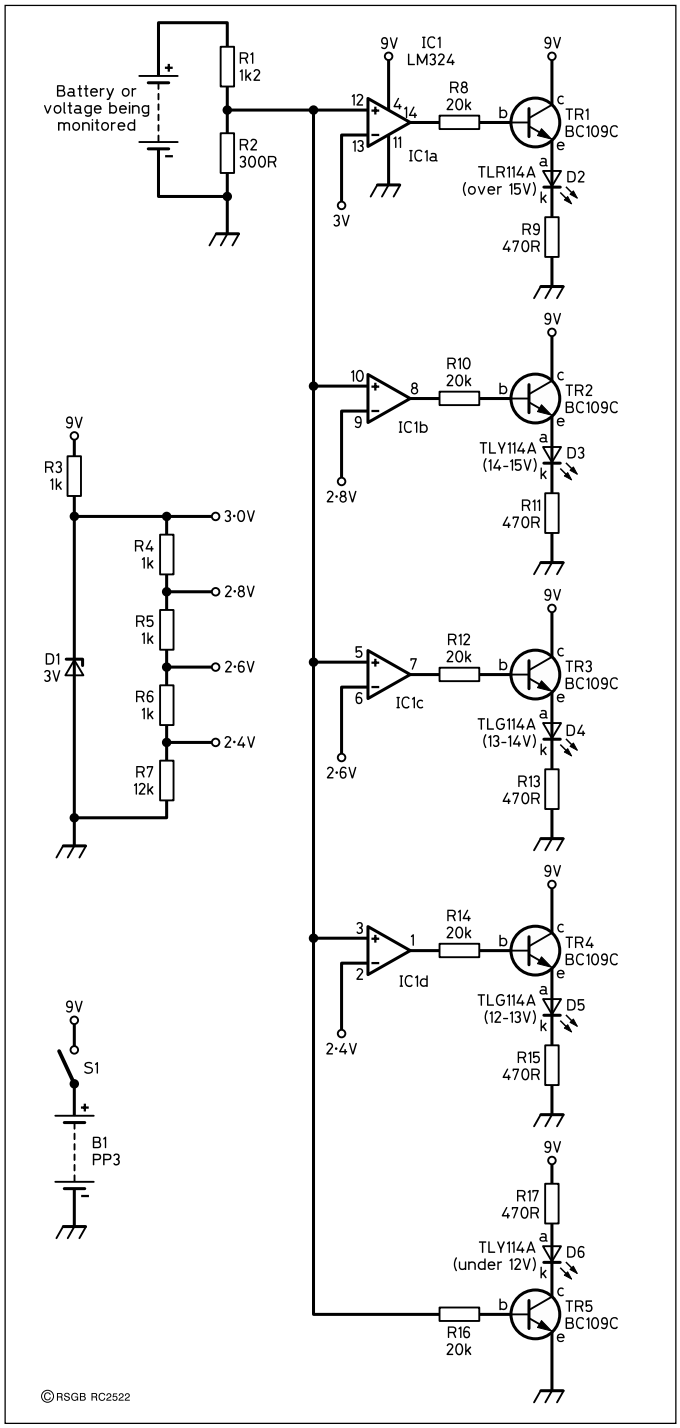


Fig 1: The device works by comparing a divided fixed voltage to a divided sample of the voltage being monitored.

HOW IT WORKS

TO GIVE A meaningful output in the form of a sequence of ranges, a series of reference points are needed with which to compare the test voltage. These reference voltages can easily be generated using a resistance divider chain, however the main reference from which all these are derived needs to be stable at all times, and it is not sufficient simply to connect the resistor chain across the supply battery. If this technique were to be used the reference voltage would of course change as the supply battery aged, or when it was subject to different load currents. In this project a Zener diode is used to achieve a stable reference voltage. These devices are semi-conductor diodes connected 'backwards', ie reverse biased, and when used like this the normal flow of current through them is blocked. However, all semiconductor devices have a 'leakage' current which is a small current that passes in the 'wrong' direction, and Zener diodes are designed to give a particular fixed voltage across them when this leakage current is flowing.

This project uses a series of LEDs to indicate when a voltage falls below twelve volts, when it is inside an acceptable range of twelve to thirteen volts, when it is inside a second acceptable range of thirteen to fourteen volts, when it is a little too high at between fourteen and fifteen volts, and to warn when it is above a maximum acceptable fifteen volts. With these ranges it is ideal for monitoring car battery voltage, and when using re-chargeable batteries to power equipment 'around the shack' or 'in the field'.

Each reference voltage from the resistance divider chain is fed to the '-' input of its own comparator, the test voltage being connected to all of the '+' inputs. Thus the output of an individual comparator will be around 0V unless the test voltage rises above the comparator's reference voltage, at which point it will switch over to a value close to the positive supply voltage. By connecting each output to an LED with its own driver transistor to provide enough current, the LEDs will light up in turn as the test voltage increases.

Since the test voltage will nor-

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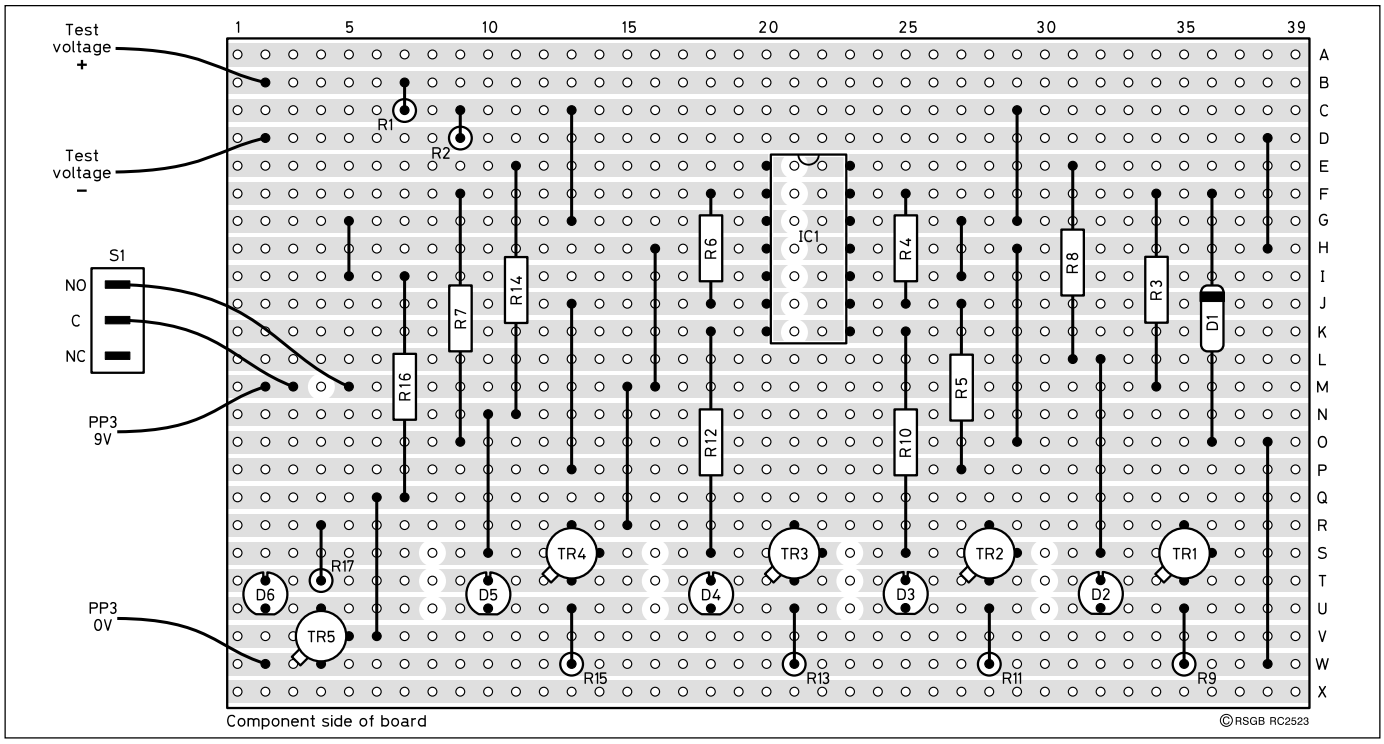

Fig 2: Stripboard layout of the colourful voltage monitor.

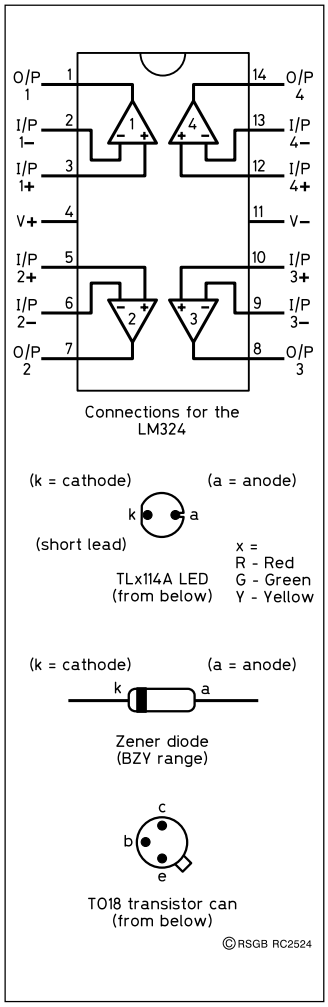

Fig 3: Pinouts and connections of the semiconductors.

mally be higher than the circuit supply voltage, the test voltage and the reference voltages are both scaled down by the same amount, in this case by a factor of five. The test voltage is scaled by a simple voltage divider, the reference voltages by using a 3V Zener diode (the maximum reference voltage before scaling being 15 volts).

The '<12 volt' indication is given by switching the LED driver directly from the scaled test voltage. In this way a false '<12 volt' indication is not given when there is no test voltage connected.

CIRCUIT

THE CIRCUIT diagram for the voltage monitor is shown in **Fig 1**. The comparator functions are obtained by using the operational amplifiers (op-amps) of IC1 wired without any feedback. In this configuration the op-amp's high gain means the output can only ever be equal to the positive or negative (0V) supply voltage, depending upon whether the voltage at the '+' input is more positive or more negative than the voltage at the '-' input.

The transistors all operate as switches, ie they are either 'on' (conducting) or 'off' (non-conducting). When they are 'on' the transistor passes enough current to light the LED (the op-amp output alone cannot reliably provide enough current to do this). The values of resistors chosen in the transistor/LED part of the circuit are those that limit voltages and current flows to the working values of the transistors and LEDs.

CONSTRUCTION

THE STRIPBOARD layout for the project is shown in **Fig 2**. The LM324 quad op-amp integrated circuit, the transistors and the LEDs, all need to be connected the 'right way round', and **Fig 3** shows the correct orientation of these devices. An important point to note is that the 'positive' test lead needs to be connected to the more positive terminal of the battery under test, so it is useful to use red and black wires respectively for the test leads.

COMPONENTS

AN LM324 QUAD op-amp was chosen as it gives four devices in a single package and can be powered from a single supply voltage. The transistors are a general purpose NPN type, and similarly the LEDs are different colours of a general purpose type. The lower the tolerance value of the resistors used for the voltage divider chain, the more accurate the reference voltages.

IN USE

SIMPLY CONNECT the test leads to the voltage being monitored (ensuring that the 'positive' test lead is connected to the more positive terminal), and switch on! ♦

COMPONENTS

Resistors
(all metal film, 0.6W, 1%)

R1	1k2
R2	300R
R3-R6	1k
R7	12k
R8, R10, R12, R14, R16	20k
R9, R11, R13, R15, R17	470R

Semiconductors

IC1	LM324
TR1-TR5	BC109C
D1	BZYC3 Zener (3V, 0.5W)
D2	TLR114A red LED
D3, D6	TLY114A yellow LED
D4, D5	TLG114A green LED

Miscellaneous

S1	SPDT switch
Stripboard	
Battery clip	
PP3 battery	
Crocodile clips	

Down To Earth

What Do You Know?

By RSGB Staff

HAVING TAKEN a rest, the quiz is back, so if you're planning to take the RAE soon why not run through these C&G-style questions?

The answers will appear next month.

RAE QUESTIONS

1. Referring to **Fig 1**, which keyed transmit waveform would be least likely to result in key clicks?
   a. a
   b. b
   c. c
   d. d

2. The Q-code for 'I am ready to transmit' is:
   a. QTH
   b. QRV
   c. QSP
   d. QRT

3. What are the components normally found in a low pass filter?
   a. Resistors and diodes
   b. Capacitors and resistors
   c. Inductors and capacitors
   d. Diodes and inductors

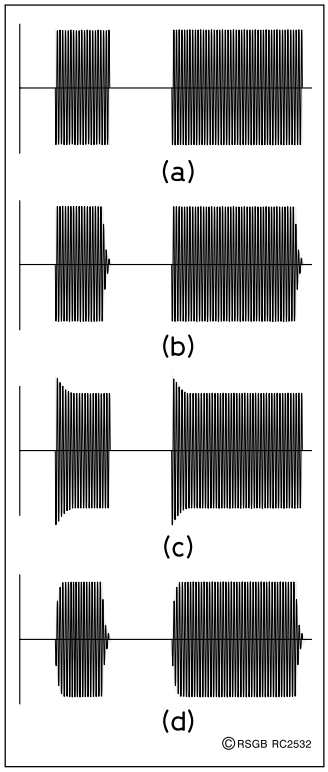

Fig 1: Which waveform is least likely to result in key clicks?

4. When calling CQ on CW, the invitation for someone to call you is:
   a. K
   b. KN
   c. AR
   d. CT

5. A coil has an approximate inductance of 0.1H. What would be its reactance at 800Hz?
   a. 250Ω
   b. 500Ω
   c. 80Ω
   d. 0.02Ω

6. What is the nature of the power source that causes the current shown in **Fig 2** to flow in the resistor R?
   a. Smoothed DC
   b. Half-wave rectified DC
   c. Full-wave rectified DC
   d. AC

7. What electronic components are used to limit the audio signal in a simple noise limiter circuit?
   a. Capacitors
   b. Field Effect Transistors
   c. Diodes
   d. Inductors

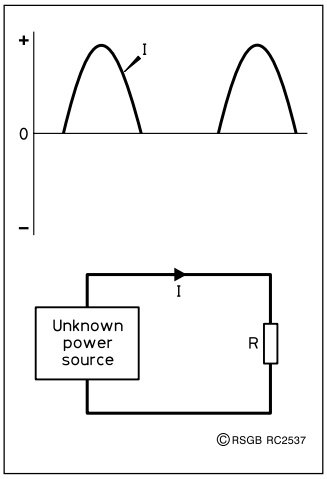

Fig 2: What kind of power source produces current flow like this?

8. If you were to make a radio contact across the Atlantic on 14MHz, via what mode of propagation would your signals have been carried?
   a. Ionospheric
   b. Sporadic-E
   c. Ground wave
   d. Tropospheric

9. The 28MHz amateur allocation in the UK lies between:
   a. 28.000-29.700MHz
   b. 28.000-30.000MHz
   c. 27.600-29.000MHz
   d. 28.999-29.000MHz

10. What are the frequencies that you would expect to find at the output of the double balanced mixer shown in **Fig 3**?
    a. 4MHz, 5MHz, 9MHz, 14MHz
    b. 5MHz, 9MHz
    c. 4MHz, 14MHz
    d. 4MHz, 9MHz, 14MHz

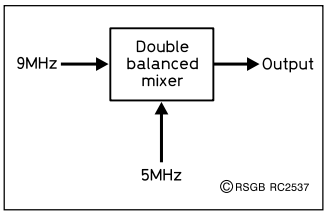

Fig 3: What frequencies emerge?

11. What is the likely effect of operating a single sideband transmitter that is non-linear?
    a. The signal will sound distorted and spread out
    b. The modulation index will be reduced
    c. The antenna might be damaged
    d. It will make the VFO drift

12. The impedance at the feedpoint of a full-wave loop antenna is approximately:
    a. 35Ω
    b. 50Ω
    c. 90Ω
    d. 300Ω

ABBREVIATIONS AND SYMBOLS

AC	Alternating Current
CW	Continuous Wave (Morse)
C&G	City & Guilds (examination body)
DC	Direct Current
G-QRP Club	Club devoted to low power operation
HF	High Frequency
IC	Integrated Circuit
LED	Light Emitting Diode
MHz	Megahertz (one million Hertz)
NPN	Negative Positive Negative (a type of transistor)
NRAE	Novice Radio Amateurs Exam
Q-code	Three letter abbreviation code (see below)
QRP	Low power
QSL	Confirmation of a contact (usually a card)
QSO	A contact
RAE	Radio Amateurs Exam
RSGB	Radio Society of Great Britain
SPDT	Single Pole Double Throw (a type of switch)
UK	United Kingdom
V	Volt (the electrical unit of potential)
VLF	Very Low Frequency
W	Watt (the electrical unit of power)

euro tek

edited and translated by **Erwin David,** G4LQI*

A celestial foxhunt! *The* ***location of a beacon received via an amateur satellite*** *can be computed from the satellite trajectory and the Doppler frequency shifts.* ***André Cantin, F5NJN****, explains the geometry and provides the formulae in Radio-REF 6/99 and asks for a computer program.*

THE DOPPLER effect is key to the task. The beacon signal is received by the satellite (uplink), frequency-converted in the beacon transponder and returned to earth (downlink). The speed of the satellite with respect to the earth causes, by virtue of the Doppler effect, frequency shifts beyond that applied by the transponder.

Here is a realistic example: The beacon sends at 145,000kHz. At a given instant, the satellite receives it shifted down (increasing distance between beacon and satellite) by 4kHz, ie at 144,996kHz. The transponder converts this to 436.804MHz. If, at the same instant, the distance from the satellite to the observer also increases, another downshift occurs, say 8kHz, making the observed frequency 436.804 - 8 = 436,796kHz.

The relationship between frequency shift and the relative velocity between transmitter and receiver is given in **Equation 1**.

PRACTICALITIES

THE COMPLEXITY AND the number of mathematical operations requires the use of a computer and special software. The theory towards the solution of the problem is given below. The software would include the data normally computed by amateurs to track satellites, hereafter called 'orbit data'. The rest of the software has yet to be developed.

INPUT DATA

REFERRING TO **Fig 1,** to find the coordinates (longitude and latitude) of a beacon at 'B', we need to know:

a) The carrier frequency of the beacon
b) The coordinates (longitude, latitude and altitude) of the receiver at 'A'
c) The frequency conversion in the transponder of the satellite
d) Orbit data in real time, including:
- The speed of the satellite toward or away from 'A'
- The speed 'V' of the satellite along its trajectory
- The distance 'SA'
- The coordinates of 'T', the vertical projection of 'S' onto the earth
- The altitude (asl) of the satellite, 'ST'

THE METHOD

THIS INVOLVES several stages.

a) For a given moment, t_0, the following is known:
- The velocity V_0 of the satellite along its path (from its orbit data)
- The exact frequency f_0 received at 'A', eg 436,796kHz
- The speed V_{A0} of the satellite toward 'A', (or away from A, depending on sign) (from its trajectory data).

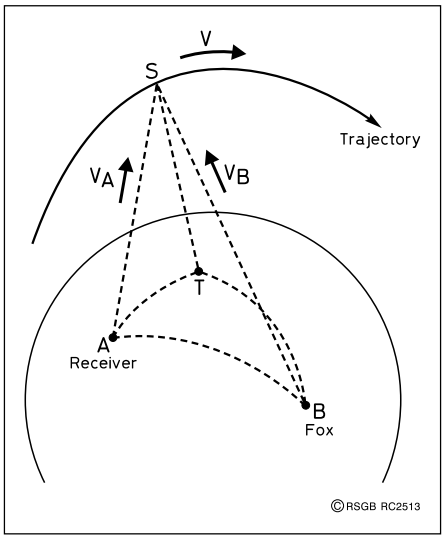

Fig 1: The geometry of a terrestrial beacon 'B' (the fox), an orbiting satellite 'S' and a receiver at 'A' (the hunter).

Plugging these data and the known frequency conversion by the transponder into Equation 1, it is found that the signal is received by the satellite on 144,996kHz. From the difference between that frequency and the known frequency transmitted by the beacon, ie 145,000kHz, the speed V_B of the satellite towards or away from the beacon, at T_0, can now be computed.

b) For $t_1 = t_0 + \varepsilon$ (ε being eg 30sec) a new set of data is generated as in a) above, including V_{B1}, while the trajectory data yield the distance Δ, travelled by the satellite between t_1 and t_0. See **Fig 2.**

c) Knowing V_0, V_1, Δ, V_{B0}, V_{B1} permits calculation of the distances S_{B0} and S_{B1} between the satellite and the beacon. **Equation 2** applies.

Of the pyramid ATBS (Fig 1) the following are known:

- The coordinates of A and (from orbit data) T, which permits calculation of the great-circle distance AT from **Equation 3**.
- The distance SA (from orbit data)
- The distance ST (from orbit data)
- The distance SB, as computed above.

These data permit the great-circle distances BA and BT to be obtained from **Equations 4**, **5** and **6**.

The three sides of the spherical triangle ATB (Fig 1) are known, as well as the geographic coordinates of A and T. This permits calculation of the coordinates of B, the beacon. The fox has been spotted!

The spherical trigonometry, based on Equation 1, is rather complex and is not given here.

ACCURACY

FROM EQUATION 2 it is apparent that the accuracy of the distance 'BS' depends on Δ, V_{A0}, and V_0. If the orbit data Δ and V are accurate within 2%, and the measurement of the sum of the two Doppler frequencies within 5%, the distance BS can be an unacceptable 12% off. This error can be reduced by repeating the procedure at well-defined intervals (say every 30 seconds) for as long as the beacon can be heard via the satellite and then averaging the results.

The software to be created ought to include a mathematical error computation and display it along with the coordinates of the fox. The following observations apply:

- The coordinates of the observer, A, must be precisely known.
- The trajectory of the satellite must be precisely known; it can be verified by comparison with data furnished by NASA at http://oisysop.atsc.allied.com

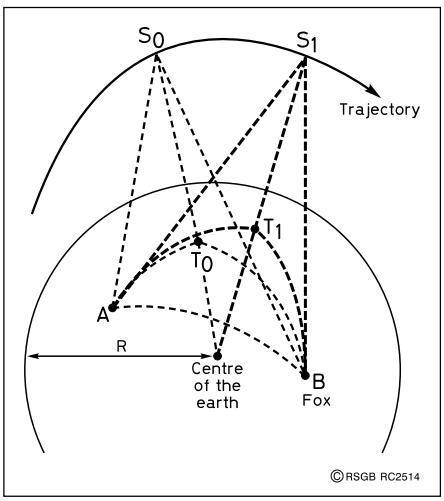

Fig 2: As in Fig 1, and duplicated after a short delay.

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- The carrier of the beacon must be ultra-stable; the modulation does not matter.
- The higher the beacon frequency, the greater the Doppler shift and the more accurate the results.
- The greater the satellite speed, the more accurate the results.

The measurements from several receiver locations can be combined for better accuracy.

A CHALLENGE

THE FOREGOING represents a formidable mathematical task but haven't suitably trained and dedicated amateurs accomplished such feats before? When will the open season for celestial foxes start? ♦

$$f_s = f_0 \cdot \frac{C + V}{C - V} \quad \text{or} \quad f_s = f_0 \cdot \frac{C - V}{C + V}$$

Equation 1: For decreasing or increasing distance, resp. in which: f_0 = transmitted frequency, f_S = received frequency, C = the speed of light, V = rate of increase or decrease of the distance between transmitter and receiver.

$$SB = \frac{0.5 \Delta V_{A0}}{V_0 \cdot \cos\left[\frac{V_{A0}}{V_0} + \operatorname{arctg}\left(\frac{2\Delta (t_1 - t_0).V_{A0}}{(V_{A0} + V_{A1}).V_0}\right)\right] \cdot \sqrt{1 - \frac{V^2_{A0}}{V^2_0}}}$$

Equation 2:

$$\cos(AT) = \sin(\text{lat A}).\sin(\text{lat T}) + \cos(\text{lat A}).\cos(\text{long A - long T})$$

Equation 3: AT is the angle subtending the great circle distance AT referred to the centre of the earth. This formula is valid for one quadrant of the globe only. In other quadrants corrections of ±π/2 or ±π must be applied to the coordinates. A more generalized formula, valid for all quadrants, can be found in the *ARRL Operating Manual* p. 4-4, where it serves to calculate the great circle distance between any two points on earth.

$$BT = 2.\operatorname{arctg}\sqrt{\frac{(P - R)(P - d_{Centre})}{P.(P - d)}}$$

Equation 4:

$$P = \frac{d + d_{Centre} + R}{2}$$

Equation 5: d = distance between the satellite and the beacon (SB), d_{Centre} = distance between the satellite and the centre of the earth (ie altitude of the satellite + radius of the earth), and R = radius of the earth (6378.16km on average).

$$\operatorname{tg}\frac{BA}{2} = \operatorname{tg}\frac{AT - BT}{2} \cdot \frac{\sin\left(\frac{TAB + TBA}{2}\right)}{\sin\left(\frac{TAB - TBA}{2}\right)}$$

Equation 6: BA, AT and BT are the angles subtending those great circle distances referred to the centre of the earth and TAB and TBA are spherical angles.

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technical topics

by **Pat Hawker**, G3VA*

TUNING DIODES OR VARIABLE CAPACITORS?

JOHN H TAIT (ex-GW8MGF) raises a design point of practical consequence which, although noted in *TT* some 30 years ago, seems to have dropped out of general discussion. Put briefly, are there snags in using electronic tuning diodes (voltage-variable diodes/varactor/varicap diodes) in applications where formerly mechanically-variable capacitors held sway?

He writes: "A problem that troubles me is, if the capacitance of a varicap diode is voltage dependent, why in a VCO/VFO using such a device(s), is there not a high level of sideband noise and frequency instability caused (by harmonic generation) as the capacitance of the varicap diode changes during each oscillatory cycle? I would expect this problem to be severe in VCOs with a wide tuning range, where the capacitive contribution of the varicap would be a large proportion of the total resonant circuit capacitance. Furthermore, at low levels of DC control voltage on the varicap, where the oscillatory voltage becomes a significant fraction of the control voltage, and hence the capacitance change (dC/dV) per cycle is high, how does the oscillator manage to work at all? Is the change of capacitance a DC phenomenon, remaining static in the presence of high frequency AC? If this were the case, varactor multipliers would not work. Is there a fundamental difference in the physics of a varicap diode and a varactor diode? I have asked these questions of some very clever designers of frequency synthesisers and have yet to receive a plausible answer. I confess I would not know where to start analysing these factors and their effect on oscillator performance. The differential equations must be horrific. Readers may be interested in this problem and someone may know the answer."

Some 30 years ago I included an item in *TT* (later included in many editions of *ART*) that answers some, but not all of these questions. The following is an abridged version: "The principle of using the variable capacitance of a semiconductor diode, when subject to changes in reverse bias, has many useful applications, using only a DC potentiometer at the control point for such purposes as the simple production of NBFM and in broadcast VHF and TV receivers for automatic frequency control (**Fig 1(a)**)… Special diodes such as varicaps and varactors have been developed for this application, but it is often more economical to make use of conventional semiconductor diodes - from germanium point-contact signal diodes (though these have only a small capacitance variation) to silicon power diodes, and zener diodes. [There is thus seemingly no fundamental difference in the physics of various forms of diode, although the capacitance range may differ widely - *G3VA*] . . . When the technique is used to provide ganged electronic tuning (**Fig 1(b)**) care must be taken to use diodes with similar tracking (special diodes have been developed which track within an accuracy of 1%)."

Current practice is generally to use fixed sub-octave or band filters for the signal frequency stages, to eliminate the need for ganged tuning and also to avoid introducing non-linear devices into the front-end of the receiver. The limiting factor with the use of electronic tuning is often the relatively low *Q* of the diodes at HF or VHF. . . Some further useful information was given in the Marconi *Point-to-Point Telecommunications* journal in February 1965, in which it was noted that at low reverse bias voltages the temperature coefficient of the capacitance of a tuning diode becomes worse, and what is more serious, the *Q* falls. In the Marconi design, the lowest reverse bias voltage was limited to 1V, although this appreciably restricted the capacitance variation. Another problem is that very strong unwanted signals could cause the diode to conduct, resulting in cross modulation. This problem is much reduced by the 1V bias limitation, and a further useful reduction in spurious responses can be obtained by using two diodes in a back-to-back configuration: see **Fig 1(c).**

A further reference to problems with electronic tuning appeared in the January 1970 of the same (long defunct) Marconi journal, presenting the design of a professional communications receiver. The variable LC oscillator covered a tuning range of 2MHz and was used with a series of crystal oscillators: "Tuning [of the oscillator] by varying inductor permeability by passing high magnetising currents has been tried, but suffers from hysteresis effects, temperature change and, what is more important, introduces non-linear distortion. By using large capacitance varactor diodes it was possible to design a good workable system, but the performance was limited by non-linearities being introduced. As the complication and relative cost of this method were higher than those of simple mechanical tuning, the latter was adopted."

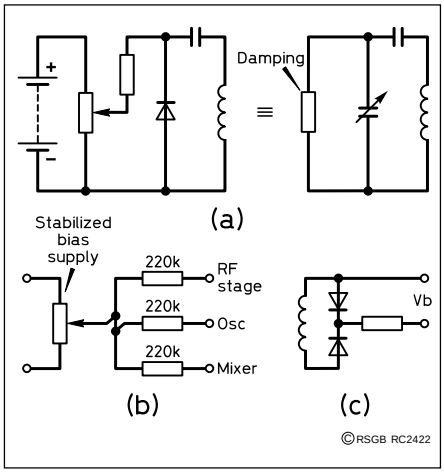

Fig 1: Principles of electronic tuning diodes: (a) how a reverse-biased semiconductor diode can replace the variable capacitor in a tuned circuit, with its capacitance varied by changing the reverse bias; (b) ganged control of diode-tuned circuits is possible provided the diode-capacitances track; (c) it is preferable to use two back-to-back diodes to reduce spurious responses.

A few months ago I spent some time repairing my old KW2000A transceiver to provide an SSB capability (which I use mainly on 3.7MHz). After finally overcoming a whole series of faults (most of them introduced during my rather ham-fisted servicing) all seemed well, although some reports noted a degree of ripple on my signal (and I recalled earlier similar such reports, although the rig had usually been operated on CW). By listening to harmonics of the 3MHz VFO on 28MHz, there was clear evidence of significant frequency ripple. It was some time before the penny dropped and I realised that this ripple occurred only when I was using the RIT/ITT facility for fine tuning. I soon concluded that the frequency ripple was being introduced by ripple on the 12V DC line 'modulating' the tuning diodes used to provide the RIT/ITT facility.

Electronic tuning with diodes has become firmly established, and most of the potential problems are now understood and overcome. Nevertheless, tuning diodes require careful design and attention to detail. Mechanical tuning with variable capacitors still provides a useful and in several respects a superior approach.

RECEIVERS FOR Y2K-PLUS

THE JANUARY *TT* included an item 'Receivers for 2000', based on forecasts made in 1981 by Dr Ulrich Rohde, DJ2LR. He discussed some new approaches that were being introduced in the 1980s, primarily in professional communications receivers. I attempted to show that many of these ideas have had an impact on current receiver design but had been rather sidelined by the rapidly increasing use of digital signal processing. Shortly before this item was published, Michael O'Beirne, G8MOB, sent along some comments on the features he sought in receivers together with a photocopy of an article by Ulrich Graf, DK4SX 'Performance Specifications for Amateur Receivers of the Future' (*QEX*, May/June, 1999. pp43-49) which was followed by a discussion in the following July/August, 1999 issue

DL4SX emphasised that the increasing severity of EMC problems in Europe, especially

*37 Dovercourt Road, London SE22 8SS.

in Germany, may lead in the near future to a requirement that amateurs reduce output power [the current German power limit is I believe 750 watts.- G3VA]: "In so doing, the strength of desired signals would be much lower in our receivers. Achieving the same signal quality as before - with unchanged signal-density and signal-levels from commercial and broadcasting stations - will require that receiver strong-signal performance will need to be significantly increased. This means improvements that have not yet been addressed in most equipment presently on the amateur market."

The desirability of developing super-linear receivers with an intermodulation performance appreciably better than that of the current range of transceivers/receivers has been discussed a number of times in *TT* over the past five years or so, emphasising the importance of such front-end techniques as the H-mode mixer developed by Colin Horrabin, G3SBE, low phase noise and higher level oscillators and the improved IF amplifiers of, for example, Bill Carver, K6DLG/7. At the same time it was stressed that to achieve true super-linearity in front ends requires considerable re-thinking on every aspect of the design, including oscillator phase noise, filter performance, diplexers, improved linearity in IF amplifiers and demodulators, etc. I understand that G3SBI together with K6DLG and his American colleagues have recently resumed work on a complete design that had been in temporary abeyance due to work commitments.

In his *QEX* article, DK4SX notes that, some 40 years ago, the DARC defined technical standards (RX57, RX60) and demonstrated to amateurs how to homebrew proven top-technology receivers: "Today, this task has been ceded entirely to industry. . . [yet it is likely that] the demand from commercial customers for short wave communications equipment will soon decrease dramatically. To the amateur, this means fewer manufacturers and reduced variety in the foreseeable future. In my opinion, radio amateurs are forced to define the receiver of the future before this situation occurs. Decreased competition among only a few brands will offer little chance to influence specifications. It's time for amateurs themselves to define the functionally critical parameters of top-of-the-line radios, rather than leave this essential task to Far East marketing strategists."

In his closing remarks, DK4SX points out: "Correct use of DSP and DDS technology holds a great potential to revolutionize large areas of RF technology, while modern microprocessor control eases handling and operational convenience. Many remarkable improvements will be expected with these developments. Unfortunately, too many recent equipment 'improvements' were obviously orientated towards marketing arguments rather than performance. Just remember the still-used, now more than 20 years old JFET mixer technology, and those useless spectrum displays!

"Finally, an important note: Data-sheets and test reports serve - besides displaying pretty pictures - to present an understandable explanation of a new product's performance, so it can be compared to other products. Great stock is put on comparability! It would be better if specifications were based on internationally standardized measurement procedures. In case of any doubts, the amateur should not hesitate to look into professional 'specs' for comparisons. You will quickly learn that good performance has always been a good reason for exposure, and that bad performance will be glossed over."

One of the many topics discussed by DK4SX is that of receiver operability or 'Operational Ergonomics'. He writes: "The most prominent feature of today's standard and high-end [top-of-the-range] equipment is operational complication. Who is still able to operate a top transceiver only infrequently or after a holiday period, without the instruction manual? Who could say what function is hidden in which sub menu, and which memory contents must be activated in which mode? The unspoken desire of many radio amateurs is a radio with self-explanatory operation. Why is the Collins KWM-380, almost 20 years after its introduction, still valued at second-hand prices hardly 30% lower than its original list price? The answer is simple: This transceiver provides both experts and amateurs respectable, top-quality RF performance and unbeatable audio quality. Its operation requires only a brief front-panel study. Tuning elements, mechanical design and modular constructions are robust and easy to use and service.

"Large signal capabilities of the somewhat less-prized Drake TR-7A, introduced about17 years ago, are still unsurpassed. The AGC characteristics, the expert design of the crystal filters, and their mounting on the PC board are exemplary. Only a few additional features offered by modern transceivers were not realized in those [old] rigs. That leads to a provocative question: Is this all we have achieved from almost 20 years of amateur radio development? Of course, you can't make it right for everyone, but we are invited to think about all the money we've invested in the realization of questionable 'gimmicks' instead of definite RF parameter improvements."

DK4SX is undoubtedly provocative in the manner in which he lambasts some current practices and equipments: "I really want to question the necessity of four controls for a station receiver's noise blanker now that the *woodpecker* has gone. Scan functions are nonsense in an amateur receiver, as are hundreds of memories. The squelch control, RF/IF manual gain controls and multiple-step RF attenuators are obsolete as well. Nobody could convince me so far that a PC-controlled transceiver can be more ergonomically operated than one with only a handful of discrete knobs [of reasonable size and placement! - G3VA].

"For simple handling in a future top receiver, the mode, selectivity, tuning rates, AGC time constants and memories could be chosen by individual keys. Selected parameters could then be shown on the display. Double or even multifunction keys must be strictly avoided! Besides a stripped-down keyboard, it would have elements for frequency tuning, audio volume, passband tuning, IF shift and DSP audio-response adjustment. . ."

The July/August issue of *QEX* contains a long comment from Cornell Drenten, KW7CD (author of the 1982 book *Radio Communications Receivers*), together with a reply from DK4SX. KW7CD agrees with much of DK4SX's article, although he feels that a more appropriate title would be 'Design Considerations for Today's Receivers'. But he feels that it does little to define dynamic range performance standards and in fact introduces some confusion. He writes: "Although I am all for progress, tough dynamic range standards already exist in sufficient detail to take care of crunch-proof receiver performance for the next hundred years - that is, if only the manufacturers followed them! This includes radios equipped with DSP implemented not only at base-band, but even at first up-conversion IFs if so required. DSP at these frequencies is technically feasible today, but not necessarily economical for ham

MATTERS ARISING

ADI SHAMIR & Alex Biryukov of the Weizzmann Institute, Israel, claim they can break the security of the GSM digital phone, which uses the A5/1 algorithm, in less than a second, apparently using massive computer power. But the GSM Association does not believe A5/1 security can be broken in the 'real world'.

AN ARRL Technology Task Force has been set up, charged with "Sharpening the Edge of Amateur Innovation" (*QST*, November 1999, p57). In seeking its members' visions, hopes and dreams, it lists as a start such frontiers for tomorrows ham radio:

Wavelength: microwave, laser, radio astronomy.
Modulation: audio/video, digital modes, spread-spectrum.
Mobility: miniaturization, hands-free operation.
Automation: store/forward networks, satellites.

radios. Trying to change the *standards* is not a good idea. Spurious-free dynamic range (SFDR) was defined in the early 1970s at Watkins Johnson Company (CEI Division) in concert with work done at the Rome Air Development Centre. This definition includes, but is not limited to, the MDS as *a signal 3dB higher than the noise floor*, rather than how DK4SX defines it. *QST* adopted these de facto SFDR standards a long time ago.

"One area not emphasised in the article is the *absolute necessity* today for manufacturers to use higher level and much higher intercept mixers in the first conversions of receivers, despite all claims of achievement in active commutating mixers. It is unacceptable in today's crowded HF environment to have class I or II mixers (+7 or +13dBm LO) in the first conversion of a receiver to reduce cost. HF is the toughest RF environment, and Europe is the test bed. . . ham radios with SFDRs upward of 105dB have generally been crushed by the European environment. . . Ham radio manufacturers have almost never used +27dBm passive class I mixers (triple balanced) in the first conversions. Why not? It is possible to build receivers with 120+ dB SFDR this way… "

In his reply, DK4SX refutes the idea that super-high-level MOSFET mixers [eg H-mode mixer - G3VA] are more costly than the ancient quad-FET mixer [if well-designed]. "In addition, using small relays to choose front-end bandpass filters is even cheaper than quality PIN diodes. . . Modern receivers show IP3 SFDRs of up to 105dB only because of [specified] reduction of IF and/or audio bandwidth. They still do not succeed in surpassing a 20-year-old Drake TR-7… I agree there would be a market for radios with ergonomic operation, ie, half as many knobs or sub-menus and superior RF performance. Hams take the 'cheapies' because they are there. I think with in-depth education, everybody would like to have top RF performance.

"There is a lot to do to make amateurs aware of the technical background of a well designed, modern radio's RF section and how best to evaluate the 'spec'. Just have a careful look at colourful 'data' sheets; even the difference in dynamic ranges is mostly unclear or intentionally concealed. . . One of the best receivers I know, the [professional] DASA/Telefunken E1800, with a guaranteed IP3 of +40dBm (typically +45dBm), has a first IF around 40MHz for IMD3 reasons. This receiver makes use of discrete quartz crystals to form a first [roofing] IF filter to avoid the IMD3 encountered with thin, VHF monolithic two-pole filters. So, why use such a high first IF [around 70MHz]? A first IF around 40MHz, with preselection, will grant a high IP3 and the possibility of narrow [roofing] bandwidths down to 3kHz. Compare the in-band behaviour of the KWM-380 (with only +15dBm IP3 and an 8-kHz filter in the first IF) to a modern radio. . . "

In a further comment, KW7CD agrees that most current radios were designed for the US where EMI is not as big a problem as in Europe. But on the 40MHz versus 70MHz first IF he remains convinced that the *image* [response] kills the 40MHz approach. "As you go up in the received frequency, say, towards 20MHz, these 40MHz IF radios will suffer interference from VHF/FM broadcast stations even with good front-end filtering. You must trust me on this, I speak from experience." [American high-power FM stations are more often sited in town centres than is the case in Europe - G3VA]

A letter from Peter Traneus Anderson, KC1HR, disputes DK4SX's suggestion that he needs no computer outputs from his ideal receiver. "I do need computer output, for RTTY, PSK31, SSTV and so on. I set up my homebrew receiver to have a control panel with few controls, as Graf recommends. Four knobs, three buttons and one numeric display. This design, using a DDS for its VFO, has permitted me to experiment with a wide range of tuning rates. . . on size, once 120dB RF ADCs appear [fully digitized receivers] you *will* carry your receiver in your pocket; the single-input low-pass anti-alias filter needs only a few large coils, and all other filters will be implemented digitally in the DDC chip." [But what size the control knobs and displays? - G3VA]

With the original *QEX* article, the Editor ran a sidebar: 'A better mousetrap'. "Although we don't often run this kind of article, we feel that the author's main point about dynamic range justifies the discussion. HF receivers operating in Europe suffer from extremely high levels of international broadcast interference. The cry for better strong-signal capability is echoed across the continent and in Great Britain. . . Receiver design involves conflicting goals. For example, the high-level mixer needed for dynamic-range extension requires more LO energy, which potentially means increased phase-noise and birdy difficulties. Multiple narrow bandpass filters in the first IF of an up-converting HF receiver seem to strain the trade-offs between performance, cost and reproducibility. Many experimenters have set their sights on digital direct conversion (DDC), since this architecture addresses most of the desires mentioned while avoiding many of the pitfalls. The number-crunching horsepower for DDC can be mustered even today, but ADCs with 119dB of dynamic range and sufficient conversion speed are still a way off. Until they appear, designers are hard-pressed to improve on the superhet. Practical matters in the design and operation of receivers mean that you are likely to agree with some of the author's points and disagree with others."

G8MOB, who shares my liking for the mid-20th Century large and heavy but serviceable valve receivers despite their limitations (his favourite receivers are still the Racal RA17L plus SSB adaptors and the later solid-state RA1772) was rather surprised to find DK4SX still recommending that a receiver noise figure of 15dB (just about achieved in the 1930-40s by the HRO) as adequate for most of the HF band. In fact this point has been made a number of times in *TT* for receivers used with a good, full-sized outdoor antenna, although 10dB is more appropriate for 28MHz or where a poor antenna is used. But it has to be admitted that for modern HF SSB or CW operation, particularly during CW contests where the other end is likely to be using a 300Hz filter, a separately tuned receiver is at a serious operational disadvantage to a modern transceiver because of the time required to ensure an accurate zero beat or at least one close enough to appear in his pass-band - at least that is my experience!

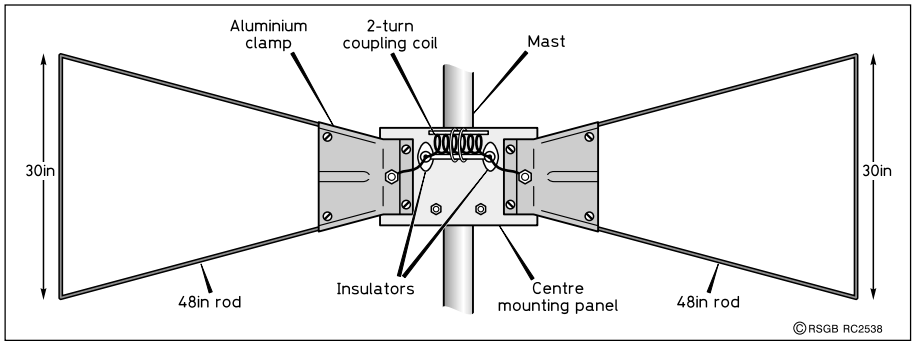

Fig 2: The 28MHz Wonder-Bar bow-tie antenna, as developed by K6OFM in 1956. Fashioned from a VHF biconical TV antenna, it provides good performance over the 28MHz band despite having an overall span of only 8ft (*QST*).

THE WONDER-BAR ANTENNA

RECENTLY, PETER Halpin, PE1MHO, sought my aid in tracing the original *QST* articles on the 28MHz Wonder-Bar antenna first described over 40 years ago by E T Bishop, K6OFM (*QST*, November 1956, but found sufficiently useful to merit further notes in February 1957, April 1981 and May 1981; and also in *CQ*, January 1961) as a recommended antenna for 50MHz. By adjustment of the elements and loading coil it should prove equally effective for 24 or 70MHz. With two or

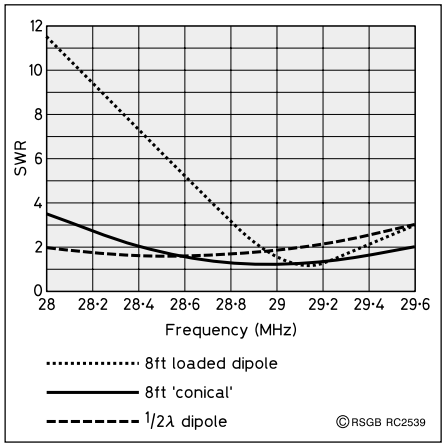

Fig 3: Comparison of SWR performance of the 28MHz Wonder-Bar (conical) antenna with (a) an 8ft dipole using 1in aluminium tubing; and (b) a full size half-wave 28MHz wire dipole.

three elements it can be used for two- or three-element beams, as noted in several of the *QST* items.

A 1956 editorial introduction states: "Using TV Biconicals on 10m - K6OFM describes the results he has had on 10m with a simple loaded dipole only 8ft long: **Fig 2**. SWR measurements indicate that fanning of the conductors brings considerable increase in bandwidth over a similar antenna with conventional elements."

As with all inductively loaded antennas there will be some small loss of radiation efficiency, but with this design this should be very little indeed. The spread (fanned) elements should ensure satisfactory operation over the entire 28MHz band. VHF biconical TV antennas are unlikely to be readily available in the UK, but, as K6OFM pointed out, many variations in construction are possible. "If a TV antenna of this type is not available, half-inch outer diameter lightweight aluminium tubing can be substituted, with four 48in and two 30in lengths needed. Also required will be two stand-off insulators, the loading coil which in the original comprised a B & W Miniductor No 3013 (12 turns No.16, 1in diameter, 3in long) and a few nuts and bolts. **Fig 3** gives the curves comparing SWR on a 52Ω coax line feeding the 28MHz Wonder-Bar antenna; an 8ft non-fanned dipole using 1in aluminium tubing, and a full size (16.5ft) half-wave 28MHz wire dipole.

The *CQ* 50MHz version is shown in **Fig 4.** The centre insulator is a 5in x 7in piece of plexiglass or similar insulating material. TV antenna elements or quarter inch copper tubing or rod may be used to construct the 'bowtie'. The centre loading coil consists of 10 turns of No.14 (AWG) bare wire, 1in diameter and spaced a quarter-inch between turns, with a 2 turn link of No.14 plastic covered wire around the centre. Adjust for minimum SWR by varying turn spacing.

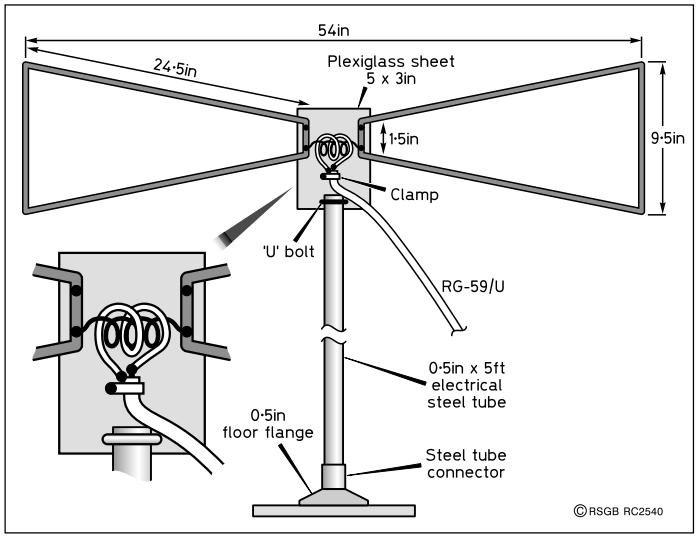

Fig 4: A 50MHz version of the Wonder-Bar antenna, as given in *CQ* in 1961. See text for constructional details.

BEAUMANOR & THE DOMINO INTERCEPTS

THE ILLUSTRATION showing Beaumanor Hall on page 10 of the December, 1999 *RadCom* reminded me that virtually nothing has ever been published in the amateur journals of the role played by the secret intercept stations concerned with the reception of the German occupation police (ORPO) traffic throughout the war (a source that became known as 'Domino') - an activity in which a number of amateurs played an important role. Although I was never personally concerned, details are now to be found in the Public Record Office at Kew (File HW3/155 'History of the German Police Section 1939-45') an account written as part of a secret history of GC&CS compiled at the end of the war. Additionally, the value of this work appeared in 1981 as an Appendix to Volume 2 of the official history of British Intelligence in the Second World War.

The PRO file shows that interest in German police W/T traffic increased after an initial 'break' into the hand-ciphers was made by Brigadier Tiltman at BP in the autumn of 1939, although the French [under Gustave Bertrand] and the Poles were already monitoring this traffic, which then amounted to some 80-100 messages per day. In the UK, sets were

An aerial view of Hanslope Park and the associated workshops and accommodation huts, but with the RSS/SCU intercept station off the right of the illustration.

allotted at the existing Metropolitan Police radio stations at Camberwell, South London, and Harpenden, Herts. These stations, under Harold Kenworthy, G6HX, had for some years been intercepting diplomatic and commercial traffic, with Harold Kenworthy working in close collaboration with Leslie Lambert, G2ST, the 'wireless expert' of GC&CS (aka 'A J Allenby' and 'A J Alan'), the polished star-story-teller of BBC Radio in the 1920s and 30s who fell terminally ill while at Bletchley Park and died in December 1941. G6HX (later awarded the OBE) was for a time seconded to GC&CS, although he stayed in Camberwell. He retired to Banstead, was a founder member of the Radio Amateurs Old Timers Club, and died in April 1960. Among a number of amateurs concerned with wartime intercept engineering at Camberwell was, I believe, Lyell Herdman, G6HD. In the early 1930s, G6HX and G2ST were jointly responsible for tracing by D/F the first identified Russian clandestine station in the London suburbs.

Hut 5 at BP was allotted for exploitation of Domino traffic. A French station at Metz was well suited to intercept the traffic from occupied Poland etc in the early months of the war, but when France was occupied in the summer of 1940 Bertrand and the Poles continued to intercept and decrypt some of the German police traffic from a secret base near Montpelier in Unoccupied France until November 1942, decrypting and passing some of this traffic to the UK via the Polish clandestine station at Stanmore.

In August 1940, some 12-16 receivers where allocated for intercepting Domino traffic at Beaumanor, which became the main Domino intercept station , although later additional sets were used at Kedleston Hall, Derbyshire, a large Georgian House in a deer park with a lake. The Germans became increasingly conscious that their ORPO traffic might be intercepted and increased both cipher and signals security - but to little avail, as indeed was the case with the parallel Abwehr traffic intercepted by RSS/SCU. Originally the German Po-

lice used (carelessly) a straightforward double-transposition cipher; this was changed first to double-Playfair with the 'key' soon being changed every three hours; and then, from September 1944, the 'Roster' cipher, described as "by far the best hand-cipher which the Germans developed", but the Germans made heavy going of the relatively complex system and the traffic continued to be deciphered.

An attempt was made in 1942 to co-operate with the Russians, but this soon broke down. By February 1943, some 400-500 messages were being 'read' each week. By mid-1943, apart from Beaumanor, Kedleston Hall was fully operation on Domino, with a few sets also at Sandridge, Herts, and some at Woyg (?) and Shenley near Barnet. Decodes in October 1943 numbered over 3000, with some 70 different 'keys' being used. Almost certainly, the intercept operators included pre- and post-war amateurs, who may not have known what they were copying

Signals security followed similar lines to the Abwehr, with the stations changing callsigns every six months (Abwehr often adopted daily changing callsigns from about 1942), they changed the network configurations and broke up the areas covered by specific keys.

The total number of people involved in this work was about 500 and it was estimated that the cost per message decoded was roughly £4. While the author of the 'history' admits that it might be questioned whether reading messages that might simply be a request by an NCO policeman in the Ukraine to be sent an extra pair of underpants, there can be little doubt that it gave the Allies a very full picture of the activities of the ORPO detachments including their D/F and intercept teams endeavouring to track down the clandestine radios of the Intelligence and Resistance agents.

A rare view of the inside of the RSS/SCU (SIS-controlled) Hanslope Park station, with 24 operator positions (22 having two HRO receivers, 2 having three HROs). It became operational in May 1942 and remained so continuously until after VE-day, intercepting mainly the traffic of the Abwehr. This photograph was taken in the summer of 1946, soon after the station was converted for two-way working for what the following year became the Diplomatic Wireless Service. A feature of the station was a set of wide-band distribution amplifiers - the first of their type and designed by the late 'Dud' Charman, G6CJ. These amplifiers, using 807 valves as small-signal amplifiers of impressive linearity, remained in use at Hanslope for 30 years without a single 807 ever failing.

Vol 2 of the official *British Intelligence in the Second World War* (HMSO, 1981) in Appendix 5 'The German Police Cyphers' clearly draws on the file now in the PRO but adds "Among the reasons why GC&CS maintained so large an effort against the police hand cyphers, some were technical. The most important was the fact that decrypts of the hand cyphers often provided a means of entry into Enigma keys, but there were others. The German Army and the GAF used similar hand ciphers. . . Over and above these technical considerations, work on the police ciphers was not unimportant for the intelligence they yielded. With the outbreak of war the ORPO was formed into battalions or regiments and equipped with artillery, tanks and aircraft, and was used in close collaboration with the SS as an army of occupation in the subject territories. For most of the war the bulk of the radio traffic of both organisations was concerned with German suppression of resistance and subversion, especially in Poland and the Baltic States, in the Balkans, in Russia and, after the fall of Mussolini, in Italy. From 1942, anti-partisan operations grew into a bitter and specialised form of warfare. . . the decrypts acquired increasing value for the light they threw on the training, the tactics and the detailed operations of the SS and the police and of the resistance forces. . . they provided a good deal of information about the reprisals inflicted by the Germans in the course of their anti-partisan operations and disclosed the extent to which atrocities were being carried out in Russia as calculated acts of policy. In September 1941, Daluege, Chief of the ORPO in Berlin, warned police commanders throughout Russia that there was a danger that matters of great secrecy, such as the exact number of executions, might be decyphered by the enemy; they should henceforth be sent by courier and not by wireless. But by then much of this nature had been transmitted by W/T and decrypted by GC&CS. From the spring of 1942 until February 1943, when it ceased to be sent by W/T, GC&CS decrypted a daily return of prisoners at Dachau, Buchenwald, Auschwitz and seven other concentration camps. The daily return consisted of a series of unheaded, unexplained columns of figures which GC&CS worked out to mean the number of inmates at the start of the previous day, new arrivals, departures by any means, and number at the end of the previous day. It also specified the vairous categories of prisoner, such as politicals, Jews, Poles, other European and Russian. It was realised that departures by

Another view of the Hanslope Park intercept station, showing at the far end the massive construction of the set of wideband amplifiers, but with the original 'concentrator' torn out.

any means was accounted for primarily by deaths. The returns from Auschwitz, a camp with 20,000 prisoners, mentioned illness as the main cause of death, but included references to shootings and hangings. There were no references to gassing during this period.

There were references to auxiliary units formed, for example, by Flemish and Norwegian volunteer battalions, and a reference to the participation of Indians, Cossacks and Ukrainians. In contrast, the police traffic revealed relatively little about conditions in France, Belgium, Holland, Denmark, Norway and Greece until late in the war, reflecting the greater availability of land-lines and the fact that the police played a smaller part in occupation duties than they did in the east. However, from mid-1944, following D-Day, there were voluminous decrypts disclosing intelligence about the activities of the Maquis and the counter-measures against them. In 1944-45, much information came from within the Reich, throwing much light on the economic effects of Allied bombing and the economic situation. Finally, they became one of the most important and interesting sources of operational intelligence.

At the 1999 CHiDE colloquium on 'The History of Military Communications' Arthur Bauer, PA0AOB, described how the German armed forces developed great expertise in long-distance line telephony which in most countries was still only at an elementary stage. This was of significance, since it restricted the usefulness of radio interception. He showed how, in the autumn of 1944, the Germans bridged a gap of 300km over Russian-controlled territory with telephone lines extending in length over 4500km using carrier telephony and a short length of sea cable! PA0AOB emphasised that the importance of line communications for military operations is still underestimated and is a neglected theme for historians. But, even so, a pro-Allied French intelligence service succeeding in tapping the telephone link to Vichy (Source K) and passed useful information to the Allies. ♦

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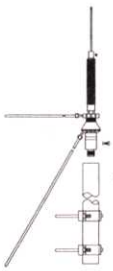

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I SAID LAST month that conditions had improved, and this appears to have continued during November and early December. I ended up in Ghana for the CQWW CW Contest with the 9G5AA Voodoo Contest Group so had no direct experience of propagation from within the UK, but correspondents mention having worked rare ones like T32 and FO0 on 10m, so I can only assume that the high bands were in good shape. The Bavarian Contest Club operated as CN8WW in the contest and, as they had done in the Phone leg, turned in an absolutely fantastic score, perhaps turning on its head the common perception that these contests can only be won from the Caribbean.

As a result of the good conditions, table scores continue to increase. Sean, G4UCJ, reports that, with 30W, he has for the first time worked over 200 countries in a year using a vertical and indoor dipoles. With 3W his all-time score is approaching 150 countries. Sean also commends the work of the QSL bureau sub-managers, who do an excellent job in keeping the cards flowing.

DX NEWS

JOHN, SM0DJZ, draws attention to a number of new-look Swedish callsigns. Some stations will begin using 2 x 1 calls such as SM0A and SL3A. Also, others will use the 7S and 8S prefixes. A web page containing information on contest, special event/anniversary, and other special callsigns in Sweden can be found at: http://www.sk3bg.se/contest/speccall.htm

The Romanian Amateur Radio Federation reports that the logs from YR99E (special callsign for the Total Solar Eclipse seen from Romania) are now available on the web and stations can search for their logged QSOs. Also, the final scores of the 1999 YO-DX HF contest are now available at the same site. All the above information can be obtained by visiting the Romanian Amateur Radio Federation web site at: http://www.qsl.net/yo3kaa

WARC BANDS TABLE 1999

	10MHz	18MHz	24MHz	Total
G3YVH	142	165	151	458
G3WGV	131	156	145	432 (all CW)
G0NXX	145	151	127	423 (all CW)
G4UCJ	101	109	95	305 (all CW)
G4MUL	75	116	112	303 (all CW)
G4OBK	69	67	150	286 (all CW)
G3SXW	80	83	92	255 (all CW)
G0BMS	77	93	84	254 (all CW)
G3WP	36	64	69	169 (all CW)
G3ING	54	63	41	158 (all CW)
G4KHM	54	68	14	136
MM0BQI	30	52	35	117
GM4OBK	37	33	45	115 (all CW)
G0VLC	33	35	24	92 (all CW)
GM0NTL	0	56	33	89 (all SSB)
M0BIB	14	12	54	80
2U0ARE	70	0	0	70 (all CW)
5Z4GS	0	44	25	69 (all SSB)
M0BUY	9	10	6	25

Zdeno, OK2ZW, is currently in Ghana and operating as 9G5ZW. He plans to be there for the next three years. His QSL manager is Miro, OM3LZ, who was due to start sending out QSLs after 1 January. While in Ghana I met both Zdeno and Japanese operator Kazuo, JH8PHT, 9G5DX.

Derek, F5VCR, has announced that he and four others will activate Abokwa Island (AF-*new*), Ghana during the first week of April. The group will be active for six days with two complete stations. This is the same team that activated TR0A/P (Banie Island, AF-043) last year.

Gus, 9U5D, should be back in Burundi from 10 January for another three-month assignment.

Bob, ex-A92GD, is now active (on all bands with CW/SSB/RTTY/PSK) as EL2RF from Monrovia, Liberia. Bill, K1SE, still has the logs for Bob's previous operations as A92GD and J28BM.

Michael, 5H3MS, has a home page at http://www.qsl.net/5h3ms/ which has information about obtaining a 5H licence and gives details about the IARU society, the Tanzania Amateur Radio Club (TARC).

Steve, K2WE (ex-3W6WE and XU2WE), reports that he will return to Vietnam in February or March and has permission from Hau, 3W6LI, to operate from his farm in Vung Tau, about 55 miles from Saigon, right on the South China sea. He will make every attempt to operate on 40, 80 and even 160m if he can get the licence.

The Kermadec DX Association reports that all QSLing for the January 1999 DXpedition to Campbell Island (ZL9CI) is up to date with both direct and bureau requests. At 10 December 1999 a total of 12,680 envelopes had been received which contained QSL cards for 50,155 individual QSOs. In addition, 4,089 QSOs have been responded to via the bureau. The group intends to be active from Tokelau, ZK3, in 2002.

Jukka Heikinheimo, OH2BR, gives an update on his Pitcairn, Island trip (see last month). Jukka was expecting to operate as VP6BR/MM *en route* to Pitcairn where he should land in late January. He then expects to be active until the beginning of May, when the next ship arrives. He will take two rigs and one amplifier. He'll have beams for 10 - 20m and two-element phased verticals for 30 - 80m. For 160m he plans to have a single vertical. Since he will be in the Pitcairn Islands so long, side trips to both Ducie Island (OC-182) and Henderson Island (OC-056) are also being planned. Suggested frequencies are as follows:

CW - 1824, 3504, 7004, 10,124, 14,024, 18,074, 21,024, 24,894 and 28,024kHz.

SSB - 3774, 7044, 14,244, 18,144, 21,244, 24,944 and 28,444kHz.

RTTY – 14,074, 21,074 and 28,074kHz.

A web site has been set up by Lech, LA7MFA, at http://www.qsl.net/oh2br/

Mike, G0VJK, and Bob, G4VGO/KY0C, will be active from 14 February to 6 March on 40 - 160m CW from Truk Island (OC-011), Micronesia (V6).

Bernhard, DL2GAC (VU2BMS, H44MS, H40MS), should be back in the Pacific by the time you read this. During February he expects to be in Temotu (H40).

Lech, reports that Ueata, T31UA, is now active (with 100 watts and a vertical for 20m or a long wire) from Kanton Island (OC-043), Central Kiribati. He is a professional radio operator, but is new to amateur radio and is not able to run big pile-ups. Ueata knows CW and Lech hoped to send him a CW keyer for Christmas. Lech also says he "will try to get his logs somehow, and print a nice colour QSL card".

Adriano, IK2GNW, should be in the Pacific by the time this appears. He will sign FO0PRE from French Polynesia during the last week of January, and will then move on to the Austral Islands (same call), North Cooks (ZK1NW), Tonga (A35NW) and Wallis & Futuna (FW/IK2GNW) for a week each, and finally end with KH6/IK2GNW from Hawaii. The exact dates from each location will depend on the local flights. He will be active on all bands CW/

28MHz COUNTRIES TABLE 1999

G4DUW	248
G3TMB	219
M0BIB	213
G3ZKN	209
M0BZQ	209
G3JFH	208 (all SSB)
G0VHI	206
M0CCQ	203
G0TSM	187
G3SNN	185
G0CAS	179
G3XMM	168 (all CW)
G3YVH	160
GM3COQ	154 (all CW)
G3IFB	150
G3WGV	148 (all CW)
M0CAL	147 (all SSB)
GW0MOW	140
G0KDS	139 (all SSB)
G3NKS	134 (all CW)
G3LVP	130
G3ZBE	130
G4BGW	130
G4OBK	129 (all CW)
G4UCJ	128 (all CW)
G3SXW	127 (all CW)
G4PDQ	126 (all CW)
G4IDL	125 (all CW)
G0NXX	122 (all CW)
G4FUJ	119
G3LME	114 (all CW)
G3TEV	113 (all CW)
GM4CHX	113
G3MDH	105 (all SSB)
MM0BQI	79
GI4XSF	77
GM0NTL	74 (all SSB)
G4ENA	71
G3WP	52 (all CW)
G3SZS	51
G4OVB	50 (all SSB)
G0BMS	49 (all CW)
2U0ARE	48 (all CW)
5Z4GS	46 (all SSB)
GX0WAW	46
G3ING	37 (all CW)
GM4OBK	37
G4OTY	35 (all CW)
MI0BVK	33
M0ASJ	29
G0NCS	25 (all RTTY)
GU0SUP	22 (all RTTY)
GI0NQC	9

SSB/RTTY. QSL via I2YSB (see QTH Corner). For further details, check the web site at: http://digilander.iol.it/i2ysb

Once again Martin, VE3MR, is spending winter on the island of Aruba. He will use P49MR until April and should be active mostly on 12 and 17m SSB. QSL via his home call.

A large group is planning to activate Pinguino Island in the Santa Cruz Province North group (Argentina - not previously activated) in February, 2000. This would be the first-ever IOTA activation of this group. Activity is planned between 10m and 80m from 10 - 14 February. Three stations will be on the air, one on CW and two on SSB. Operators are expected to include LU1DK, LU2NI, LU4DA, LU5DV, LU5FCI, LU5WW, LU7DP, LU7DPR, LU8VCC, LU8EEM and JA7AYE. QSL to F6FNU.

The Island Radio Expedition Foundation (www.sat.net/~iref) recently issued a bulletin detailing some of its activities. IREF now has 32 members from seven different countries and has received close to $4,000 in contributions. A $500 contribution was offered to the VK9RS Rowley Shoals expedition, but was declined as the VK9RS team were not happy to accept the conditions (mainly to do with QSL arrangements) attached to the donation. However, a $400 grant has been made to OH2BR, contingent upon him activating Ducie and Henderson Islands during his stay on Pitcairn (see earlier). The Board has also approved a $400 grant to the team which will activate Abokwa Island off Ghana in April (see earlier). A further $300 has been set aside for the activation of a rare African island, details of which will be announced later. IREF continues to seek new members, in order to be able to increase the scope of its activities.

Two of the expeditions which were expected last autumn have ended up being postponed. The St Peter and St Paul Rocks (PY0S) trip was postponed for a second time, apparently because the wooden building and anchorage at the Rocks are being reconstructed by the Brazilian Navy after damage by heavy seas. This work may be finished by March, so that a DXpedition could take place as early as April, but this is not certain. The Italian group which was to have operated from Chad during late November was unable to travel between the various missions due to heavy rains. They hope to try again in March.

BHUTAN AND MACQUARIE

JIM SMITH, VK9NS, is now back on Norfolk Island, and has passed on information about both Bhutan and Macquarie Island. Jim revisited Bhutan after a spell in the UK, during which many of us were able to meet him at the GM Convention and at the RSGB HF Convention. Jim reports that the introduction of the Amateur Radio Service in Bhutan is now very close and he predicts that A5 activity will soon be on a regular (but sustainable) level. This is largely a result of the passing of the Telecommunications Act (Bhutan) by their Ministry of Telecommunications. This act is a significant step

HF F-Layer Propagation Predictions for February 2000

	7.0MHz	10.1MHz	14.0MHz	18.1MHz	21.0MHz	28.0MHz
Time	000001111122	000001111122	000001111122	000001111122	000001111122	000001111122
(UTC)	024680246802	024680246802	024680246802	024680246802	024680246802	024680246802
*** Europe						
Moscow	888643221788	8..862.36888	....766678.1	....87778...	...188888...	....88888...
*** Asia						
Yakutsk	42..111..343	34.31...1433	....411..451	....44.....	....44.....	.....
Tokyo	.....1.	.1.111..1242	.....24.1	.....1..1...	....3.....	.....1.....
Singapore	1.....111	11.....11	.....11..	.....11..	.....1..1...	.....1...
Hyderabad	42.....222	431.....333	.....24.1	...1...124..	....11124...	....44444...
Tel Aviv	6663...1.666	66.61...4666	...65324661.	....655566..	1...66566...	....6666....
*** Oceania						
Perth	.....1.	.....1..1	.....1..31	.....1.13..	.....1.12...	....11..2...
Sydney	.....	.....1.1.	.....1.2.1	.....11.2...	....1..12...	...1..333...
Wellington	.....	.....	.....45..	....444556..	...155446...	.....666....
Honolulu	.....	.....	1...1...12..	.....3..	.....	.....1..
W. Samoa	.....	..1..1.....	....3...22..	.....31134..	.....34444..	.....3....
*** Africa						
Mauritius	11.....112	22.....	23.1...1..2.	...1..1.1221	....111233..	....2233.3..
Johannesburg	11.....1	..2.....1...	13.1.....311	.....1..133.	.1..21..233.	....2211.4..
Ibadan	4444.....454	5566.....545	44664...3554	44344544	....4445466.	....665566..
Nairobi	433.....234	444.....334	44.21...2444	....2122455.	....333344..	....4.3.....
Canary Isles	88774....478	8888621..788	88..75456888	....7767788.	.....777788.	.....78....
*** S. America						
Buenos Aires	11111.....	33231.....1.	33..3.....13	....3.....3.	....41..113.	11....2233..
Rio de Janeiro	4433.....13	44442.....4	4...4.....44	....41..2344	2223444	.....4344.5.
Lima	12..1.....	22..21.....	....2.....12	....3.....1.	..1.....1..	.....1122.1
Caracas	4444.....4	455.4.....4	5....2...124	.....411234.	11....33344.	.....4455..
*** N. America						
Guatemala	23441.....	444.4.....	.4..4.....14	.1....2.124.	.....223.1	.....444..
New Orleans	3443.1.....	344.3.1...1.	....4...11..	..1....122..	.....13234.	.....445..
Washington	55542.....4	555.5....125	55.1..1.1455	11...14344.5	.....444..	.....44...
Quebec	54552.....25	655.42.11155	5.....211556	.....44556.	.....54566.	.....666..
Anchorage	1322.....1..	44..3...1234	.....34.	.....	.....	.....
Vancouver	.31...11...1	113.2.....	.....123.	.....342.	.....43.1	.....
San Francisco	.121.11.....	.2..3...1...	.....1..1...	.....123.1	.....23..	.....44..

Key: The numbers in the table represent S-meter reading on the average amateur rig, whilst colours represent availability. When the predictions are expected to be 67-100% certain, the numbers are blue; when 33-66% certain, red; when less than 33% certain, black.

The RSGB Propagation Studies Committee provides propagation predictions on the Internet at www.g4fkh.demon.co.uk The page is updated weekly.

The provisional mean sunspot number for December 1999 issued by the Sunspot Data Centre, Brussels, was 86.4. The maximum daily sunspot number was 116 on 18 December and the minimum was 48 on 30 December. The predicted smoothed sunspot numbers for February, March and April are respectively: (SIDC classical method – Waldmeier's standard) 111, 110, 108 (combined method) 119, 121, 125.

forward, opening the door to the first TV station in Bhutan, as well as to Internet and e-mail facilities. The Ministry now has a Spectrum Management Agency, Monitoring Unit and related activities. Where previous amateur radio operations have been on an *ad hoc* basis, with special permission required, a section of the Act opens the door to a properly-regulated amateur radio service on a continuing basis. This is very good news indeed. Incidentally, one of Jim's hosts in Bhutan was Dasho T Yonten (S/Judge, retired) better known to us all as Yonten, AC5TY/A51TY. Yonten used to be quite active and appears keen to get back on the air. The Heard Island DX Association donated a Kenwood transceiver (with antenna tuner), a brand new state-of-the-art switched-mode power supply, an HF-6V Butternut antenna, coax cable, log book etc, and a 20m dipole. It was all set up in Yonten's house in Thimphu. Hopefully he will soon be back on the bands. Jim and his wife Kirsti hope to travel to Bhutan sometime later this year.

Further to what I reported last month on the subject of Macquarie Island, Jim adds that Alan Cheshire is now active as VK0LD (VK0MM during 2000) from the Australian Antarctic Research Expedition (ANARE) Base, and will be there for most of the year. Jim estimates that the various recent operators on Macquarie Island have amassed no more than 10,000 to 12,000 QSOs between them, so there is substantial latent demand, especially for CW QSOs. Hopefully, Alan will be able to make inroads and satisfy the waiting masses. This said, Jim points out that Alan is a Senior Communications Engineer for ANARE, with a significant workload. He is primarily a CW operator and plans to focus on 20 and 15m in order to maximise the number of contacts, rather than to satisfy a smaller number of people with multiple band/mode combinations. His rig is an Icom IC-706 MkII. By the way, it is impossible to get authorisation from the Tasmanian Parks and Wildlife Services to carry out DXpedition-style activities on Macquarie, so DXers must rely on finding personnel such as Alan who are prepared to work the bands during their spare time. At the moment Alan is planning to take care

Mike, KC7V / 9G5MF, does some pre-contest operating from the 9G0ARS club station.

of the QSL chores when he returns to Australia. This could mean a long wait, but the successful DXer counts patience as one of his virtues.

BEACONS

SADLY, THE 10m beacon chain, which is an invaluable indicator of propagation conditions, is experiencing problems. The *Six and Ten Report* draws attention to the high level of interference currently being caused to 10m beacon transmissions by illegal CB operators in many countries. As the author comments, "I fear there is no solution to this problem other than patience and the use of narrow filters!"

Bob, N6EK, NCDXF Beacon Project Director and IARU Beacon Coordinator, reports that the seventeenth beacon in the NCDXF/IARU Beacon Network came on the air from Novosibirsk, Russia, at 0945Z on 26 November 1999. The beacon operator, Yuri Zaruba, UA9OBA, reports that this is the first radio beacon to be placed on the air in Russia and both local and national TV covered the event. The callsign is RR9O. The NCDXF/IARU beacons provide world-wide coverage and transmit in turn every three minutes on five different amateur bands. The final beacon will be in Hong Kong, China, with the callsign VR2HK. Full information is available on the world wide web at www.ncdxf.org

The VK3RMH 10m beacon is now active 24 hours a day on 28.2565MHz. Its QTH is approximately 25km NE of Melbourne, Victoria. The CW ID cycles through two messages, each followed by a 20W carrier and 2W carrier for 5 seconds each. The CW messages read: "VK3RMH MELB QF22JH 20/2W VERT" and "VK3RMH AT HOTMAIL.COM QSL". QSL currently is only via Internet e-mail to: vk3rmh@hotmail.com or, if there is no response, send the QSL to: m.harrison@medoto.unimelb.edu.au The beacon is operated by the North East Radio Group, Inc.

AWARDS

THE 'DISCOVERY of Brazil Award', to celebrate the 500th Anniversary of the discovery of Brazil by Portuguese navigators, is available for contacts made from 1 January to 31 December 2000. European stations require 50 QSOs with Brazilians plus 10 with Portuguese amateurs. The same station may be contacted one additional time but on a different band and with a minimum of 24 hours between the QSOs. Send the list of stations contacted with a signed certification by an official of your radio club or two other licensed stations that the QSOs are registered in your logs. You must also sign the following declaration: "I declare, for my honour, that the contacts for obtaining the Discovery of Brazil Award, with the related stations in GCR log, were indeed accomplished." (Date, Signature, Callsign). The fee is $5. Apply to the custodian: Ronaldo Bastos Reis, PS7AB, PO Box 2021, 59094-970 Natal, RN, BRAZIL. e-mail: ps7ab@qsl.net

Paul Blumhardt, K5RT, has been appointed CQ Worked All Zones (WAZ) Award Manager, with immediate effect. He succeeds the late Jim Dionne, K1MEM. Please note that it will take some time to transfer all of the WAZ records to Paul and for him to work through the growing backlog of award applications, so he asks for patience during this transition period.

I have been sent details of the JARL 2000 Awards programme. The 'Japan Domestic 2000 Award' is for contacts with more than 2000 different amateur stations in Japan (a contact with the same station on different bands counts as if a new station had been worked). The 'Global 2000 Award' is for contacts with more than 2000 different amateur stations outside your own country (as above for contacts on additional bands). The 'Japan Domestic Award' is for acquiring more than 2000 prescribed points by communication with amateur stations in Japan. Points are calculated as: (the total number of 'cities', 'guns', 'kus' contacted in each band) x (the total number of 'prefectures' contacted in each band). (Note: in Hokkaido, 'shichos' are considered as 'prefectures'.) The 'Global Award' is for acquiring more than 2000 prescribed points by communication with amateur stations in the world. Points are calculated as: (the total number of DXCC entities contacted in each band) x (the total number of WAZ zones contacted in each band). Requirements for all awards: (a) A list of contacts (receiving QSL card is not necessary) furnished with the callsigns of stations worked (heard), dates, bands and modes of the contacts (receptions). Please do not send QSL cards. (b) The fee for the award: eight IRCs. (c) Only contacts (receptions) made from 1 January 2000 to 31 December 2000 will be acceptable. (d) JARL will start accepting applications on 1 April 2000, and will close on 31 May 2001. (e) Applicants can request a maximum of three of the following four endorsements: Bands, Modes, QRP, QRPp. (f) There are more new JARL awards. Please refer to: http://www.jarl.or.jp/English/4_Library/A-4-2_Awards/Award_Main.htm (g) Information requests and all correspondence should be sent to: Japan Amateur Radio League - Award Desk, 1-14-5 Sugamo, Toshima, Tokyo 170-8073, JAPAN. E-mail can be sent to: oper@jarl.or.jp

THANKS

MY THANKS to all who have provided information. Special thanks go to the authors of the following for information extracted: *OPDX Bulletin* (KB8NW), *The Daily DX* (W3UR) and *425 DX News* (I1JQJ). Please send items for the **April** issue by **19 February**. ♦

QTH Corner

EL2RF	K1SE, P.O. Box 685, Manassas Park, Virginia 20113-0685, USA.
I2YSB	Silvano Borsa, viale Capettini 1, 27036 MORTARA(PV), ITALY.
T31UA	Lech Slawomir Tomczak, LA7MFA, Froeyas vei 61, 3472 Boedalen, Norway.
VP6BR	Jukka Heikinheimo, OH2BR, P.O. Box 37, FI-01361 Vantaa, Finland.

VHF/UHF

NORMAN FITCH, G3FPK
40 Eskdale Gardens, Purley, Surrey CR8 1EZ
E-mail: g3fpk@compuserve.com

THANKS TO THOSE who sent Christmas cards with their letters. I hope you all had a pleasant holiday, enjoyed the new millennium celebrations and maybe even worked a bit of DX on VHF. With sunspot cycle 23 expected to peak this year, let's hope that some super DX will be worked on 50MHz.

Both the Leonids and Geminids meteor showers proved quite rewarding. There was some good tropospheric propagation on 144MHz and the 50MHz band saw some trans-Atlantic DX worked in the period. All times are given in UTC and in the Reports sections an asterisk (*) after a call sign indicates a CW QSO.

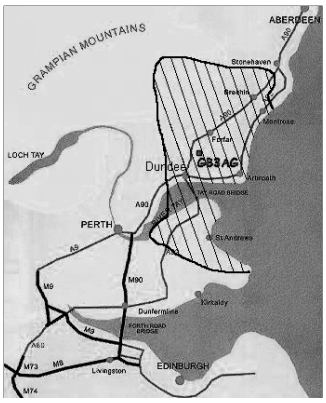
REPEATER NOTES

THE WINTER 1999 edition of the Central Scotland FM Group's publication *FM News* includes three pages of information on the status of the group's many repeaters. GB3AG on 145.725MHz (RV58) has been performing faultlessly for three years and in mid-November an uninterruptible power supply (UPS) was installed. The illustration shows the coverage of GB3AG, which now has its own web site - see the panel.

GB3CS on 145.750MHz (RV60) has been moved to a new site above Kilsyth. On 12 September, test calls verified a very wide coverage, but sometime later the antenna suffered storm damage and had to be replaced. Problems in October with GB3HI on 145.700MHz (RV56) were fixed by Jack Hood, GM4COX, and he also re-tuned the cavities.

Charging circuit problems with GB3PA on 145.625MHz (RV50) in late November have now been fixed. GB3AY on 145.650MHz (RV52) continues to give good service and GB3DG on 145.775MHz (RV62) is operational (QRV) again from its original site. The relocation and running of GB3FF on 145.600MHz (RV48) has been taken over by the East Coast Group, but the CSFMG will retain title to the repeater. There has been no further progress with GB3LG, which is still being overhauled.

GB3KA on 433.075MHz (RU246) continues to give good service, but is little used. Other articles in this issue range from a Christmas fruit cake recipe to a membership list. John Power, GM0KTO, edits *FM News* and membership inquiries should go to Treasurer Robert Henry, GM7AON, whose address is in the *RSGB Yearbook* (QTHR).



GB3AG repeater coverage

The Kent Repeater Group runs seven repeaters. In its December *Newsletter* there is news that VHF repeater GB3KN on 145.700MHz in Maidstone is operating properly. Due to escalating site costs GB3KS on 145.625MHz in Dover urgently requires re-siting by 31 March. The Kent Ambulance Service NHS Trust has offered space on a mast in the area, subject to certain conditions. These have been met following a KRG meeting on 10 November.

On UHF, GB3EK on 433.050MHz (RU244) in Margate, GB3NK on 433.100MHz (RU248) at Wrotham, GB3RE on 433.275MHz (RU262) in Maidstone and GB3SK on 433.150MHz (RU252) in Canterbury are all working well. GB3CK on 433.000MHz (RU240) in Charing is off the air (QRT) due to a hiccup in the transfer of the NoV. Work has started on the construction of a new repeater.

David Burdett, G7MFW (QTHR), edits the *Newsletter*. The post of Secretary is still vacant, so membership inquiries should go to Treasurer John Wellard, G6ZAA (QTHR), whose e-mail is krg@zetnet.co.uk

VHF CONVENTION

IT'S CONVENTION TIME again. A comprehensive programme has been lined up for this long-running annual event which is on 20 February at the Sandown Exhibition Centre, Esher, Surrey; for full details see pages 18 and 19. Although it's the weekend when I will be compiling the April *VHF/UHF*, I hope I'll be able to attend, at least for part of the day, so I look forward to meeting some of you and to discussing the format of the *VHF/UHF* column.

PUBLICATIONS

THE 'TECHNICAL Reports' section in Issue 3/1999 of *DUBUS* magazine deals with microwave topics. The 'EME' section runs to 14 pages, well-illustrated with photographs of antenna arrays. The 'Es News' section chronicles the 1999 Sporadic-E events on 2m from late May through to late August and there were *no* reports from any operators in the British Isles.

There is extensive coverage of 1999 meteor scatter (MS) activity, including the results of the EA3BB Perseids operations from IN62, 72, 73, 82 and 83 grids. The LA0BY/P operations from JP61 and the OM9M expedition to KN18AM are covered in detail.

In the 'News and Comments' section, there is a report on the 44th Mannheim VHF Convention, which attracted nearly 9000 visitors on 18/19 September last year. This year's dates are 9/10 September. There are short sections covering tropo and auroral propagation and 6m news. The UK agent for *DUBUS* is Roger Blackwell, G4PMK (QTHR), whose e-mail address is dubus@marsport.demon.co.uk

The November issue of the UK Six Metre Group's quarterly journal *Six News* comprises 64 pages and, as always, is packed with a very varied selection of articles and reports. There is a Code of Practice for 6m operators issued jointly by the UKSMG, the Hong Kong Amateur Radio DX Association (HARDXA) and the Japanese Amateur Radio Overseas Club (JAROC). Non-members can find this on the group's web site - see the panel.

There are the results of several contests and a report by Neil Carr, G0JHC, on his Cyprus operation at the end of last July. Paul Bradbeer, G7GUC/AC5NO, reviews the Commander VHF-1200 Amplifier manufactured by Command Technologies in Bryan, Ohio, USA. The Clive Davies, G4FVP, 'What's on Six?' column runs to 17 pages, with a couple more of 'Late News.' Also included is the Geoff Brown, G4ICD, '50MHz Beacon List' updated to 10 October 1999, and the 'All-time Operating Table.'

Chris Deacon, G4IFX (QTHR and e-mail cdeacon@compuserve.com), edits *Six News* and membership details can be obtained from Secretary Iain Philipps, G0RDI (QTHR), whose e-mail address is six@sms.xerox.com

PROPAGATION

THE OCTOBER ISSUE of *The Six and Ten Report* records Es openings on 6m on 17 days with a possible double-hop event from the UK to Cyprus on 28th. Some 24 countries were heard/worked from the UK via E-layer in October. The DX openings to South America and South Africa on 12th, already covered in *VHF/UHF*, are mentioned.

There are comments on the reports of intra-European backscatter and of a number of skewed paths, indicating signals off the great circle routes. Auroral propagation was reported on 17 days and there were several good events when many stations were operating (QRV). The table of Solar and Geomagnetic Data shows that the 2.8GHz solar flux averaged 164.9 units, with a peak value of 200 on 14th and a minimum of 122 on 1st.

The *Report* is compiled monthly by Dr Steve Reed, G0AEV, and Prof Martin Harrison, G3USF, and is an activity of the RSGB's Propagation Studies Committee. Subscription inquiries are handled by G0AEV (QTHR) whose e-mail address is g0aev@explore.force9.co.uk

MOONBOUNCE

THE DECEMBER edition of the *432 and Above Newsletter*, edited by Allen Katz, K2UYH, reports that conditions in the 1999 ARRL EME Contest were sometimes excellent and that overall they were very good. But to quote: "Unfortunately, the contest was marred by extreme weather, which made operation impossible in many parts of Europe and some other areas of the

world." Preliminary results suggest that OH2PO is again the winner on 70cm with 123 QSOs and 34 multipliers, followed by K1FO (112x35). On 23cm it seems that K4QI was top with 66x34, with N2IQU (59x37) runner up.

Peter Blair, G3LTF (IO91), had problems with the strong winds. There was polarisation spreading on 70cm on 27 November, but at dawn this cleared and signals got stronger. From 0049 on 28th, he completed with ON5OF, 7M2PDT, JH4JLV, UA6LGH, K5WXN, VE6TA, KD4LT, N4GJV, EA3DXU, OZ4MM, W7GBI, OH2DG, K5GW and K8ISK. From 0830 he was QRV on 23cm and worked OE9ERC, OZ4MM, F6CGJ, OE5EYM, K2DH, W5LUA and W7QX. After that he had equipment problems.

Dave Dibley, G4RGK (IO91), suffered torrential rain and howling gales for the second leg of the contest and was only QRV on 70cm for three 20min periods to work OZ4MM, OH2PO, DL9KR, OE5JFL, DL9NDD, K5GW and K0RZ.

In spite of the strong winds, Roy Reed, G3ZIG (JO02), managed to work another 28 CW stations on 2m to aggregate 107 for the two legs of the contest. With 39 multipliers his claimed score is 417,300 points. The 12 new 'initials' were YO2IS, K2RTH, WA6PY, DL2MHS, N7EIJ, DK3BU, SM3PWM, RX1AS, SV1BTR, RW3PF, PA3CJI and ON7RB, bringing his total to 189.

The third 23cm EME SSB contest is scheduled for 12/13 February and the rules are in the *Newsletter* - see the panel for the web site details (The Lunar Weekend Calendar for 2000, compiled by Ian White, is also available on the web site). There are just over 27 hours of Moon time for London latitude stations. The declination varies from +11.77° to +17.38° and the 144/432MHz sky temperature range is 401/28K to 441/32K. The signal degradation, referred to perigee, varies from -0.22dB to - 0.05dB and the Sun offset at Saturday midnight is +90°.

LOCATOR SQUARES TABLE
Starting date: 1-1-1979

Callsign	50MHz	70MHz	144MHz	430MHz	1.3GHz	Total
G3NKS	5	52	12	4	-	73
G4YTL	-	50	444	72	-	566
G1SWH	338	42	222	81	30	713
G3XDY	-	33	246	170	120	569
G8TOK	293	31	132	55	29	540
G3FIJ	222	29	104	50	23	428
G4OUT	-	23	107	-	-	130
G0JHC	718	20	48	4	-	790
G4DEZ	435	17	256	81	67	856
G0GCI	246	16	94	38	-	394
G4FUJ	57	17	18	4	3	99
G3IMV	600	15	610	125	53	1403
G0EVT	416	14	292	77	16	81
G8GNI	113	13	36	18	-	180
GJ4ICD	753	1	267	121	79	1221
G0FYD	468	1	255	7	-	731
M0CNP	-	1	29	10	-	40
G4RGK	267	-	339	221	78	905
G0FIG	344	-	35	191	34	820
GW6VZW	488	-	146	6	-	640
GW7SMV	392	-	150	-	-	542
G7CLY	238	-	221	13	-	472
G0XDI	196	-	213	59	-	468
G6TTL	182	-	133	89	27	431
GU7DHI	415	-	-	-	-	415
G1UGH	265	-	130	14	-	409
MM1BUO	296	-	76	31	-	403
G8XTJ	247	-	137	-	-	384
G7LRQ	212	-	60	36	34	342
G4OBK	279	-	58	-	-	337
GW8JLY	-	-	293	36	-	329
G4ZHI	19	-	225	32	-	276
2U0ARE	238	-	18	12	2	270
G1EFL	206	-	63	-	-	269
G3FPK	-	-	246	-	-	246
GW3EJR	233	-	-	-	-	233
GM1ZVJ	224	-	-	-	-	224
GU6AJE	214	-	-	-	-	214
MM0BQI	146	-	63	2	-	211
G4APJ	111	-	38	19	-	168
G4UCJ	141	-	26	-	-	167
EA7IT	-	-	71	-	-	71

No satellite, repeater or packet radio QSOs.
If no updates are received for a year, entries will be deleted.
Next deadline is 17 February. Band of the month, 70MHz.

METEOR SCATTER

THE NASA SPACE Science News service has issued an interesting paper about the Leonids meteor shower. The peak of activity centred on 0205 on 18 November. Astronomers Rob McNaught of the Australian National University, and David Asher of the Armagh Observatory, had predicted 0208 in the Mediterranean region. The Zenithal Hourly Rate (ZHR) was substantially greater than the 500-1000 most experts had predicted. There was an abundance of faint meteors and a relative absence of bright fireballs, which were such a feature of the 1998 shower.

David Whitaker, BRS 25429, listened to the event on 2m up to 0330 on 18th and lists at least 116 stations QRV as 'spotted' on the packet cluster. These included RW1AW, RK3AF, RA3BLK (KO65), RV3ZR and RX1AS from Russia, SV0EC (KM17), SV1OE, 3A/PA2CHR, TK5EP, plus the more usual Europeans, but no modes were stated.

John Palfrey, EA7IT, found the visual peak at 0200 in southern Spain and, with a crystal clear sky, he observed 30-40 meteors per minute. On 2m he worked DH1TW, G0KPW and DF9RJ. Andy Durrant, G7OEC (JO01), was QRV on 6m and the band was quiet up to midnight on 17th when several Italians popped up at up to S9 for about a quarter of an hour. By 0115, most of Eastern Europe and Scandinavia was workable on random meteors, signals peaking around 0210, with little heard after 0300. The radio raw count data graph for the Leonids is available on OH5IY's home page - see the panel.

Colin Fallaize, 2U0ARE in Guernsey, found conditions on 6m more like an Es opening between 0030 and 0215 on 18th. He completed with G4HBA, SM7FJE and DL4ALI, but Jamie Ashford, GW7SMV, thought the shower: "…disappointing, with weak and short bursts" on 2m, although the QRM was unbelievable. He managed to complete with S5IZO (JN86), I3LGP (JN65) and SP2FAX (JO83) in the 0112-0219 period on 18th.

Conrad Farlow, G0RUZ (IO93), reckons that the Geminids shower on 2m was "Not bad at all". He was QRV from 2300 on 13 December and completed on random with 9A4FW, DL1MAJ, DL5MAE, YU7MS, DL4NAA, S51AT, S51MQ, LA0BY on side scatter, HB9FAP, DF1CF and I8TWK and with LA7DFA on a sked, modes not stated.

G4RGK completed on 2m with 9A4FW, YU7MS, HA5OV, HA6NY and S51MQ. EU6MS was a big signal early on and by 0200 all the A to Z QRGs were full. Dave is now using the 9A4GL software which "…makes life so easy".

GW7SMV was QRV on 2m on 14th and found it to be "…a nice shower with strong, long bursts". Jamie completed with OK1KT (JO70), 9A1CAL (JN86), I2FAK (JN45), HA9MDP (KN08 and ODX at 1706km), F1LHL (JN19) and 9A2AE (JN86) at 2326, after which he went QRT.

BAND REPORTS

50MHz

Ted Collins, G4UPS (EX), heard a JA station for the first time for many years on 8 November when JA4CQS* was S2 at 0927. Brian Hummerstone, G3HBR (HP), heard JA4KFA* and JA4DLW* that day. On 11th Ted copied VK6HK* at S3 at 0933. He reports that 5N3CPR made his first G QSOs on 15 November - Bogdan's QSL route is via his home call, SP5CPR. The first W and VE QSOs of the winter season were also on 15th. On 21st at 0936, DU/GM4COK* was S3 with QSB.

Chris Gare, G3WOS, the vice-chairman of the UKSMG, advises that the group's web site has been transferred to another host <dialin.co.uk> which is run by

Paul Simons, G4CCZ, a keen 6m DXer. They have established the UKSMG Discussion Forum - see the panel. Ken Punshon, G4APJ (BL), caught a couple of auroras: on 28 October with GM4WJA (AB) worked, while on 16 November he worked GM4SFW* (IV) and GM3POI* (KW).

24 November was a great day for DX. Alan Doherty, GI4OTC (BT), made 50 QSOs, including HK4YH (FJ24) and PY0FF. The YV5AB beacon in FK50 was S9, accompanied by very loud European back scatter signals. He has placed his log and other data on his web site - see the panel. G4RGK copied the HC2FG beacon at S5 at 1300 and HK3YH was S7 working Europeans. The latter was also strong in South Wales, as reported by Gordon Wyatt, GW8ASA (CF), who worked 9 Ws later on.

John Hilton, GM1ZVJ (KY), was QRV for 30mins from 1435 on 24 November and worked VE1YX (FN74), K1WHS and AF1T (FN43), W1LP and WA1ECF (FN41) and W1EN (FN32), which brought four new grids and two more countries.

USEFUL WORLDWIDE WEB SITES

GB3AG	http://www.gb3ag.ukf.net
UKSMG	http://www.uksmg.org
OH5IY	http://www.sci.fi/~oh5iy
UKSMG Disc. Group	http://www.uksmg.org/discussion_page.htm
GI0OTC	http://www.gi0otc.demon.co.uk/home.htm

Mike Johnson, GU6AJE, reported his activity from mid-September. On the morning of 13 November there was Es to Italy and from 1300 the band opened up to South Africa, with ZS6 stations and beacons heard in KG33, 44 and 46. On 20th, 5N3CPR* (JJ25) and PP8KWA (FI96) were copied before lunch and the 5N was S1 on SSB at 1335.

2U0ARE worked VE1RG* (FN65) and VE1YX via F2, possibly with some auroral enhancement, on 16 November, but failed to complete with PY0FF* on 20th, perhaps because his call sign was unfamiliar to the Brazilian. Colin heard little of the trans-Atlantic DX on 24th, but did work VE1YX again.

GW7SMV also contacted VE1YX on 16 November, 5N3CPR on 20th and W1JJM and K1VV (FN41), W1RMA (FN65), with WA1OUB and K1WHS on 24th. Bob Mobile, WA1OUB, now has the new and very appropriate call sign K1SIX.

144MHz

John Lemay, G4ZTR, took part in the RSGB CW Contest on 5 December from JO01KW and made 200 QSOs in 42 grids and nine countries for a claimed score of 49,919 points. ODX was F6FHP/P (IN94) at 807km. Other QSOs over 600km were DL9NEK/P (JN59), F5HGO (JN05), DH9NBB, DF1IAZ and DF4IP (JN49), DK8SG (JN48) and DG5FEB/P (JO40).

GW7SMV reckons the Scandinavian tropo opening on 12 November was the best for years. Between 1721 and 2340 Jamie worked 16 stations in DL, OZ, PA and SM, in JO22, 31, 43-45, 55 and 64-66. Richard Marshall, G4ERP (GL), listened to the event while driving home and eventually worked SK7MW (JO65) from the car, a QRB of 1062km.

430MHz

G4APJ missed two of the Cumulatives sessions but was QRV on 10 December. However, conditions were disappointing, with only a few stations heard and even fewer worked. Ken worked G0GCI (JO01) again, at 331km. GW8ASA was out portable in IO81FP on 25 November for one of the sessions, but Gordon found both conditions and activity poor, only managing 34 QSOs. ODX were PA0GHB, PE1EWR and ON5NY.

DEADLINES

THAT'S IT FOR another month. The April copy deadline is **17 February** and for the May issue, which will include the first entries in the 2000 Annual Table, it is **23 March**. My telephone answering/fax machine is on 0208 763 9457 and the CompuServe ID is g3fpk ♦

SWL

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AS I WRITE THIS a few days before the Christmas holiday, I am pondering on all the things that need to be achieved in the next two days, including this column. With the 160m contests on the horizon again, it is timely to devote much of this column to last year's results.

CQ 160 CONTEST 1999

THE SECOND CQ 160m contest produced eight entries for the CW section (compared with nine in 1998) and 24 entries for the SSB section (compared with 16 in 1998), so the number of entries showed a welcome increase.

Several entrants remarked that it was their first attempt at a 160m contest, but all were pleasantly surprised at the activity.

As we approach the peak of the sunspot cycle, DX opportunities on 160m will decline. The first signs were there during the SSB contest, when the DX that was heard was only of mediocre quality, and many of the North American signals were quite weak and only audible with those listeners with 'better' 160m antennas.

CW SECTION

The log of Vilmantas Morkunas, LYR-794, was head and shoulders above the others. He logged 853 stations during the contest and found 86 multipliers. His score of 427,000 was outstanding and dwarfed the other entries. Jean-Jacques Yerganian, ONL383, was second; his excellent log consisted of 429 stations and 65 multipliers for a score of 152,000 points.

Vilmantas seems to have an ideal QTH for top band and boasts an impressive antenna array - a 42m long wire, a delta loop and an inverted-V. He also has the logging speed and accuracy required to do well in SWL contests. To give readers an idea of the speed of logging of the top two CW entrants, Jean-Jacques logged 90 stations in the first hour of the contest, but Vilmantas logged a staggering 115 stations in the first 60 minutes - an average of almost two loggings every minute. Neither operator used computer logging. There was a close fight for third and fourth places between Avi Suhanov, UA1-143-1, and John Goodrick, BRS44395.

SSB SECTION

There were 24 logs last year, compared with 16 in 1998, an increase of 50%, and there were a few new faces in the 1999 contest. The section was won yet again by Vilmantas Morkunas, LYR-794, by a very handsome margin, but the second, third and fourth places were closely fought. After close scrutiny, Mick Toms, BRS31976, captured second place from David Whitaker, BRS25429, by only 980 points. Both Mick and David found 70 multipliers, but Mick logged 46 more stations - 344 to 298. In third and fourth spots, not far behind, were Jean-Jacques Yerganian, ONL383, and Karl Drage, RS174461, with 108,824 and 104,715 points.

The first five stations in this section were all boosted by tremendous logging skills in the first hour. LYR-794 and ONL383 logged 85 stations in the first hour, BRS31976 logged 84, RS174461 logged 83 and BRS25429 logged 67. In the battle for the 'minor' placings, David, BRS25429, seemed to have the best DX conditions to the USA. Between 0451 and 0702 UTC on the Saturday morning, he logged 55 American stations. His relatively 'poor' start was balanced out by the number of DX points he scored. It is interesting to note that most of Vilmantas's morning DX was courtesy of I4JMY. He heard him work HK, P4, XE plus nine American states. While on the subject of logging practice, although there is no rule regarding 'sitting' on one particular station, one log included 63 consecutive stations worked by 3V8BB - I wonder how many multipliers that listener missed by sitting on one frequency rather than 'hunting'? Compared with the CW section, the SSB DX heard was rather more mundane, but a few listeners did hear E44/HA1AG.

It was a real pleasure to receive a log from Greg Hall, an SWL from Texas. He logged 193 different W/VE stations, including V47KP, XE1RCS and XE2SOZ. He heard 45 American states and four Canadian provinces. He heard no Europeans - probably because the American signals were so strong and plentiful, but his log did show that many American stations in the mid and far west were active. It was also interesting to note how much American activity there was between 0400 and 0700 UTC in the segment between 1.860 and 1.910kHz - where many European SWLs do not look.

Another DX log came in from Bob Chandler, VE3SRE. He heard 142 stations outside of Canada, but did not hear any European signals. He doesn't have space in his inner city location for a proper 160m transmitting antenna, so found it interesting to try the contest from an SWL perspective. He found it involved a slightly different set of skills and a different manner of operation, and also found that having to log the station worked as well as the station heard was an interesting challenge. It was easy to listen to 59+20dB signals, but was not able to log them until they worked someone; after a while, everyone had worked 'the big gun' signals and he found 20-minute waits for another station commonplace. Static crashes were very high but, despite that, he logged a number of stations in the western USA, including California, Arizona, Wyoming, Utah, Nevada, Idaho and Oregon. ♦

CQ 160M CONTESTS 1999 CHECKED SCORES

CW

POS	SWL No	QSOs	POINTS	MULT	SCORE
1	LYR-794	853	4972	86	427592
2	ONL383	429	2341	65	152165
3	BRS44395	317	1588	45	71460
4	UA1-143-1	244	1332	53	70596
5	BRS88921	53	336	53	17808
6	UA3-155-28	47	285	47	13395
7	F5NLX	25	119	13	1547
8	DE7ANE	12	45	6	270

SSB

POS	SWL No	QSOs	POINTS	MULT	SCORE
1	LYR-794	592	3251	76	247046
2	BRS31976	344	1855	70	129850
3	BRS25429	298	1841	70	128870
4	ONL383	326	1784	61	108824
5	RS174461	236	1611	65	104715
6	RS95258	203	1166	63	73458
7	BRS32525	175	1015	66	66990
8	RS171662	191	959	43	41237
9	RZ3EC	172	843	43	36249
10	VE3SRE	151	728	46	33488
11	SP-3003-LG	165	844	39	32916
12	F-15452	135	691	43	29713
13	F-15452	135	686	43	29498
14	BRS52543	134	652	38	24776
15	RS177448	119	593	39	23127
16	NL-290	121	609	35	21315
17	W5-SWL/Hall	196	401	51	20451
18	PA2164	99	547	36	19692
19	GW-5218	103	521	33	17193
20	RS102891	56	251	24	6024
21	F-11556	40	202	21	4242
22	BRS44395	31	149	22	3278
23	OE1OLB	13	70	10	700
24	OK1-32839	7	35	7	2457

RULES FOR THE CQ WORLD-WIDE 160 METRE DX CONTEST 2000

Short Wave Listeners around the world are invited to take part in the 2000 CQ World-Wide 160 metre DX Contests. The objective is to hear as many countries, US states and Canadian provinces as possible on the 160m band.

When: CW: 2200 UTC, 28 January to 1600 UTC, 30 January 2000. **SSB**: 2200 UTC, 25 February to 1600 UTC, 27 February 2000.

Sections: Single and multi-operator sections. Single operator stations MUST NOT use the Packet Cluster or Web Cluster during the contest.

Scoring: Stations from the SWL's own country count two points. Stations from other countries in the same continent as the SWL count five points. Stations from countries in other continents count 10 points.

Multiplier: Each DXCC country, American state and Canadian Province heard counts as a multiplier. Countries are those on the current DXCC list plus additional countries from the WAE list (IT9, GM Shetland Islands, etc).

Final Score: Total points multiplied by the total number of multipliers (DX countries, states and provinces).

Awards: Certificates will be awarded to the winner, second- and third-placed listener in both the SSB and CW sections, and to the leading listener in each DXCC country, provided the listener has at least 25% of the winner's score.

Logs: Logs should show date, time (UTC), station heard, SWLs RS(T) report of station heard [no report shall be less than 33 on SSB and 33(9) on CW and reports are not expected to be 59 or 59(9) in every case], station worked, multiplier, points. Any unmarked duplicate will lose 10 times the logging value. **Any log which the Contest Director considers is not within the spirit of the contest will be excluded from the listing of the results.** A Multiplier check list *must* be provided.

Entries: CW Logs *must* be postmarked no later than 29 February 2000. SSB logs *must* be postmarked no later than 28 March 2000.

Entries to CQ160 SWL Contest Director, Bob Treacher, BRS32525, 93 Elibank Road, Eltham, London SE9 1QJ, England. Please enclose 2 IRCs or $1 if you want a copy of the results booklet that will be prepared. Please indicate SSB or CW on the envelope.

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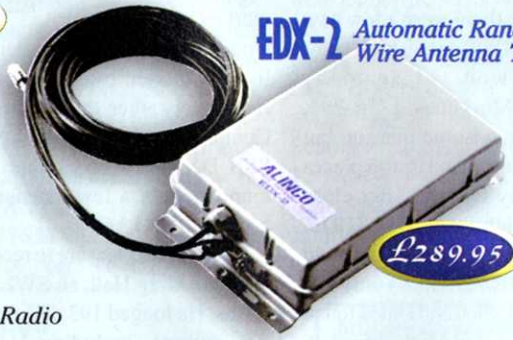

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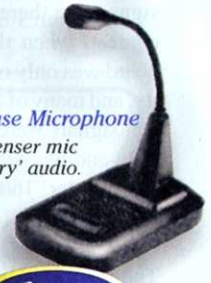

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THIS YEAR'S BATC Rally and Convention will be held at Bletchley Park on Sunday 7 May. Besides a hall for the usual traders there will be rooms for members to display and demonstrate their gear. If you wish to do so, please contact either myself or Tom Mitchell, G3LMX, both QTHR. There will be limited space in the outdoor flea market, so early booking is advised. Although the main museum will be closed, special tours of the Cryptology Trail will be provided.

TV REPEATER

THE REPUBLIC of Ireland has a TV repeater at last, in the form of EI4DVR. Set up by the RTE Amateur Radio Club it has been in operation since 27 November 1999. Located at Three Rock Mountain, County Dublin, QRA IO63VF, it is probably the highest ATV repeater site in the British Isles at 1500ft ASL! Initially in beacon mode, its output frequency is 1293MHz. With an EIRP of 10W from a trough reflector antenna, P5 signals have been reported as far away as Dundalk in County Louth. No details have been received regarding the azimuth polar diagram, so I shall be interested to receive reports of reception in England, Wales or Scotland. The input frequency is 1250MHz. The RTE TV Group also welcomes reports, which should be sent to Michael Wright, EI2DJ, Radio Centre RTE, Dublin 4.

CLOSER TO HOME

THE HOME counties ATV Club, which operates GB3HV, has sent me a copy of their journal '*Line Out*' published by their secretary John, G8MNY; it runs to some five pages, and only a summary is possible here . Their AGM was on 25 January at their usual haunt, The Binfield Club, Terrance Road , Binfield, on the A329/B3024 near the M4 junction 10. Talk in was on 144.75MHz (the ATV talkback frequency). As usual, it was followed by a Junk Sale and collection of subs from old and new members. From personal experience I know this to be one of the most active and knowledgeable specialist ATV clubs. It has a wide geographical membership, this being due, in part, to the proximity of various fast food establishments in the vicinity. Newcomers to the mode are welcomed and actively encouraged by site visits to assist with antenna placement by their Aerial Test Gang, Phil, G6IQM, and Barry, G6ZHC.

Tom, G3LMX, with the GB3TG 10GHz slot aerials.

At general meetings, members' gear is checked and aligned on request. Technical officer Mike, G8LES, has checked GB3HV for Y2k compliance and his gang have cleared the weeds from the site.

Newsletters from all the other ATV groups will be most welcome. Is anyone working on amateur digital TV yet? Who is active on 70cm? ♦

The subject of ATV (including repeaters) is comprehensively covered in the *Radio Communication Handbook*, 7th edition, pp20.2 – 20.9. See RSGB Shop, page 92.

Mike, G8LES, demonstrating ATV at a Sandown Model Rally.

DATA

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WELCOME FROM a new columnist! From this issue I shall be taking over the reins of the *Data* column and, consequently, I should like to devote this month to laying the groundwork for the future.

INTRODUCTION

FIRST OF ALL, I had better introduce myself. The name and callsign may be familiar to a number of readers, from various published articles covering matters from LF to microwaves. I have long had an interest in the field of RF data communications, although this has always been in the techniques and science of this mode rather than in 'using and doing'. Having operated a bit of RTTY on VHF when mechanical teleprinters were the norm, then moving on to a simple home computer, I never followed the trend onto packet radio when this became popular in the early 1980's. Instead, I diverted to other routes of interest at the time. When the 73 kHz band came along three years ago, I saw an opportunity for novel and exciting data transmission techniques and my interest was further kindled on meeting-up again via e-mail with an old friend from the past Charles Brain, G4GUO, and Peter Martinez, G3PLX, both of whom were already heavily involved with modern data communications techniques and who knew about (what seemed to me at the time) the black art of Digital Signal Processing (DSP). Interest was further rekindled, and so here we are.

COVERAGE

IN THE PAST, this column has concentrated principally on packet radio, which saw a huge growth in popularity over a period of about 15 years. Other data modes in use by the amateur community over this period were predominantly radio teletype (RTTY), and its subsequent error-correcting variant, AMTOR, both aimed at station-to-station, real time contacts.

Packet radio was generally used as a store-and-forward system, with bulletin board access being arguably the most common usage of this mode. Packet was predominantly used at VHF at a data rate of 1200 bits per second (b/s or baud), or occasionally at HF at around 200b/s, both speeds painfully slow compared with today's expectations from the Internet of typically 24 - 56kb/s.

A few efficient modulation techniques were developed to take HF data communications towards the speeds typical at VHF, such as Clover and Pactor. The waveforms employed were mainly developed commercially and users had to purchase stand-alone modems in order to use them. Such modems are quite expensive and the amateur take-up has not been very rapid.

MODERN TRENDS

WITH THE huge growth over recent years of low-cost high-technology radio communications techniques, there has never been a better time for amateurs to make use of some of the technology now available. DSP hardware in the form of low-cost evaluation modules is now available for less than £100 having enough processing power to make feasible very efficient and advanced modems. The Motorola 56002 EVM is probably the most popular of these and is the easiest to programme, but the Sharc Easilite (using floating point maths) is gaining in popularity. I hope to cover these in more detail in a later column.

Even the modern home computer, equipped with a sound card and running Windows®, is capable of handling some quite complex and efficient modulation formats. The capability of this basic system can be further enhanced if a different Operating System such as Linux is running on the computer. You don't even need the latest in home-computer technology either; a 486 machine is capable of running much of the freely-available software and these machines can frequently be obtained as scrap!

THINGS TO COME

IN THE forthcoming columns, I intend to provide an overview of the data communications techniques currently available, along with the work being done by various individuals on new techniques. To whet the appetite and explain some of the acronyms abundant in this field, here is a short list of those that spring to mind immediately, and which will be covered over the next year or so.

Frequency Shift Keying (FSK) systems such as RTTY, AMTOR and packet.

Phase Shift Keying (PSK) modulations, such as 'Coherent' by VE2IQ, and PSK31.

Parallel-tone systems such as digital voice by G4GUO, and MT63 by SP9VRC.

Minimum Shift Keying (MSK) and Continuous Phase Modulation (CPM) - an up-and-coming area.

Quadrature Amplitude Modulation (QAM).

Experimental High Speed HF communication techniques.

Hellschreiber (and 'fuzzy' modes generally) and SLOWCW - designed for human interpretation rather than strictly as data modes.

Data Coding and Error Correction.

Data Communications protocols - why and how.

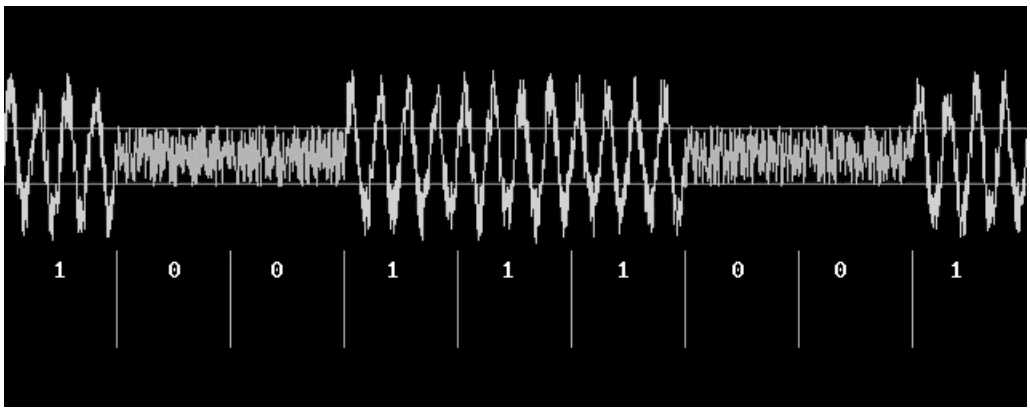
I will also be looking for news and views from users, together with any information readers may have on happenings in the amateur datacomms world.

FUNDAMENTALS

TO BEGIN, we'll review data communications from the beginning. Data consists of binary information, usually referred to as *ones* and *zeroes* (1 and 0). To send these over a radio link, we need to modulate the RF carrier in such a way that the receiver can differentiate between a *one* and a *zero* being sent. The easiest and most obvious way is to switch a carrier on for a *one* and off for a *zero*. This does actually work (in the right circumstances) and is known as amplitude shift keying, or ASK.

The problem with this process is knowing where to make the decision between *zero* and *one*. When the whole signal is varying in amplitude (fading) this slicing- or decision-level, usually placed half way between zero and the maximum received amplitude, will have to move correspondingly. Automatic gain control (AGC) can be used to track the amplitude, but the AGC time-constant will have to match the fading on the signal and, in addition, we need to know the number of *ones* and *zeros* being transmitted, as this will affect the average signal strength. Also, a *zero* will consist only of noise which, in turn, may consist of large random spikes that could be misinterpreted as *ones*. The photograph shows a typical ASK signal corrupted with noise and the optimum slicing level for best *zero* / *one* decoding.

The solution to this problem is the use of Frequency Shift Keying (FSK), which will be covered next month. ♦



Amplitude Shift Keyed carrier with added noise

IARU

TIM HUGHES, G3GVV
10 Farm Lane, Tonbridge TN10 3DG

THE PROFESSIONAL and amateur worlds of telecommunications meet almost continuously at conferences, with the aims of progressing technically and administratively. On many occasions, the amateur service is represented at such meetings; often, developments in the professional area are of interest and may have a bearing on our activities.

INTERNATIONAL TELECOMMUNICATION UNION (ITU).

THUS, AT A recent meeting in Helsinki of a group of radio experts, a comprehensive set of terrestrial and satellite radio interface specifications was agreed. These specifications will provide wireless multimedia service capabilities, harnessing the power of the Internet for e-commerce while on the move, instant access to personal or business information, and entertainment services. The economic benefits of this new global standard will be felt by all ITU Member States as wireless access provides a cost-effective solution to the 'telecommunications gap' between developing states. "It is particularly important to narrow this gap as we move into the 21st century, where timely access to information will be essential for economic progress," said Mr Yoshio Utsumi, Secretary-General, at the close of the meeting.

The 9th World Telecommunications Exhibition will be held in Geneva in 2003. This event, organised for the first time in 1971, has been repeated every four years. It is recognised as the 'Telecommunications Olympics', and is attended by a wide range of bodies from service providers and operators to governments and leaders in manufacturing and industry.

INTERNATIONAL AMATEUR RADIO UNION (IARU)

AT ITS LATEST meeting, under the chairmanship of President Larry Price, W4RA, the Administrative Council of IARU agreed twenty actions, including reducing the possibility of the inappropriate use of the Amateur Satellite Service. An information paper for prospective owners and operators of amateur satellites was adopted. The paper is a joint project of the IARU and AMSAT and is intended to ensure that the operation of satellites in the Amateur Satellite Service is consistent with the objectives of the Service. It will be placed on the IARU web site, www.iaru.org

Responding to growing threats of interference from broadband telecommunications over unshielded power and telephone lines, the Council affirmed the seriousness of the threat and resolved that the IARU and member societies must develop appropriate responses. The IARU will develop an input paper to working parties of ITU-R Study Group 1, which is studying the acceptable levels of radiation from such systems so as not to impair the performance of radiocommunication systems, measurement techniques, and techniques which may be used to minimise the effects of such radiation.

Following up the previous work of the Future of the Amateur Service Committee (FASC), the Council prepared a draft Recommendation defining the operational and technical qualifications for persons wishing to operate an amateur station. If a review of Article S25 of the international Radio Regulations is put on the agenda for the next World Radiocommunication Conference after WRC-2000, the draft Recommendation will form the basis of a submission to the appropriate ITU Study Group.

An updated Action Plan for the development of support for Amateur Radio in Africa was reviewed and approved. The Plan includes several courses in Amateur Radio Administration, to be taught in Africa under the joint sponsorship of the ITU and IARU.

Tafa Diop, 6W1KI, Vice-President of IARU Region1.

THE IARU positions on WRC-2000 agenda items were reviewed and approved. These form the basis for instructions to the IARU delegation to WRC-2000. A report was received on the status of preparations for the eventual harmonisation of the 7MHz allocation between amateurs and broadcasters. The item is on the preliminary agenda for WRC-2003, but this agenda is expected to be extensively revised at WRC-2000.

The present and anticipated future requirements for spectrum allocations to the Amateur and Amateur Satellite Services were reviewed, updated and approved, with special emphasis on the frequencies above 71GHz.

The members of the Administrative Council are: IARU President Larry Price, W4RA; Vice President David Wardlaw, VK3ADW; Secretary David Sumner, K1ZZ; Region 1 representatives Lou van de Nadort, PA0LOU, and Tim Hughes, G3GVV; Region 2 representatives Tom Atkins, VE3CDM, and Eduardo Estrada, HC2EE; Region 3 representatives Fred Johnson, ZL2AMJ, and Sangat Singh, 9M2SS. Technical assistance was provided by Paul Rinaldo, W4RI. Additional regional representatives invited to be present were Hans Ehlers, DF5UG, and for part of the meeting, Hans van de Groenendaal, ZS5AKV. Thus all six continents were represented.

S25 - LATEST

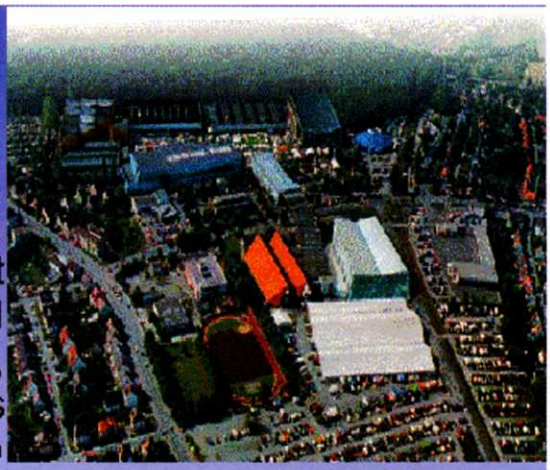
READERS WILL be aware that Document S25 in the Radio Regulations defines the basis on which the Amateur Service is structured and implemented by individual administrations. This definition has been debated by all three IARU Regions at their individual triennial conferences over the past four years, and an agreed proposal formulated.

CEPT has had the revision of S25 on their Agenda for several months now. The initial discussion was delegated to a working group to review proposals from administrations and the IARU. This working group generously agreed to leave the opening debate until after the September 1999 Region 1 Conference, to enable the matter to be concluded within IARU.

The first meeting of this working group, with S25 on the agenda, took place in London in the early part of November. It soon became apparent that the proposals outlined by the IARU were more radical than the majority of administrations proposed and expected. At the end of the discussion it was agreed that the matter be placed on the Agenda for the next CEPT-RR meeting, where more administrations will be present. ♦

Friedrichshafen

Ham Radio 2000



Take this opportunity to visit the largest European amateur radio exhibition, held annually in Friedrichshafen, on the Bodensee, Germany. The 8th Friedrichshafen trip departs Barnsley on Sunday 18th June 2000 picking up en-route to Dover and arrives back in England on Monday morning 26th June. We will travel through Belgium, Luxembourg, France, and Germany's Black Forest. We stay in Lindau, on the Bodensee, From there, our coach will take us to the rally (12km) on Thu, Fri & Sat. There will be plenty of time to explore the surrounding areas of Germany, Austria and Switzerland. For further details contact Ernie Bailey G4LUE. 8 Hild Avenue, Cudworth, Barnsley, South Yorkshire, S72 8RN. Tel 01226-716339 Mobile 07787-546515.

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ALTHOUGH the prospect of Power Line Telecommunications (PLT) has receded, it is not the only type of data communications using RF transmission over unscreened cables. There are further trials of ADSL on telephone lines and VDSL is being developed (*EMC*, December 1999). Now, home phoneline networking products are on sale in the UK (see below). The EMC Committee is keeping a close watch on all these systems.

NEIGHBOURS ON TV?

AS MENTIONED in the *News* section (p9) of *RadCom* for December 1999, the EMC Committee has been approached by a television company researcher who was preparing a programme about disputes between neighbours. We were very concerned that if the programme featured an RSGB member's EMC problems, it could be a public relations disaster for amateur radio in the UK.

The researcher phoned me on several occasions, asking for information about interference in relation to amateur radio. The case had already been featured in a local newspaper, where the main story was about breakthrough on the sound system in a church. The newspaper had also reported that 34 neighbours had complained about alleged interference.

We found out that a former neighbour of the radio amateur had delivered a circular letter to every house in several streets, asking residents to return a slip if they had any interference problems or if they were opposed to the amateur's aerial mast on planning grounds (the mast already had planning permission, however).

We also found out that, on many of the replies, it was not clear whether the reply related to planning or interference. Some replies mentioned specific problems, but the cause had not been established. One resident reported that a car alarm was triggered; someone else reported a house alarm that sounded. Both these incidents occurred late at night when the radio amateur was asleep in bed!

The researcher told me about various alleged problems including TVI, security lights and audio breakthrough on telephones and computer speakers. I said that the EMC Committee was not prepared to be interviewed or to make any comment on any specific case without full details of the make, model and location of the affected equipment. We would also need to observe tests to prove that the alleged problem actually occurs when the radio amateur transmits and would like to inspect the affected equipment or installation for any obvious defects.

The main complainant was a former neighbour who had now moved away, so it was clearly not possible to establish exactly what equipment was affected and what could have been done about it. Neither did we find out how many of the other interference reports were actually related to amateur radio.

I explained to the TV researcher about the UK EMC Regulations that require all electronic equipment made after 1996 to have a certain amount of immunity to signals from nearby radio transmitters. I also explained that security lights, telephones and PC speakers are all examples of products that can still be tested to a very weak standard until newer standards become compulsory. It seemed difficult to convince him, however.

Multi-media active speakers for computers, showing a clip-on ferrite core and a ferrite ring fitted to the power cables.

The only problem where we obtained full details concerned the breakthrough in the nearby church, and we got this information by our own initiative. The problem occurred when the radio amateur's Sunday morning 80m 'sked' coincided with the church service. The congregation included two other radio amateurs, one of whom acted as a contact point between the EMC Committee and the church.

Construction of the microphone RF filter.

Only one microphone input on the sound system was affected and we managed to solve the problem by 'mail order' with a plug-in filter that I constructed on our member's behalf (see above). This was supplied on loan to the church, as a gesture of goodwill, but not as an admission of liability.

The radio amateur whose transmissions were causing breakthrough was elderly and was not prepared to appear on the TV programme. As we were not given details of any specific equipment that was affected in neighbours' houses, the EMC Committee was not prepared to comment on such cases on the programme. Representatives of the church did not wish to be involved either, and, in view of the name of the programme, this was not surprising.

Hilary Claytonsmith, G4JKS, then wrote to the television company in her capacity as 1999 RSGB President. She reminded the programme makers that any programme about this case should present a balanced view and that if it did not, we would refer the matter to the Broadcasting Standards Commission. The last we heard on this matter was that the television company had decided not to feature this case in their next series.

ADVICE TO MEMBERS

The case described above is rather complicated, so it is not possible to draw any specific conclusions, but it does show how important it is to keep on the right side of your neighbours if you possibly can.

Now that we have the new M5 licence, many amateurs will be trying HF for the first time. If this includes you, you would be well advised to look at the EMC Committee's advice on avoiding EMC problems, such as the EMC pages in the *RSGB Yearbook 2000* or the *RSGB Guide to EMC* (see RSGB Shop, pp92-3).

If you live in a typical suburban location with houses all round, then running high power on HF will probably mean that you need to assist neighbours to overcome breakthrough problems. The best approach is to start with low power, and gradually to increase it over a period of weeks. This will enable any problems to be dealt with diplomatically, one at a time.

If you live in a location such as a block of flats, where your choice of transmitting aerial is very limited, don't forget that there are other modes of transmission that require much less power than SSB and which are also more EMC-friendly. As well as CW, there are new computer-generated data modes. Some of these rival CW in their ability to get through on relatively low power.

If you do get a report of breakthrough, the first thing to establish is whether it is actually related to your transmissions. If it is, try to see the neighbour's point of view, which is usually that if you didn't transmit there wouldn't be a problem. The EMC Committee's advice is to be polite and helpful. Advise the neighbour how to solve the problem and offer to help, even if some neighbours may not be polite and may reject your offer. If you carry on regardless at maxi-

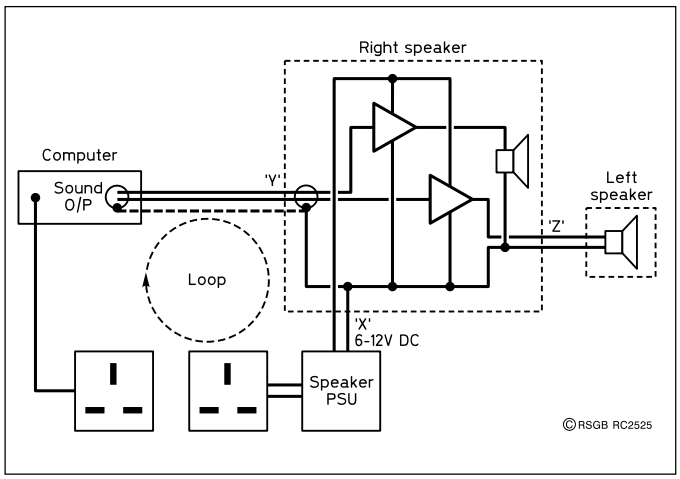

Fig 1: Multi-media speakers connected to a computer.

mum power, you could attract some unwanted publicity!

There are 27 EMC Co-ordinators (see the *RSGB Yearbook 2000*, p90) who can provide members with telephone advice on the majority of cases. If things start to get out of hand or if the press, TV or local council get involved, please contact the EMC Committee Chairman, Robin Page-Jones, G3JWI, immediately.

PC SPEAKERS

MOST COMPUTERS sold nowadays come with sound systems, some of them quite sophisticated. These normally use 'active loudspeakers' such as those shown in the photo below left. These have a stereo amplifier built into one of the speakers.

Strange as it may seem, multi-media speakers are not classed as audio equipment, but can be EMC tested as Information Technology Equipment (ITE). At the moment, ITE can still be tested to the 1992 edition of the Generic Immunity Standard, EN 50082-1:1992 (see also the December 1999 *EMC* column). This standard allows equipment to be tested with an *unmodulated* carrier which, for audio equipment, is a worthless test.

Some manufacturers appear to be taking full advantage of this loophole and are selling multi-media active speakers with poor RF immunity. Manufacturers may claim that they haven't had any complaints, but there are hundreds of different brands, mostly made in the Far East, so it can be very difficult finding out to whom any complaint should be made. Meanwhile, there is opposition to compulsory immunity standards in the ITE industry. As reported in the December 1998 *EMC* column, Bill Horan of Intel Corp. (UK) has stated, "From the consumer's point of view, immunity requirements add cost to PCs but little or no tangible benefit."

Fig 1 shows the set-up of a typical multi-media speaker system. Some speakers are powered from an external DC power unit while others have a mains power supply unit built in.

The sound sockets at the back of a computer nearly always include a headphone output that can drive headphones or passive speakers directly, although at relatively low power. There may also be a separate line output for driving active speakers. A useful test when tackling an RF breakthrough problem is to unplug the speakers and plug headphones into the headphone output at the back of the computer. Usually, there is no breakthrough with headphones connected, which indicates that the RF is getting into the active speakers themselves and not into the sound card in the computer.

The most common problem at HF seems to be that the power cable to the speakers and the audio input cable form a loop that allows RF currents to circulate via the inter-winding capacitance of the mains transformer. The cure is to break the loop at RF, by winding the speaker's power cable through a ferrite ring on a clip-on ferrite core at point X in Fig 1. For HF, use 12 turns on an RSGB ferrite ring or 6 turns on a Maplin BZ34M clip-on core. If this does not solve the problem, try another ring or clip-on core at points Y and Z in Fig 1. The clip-on core has the advantage that it only shortens the cable by about 50cm, but it is important to ensure that the two halves of the core can close together properly *with no air gap.*

In a recent case, a member received a complaint from his neighbour of HF breakthrough on a pair of 'Arowana' model DC691 computer speakers. This model is similar to the type shown on the left in the photo, but the DC691 has a built-in mains power supply. As the Arowana speakers were normally left on all the time, they functioned 24 hours a day as broadband RF detectors! Fortunately, a ferrite ring on the power cable solved the problem.

Amateur transmissions are not the only radio signals that can show up poor immunity in multi-media speakers. There could also be some unwanted noises when TETRA (Terrestrial Trunked Radio) mobile transmitters come into widespread use by emergency services, public utilities, motoring organisations, taxis, etc. Vehicle-mounted TETRA mobiles transmit up to 25W at around 400MHz, with a carrier pulse-modulated at 18Hz. One of these driving past could make a loud buzz on some computer speakers.

MICROPHONE FILTER

THE PHOTO above left and **Fig 2** show a microphone filter that was used to cure 3.5MHz breakthrough in a church sound system. This includes a low-pass filter and a ferrite ring choke to reduce currents on the screen of the cable.

This is designed for a mono 600Ω balanced microphone input, but the same circuit could also be used for a stereo unbalanced line input if the source impedance is low, such as 600Ω or less. It is not suitable for use in a loudspeaker circuit or in a high impedance audio circuit such as 50kΩ, because the 4.7nF capacitors would introduce severe treble cut.

HOME NETWORKS

HOME PHONELINE networks were first mentioned in *EMC* in December 1998. These networks allow two or more home computers to be linked using existing indoor telephone wiring, instead of installing proper network cables. This allows users to share printers or modems, transfer files or play multi-player games.

The UK is being targeted as the first country outside the USA for this product. Computer home phoneline networking cards such as the Diamond 'Home Free' phone line 1Mbit/s range are now on sale in the UK, with a CE mark and BABT approval. These use RF transmission on the indoor home telephone wiring at frequencies of 5.5 - 9.5MHz, which goes right across the 40m amateur band. Such networks may not radiate much if the phone wiring is well balanced at RF and no phones or answering machines are connected, but the wiring can radiate if the RF balance is not good.

Thanks to the member who sent me an AMD CD-ROM recently. This contained data sheets on AMD chips for home phoneline networking and also included design information and details of home telephone wiring in various countries, including the UK. There is a diagram showing the bell-ringing capacitor in the BT master socket, but there is no mention of what effect this has at RF. As this capacitor connects the 'B' line and the bell wire in parallel, UK home phone wiring is an unbalanced 'three-wire pair' at RF!

The Home Phoneline Networking Alliance (www.HomePNA.org) issued a second generation specification for 10Mbit/s cards on 1 December 1999. We understand that this includes a notch for the 40m amateur band. ♦

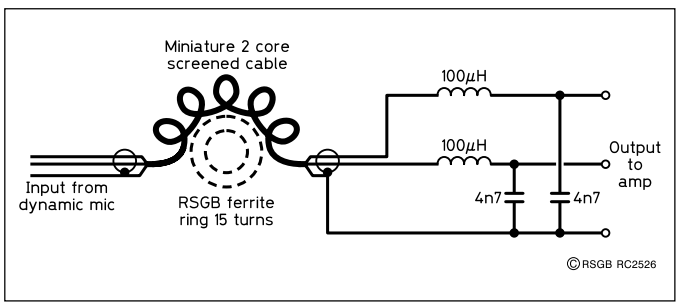

Fig 2: Circuit diagram of a microphone RF filter for HF.

CONTEST

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THE AFTERMATH of the two CQWW contests always brings lots of comments about contests and band planning. This year was no exception, indeed, the departures from the recognised band plans seemed deeper than ever this year.

David, G3VFP, wrote, "Never in all the years of being licensed have I heard such bad manners and lack of discipline on the HF bands. Especially on 40m where SSB stations were working right down to 7.015MHz, an absolute disgrace. On 20m the SSTV frequencies were completely unusable, as was the DX window on 80m.

"I really think it is high time that specific frequencies are allocated for these contests, and an absolute condition of entry should be that no-one operates beyond the recognised segments. An even better idea would be to scrap contests altogether! Of course I realise that amateur radio is a diverse hobby, and only wish that people would operate in a manner that does not cause a nuisance to non-contest users. It really is about respect for other people, and if you take the way in which a lot of the guys operate, it reflects on themselves and on their view of the world. It is a pity that good manners do not prevail in amateur radio any more."

A pity indeed. Even as a contest enthusiast, I have great sympathy for David's views - apart from the bit about scrapping them altogether, perhaps!

I was discussing the issue with one of the leading lights in contest circles in North America. Their group had attracted some criticism during the CQWW SSB contest by operating around 28.240MHz - slap bang, as I pointed out, in the middle of the beacon band! The riposte was that, "It's the middle of a world-wide contest, for goodness sake! What do you need a beacon for?" Another commonly-heard rebuttal is that these incursions only take place on one or two weekends a year.

So what's the solution? It's certainly not clear to me. Respect for other people seems the key, but that is not fashionable in all circles, unfortunately. Mandatory band planning? This is a hot topic at the moment and the types of behaviour we have seen might provide an argument for making adherence to the band plan part of the licence. But do we really want to legislate for everything? Perhaps greater emphasis is needed in the contest rules about adhering to the recognised contest segments? Another interesting letter this month was from Alan, M0AVN who, as a relatively-recent licensee, is interested in CW contesting. He finds the speeds prevalent during some of the contests off-putting and feels that newcomers to contesting may be put off with the "flashy, fast stuff blowing them away".

Well-known contester Dave Goodwin, VE2ZP, operates the 28MHz position during CQWW CW, 1999 from the VE3EJ superstation.

Certainly it is true that the 12WPM test pass will not prepare you for many contests. However, the RSGB has been careful to provide some contests aimed specifically at beginners. The Slow Speed Cumulative events on HF are ideal events to cut one's contesting teeth. Here, high-speed CW operation is positively discouraged! I also found that some of the VHF CW contests were a great place to learn. The average CW speed of a contest QSO on 144MHz, for example, is a lot lower. Why not get together with a couple of like-minded club members and go to the nearest hilltop for the next 144MHz CW contest? You will learn some new skills and, hopefully, have a lot of fun into the bargain. Finally, please do bear in mind that most CW contesters are very mindful of beginners and will, when you call them, be more than happy to slow down for you.

A quick reminder. Please do not send your contest entries to me! One or two entries have found their way to me, either by e-mail or post. I am not involved in the adjudication procedure, so please check the rules for the contest and make sure that you send your hard-won logs to the right place. Sending them to the wrong place could mean that they do not reach the contests committee in time for the deadline.

Finally, some important corrections that I've just received from the VHF Contests Committee.

CALENDAR CORRECTIONS

THE MAY 144MHz contest should be listed as 20/21 May 2000 and the 1st 144MHz Backpacker on 21 May.

RESULTS CORRECTIONS

VHF NFD

GM4WLL should be shown in 11th place in the Low Power section on 432MHz, score 7387 points. Positions in the overall table are unchanged. GM4WLL/MM0BQI have been awarded the Scottish Trophy.

50MHz trophy

G6FQZ should have been listed as winner in section SS, instead of being entered in section S.

432MHz Fixed, August 1999

AGAIN THERE was nothing special in the way of conditions to report for this contest, with most entrants reporting flat-to-poor propagation throughout. The proceedings were enlivened by the big signal from Richard Thoen, PE1OUP, who was trying out a new PA and antenna combination. His efforts netted a fine second place and leading overseas entry in the single operator group, with Richard Baker, GD8EXI, taking the top position with the highest overall score and giving many entrants their best DX in the process.

There were several portable stations out for this event and, as part of the rule changes for 2000, all the contests which are currently designated Fixed contests will include an Open section. Most of the entries were e-mailed, which reflects an increasing trend these days, but if you don't have computer logging facilities please send a paper entry if you can – all logs are welcome. Congratulations to all of those receiving certificates and see you again this year.

Steve Redfern, G4AEQ

432 MHz Fixed, August 1999

Multi Operator

Pos	Call	QSOs	Points	Mults	Total	Loc	Best DX	km	Power	Ant
1	G8CUL*	27	3409	34	115906	IO91JO	PE1OUP	375	40	21Y
2	G1WAC*	14	1511	22	33242	IO92BJ	GD8EXI	268	25	21Y

Single Operator

Pos	Call	QSOs	Points	Mults	Total	Loc	Best DX	km	Power	Ant
1	GD8EXI*	31	10380	38	394440	IO74PC	PE1OUP	639	400	38Y
2	PE1OUP*	38	9965	37	368705	JO22CA	DL9MCC	696	400	2x21Y
3	G3RIR*	37	4718	42	198156	IO92JL	PE1OUP	372	25	20Y
4	G3MEH	36	4918	40	196720	IO91QS	DL8OBU	726	150	2x19Y
5	G0GCI	22	4196	30	125880	JO01ED	GD8EXI	475	120	2x21Y
6	G4GFI	22	3462	36	124632	IO91VH	GD8EXI	434	30	19Y
7	G4JTJ	26	3393	32	108576	IO92SD	DF2VJ	607	80	21Y
8	PE1EWR	21	4703	23	108169	JO11SL	M1BQY/P	394	13	2x21Y
9	G4APJ	18	3693	27	99711	IO83UP	G0GCI	331	25	19Y
10	G0DVJ	24	3095	28	86660	JO01MX	GD8EXI	451	50	5Y
11	G7ULL	25	2742	30	82260	JO01AK	GD8EXI	436	20	16Y
12	G3FIJ	22	2618	28	73304	JO01KV	GD8EXI	447	10	21Y
13	G4CXT	16	2435	23	56005	JO02PB	GD8EXI	460	20	19Y
14	G1KHX	15	2336	23	53728	IO81MI	G4DEZ	255	120	2x19Y
15	2E1GUA	13	2037	21	42777	JO01FS	GD8EXI	432	10	23Y
16	M0COP	5	546	10	5460	IO92BK	GD8EXI	264	15	17Y

* = Certificate winner Checklogs with thanks:- M1BQY/P, G4AEQ

70MHz Trophy 1999

THE POPULARITY of 4m contests continues, with nearly 150 stations active during the 4m Trophy. Most people had some sort of bad weather, either on the night before the contest or on the day itself.

Despite a lower average score than some of the more remote stations, a combination of a high number of both QSOs and multipliers put The Northern Lights Contest Group, GD0EMG, at the top of the Open Section and they are awarded the VHF Manager's Trophy. A similar strategy gave Steve Redfern, G4AEQ, a commanding lead in the Single Operator Fixed Section. Brian Coleman, G4NNS, wins the 25W/single-antenna certificate.

Pete Lindsay, G4CLA

70MHz Trophy 1999

Single Operator Fixed

Pos	Call	Loc.	QSO	Points	Mul	Total	Best DX	km	Power	Ant
1*	G4AEQ	IO93PE	77	15059	60	903,540	GM4WJA	507	160	2x6,3
2*	G3XDY	JO02OB	46	10937	42	459,354	GM4CWH/P	589	150	6
3	G8ECI	JO03AK	45	10896	41	446,736	G4YPC/P	510	130	5
4	G3NKS	IO81XU	54	9718	44	427,592	GM4CWH/P	562	100	6
5	G3MEH	IO91QS	57	9007	47	423,329	GM4CWH/P	584	80	6
6	G3UKV	IO82RR	50	9694	43	416,842	GM4CWH/P	463	100	5
7	G0GCI	JO01ED	36	7033	33	232,089	GM4SIV/P	615	100	4
8	G1KHX	IO81MI	33	5863	29	170,027	GM4SIV/P	476	90	5
9	GM4AFF	IO86ST	25	7263	22	159,786	G4ADV/P	733	150	8
10	G4AFJ	IO92HO	30	5183	30	155,490	GM4CWH/P	483	50	8
11*	G4NNS	IO91FF	23	4508	24	108,192	GM4SIV/P	531	25	3
12	G4JTJ	IO92SD	25	3734	27	100,818	GM4SIV/P	493	40	6
13	GM4DIJ	IO85IW	17	2257	17	38,369	G3NKS	461	50	4

Open

Pos	Call	Loc.	QSO	Points	Mul	Total	Best DX	km	Power	Ant
1*	GD0EMG	IO74QD	90	26388	70	1,847,160	G0GCI	474	160	2x5 2x8
2*	GX4ZAP/P	IO85UI	75	24821	63	1,563,723	G4YPC/P	613	160	2x6
3	GM4SIV/P	IO75DH	63	22910	54	1,237,140	G0GCI	615	160	9
4	GI3PDN/P	IO74AI	62	18603	48	892,944	G0GCI	555	160	6
5	G3TCU/P	IO91SF	72	15020	58	871,160	GM4CWH/P	645	150	2x6
6	GW4MGR/P	IO83JA	63	11941	53	632,873	GM4CWH/P	433	75	4
7	G0VHF/P	JO01GN	64	11726	51	598,026	GM4CWH/P	626	150	10
8	G4YPC/P	IO70ID	40	13200	39	514,800	GM4CWH/P	772	150	8
9	G3LVP/P	IO81XW	70	10473	47	492,231	GM4CWH/P	552		
10	GM4CWH/P	IO86RV	42	12395	36	446,220	G4ADV/P	741	150	10
11	GM4UYZ/P	IO85RU	41	11368	39	443,352	G4YPC/P	661	90	8
12	G4ADV/P	IO70LJ	41	10776	34	366,384	GM4CWH/P	741	60	2x7
13	G4SJH/P	IO91QF	45	8956	38	340,328	GM4CWH/P	642	50	6
14	G3BPM/P	IO80OV	45	8027	36	288,972	GI3PDN/P	492	50	8
15	GM4WLL/P	IO85NR	30	7185	28	201,180	G3TCU/P	525	90	6
16	G0JLF/P	IO80CN	27	5596	20	111,920	GM4SIV/P	544	25	4
17	G0GZI/P	JO02FU	9	2288	12	27,456	GM4SIV/P	486	20	1
18	G4WVD/P	IO70KA	9	2077	11	22,847	GD0EMG	460	30	3

* = Certificate winners Checklog from G4FEV.

5th 144MHz Backpacker 1999

RADIO CONDITIONS were reported as 'above average' by most entrants, with some good DX workable by most of the stations. The weather was also hot and sunny over most of the country.

The standard of logging was not as good as in previous backpacker contests, and entrants lost an average of 7% of their score through errors.

This was the final 144MHz Backpacker contest of the millennium. Thank you to all of the entrants who have supported this series of contests.

Congratulations to the winners and runners-up in each section, you will all receive certificates.

Ian Pawson, G0FCT

5th 144MHz Backpacker 1999

Multi Operator 10W

Pos	Group Name	Call sign	Loc	QSO	Multi	Points	Total	Best DX	km	Power	Ant
1*	One Man & His Dog CG	G8NWM/P	IO92TR	68	37	18810	695970	F6KIM/P	648	10	2x10EL
2*	Barpackers CG	M1BAR/P	IO83XG	55	26	8462	220012	TM6P	579	10	9EL

Multi Operator 3W

Pos	Group Name	Call sign	Loc	QSO	Multi	Points	Total	Best DX	km	Power	Ant
1*	Charlie & Sue Jordan	GW0PZO/P	IO83ID	87	33	15025	495825	TM6P	629	2.5	5Q
2*		GW5NF/P	IO81PR	59	32	13648	436736	DK0BN	762	2.5	9EL
3	Wythall CG	G1WAC/P	IO82XJ	48	26	7905	205530	GM4ZUK/P	506	2.5	13EL
4		G0HDV/P	IO93GD	55	25	7544	188600	DL2KK	607	3	13EL
5	Stockport RS	G8SRS/P	IO83XH	42	25	6622	165550	TM6P	582	2.5	9EL
6	Oldham RC	G1ORC/P	IO83XN	50	18	4429	79722	GM4ZUK/P	377	2.5	17EL

Single Operator 10W

Pos	Call sign	Loc	QSO	Multi	Points	Total	Best DX	km	Power	Ant
1*	GW8ZRE/P	IO83JF	110	36	22573	812628	DL2KK	719	10	7ZL
2*	G0PQF/P	JO01AX	56	33	12743	420519	DK0BN	586	10	9EL
3	G0GRI/P	IO81WG	66	31	12922	400582	GM4ZUK/P	631	10	7ZL
4	G4EDR/P	IO94RD	37	27	9305	251235	TM2F	515	10	4Q
5	M0BAO/P	IO80LV	60	22	10170	223740	GM4ZUK/P	672	10	8EL
6	G8ORG/P	IO83VC	38	26	7329	190554	TM6P	765	10	8EL
7	G0BXT/P	IO80FN	15	17	4427	75259	M0V	472	10	8EL
8	G4WVD/P	IO70PM	14	13	3421	44473	M0V	515	10	10ZL
9	G7VBY/P	IO91SD	15	14	2400	33600	TM6P	351	8	13EL

Single Operator 3W

Pos	Call sign	Loc	QSO	Multi	Points	Total	Best DX	km	Power	Ant
1*	GI7JYK/P	IO74BS	72	32	23971	767072	PA6C	807	3	13ZL
2*	M0AFC/P	IO84SA	85	32	15177	485664	DG2EBK	679	3	13EL
3	G8JAY/P	IO91AW	60	32	13015	416480	DL2KK	600	3	9EL
4	G1WKS/P	JO01ED	55	32	10772	344704	DK0BN	539	3	9EL
5	GW7LQD/P	IO82KW	76	28	12267	343476	TM2F	527	3	2x9EL
6	G4APJ/P	IO83TP	49	25	8476	211900	TM1H	504	2.5	10EL
7	G0BVW/P	IO92XA	56	26	7469	194194	GI7JYK/P	493	2.5	9EL
8	G1JDM/P	IO90SV	36	19	5777	109763	PA1TK	483	3	9EL
9	G1ATZ/P	IO84KI	38	18	5594	100692	PA6NL	550	2	5EL
10	G0NFO/P	IO82RJ	26	16	3737	59792	TM2F	460	2.5	7ZL
11	G3OLY/P	IO91VX	24	17	3237	55029	GI7JYK/P	487	2.5	5EL
12	G4FAA/P	JO01DH	29	11	2910	32010	M0V	348	3	8EL
13*	G1GYM/P	IO85WL	26	7	1552	10864	GM4RWE	140	0.5	V

* = Certificate winner

144MHz Low Power 1999

IN CONTRAST to the 70cm event, most competitors complained about the lack of activity from the UK. This was offset only by some Sporadic - E for East Anglia and tropo into the middle of France for the lucky ones in the south of the country. The Victory Contest Group showed how good their site is for low-power contests and have to be congratulated for putting out an exceptional signal and taking top honours once again by a convincing margin. Wythall Contest Group had a mini contest all of their own and several operators took advantage of poor activity to use their own callsigns and, in effect, start the contest all over again. This gave the group a chance to hone their operating skills, whilst still maintaining some interest when things got quiet. Entry levels are still very good and the VHFCC is looking forward to the first novice entry in this event. As usual, certificates go to all winners and runners-up, plus PE1EWR, top overseas station.

Martin Platt, G4XUM

144MHz Low Power 1999

Multi Operator

Pos	Call	Score	Loc	QSO	Mult	Antenna	Best DX	km
1	G6ISY/P	11298840	IO90JO	299	140	4X19	DL5MAE	957
2	GW4ZAP/P	8274632	IO81KR	267	118	2X17 4X9	F6AIU/P	822
3	GD0EMG	6791572	IO74QD	189	109	8X9 2X17	F5IKO/P	789
4	G4BRA/P	4233640	IO80ST	163	106	2X17	F6BEG/P	799
5	G4IRC/P	4028880	JO02OD	170	80	2X17	UT8AL	2223
6	G4SIV/P	3942330	JO03AD	154	105	8X12	HB9RDE	810
7	G0VHF/P	3361400	JO01GN	166	98	2X15	DF1IAZ	655
8	G8NWM/P	2187926	IO92TR	112	86	2X12	F6AIU/P	704
9	G4HLX/P	1566684	IO91FN	114	84	13	DC6IA	579
10	G4BVE/P	1224922	IO93AD	119	74	9	F4SGU/P	585
11	G3WHK	1040039	IO91VJ	96	77	16	GI6ATZ	510
12	G3OLX	994552	IO91VH	101	73	13	DL6KR/P	516
13	G3VEF/P	766976	IO90LU	78	64	13	DG2EBK	531
14	G1XYZ	438750	JO02FR	48	50	8	GD0EMG	372
15	G0DLR	336532	JO01EI	45	49	15	GD0EMG	458
16	G8OHM	52731	IO92AJ	15	27	YAGI	GD0EMG	263

Single Operator

Pos	Call	Score	Loc	QSO	Mult	Antenna	Best DX	km
1	GW7LQD/P	4161677	IO82KW	184	113	2X9	DJ5BV	747
2	G8VOI/P	2427750	IO90MX	132	90	13	F6BEG/P	745
3	G4AEQ	2247882	IO93PE	122	91	2X9	DG3IS/P	607
4	M0AFC/P	1678158	IO84SA	119	81	13	F6KPL	498
5	G3MEH	1633768	IO91QS	121	82	2X9	DL6KR/P	553
6	G1ATZ/P	1370550	IO82KV	109	75	5	ON4AFO	493
7	G4HGI	1331253	IO83PL	104	77	11	PE1EWR	478
8	2C8ZRE/P	1130025	IO83JF	101	75	7ZL	M1CQR	333
9	G3FIJ	407420	JO01KV	42	52	10	GD0EMG	445
10	PE1EWR	388626	JO11SL	36	38	10	GD0EMG	623
11	G1WAC	266443	IO92BJ	45	47	18	GM0GMD	443
12	M1BME	208560	IO92AJ	47	44	9	GD0EMG	263
13	G0WRC	195351	IO92BJ	36	39	18	PE1EWR	385
14	G1TWS	175028	JO01HO	26	38	11	GD0EMG	451
15	G4APJ	106227	IO83UP	20	33	9	G4BRA/P	315
16	G7UGC	80352	IO92BK	27	32	6/6	GD0EMG	264

Checklog:- GW4ALG/P

432MHz Low Power 1999

THIS YEAR'S event saw a large increase in entries and variable band conditions, dependent on where you were sited in the country. The Multi-Op section winners, GD0EMG, reported working into PA but having to beam along a weather front towards southern England to achieve this. Direct signals were either non-existent or considerably weaker. This is something to watch for especially at UHF, where propagation is far from straightforward. The usual more-successful east coast stations were disadvantaged by this weather front and struggled to make any impact. Once again I am saddened to report a lack of novice activity. Generally, entrants are happy with the format which is now well established on the contests calendar. Congratulations go to all section winners and runners-up, with extra awards going to PE1EWR for a commendable entry as always, and to 2U0ARE for representing the novice community.

Martin Platt, G4XUM

432MHz Low Power 1999

Multi Operator Section

Pos	Call	Score	Loc	QSO	Mult	Antenna	Best DX	km
1	GD0EMG	1837556	IO74QD	73	73	4X20	PA3CEG	740
2	GW4GCM/P	1239600	IO82KW	79	80	2X28	DC9KU	677
3	G4BRA/P	1148760	IO80ST	70	72	4X21	F6AIU/P	684
4	G0VHF/P	1147573	JO01GN	74	71	4X21	DF0WD	548
5	GW4ZAP/P	795074	IO81KR	73	61	4X21,19	PE1JBK	561
6	G4SIV/P	787311	JO03AD	52	63	8X28	DF0CI	721
7	G8NWM/P	727272	IO92TR	55	63	2X22	DF0WD	602
8	G8OHM/P	581102	IO82QL	58	58	4X19	DC9KU	631
9	G4HLX/P	332250	IO91FN	52	50	19	PA1TK	438
10	G3VEF/P	289149	IO90LU	36	49	19	GD0EMG	439
11	G6MXL/P	187680	IO80XR	31	40	19	GD0EMG	424

Single Operator Section

Pos	Call	Score	Loc	QSO	Mult	Antenna	Best DX	km
1	G4AEQ	791844	IO93PE	54	69	2X19	DC9KU	537
2	G3XDY	750310	JO02OB	60	55	28	DF4UE	692
3	G0GRI/P	670560	IO81WG	66	66	17	GM4WLL/P	498
4	G3WHK	469944	IO91VJ	53	61	24	GI6ATZ	510
5	G3MEH	442475	IO91QS	52	55	2X19	PA0ZM	495
6	G4APJ	411696	IO83UP	37	54	19	F6KPL	454
7	G1ATZ/P	396525	IO82KV	43	51	21	PE1EWR	481
8	PE1EWR	360506	JO11SL	37	38	2X21	GD0EMG	623
9	G3OLX	347544	IO91VH	45	54	21	GD0EMG	433
10	M0AFC/P	184718	IO84SA	27	38	2X12ZL	PA1TK	510
11	G3FIJ	149765	JO01KV	23	35	21	GD0EMG	445
12	GM4WLL/P	79992	IO85NR	13	22	-	G4BRA/P	547
13	G3WZR	50520	IO91AI	15	24	8+8	GD0EMG	359
14	M1CFI	43100	IO92BK	14	25	17	GD0EMG	264
15	G3YHF	39888	IO92BK	15	24	19	G0VHF/P	192
16	G8JXV	29646	IO91WE	10	18	48	GD0EMG	447
17	2U0ARE	21994	IN89RL	8	14	19	GW3ZTH/P	251

Slow Speed Cumulatives Sept/Oct 1999

THERE WAS ONLY an average number of entries for this contest which is aimed to encourage the art of CW operating, but not many new calls entered. Congratulations to Terry Robinson, G3WUX, for taking first place with his TS-940 running 10W and a Windom antenna. Second place went to Tom Cannon, G3VQR, with his FT-1000MP running 10W and a dipole. Our two Novices who took part both gained certificates - Juna Bell, 2E0ASU/P, as first Novice and Rose Rackham, 2E0AUB, for a first time entry in a contest. Both Novices were YLs, so where were the boys? OK1FVD found it a battle to get into G land through the QRN.

Derrick Webber G3LHJ

Slow Speed Cumulatives Sept/Oct 1999

Pos	Call	30Aug	7Sep	15Sep	23Sep	1Oct	Total	Codes
1*	G3WUX	235	-	220	-	215	670	2C13
2	G0VQR	225	CKL	CKL	200	218	643	2C12
3	G3LIK	220	195	CKL	CKL	220	635	2C13
4*	2E0ASU/P	231	80	280	-	-	591	2C1?
5	G3TTB	221	175	-	-	177	573	2W1?
6	G3YAJ	190	180	-	CKL	140	510	2C13
7	G2HLU	170	-	182	-	155	507	2C12
8	G3JSR	180	159	-	-	158	497	2W13
9	G4BLI	CKL	CLK	161	140	185	486	2C13
10	G4EBK	-	180	126	-	175	481	2C13
11	G0IGP	195	CKL	135	-	145	475	2C11
12	G0VYR	160	135	CKL	CKL	173	468	2C12
13+	2E0AUB	220	-	40	-	193	453	2C13
14	G4XPE	190	119	-	-	138	447	2C11
15	G4BJM	-	-	143	125	148	416	2C1?
16	G3HEL	-	CKL	106	78	181	365	2C12
17	G3ZDD	83	CKL	120	115	-	318	2C13
18	G0FYX	110	-	98	85	-	293	2C11
19	G3SZS	95	100	80	-	-	275	2G11
20	GW4LZP	CKL	85	80	CKL	105	270	2C11
21	G4KEW	CKL	83	75	-	93	251	2C1?
22	OK1FVD	-	60	50	-	60	170	2W1?

* = Certificate of Merit + = First Time Entry in RSGB Contest Many thanks for checklogs from G0IBN, G0UHM and G0VQQ.

144MHz Backpacker 1999

THE LEVEL OF competition and friendly rivalry in the 144MHz Backpacker contests has not diminished this year, with 54 stations entering this series of events. The top of the table was very close, with third, fourth and fifth places only separated by 12 points.

An interesting tactic of swapping between the 3W and 10W sections in different events was employed by several of the leading stations. Whether it worked is debatable, but it certainly must have kept the opposition guessing as to which section each station was entering!

The standard of logging was somewhat variable this year, with one event having an average error of 12%. The majority of entrants submitted their log on disc or via e-mail.

Congratulations to the overall winner of the 144MHz Backpacker Contest, Dave Hewitt, GW8ZRE/P, who managed to win four of the five sessions outright. Congratulations also to the overall runner-up, GW5NF/P.

Ian Pawson, G0FCT

144MHz Backpacker 1999

Pos	Group Name	Call sign	Best 3 Total	BP1	BP2	BP3	BP4	BP5
1*#		GW8ZRE/P	3000	1000	1000	1000	862	1000
2*		GW5NF/P	2881	530	660	1000	1000	881
3		GI7JYK/P	2758	-	758	1000	-	1000
4	One Man & His Dog CG	G8NWM/P	2757	116	757	649	1000	1000
5		M0AFC/P	2746	1000	-	746	1000	633
6	Charlie & Sue Jordan	GW0PZO/P	2513	513	33	430	1000	1000
7	Bristol CG	MW1BCG/P	2000	1000	1000	-	-	-
8		G0HDV/P	1949	355	67	627	967	92
9		GW7LQD/P	1858	591	819	-	-	448
10		G0KYS/P	1602	-	1000	602	-	-
11		G8JAY/P	1442	369	530	-	-	543
12	West Kent ARS	G1WKS/P	1268	-	239	575	244	449
13	Barpackers CG	M1BAR/P	1220	176	59	365	539	316
14	Single Yagi & Transceiver CG	G1SYT/P	1142	142	-	1000	-	-
15	Wythall CG	G1WAC/P	1093	288	300	-	173	505
16		GM4IGS/P	1068	393	260	173	416	-
17		M0BAO/P	1037	215	51	548	-	275
18	Hereford VHF CG	GW1YFC/P	1000	1000	-	-	-	-
19		G4ERP/P	1000	-	1000	-	-	-
20		G0GRI/P	996	113	89	-	391	493
21		G0PQF/P	996	319	-	-	159	517
22	Oldham RC	G1ORC/P	983	189	204	273	505	161
23		G(W)1ATZ/P	908	418	97	7	358	131
24		G4EDR/P	807	215	33	283	-	309
25		G0ROC/P	680	-	680	-	-	-
26		G4APJ/P	663	-	-	-	387	276
27		G1JDM/P	621	167	220	173	228	143
28	Stockport Radio Society	G8SRS/P	604	93	10	177	92	334
29		G0GZI/P	447	268	179	-	-	-
30		F/M0AFC/P	425	-	425	-	-	-
31		G(M)8ORG/P	401	-	-	269	132	-
32		2A0CCC/P	399	399	-	-	-	-
33		G4FAA/P	398	85	271	-	-	42
34	Wirral & District ARC	2C4MGR/P	380	380	-	-	-	-
35		G0BVW/P	370	117	-	-	-	253
36		G0DRM/P	328	328	-	-	-	-
37		G3OLY/P	312	-	-	-	241	7238
		G8ORG/P	234	-	-	-	-	234
39		G0OKD/P	202	149	53	-	-	-
40		G7NBE/P	170	57	78	35	-	-
41		G0NFO/P	159	-	3	30	51	78
42		EI6FE/P	155	-	-	-	155	-
43		G3WZR/P	148	-	148	-	-	-
44		G7VHW/P	146	95	51	-	-	-
45		G7WJK/P	138	138	-	-	-	-
46		G7UXW/P	125	125	-	-	-	-
47		G6TTL/P	121	121	-	-	-	-
48		G0BXT/P	93	-	-	-	-	93
49		G(M)1GYM/P	81	3	20	-	48	14
50	Wythall CG	G0WRC/P	62	-	62	-	-	-
51		G4WVD/P	55	-	-	-	-	55
52		M0BHE/P	53	53	-	-	-	-
53		G7VBY/P	41	-	-	-	-	41
54	Ayr ARG	GM0AYR/P	8	-	8	-	-	-

= winner of the 144MHz Backpacker Trophy 1999 * = certificate winner

CONTEST CALENDAR

HF Contests

Date	Time	Mode	Contest
5/6 Feb	*0000-2359*	*SSB*	*10-10 Winter Contest*
12/13 Feb	*0000-2359*	*RTTY*	*CQ/RJ WW RTTY*
12/13 Feb	2100-0100	CW	RSGB 1st 1.8MHz CW
19/20 Feb	*0000-2359*	*CW*	*ARRL International DX*
25/27 Feb	*2200-1600*	*SSB*	*CQ 160m Contest*
26/27 Feb	*0600-1800*	*SSB*	*REF Contest*
26/27 Feb	1500-0900	CW	RSGB 7MHz DX

VHF Contests

Date	Time	Mode	Contest
6 Feb	0900-1500	CW/SSB	RSGB 432MHz AFS
13 Feb	1000-1230	CW/SSB	RSGB 70MHz Cumulative #3
27 Feb	1000-1230	CW/SSB	RSGB 70MHz Cumulative #4

The full rules of RSGB HF and VHF/UHF contests were published in the RSGB Contesting Guide in October 1998 *RadCom*. Brief rules for non-RSGB contests, which are listed in italics above, can often be found in the *HF* and *VHF/UHF* columns.

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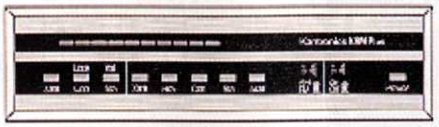

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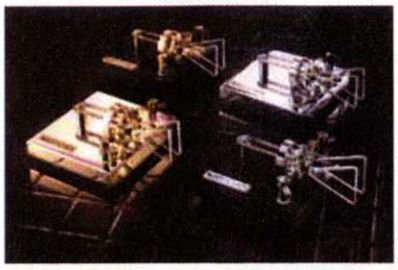

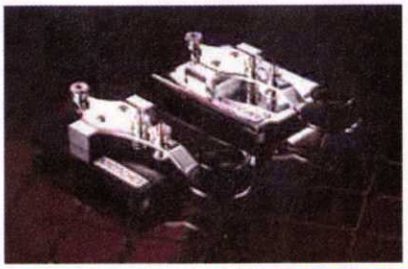

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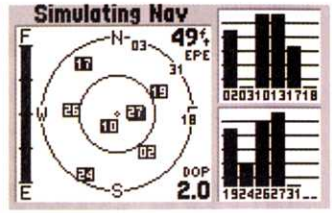
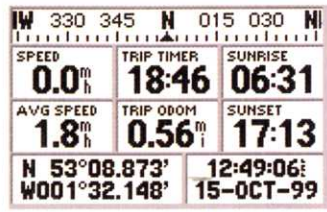


These are actual screen grabs from our demo GPS3 Plus and show just how much detail is available on the dot matrix LCD display.



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FDK MULTI 725X 25W FM MOBILE BOXED	125
FDK MULTI-800 25W 2M FM SLIGHT FAULT	60
ICOM IC-275E BOXED AS NEW 1 OWNER	495
ICOM IC2E 2M HANDIE + EXTRAS	40
KENWOOD TM-255E	550
MIZUHO 2M SSB PORTABLE	85
TRIO TR-751E 2M MULTIMODE	325
TRIO/KENWOOD TH-22E	125
TRIO/KENWOOD TM-221	145
YAESU FT-208R + NC8 BASE CHG	60
YAESU FT-209R 2M HANDIE	50
YAESU FT-2200 144MHZ FM MOBILE	150
YAESU FT-290R MK1	150

NEW SINGLE CHANNEL HANDIES S22 145.550 2WATTS NEW+NI-CAD+CHARGER OR A PAIR FOR £40 (NEW) 25

Members' Advertisements

RSGB Members wishing to place an advertisement in this section must use the official form incorporated on the label carrier of Radio Communication. This will prove membership and must be for the current month. No acknowledgment will be sent. Ads not clearly worded, or which do not comply with these conditions will be returned. If an ad is cancelled no refund will be due. An advertisement longer than 60 words will be charged pro rata. Trade or business ads, even from members, will not be accepted. Traders who wish to use this facility must send a signed declaration that the items for sale are part of, or intended for, their own personal amateur station. The RSGB reserves the right to refuse ads, and accepts no responsibility for errors or omissions, or for the quality of goods for sale or exchange. Each advertisement must be accompanied by the correct remittance, as a credit card payment, cheque or postal order made payable to the Radio Society of Great Britain. Please note that because this is a subsidised service to members, no correspondence can be entered into. Licensed members are asked to use their callsign and QTHR, provided their address in the current edition of the RSGB Yearbook is correct. RS members will have to provide their name and address or telephone number. Please include your town and phone number in the free boxes provided to assist readers. Advertisements will be placed in the first available edition of *RadCom.*

The closing date for copy is the first day of the month prior to publication, eg the deadline for the March issue is 1 February.

Warning: *Members are advised to ensure that the equipment they intend to purchase is not subject to a current hire purchase agreement. The 'purchase' of goods legally owned by a finance company could result in the 'purchaser' losing both the goods and the cash paid.*

FOR SALE

ADI AR-146 base/mobile 2m, FM, 50W tcvr, wideband receive 130-180MHz plus Altai 13.8V 7-10A PSU. Both perfect working order, vgc, original boxes, £100 plus carriage. ADI AT-200 2m, FM handie, 5W o/p, nicad battery, AA battery pack, car lighter adapter, nicad charger, man, original packing, vgc, £60 including post & packing. G3UUZ, QTHR. 01736 786 131 (Penzance).

AEA PK-900 multi-mode data controller, HF/VHF Baudot, Morse, packet, ASCII, Amtor, FEC/ARQ, Navtex, Wefax, immac, mans, boxed, with Windows® programme controlling all data, £145 ono. DRAE 4A power supply, £17. AEG SWR/50A power/SWR meter, £14, Yaesu FSP-1 extension speaker with bracket, 6W-8ohm, boxed £12. Hewlett-Packard Scanjet 4S, £32. Buyer collects or cost despatch added. G4YPN. 01708 523 487 (Rainham, Essex). E-mail: david.howroyd@lineone.net

KENWOOD TS-850SAT. Immac cond, with separate speaker unit, 500Hz CW filter, £750. 12V DC PSU available if required. 01279 427 788 (Harlow). E-mail: david.gould@btinternet.com

RACAL RA-1795, 20-1000MHz rcvr, £995. Marconi CPM-46 counter power meter, £1995. Marconi 6790 RF power meter, £595. Marconi 6924 power sensor, £595. WJ DMS-107-1 demodulator, £395. WJ 521A-1, 20-80MHz rcvr c/w panadaptor, £395. WJ 340-6, 0-900kHz VLF rcvr, £295. Motorola R-2400A 1GHz service monitor, c/w spectrum analyser, £1995. Racal MA-2313 panadaptor (worked before tube cracked), c/w man, £195. Harris RF-3200 HF tcvr, £995. P133, 32MB RAM, 1.7GB HDD, CDD, SVGA monitor, Tower PC, £195. Eimac 3CX2500F3 (pull), £195. Panasonic P133 Toughbook (magnesium alloy cased) laptop, £495. Iridium Motorola 9500 portable satellite phone, £495. Icom PS-30 30A PSU, £95. Icom IC-725, c/w FM, £395. SGC-2020 QRP tcvr, £395. NOS STC 3J/160E (CV2245), £30. Ex-PMR h/held walkie-talkies, 5W VHF & UHF, £9.95 ea or 3 for £20. New Jennings 50-2300pF ceramic vacuum variable capacitor, £495. Motorola GP-300 6-way charger, £195. Eddystone 40A 0-33MHz portable interference-measuring rcvr, £195. Philips PRC-2000 1.5-30MHz man-pack, £995. Ex Special Forces 123 tcvr, £795. SD-1468 UHF power transistors NOS, £9.95. Sparta 10W AM (medium wave) broadcast exciter, £495. 1200W PEP output HF mobile linear, 1.8-30MHz (8 x 2SC2879), £995. Tel/Fax 01372 849 909 (Surrey). E-mail; pdc@invest.fsbusiness.co.uk

TRIO TS-530SP, c/w man, no mic, £180. Trio TS-830, c/w man, no mic, £180. Two VFOs, VF-230, c/w mans; one wkg, £40; one repairable, £25. IC-290E, gwo, £125. MFJ-962B 1.5kW tuner, £100. Linear amp (homebrew) 2 x 813, requires final wiring, £50. Cushcraft R-6000 6-20m used only 3 weeks, £150. BC-221, complete, £10. Heathkit HD-1250 GDO, gwo, £30, buyer collects or pays carriage. G4VPU. 0191 252 2304 (Whitley Bay).

YAESU FT-767GX HF with/2m/6m/70cm modules, auto ATU, exc cond, boxed with man and MH-18 fist mic, AC, as new, £750. G1OPZ, QTHR. 01373 834 483 (Frome).

ALTRON tilt-over mast with Daiwa DR-7500A rotator, £150. Buyer arranges collection. GW0FMD. 01994 230 773 (Carmarthen).

AMERITRON AL-811X linear amp, 1.8-30MHz, 400W PEP output, boxed, £400. MFJ-949E deluxe versa tuner II, 1.8-30MHz, boxed, £80. G3YIU, QTHR. 0121 430 6926 (Birmingham).

AR88D. Mechanically above average, electrically gwo, realigned, many capacitors replaced, £65. Could deliver up to 20 miles, G3WCE, QTHR. 01603 250 910 (Norwich).

BARGAIN. Yaesu FT-101Z, man, CW filter, fan, BTB wkg order, FT-221R, Mutek, £300 both. No split. G3ZEG. 01767 221 189 (Biggleswade).

CLEAROUT! R1155 rcvr + PSU, RA17 rcvr (nice examples), Pye Westminster, Pye Ranger, (both unmodified), AVO transistor tester, Tradiper TE-15 GDO, Heathkit mono TV, Heathkit SWR bridge, £225 no split, cash/collect. G4EHT, QTHR. 01543 300 341 (Lichfield).

DRAKE R-4A plus Drake speaker, both vgc, rcvr fully aligned, £200. Eddystone 680X, £90; 640, £75. TV alignment generator, £15. 01245 381 961 (Chelmsford).

FL-2100Z, perfect order, full 400W, WARC bands, buyer collects with demo, £360. G3LBA. 01865 821 503 (Abingdon).

FT-2500M 2m mobile, 50W, 7/8 & 5/8 antennas, magmount, £125. FT-411 2m h/h, speaker/mic, various whips, numerous adaptors and cable connectors, charger, car adaptor, £85. EP-925 PSU, 25A, 3-15V, £50. Altron 20ft wall-mounted tilt-over mast, 3in dia, 4ft fibreglass stub-mast 1¾in dia, £50 ono. KPC-2 TNC, £15. JVFAX modem, £20 ono. Compaq LTE LITE/25 laptop computer, requires new A drive, £25 ono. 2m 5/8 colinear, £7. Buyer collects or pays carriage. G0EJZ, QTHR. 01474 822 685 (Gravesend).

HEATHKIT SB-301/401 tcvr, complete with mans, good 6146Bs, £50, buyer collects. G4ZOR. 01749 676 807 (Wells).

HY-GAIN 12AVQ 10-15-20m vertical, also small quantity Telsen components with Telsen radiomag Vol 1, No1. Offers to G3WUZ, QTHR. 01278 786 330 (Burnham-on-Sea).

IC-290H 2m SSB/FM/CW 25W/1W tcvr, £155. MM 70cm TV tx, 20W PEP, £60. GW4HBK. 01495 228 516 (Blackwood).

IC-3200E Icom dual-band 2m/70cm mobile, £80, Comet CA-2x4MB antenna, £10. VSWR meter, £10. All ex-silent key with original receipts, G3RDQ, QTHR. 01264 860 244 (Stockbridge).

ICOM IC-746, narrow SSB filter, matching speaker, still under warranty, £900. G0WMC. 01322 667 210 (Kent).

KENWOOD TM-251E 2m 50W tcvr with mic, man, etc, boxed, as new (never used mobile), £175. Tony, G4KHT, QTHR. 01482 843 457 (Hull). E-mail: tonylord42@netscapeonline.co.uk

KENWOOD TS-140S 100W HF tcvr, CW filter, mic, PSU, man. Try before you buy, £300. 01283 534 515 (Burton-on-Trent). E-mail: g0hio@m-f-warrington.freeserve.co.uk

KENWOOD TS-50S HF mobile, exc cond, hardly used, £450. BNOS PSU, 30A, £65. Quantity of Tait T-500 VHF mobiles (PMR), £40 each. Gary, G0FWX. 01527 574 401 (home) or 01527 872 777 (work). (Worcs). E-mail: gary@twoway-radio.co.uk

KENWOOD TS-570D 100W HF, gen cov rcvr, auto ATU, headset boom mic plus interface, original scanning fist mic, Zurich DSP-251ZM PSU, very little use, all as-new, Diamond CP5 vertical. Complete station £900, prefer no split, buyer collects. 01568 615 667 (Leominster).

KENWOOD TS-790A 144MHz/440MHz/1.2GHz, as new, boxed with man, £1000. Cushcraft 13B2 144 MHz, £100. Cushcraft 424B 440MHz, £100. MFJ-931 artificial ground, £50. Kenwood interface IF-232C, £60. Eimac 3-500Z, new, £100. Microwave Modules linear amps, 440MHz and 144MHz, 10W in 50W out, £50 each. Kenwood AT-250 auto ant tuner, £150. 01754 811592 (nr Skegness).

KENWOOD TS-930S, fitted auto ATU, 250Hz filter, matching Kenwood speaker, mic, man, workshop man, £500 ono. Drake TR-7 full spec with extra VFO, speech processor, speaker, mic, man, £475 ono. Both in exc w/order. G6LX. 0181 654 6267 (Croydon). E-mail: g6lx@aol.com

KENWOOD TW-4000A VHF/UHF FM mobile, 35W, gwo, boxed, £225 ono, carriage at cost. John, G0GCD. 01536 711 625 (Kettering). E-mail: john@nn14.co.uk

KW Vanguard tcvr. Fully overhauled, factory-fitted 160m, engraved front panel and internal antenna relay installed. A nice example of this famous AM/CW rig, £80. Buyer inspects and collects. Valves: 6DQ5, boxed, £5 each, Penta 811A valve, boxed, £8. Heil type HMP mic pre-amp for Icom, as new, £25 plus postage. Leak Sandwich Hi Fi speakers type 200, nice cond, £35 pair. G3GGK, QTHR. 01954 210374 (Cambs). E-mail: peter@g3ggk.freeserve.co.uk

LINEAR Drake L7 160-10m new, pair 3-500Z good cond, £1000. G3PJT, QTHR. 01223 263 137 (Cambridge). E-mail: bob_g3pjt@compuserve.com

MARCONI marine CR-300 rcvr 15kHz - 25MHz 8 bands, internal mains PSU, man T1864, £30. ATU adapter aerial to trans, ZA56234 MWB/XE/988 19x16x14in, contains 7in x 5in dia roller-coaster and many variable capacitors, aerial output via 5in dia hemispherical glass insulator, £100. Meccano No10 with model books, offers? G3TJT, QTHR. 01302 365 472 (Doncaster).

RACAL RA-1792, ex cond, all filters, ISB option fitted, mans, £600. Yaesu FT-101B, G3LLL mods, FV-101 VFO, YC-601 display, YO-100 scope, landliner phone patch, Europa 100W 2m transverter, original fist mic, mans, all leads, amazing cond, £400. Hoka Code 3, latest V5 software, £250. Adrian, G4JBH. 01288 331 113 (Bude). E-mail: 106471.620@compuserve.com

RECEIVER Kenwood/Trio R-600 gen cov, ideal SWL radio, £100. 01547 520 266 (Powys).

SILENT key. TS-930 tcvr, 1.8-30MHz and WARC bands, 100W all modes, fully functional, offers please. G3JLS, QTHR. 02380 842 345 (Southampton).

STRUMECH 60ft heavy duty mast with 20m and 15m beams plus approx 100m coax cable, £500 ono. 0158 722 581 (Cheadle).

TEKTRONIX 465 oscilloscope, 100MHz, dual delay, 5mV, 20nsec/div, gc, £250. AVO meter model 8, good order, £45, G0PJI. 01934 812 543 (Weston-Super-Mare).

TEN-TEC Century-22, £200. DC PSU 7A XM21, £50. Windom aerial, £20. Buyer collects or pays postage. Purdy. 0181 950 3889 (Bushey Heath). E-mail: brod@purdy.org

TRIO TS-820, £220. TS-120, £150. TS-700, £190. TS-700G, £150. PSU 20A (Coutant), brass Morse key type D, ex-WD, £35. G0UAU, QTHR. 0121 358 3639 (Birmingham).

TRIO TS-930S, vgc, boxed, etc, £495 ono. 01203 313 109 (Nuneaton).

TRIO-Kenwood TS-530SP HF tcvr, CW filter, Shure 201 mic, man, exc cond, £230 ovno. G0BPM, QTHR. 0114 287 2358 (Sheffield).

TS-830S, CW filter, WARC, re-valved, serviced by Castle Electronics, ATU230, Shure 444 mic, £450, buyer collects, Alan, G3DAC. 01270 581 460 (Crewe).

UT7CT Morse devices: www.qsl.net/ut7ct

YAESU dynamic mic MD-100 A8X, new, unwanted gift, £70. 01992 573 596 (Epping).

YAESU FT-101Z Mk3 HF tcvr, 9 bands, FM, SSB, CW, YD148 base mic, Welz AC38M ATU, man, exc cond, £220. 01945 589 707 (Wisbech).

YAESU FT-101ZD Mk3, £175. FL-2000B linear, £200, FT-290R, £150. TS-700 2m multi-mode, £225, Pakratt PK-232MBX. G3TWJ, QTHR. 0181 668 3408 (Purley).

YAESU FT-290RM with mobile mount, linear, various antennas, rotator, portable mast in box, original charger, case, etc, man, £250 complete. 01308 863 476 (Beaminster).

YAESU FT-767GX, full working order, exc cond, complete with 2m and 6m modules, £650 ovno. G4OBB, QTHR. 01235 817 237 (Oxford).

YAESU FT-780R 70cm multi-mode, boxed, man, any trial, £200. G0WRF, QTHR. 5 mins from jct36 of M62. 01405 766 783 (Goole, E. Yorks). E-mail: waldorf@bunmail.com

YAESU FT-790R multimode, £175. Microwave Modules RU-20 70cm amplifier, £20. Rexon RL-402 70cm h/held, £70. 13-ele crossed Yagi (new), £25. Spectrum RP-6S 50MHz transmit-through receive preamp, £20. Stone, G3JFC. 01529 413 547 (Sleaford).

YAESU FT-920AF HF/6m, AM/FM boards, mint, boxed, man, etc, £850. G0CGL, QTHR. 01929 405 531 (Wool, Dorset). E-mail: eric.g0cgl@screaming.net

YAESU FT-990 HF tcvr, c/w narrow SSB, CW filters and MC-60 desk mic. The tcvr has had very little use and is in as-new cond, £750 plus carriage by courier (about £12). 01736 757 721 (Hayle).

YAESU FT-990AC fitted with 500Hz, 250Hz, 2kHz filters and TXC-O2 oscillator, latest ROM, RS-232 interface, MD-1 desk mic, £825. 01703 340 143 (Southampton). E-mail: g0tsm@qsl.net

WANTED

ALL early wireless equipment wanted: Rcvrs, crystal sets, early transmitters, horn speakers, valves, Morse keys, spy sets, pre-war television. Any cond considered. Jim Taylor, G4ERU, 5 Luther Road, Winton, Bournemouth, BH9 1LH. Tel/fax 01202 510 400 (Bournemouth)

BUTTERNUT HF6VX with 160MHz , working cond, can collect within reasonable distance of M25. 01634 379 140 (Medway).

SPY/clandestine radio sets from any period or origin. Wanted by private collector. Spares and accessories also required. Bill, G8PUJ, QTHR. 0181 505 0838 (E. London).

AUDIO frequency millivoltmeter, frequency response to 20kHz, for alignment of tape recorders, must be in good cond. Good price paid! 01580 830 558 (Hastings). E-mail: david@craig-peartree.freeserve.co.uk

DAMAGED Drake R4-? Also MS-4 or MS-7 speaker. Bill. 0141 562 4571 (Glasgow).

FTDX-400, FLDX-400 workshop mans, 6JS6A valves for above, any mods to liven the rcvr, help appreciated. Bob, G3JJU. 01252 615 831 (Fleet).

QRP rig wanted, anything considered, inc homebrew, Howes, valves ok, ATU, rcvr, etc. For QRPer useless at construction. 01730 895 309 (Liss, Hants).
E-mail: m0air@qsl.net

R1475 rcvr with PSU, any cond, also R1155 rcvr and AR88D rcvr in good unmodified cond. 01335 360 755 (Derby). E-mail: g8ebm@csi.com

TRIO 820S rcvr, Drake rcvrs any type. Also any old valve hi-fi, such as Quad, Leak, etc. 01245 381 961 (Chelmsford).

TRIO TS-530S servicing man required, also CW filters and remote VFO. Tony, G0WME. 0181 554 8187 (Ilford).

EXCHANGE

EXCHANGE new Realistic DX-394 SW rcvr for magnetic loop AWT 20-15-10m complete with control box, cash adjustment if required. 01484 462 960 (Huddersfield).

CLUB NEWS

DEADLINE – Items for club news should be sent to the *RadCom* Office at HQ to arrive by the 26th of the month, ie approximately a month before publication. For example, 26 January for the March Issue. News items should be sent in writing (fax or letter) and be signed by the club secretary or the person responsible for publicity. Post cards for this purpose are available from RSGB HQ.
Note: This is a service for clubs affiliated to the RSGB. The announcements are intended to notify non-members and potential members of your club of specific events. Therefore, 'committee meeting', 'natter night' and 'ragchew evening' etc will not be included. Basic, unchanged details about RSGB-affiliated clubs are published annually in the *RSGB Yearbook*.

APPLEDORE & DARC – 15, T 'Flying & radio instrument navigation' by local pilot. Brian Jewell, 01237 473251.
AYLESBURY VALE RS – 2, Q with Mike, G7FDL. Roger, G3MEH, 01442 826651.
BANGOR & DARS – 2, T 'BFBS Radio' by Mike, GI4XSF. Mike, GI4XSF, 028 42772383.
BLACKMORE VALE RS – 5, Opening day for new QTH (10am - 6pm). Tony, G0GFL, 01258 860741.
BROMSGROVE ARS – 8, Test equipment/ check your rigs. Put up the antenna; 22, T 'Computers & amateur radio'. B Taylor, G0TPG, 01527 542266.
CAMBRIDGE & DARC – 18, T 'Building an antenna noise bridge' by Mike, G8VCN. Bob, G0GVZ, 01223 413401.
CHELMSFORD ARS – 1, T 'GEC Archives' by Louise Weymouth. Charles, G0GJS, 01245 256654.
CHELTENHAM ARA – 4, T '50MHz - the magic band' by Tony, G3SNN. Patricia, G1NKS, 01242 241099.
CHESHUNT & DARC – 16, OTA; 23, MP. Jim, G0JXN, 01992 468204.
COCKENZIE & PORT SETON ARC – 18, Radio Check Night by John, GM7OLQ. Bob, GM4UYZ, 01875 811723.
CRYSTAL PALACE & DRC – 2, Transverter Project, MP; 19, AGM and construction contest. Vic, G1PKS, 020 8653 2946.
DORKING & DISTRICT RS – 18, Patrick Moore at the Dorking Halls. Tickets available from box office; 22, T 'How to build a spaceship' by Robin, G3LBA. John, G3AEZ, 01306 631236.
ECHELFORD ARS – 10, Society construction/home brew competition; 24, T '10GHz operation & DX' by Peter Horbaczewskyj, G4ZXU. Robin, G3TDR, 01784 456513.
EDGWARE & DARS – 10, Bring and show evening; 24, VHF OTA. David, G5HY, 01923 655284.
EXMOUTH ARC – 9, AGM. David, G0NRR, 01395 271880.
FARNBOROUGH & DARS – 23, Talk on his visit to New Zealand, by Derek, G3HEJ. Norman, G0VYR, 01483 835320.
FELIXSTOWE & DARS – 7, T 'Amtor/Pactor and other strange modes' by Andy, G3ZYP. Paul, G4YQC, 01394 273507.
GLOUCESTER AR & ES – 7, Morse Code to Multi-media - a history of digital communications; 14, OTA; 21, Mini talk - antenna controversy; 28, OTA. Tony, 01452 618930, OH.
GRIMSBY ARS – 3, HF OTA (G3CNX). Brian, G4DXB.
GUILDFORD & DRS – 11, B&B; 25, Technical Forum - our think tank. Tim, G7JYQ, 0208 3995125.
HALIFAX & DARS – 15, T 'My personal view of Scotland' by Kevin Boothroyd, G1FYS. Ray, 01274 600297.
HAMBLETON ARS – 3, ATV OTA; 17, Talk. John, G0VXH, 01845 537547.
HARWELL ARS – 15, Annual CC - great prizes. John, G6LNU, 01235 223250.
HARWICH ARIG - 9, Lecture by Brian, G0GGM. Eugene, G4FTP, 01206 826633.
HASTINGS ELECTRONICS & RC – 16, AGM; 19, TDOTA. Doug, G4ERA, 01424 812350.
HORNDEAN & DARC – 1, Club Social Evening; 22, B&B (Radio/Electronics). Stuart, G0FYX, 01705 472846.
HORNSEA ARS – 2, Activity; 9, T 'Top band antennas' by G4BYZ; 23, SSTV (G4FCT). John, G0TPS, 01964 562258.
HORSHAM ARC – 3, T 'Antenna analysis' by Ken Franklin, G3JKF. David, G4JHI, 01403 750228.
HULL & DARS – 4, Technical Forum, G0TPS; 11, AGM; 18, Q. John, G0TPS, 01964 562258.
ITCHEN VALLEY ARC – 11, The latest from Yaesu; 19/20, TDOTA; 25, Talk by RNLI. D C Symonds, G0PRZ, 01703 261877.
KIDDERMINSTER & DARS – 1, Micro Electronics. Geoff, G0RJP, 01299 888826.
LINCOLN SHORT WAVE CLUB – 2, OTA; 16, T 'Railways' by Martin Bromley; 23,T 'Taking your rig abroad' by Cliff, G3EBH. John, G1TSL, 01522 793751.
LIVERPOOL & DARS – 8, OTA; 29, ES. Ian, G4WWX, 0151 7221178.
LOUGHBOROUGH & DARC – 1 Annual Dinner at Bull's Head; 8, Three Team Challenge: How many contacts in 30mins? Band TBA; 15, RSGB Video Evening, another selection by Art, G3KWY; 22, T 'Video Players' by Ian, G8SNF; 29, T & slides 'Galapagos Islands' by Val Williams. Chris, G1ETZ, 01509 504319.
MAIDSTONE YMCA ARS – 4, Antennas; 11, Antennas; 18, Do you know your licence conditions? John, G0RHO, 01622 832259.
MAXPAK – 7, Designing your own HTML pages. Ron Taylor, G6LRD, 01922 684496.
MID-WARWICKSHIRE ARS – 8, V '1999 DXpedition'; 22, T 'Stepper Motors' by Bernard, M1AUK. Bernard, M1AUK, 01926 420913.
MILTON KEYNES ARS – 14, OTA; 21, Q; 28, CON. Dave, M0BZK, 01908 647662.
MORECAMBE BAY ARS – 15, T 'The evolution of the valve' by Stan Holt. Brian, G0RDH, 01524 424522.
NEWBURY & DARS – 23, T 'Wx satellites' by Gus, G3LLK. Ian, G3RVM, 01635 826019.
NORFOLK ARC – 2, T 'The Falkland Islands and Mt Pleasant Airport' by Neil, M0BNR; 16, RSGB contest discussion (Steve, G7VRK). John, G0VZD, 01953 604769.
NORTH KENT RS – 1, CC; 15, T 'The Planet Mars' by Gerry. Pete, G0GIR, e-mail: Silversands@aol.com
NUNSFIELD HOUSE ARG – 4, AGM; 11, T 'Zen & the art of making a magnetometer' by John Fletcher, G4EDD; 18, T 'Role of the Road Safety Officer' by Stan Werbinski; 25, T 'Logistics of portable operation – illustrated' by Peter Walker, G6KUI. Ann, 2E1GMP, 01332 752997.
OLDHAM ARC – 10, T 'Some ideas in home construction' by George Dobbs, G3RJV. Mike, M1CVL, 01706 367454 (E) 0161 2492131 (D).
PAISLEY (YMCA) ARC – 9, Electromagnetic compatibility problems and solutions; 23, Vintage radio equipment. Jim, GM3UWX, 01505 862817.
POOLE ARS – 11, Members' antenna forum. Colin Redwood, G6MXL.
SHEFFORD & DARS – 3, V 'Secret listeners' an account of amateurs during WW2; 10, Visit to 'Traffic Master' HQ @ Milton Keynes; 17, T 'A history of punched cards 1892-1975' by John, G3FWA; 24, AGM & prize giving. Mike, G8BEG, 01462 816738.
SILVERTHORN RC – 11, CC. David, G0KHC, 020 8505 1871.
SOUTH BRISTOL ARC – 2, 10m OTA; 9, Amateur radio software demonstration by Len, G4RZY; 16, Photographic Equipment B&B; 23, How to use a Multimeter. Len, G4RZY, 01275 834282.
SOUTHDOWN ARS – 4, Annual Dinner at the Chalk Farm Hotel; 7, T 'Top band contesting' by Chris Duckling, G3SVL. Brian, G4LYU, 01323 840530.
SOUTH NORMANTON & DARC – 7, Talk by RSGB Council Member Geoff Dover, G4AFJ. (Hall); 14, Visit to Sutton Observatory, 2000 UTC (meet there); 21, JS; 28, Fax demonstration by Mick, 2E0AAL (Shack). Russell, G0OKD, 01773 783394.
SOUTH NOTTS ARC – 2, OTA HF & VHF; 9, Shack clearance and cleaning night. 01509 672846.
SPEN VALLEY ARS – 3, CON. D Russell, G0FOI, 01274 875038.
STOCKPORT RADIO SOCIETY – 9, T 'Radio amateurs do it with frequency' by Gary, G0HJQ; 23, T 'Britten's war' by John Britten. David, M1ANT, 0161 2850017.
STRATFORD UPON AVON & DRS – 14, Data Modes; 28, Vexillology with M0AIZ. Ron, G0MRH, 01789 267430.
SWINDON & DARC – 3, T 'Introduction to the United Kingdom Radio Society' by Roy, G8CKN; 17, T 'An introduction to microcontrollers' by Mike, G7TAF. Den, M0ACM, 01793 822705.
TELFORD & DARS – 2, OTA; 9, Under £5 CC; 16, T/demo 'Microwave Construction' by G4NKC; 23, T 'When I was a lad' - early radio experiences from G4LU . Mike, G3JKX, 01952 299677.
THORNTON CLEVELEYS ARS – 7, T 'Radio organisation' by Ian, G3ZRZ; 14, V; 21, OTA; 28, T 'DSP voice recognition'. Jack, G4BFH.
TORBAY ARS – 18, AGM. Peter, G4VTO, 01803 864528.
WAKEFIELD & DARS – 1, Visit to Ridings Radio Studios with talk; 8, RP; 15, Rally debrief; 22, T 'Digital' by Peter, G0BQB; 29, OTA. John, G7JTH, 01924 251822.
WEST SOMERSET ARC – 1, Practical Wireless Editor, open to all visitors. Alan, M0AOJ, 01643 707207.
WESTON-SUPER-MARE RS – 7, T 'History of RADAR' by Ray Burgess; 21, Workshop. Graham, G8WAR, 01934 415700.
WIMBLEDON & DARS – 11, T 'Inside the 1155 receiver' by Len Stuart & friends. 01737 356745.
WOLVERHAMPTON ARS – 10, CON; 17, T 'First Programmable Computer' by Chris Burton; 24, T 'G3RSX: Perry and his bleeps'. J Smith, 01902 751936.
WORTHING & DARC – 2, Discussion evening; 9, Computers; 16, Hints and tips; 23, Aerials for small gardens. Roy, G4GPX, 01903 753893.
YARMOUTH RC – 11, AGM; 25, OTA. Tony, G3NHU, 01493 721173.
YEOVIL ARC - 3, T 'Life in engineering' by Eric, G3GC; 10, T 'Wireless Titanic' by Joe, G3KSK; 17, T 'Setting up an amateur station' by members; 24, OTA. Malcolm, M0BHE, 01460 54657.
YORK RADIO CLUB (AMATEUR) – 3, Business meeting - new members always welcome; 10, MP with G4XIV & G0WUY; 17, T/demo 'SSTV' by G0WUY & G0VYS; 24, T 'QSL Cards' by G0VYS. Gareth, G1DRG, 01904 421392.

RALLIES AND EVENTS

This is a list of all rallies, hamfests, exhibitions and conventions notified to HQ (as at press date). Items are given in detail for the next three months inclusive and in brief thereafter. Please send detailed information, including contact callsign and telephone numbers direct to HQ and marked 'Rally News - DIARY'.

6 FEBRUARY 2000

HARWELL ARS Radio & Computing Rally – Harwell International Business Centre, just off A34 between Oxford and Newbury. TI GX3PIA on S22, OT 10.15am/ 10.30am, £1, CP, TS, B&B. Ann, G8NVI, 01235 816 379, or www.hamradio.harwell.com
SOUTH ESSEX ARS Radio & Computer Rally - the Paddocks, Long Road, Canvey Island, Essex. OT 10.30am, CP, TS, B&B, MT. Brian, G7IIO, 01268 756 331.

13 FEBRUARY 2000

CAMBRIDGE & DARC Radio Rally & Car Boot Sale - Ambulance Station, Addenbrook Hospital, Cambridge. OT 9.30am/10am, £1.50, B&B, CP, CBS. 01954 200 072 or 01223 413 401.
NORTHERN CROSS Rally - Thornes Park Athletics Stadium, Wakefield. Easy access - M1 Jcn 39 & 40. Well signposted, TI 2m and 70cm. OT 10.30am/11am, B&B. 01924 893 321.

20 FEBRUARY 2000

RSGB National VHF Convention – Sandown Exhibition Centre, Esher, Surrey. OT 10.30am, £3 adult, under-14 free, CP free, TS, MT C, LB, SIG, LEC. Derek Lund, 01707 659 015.

26 FEBRUARY 2000

TYNESIDE AMATEUR RADIOSOCIETY 14th Annual Rally – Temple Park Centre, John Reid Road, South Shields. OT 10.30am/11.00am, £1, TS, B&B, MT, CP, LB, C. Jack, G0DZG, 0191 276 6279.

11 / 12 MARCH 2000

LONDON Amateur Radio and Computer Show - Lee Valley Leisure Centre, Picketts Lock Lane, Edmonton, London N9. CP, TS, B&B, OT 10.00, TI 2m/70cm, C, LB, DF, SIG, MT, LEC, FAM, CS. 01923 893 929.

12 MARCH 2000

WYTHALL RC Millennium Radio & Computer Rally – Wythall Park Silver Street, Wythall. OT 10am, £1.50, TS, B&B, TI S22, LB, C, park & ride. Chris, G0EYO, 0121 246 7267 or chris@g0eyo.freeserve.co.uk

18 MARCH 2000

ABERYSTWYTH & DARC, West Wales Amateur Radio & Computer Rally – Penparcau School, Aberystwyth. OT 10am, £1.00, TS, B&B, TI S22, SIG, C. Ray, GW7AGG, 01686 628778.

SILENT KEYS

WE REGRET to record the passing of the following radio amateurs:

G4SUJ	Mr L Greville-Smith	23/11/99
GM2CWL	Mr C K Haswell	
G3BWN	Mr I R Fraser	02/12/99
G0RDL	Mr M Smith	12/04/99
VK3AFQ	Mr H L Hepburn	07/12/99
G4YWC	Mr TAF Stuttard	26/11/99
G0OVP	Mr R J Layzell	
RS87251	Mr J Broutin	01/99
2E1FRS	Mr D C Powis	28/11/99
G4WXY	Mr RKA Martin	18/10/99
G3EJC	Mr D Flowers	14/10/99
ZL1APA	Mr R Hardy	
G3PNR	Mr W Higgins	06/12/99
G3TJY	Mr DRH Jolly	10/12/99
EA3DJF	Mr F J Barns	31/12/99
GI4UKH	Mr C Duignan	21/09/99
GI0VFT	Mr K Cree	25/11/99
MI1EAH	Mr J Fisher	03/12/99
GI3MUS	Mr WAR Bell	28/12/99

KEY

Club News
AD - Annual Dinner; **AGM** - Annual General Meeting; **ARDF** - Amateur Radio Direction Finding; **B&B -** Bring and Buy; **CON** - CONstruction; **CC** - Construction Competition; **D -** Details; **ES** - Equipment Sale; **EW -** Evenings/Weekends; **JS** - Junk Sale; **MP -** Morse Practice; **OH** - Office Hours; **OTA** - On The Air; **Q** - Quiz; **RP** - Rally Preparations; **T** - Talk; **VID** - VIDeo;

Rallies & Events
TI - Talk-In; **CP** - Car Park; **£** - admission; **OT** - Opening Time - time for disabled visitors appears first, eg (10.30/11am); **TS** - Trade Stands; **FM** - Flea Market; **CBS** - Car Boot Sale; **B&B** - Bring and Buy; **A** - Auction; **SIG** - Special Interest Groups; **MT** - Morse Tests; **LB** - Licensed Bar; **C** - Catering; **DF** - Disabled Facilities; **WIN** - prize draw, raffle; **LEC** - LECtures / seminars; **FAM** - FAMily attractions; **CS** - Camp Site.

Events Diary

19 MARCH 2000

BOURNEMOUTH RS Annual Sale – Kinson Community Centre, Pelhams Park, Millhams Road, Kinson, Bournemouth. OT 10.30am, £1, TIS22, TS, SIG, C. 01202 887 721.

19 MARCH 2000

TIVERTON SW ARC Radio & Computer Rally – Pannier Market. 9.45am/10am, CP, B&B, C. Dave, G4DUT, 01884 253 077.

NORBRECK Amateur Radio, Electronics & Computing Exhibition - 0151 630 5790.

26 MARCH 2000

BARRY ARS, Welsh Amateur Radio Exhibition – Memorial Hall, Barry. OT 10.30am/10am. Official opening by special guest at 11.30am. Brian, 01222 832 253.

VINTAGE Technology 2000 – de Vere Hotel, Leisure Centre & Golf Course, East Park Drive, Blackpool. OT 9.00am, £4, CP, SIG. Brian, 01253 508 232.

16 APRIL 2000

CAMBRIDGESHIRE REPEATER GROUP Annual Rally – Bottisham Village College, Bottisham, 6 miles east of Cambridge, access via A14 and A1303. OT 10.30am, £1.50, TS, B&B, A, CBS, CP, TI on S22. 01462 683 574.

SWANSEA ARS Amateur Radio & Computer Show – Swansea Leisure Centre, on the A4067 Swansea to Mumbles coast road. OT 10.30am, £1 (children 50p), TS, B&B, SIG, LB, C. Roger, GW4HSH, 01792 404 422.

YEOVIL QRP Convention – Digby Hall, Hound Street, Sherborne, Dorset. OT 10.00am, £2, TS, B&B, LEC. Peter, 01935 813 054.

30 APRIL 2000

BREDHURST RECEIVING & TRANSMITTING SOCIETY, Rainham Radio Rally – Rainham School for Girls, Derwent Way, Rainham, Kent. M2 Jcn 4 or A2 – follow RRR arrows. TI, OT 9.30am/10am, B&B, SIG. Martin, 01634 365 980.

STIRLING & DARS with Morse Enthusiasts Group Scotland, Annual Get-Together – Throsk, nr Stirling. GM0PIV, 37 Clepington Road, Dundee DD4 7EL.

1 MAY 2000

DARTMOOR Radio Club Rally, Ron, G7LLG, 01822 852 586.

MID CHESHIRE ARS Rally, David, G4XUV, 01606 77787.

7 MAY 2000

DRAYTON MANOR Radio & Computer Rally, Peter, 0121 422 9787 or 0121 443 1189.

21 MAY 2000

RIPON & DISTRICT ARS Northern Mobile Rally, Gerald, G0UFI, 01765640229, or gerald@bronco.co.uk.

THREE COUNTIES Radio & Computer Rally, Eddie, 01905 773 181.

28 MAY 2000

IPSWICH RADIO CLUB East Suffolk Radio Rally (Wireless Revival), G4DDK, 01394 448 495.

11 JUNE 2000

NUNSFIELD HOUSE ARG Elvaston National Radio Rally, Les, G4CWD 01332 559 965 or les@g4cwd.demon.co.uk

22 / 24 JUNE 2000

HAMRADIO 2000, Friedrichshafen, Germany

25 JUNE 2000

LONGLEAT RALLY, Longleat House, Warminster, Wilts.

8 JULY 2000

CORNISH RADIO Rally & Computer Fair, Robin, 01209 820 118.

9 JULY 2000

SUSSEX Amateur Radio & Computer Fair, Ron, G8VEH, 01903 763 978 or 01273 417 756.

YORK RADIO CLUB (Amateur) Radio Rally, Pat Trask, G0DRF, 01904 628 036.23 JULY 2000

COLCHESTER Radio Rally & Computer Fair, Frank, G3FIJ, 01206 851 189.

RUGBY AMATEUR TRANSMITTING SOCIETY Radio & Computer Fair, Arthur, M0ASD, 01788 550 778.

30 JULY 2000

RSGB RADIO HOBBY DAY, RSGB, 01707 659015.

CONGRATULATIONS

To the following whom our records show as having reached fifty or sixty years continuous RSGB membership this month:

50 years

Mr H Brooke, G3GJV
Mr T I Lundegard, G3GJW
Mr F V Kershaw, G3GKI
Mr J U Burke, G3HEA
West Kent ARS, G3WKS

60 years

Mr K E Roberts, G3DKR

13 AUGUST 2000

BRIDGEND & DARC Millennium Rally, Maurice, GW0JZN, 01656 864 579 or e-mail gw0jzn@yahoo.com

KING'S LYNN ARC 11th Great Eastern Rally, Derek, G0MQL, 01553 841 189, or Fred, 01760 440 570.

10 SEPTEMBER 2000

VINTAGE Technology 2000, Brian 01253 508 232.

22 / 23 SEPTEMBER 2000

LEICESTER Amateur Radio Show, Geoff, 01455 823 344, fax 01455 828 273, or e-mail g4afj@argonet.co.uk

8 OCTOBER 2000

NORTH WAKEFIELD RC 17th Radio Rally, http:/www.nwrc.mcmail.com or 01924 824 451.

15 OCTOBER 2000

BLACKWOOD & DISTRICT ARS Radio, Computer & Electronics Rally, Stuart, 01495 240 260, fax 07970 777 756, or e-mail fireham@aol.com

12 NOVEMBER 2000

GREAT NORTHERN HAMFEST, Ernie, G8LUE, 01226 716 339. Mobile 07787 546 515.

MIDLAND ARS 12th Radio & Computer Rally, Peter, 0121 443 1189

GB CALLS

These callsigns are valid for use from the date given but the period of operation may vary from 1 – 28 days before or after the event date. Operating details are provided in an abbreviated form as follows: T = 160m; L = 80 or 40m; H = HF bands (30 – 10m); V = 6 and / or 4m; 2 = 2m; 70 = 70cm; S = satellite and P = packet. Please send operational details of your special event station to the *RadCom* office at least five weeks before publication.

1 Feb	GB2MMY: Millennium Year. LeicesterTLHV27P (G0TNI)
	GB2OK: RSARS Millennium Call. Woking. (G0WEE)
12 Feb	GB5TT Contest Callsign. Ingatestone, Essex. LH2 (G4UHM)
15 Feb	GB2MIL: Millennium. Milford Haven, Pembs. (MW0BYS)
25 Feb	M2000A: Millennium. Blackheath, London. TLHV27P (G3RCV)

The RSGB Old Timers' Honour Roll

The RSGB has subscription concessions to reward loyal service of many years - at the end of 1999 the following had been members of the society fo 50 years or more

74 YEARS

G5YN	Sir E Nepean
G5RV	Mr R L Varney
RS2627	Mr W S Eadie

73 YEARS

G6JP	Mr G R Jessop
GM6FT	Mr R T Frost

72 YEARS

G3AZ	Mr J J Hunter
G2WQ	Mr A Brown

71 YEARS

G2BY	Mr H E Whatley

69 YEARS

G2JL	Mr R V Allbright
G5VQ	E W Taylor
G6HD	Mr T L Herdman
G8SC	Mr C Collins
G6QY	Cdr W B Brown
G5VO	Mr J H Hargreaves
G6NA	Mr H C Spencer
HB9T	Dr R Stuber

68 YEARS

G3CJ	Mr E H Heaton-Jones
G6XM	Mr W James

67 YEARS

G5IJ	Mr I J P James
G5WW	Mr P M Carment
GI5SJ	Mr S N Johnson
G0BXB	Mr R E Wilkinson
G2KI	Mr G A Spencer
G2QT	Mr F H Cooper
G5RI	Mr F J U Ritson
G3RQJ	Mr P Woollett
G5RL	Mr B K Rowell
G5LG	Mr A W Lister

66 YEARS

G2NJ	Mr W Carter
G8DV	Mr A P Morgan
G2PT	Mr J Piggott
G2HW	Mr H Whalley
G3AWA	Dr A J Woiwod
G6LJ	Mr S K Lewer
G5KW	Major K E S Ellis
G3MA	Mr E A Perkins
G5KM	Mr H H Eyre
G6HY	Mr R Healey

65 YEARS

G8PO	Cdr J E Ironmonger
G3KSH	W/Cdr A R Gilding
G2ASF	Coventry ARS
G2FBU	Mr J C M Greig
VK3MR	Mr M Campbell
G2KU	Mr R M Herbert
G4LX	L G Spencer
G6AG	Mr C J McClelland
G6CS	P T WCastle
G8PX	Mr F A Jefferies
GM5NU	Mr W B H Lord
G2DFP	Mr J M Lowe
G3ID	Mr A E Tupman
G5ZK	Mr R N Lawson
G8FF	Mr S Southgate
G8JM	Mr W G Hall
G6RJ	Mr A Robinson
G2DYM	Mr R Benham-Holman
G8GP	Mr E V Neal

64 YEARS

G3ADZ	Maj D W J Haylock
G8DR	Mr D R Aston
GW2AVV	Mr G E Evans
G8CXL	Mr N K Read
G6DP	Mr D E Palin
VE3XE	Mr E C Ilott
G2CIL	Mr G A Hook
G6LX	Mr R L Glaisher
G8KW	Mr R G Shears
G7EEU	Mr H W Skinner
G3WP	Mr J H Brazzill
G8GG	Mr H Fenton
G8QM	Mr V J Flowers
G8QZ	Mr H O Sills
G2HV	Mr J Dickson
G6JJ	Mr W N Craig
EA6ZY	S Ingram
G3LX	Mr H P Arnfield
G8LY	Miss C R Hall
G8VF	Mr A A Moss
G5BM	Mr F H Watts
G5QK	Southend & DRC

63 YEARS

G5KS	Mr A C Bevington
G3LD	Mr F W Foster
ZL1AH	Mr J D Wightman
G8VL	Mr J I Sinclair
GM3GG	Mr G Mortimer
G8FC	RAFARS
G4BU	Mr R H Draper
G3HN	Col J W W Cock
G2ARU	Mr R A Loveland
GM8SQ	Mr G Proctor
GW3SB	Mr T C Bryant
G8GD	Mr H E Ward
RS2692	Mr E M Frost
G2BNI	Mr D B Drage
G3VA	Mr J P Hawker
G8JR	Mr N P Haskins
G8RW	Mr R W Standley

62 YEARS

G2QA	Mr T Simkins MBE
G8GEA	Mr K T Warriner
G2BMI	Mr J Bramhill
G2HJP	Mr I A Hennell
G4CM	Mr C G Middle
G5DQ	Mr P J Broom
GI3VQ	Mr J K Thompson
GM3UU	Mr A S McNicol
G2BTO	Mr G Openshaw
G3CCH	Mr J H Stace
G6GN	Mr H J Gratton
G8SH	Dr P N Nield
G2CVV	Mr F C Ward
G3DFA	Mr D B Gaggs
G3FD	Mr H T Brock
G3OEP	Mr D J Buddery
G8DF	Mr A E Mitchell
G2CDT	Mr F H Martin
G2DSP	Mr R Allen
G3BR	Mr S T Hall
G3ZTF	Mr G T Sparkes
G4AL	Mr G R Cox
G3CU	Mr H F Knott
LA6A	Col L R Heyerdahl
G3VO	Mr J R Brierley
G8UN	Mr P Harrad
GM2AOL	Mr W S Hall
G2DTQ	Mr A Goode
G4FB	Mr F Barnard
G8FW	Mr K E Walters
G3BOB	Mr G M Ward
G3ENI	Cdr A J R Pegler
G3RZ	Dr T A Appleby
GW3QN	Mr J S Owen

61 YEARS

G3CQ	Mr A J Hallett
G3OS	Mr F Green
RS3271	Mr D Armstrong
GW2DHM	Mr W D Andrews
G2HKS	Mr R P B Udall
G2CXT	Mr A R Richardson
G3NL	Mr G W Parkes
G4DR	Mr D P Urquhart
G3FP	Mr B R Arnold
G2CPM	Mr W B Mansell
G4JT	Mr D A W Clark

G3QX Mr T R Barlow
GM3AWW Mr W S Murray
GM3UM Mr G P Millar
G8CK Mr W Bartholomew
GM3CFK Mr P Harrison
G3QD Mr J G Treece
G3AQM Mr F Gregory
G3DEQ Mr H N Woodnutt
G3YY Mr C T Fairchild
GM3AKM Mr L Richardson
GM3AWF Mr D F Craig
GW3CF Mr F G H Jones

60 YEARS
G5JR R J Buckstone
G3ANI Mr J R Senior
RS3580 Mr I M Gaye
G2ART Mr F H P Cawson
G3APN Mr D Rabbage
G4GD Mr N G V Anslow
GW3ZV Mr J Banner
G6QI Mr R Walker
G2BGU Mr K Gasson
GW2HCJ Mr R C Taylor
RS37399 Mr D H Tomlin
G2FSI Mr L W Smith
G4DC Mr P W Winsford
G3AOS Mr J G Barnes
G3AIK Mr K N Watkins
G3BWV Mr F E Springate
GW2FLZ Mr B H Green
G2CVO Mr F H Osborn
G3SZ Mr A Chilvers
GM3AVA Mr W W Peat

59 YEARS
G3DKR Mr K E Roberts
G2BLA M A Pyle
G3AJP Mr J D Baker
GD0GBA Mr J G Carroll
GM3BGB Mr S B Jagger
G3AAE Mr J D Kay
GW3ARS Mr J Sagar
G3DVV Mr J O Brown
G2AMG H W Mitchell
GW2HIY Mr E M Davies
G3GRO Mr D Atter

58 YEARS
G2BDV Mr I D Ellis
G2HHV Mr J Spivey
EI4L Mr J E Scanlon
G2BPW Mr I W K Smith
G2FQR Mr N W Austin
G4IOF Mr M East
G2FXQ Mr S Saddington
G2HIX Mr G G P Holden
G3CLL Mr J Willy
G3VW Mr R H Newland
G2HAX Mr S Shackleford
G3AEZ Mr J Greenwell
G3DAM Mr H Barnett
G3FGT L F Crosby
GJ3EML Mr J H E Watson
GM2FVV Mr W Girvan
G2FUU Mr T Knight
G2HDU Mr C W Cragg
RS4430 Mr W Telfer
AB4SW Mr I T Haynes
G2DKI Mr P N Ridout
G8XXV Mr G L Clarke
VK2FFF Mr S J Hutchison
G3FVD Mr R K Mildren
GM3CIX Mr L J McDougall
G2FWZ Mr S I Biggs
G2FXZ Mr J B Hodgetts
G3AEC Mr A J Janes
G3AKX Mr R G Lascelles
G3ASE Mr H S King
G3LCZ Mr T Hickinbottom

57 YEARS
G2HKU Mr E H Trowell
G3BWX Maj A L Fayerman
G3DRN Mr E G Allen
G3GYE Mr P T Pitts
G3HYJ Mr O F Simkin
G8LOK Mr L E Currington
G2DBA P M S Hedgeland
G3BAP Mr R Cordingley
G3GJX Mr E B Grist
G3AQX Mr S Roberts
G2FRI Mr T J Swain
G4LW Mr L Huntley
G6NB Mr D N Biltcliffe
RS5272 Mr C L Chappell
G3ALK Mr E J Holmes
G2AKY Mr E J Williams
GM0IJA Mr B C Skinner
G2ATM Mr S Read
G3GBN Mr S H Feldman
G2AOY Mr J R Muddell
G4QK Mr J B Roscoe
GM3BCL Mr A G Anderson
GM3DOD Mr A M Murray
G3AIN Mr D Withers
G3BPM Mr P J H Matthews
G3CXP Mr R A Gill

56 YEARS
G2FMU Mr M Jackson
RS6181 Mr R P Hope
G3AKU Mr R A Harding
G3IGM Mr R G Hindes
G3CAQ Mr W Moorwood
RS6464 Mr E Valentine
G3DKO Mr J W Stevenson
G3ENB Mr W E Gates
G3CBW Mr H Walker
G3GHS Mr J G Holland
G3LIA Mr R J Rogers
VK5ZO Mr D Clift
G3AAZ Mr G G Gibbs
G3HKJ Mr C F Page
G3BEG Mr P C Bond
G8JD Mr F L Firth
G3ANG Mr J W Emmott
G3NOF Mr D McLean

55 YEARS
G3AAJ Mr R J Broadbent
G3CJD Mr L F L Allen
G3CWW Mr A W W Timme
G3IRM Mr P Lumb
G2FUD Mr A W Owen
G3EKL Maj R A Webb
G3FDG Mr R G Morris
GI5TK Mr A R Irwin
G2DW Dr B F Wickham
G3BVU C J Beanland
G3HKT Mr A R Partner
G4KID Mr B C Partridge
G2DQX Mr R J Woodroffe
G3ADQ Mr A W Walmsley
G2DGB Mr A G Short
G2AAN Mr J H Clarke
G2CAZ Mr M S Ellis
G2FQP Mr L J Avory
RS8618 Mr A R Cameron
G3ATH Mr H Pain
G3YLR Mr F RBlake
RS558 Mr R D Thomas
RS8896 Mr J Crabtree
G0RVQ Mr A J Harrison
GW3HGL Mr B Clark
G3FZR Mr M W Capewell
G3EPK Mr R L S Harrison
ZL1AOA Mr J R Whitney
G3FPN Mr J R Davey
RS17973 Mr J A Lake

54 YEARS
G2ADR Mr E Parvin
G8AQT Mr F W J Neale
GW3CZC Mr P J Williams
RS9475 Mr J Smith
G0TTK Mr M A Chatfield
G3DNJ Mr G F Weller
G3TXT Mr R T Laing
RS10068 Mr P W Feesey
RS10128 Mr A C Lees
G3BPG Mr J H Richards
G3CRJ Mr B J Shaw
G3EBH Mr G C Newby
G3JON Mr J Bell
G5GC Mr G A H Eckles
G2FQS Mr R L Barrett
G3IJS Mr J F Stratfull
G2FSS Mr J A Caley
G3BVB Mr D R J Adair
G3FOO Mr A Seed
RS10548 Mr J B Gurney
RS10817 Mr R J Baker
W2CIH Mr N Champness
G3AMF Mr K G Thompson
G3BJC Mr R E Sparry
G3BYW Mr W M Dunell
G4IOT Mr A T Hunt-Duke
G4YK Mr B M Morrisey
G6RO Mr R C Kaye
G8GF Mr W A Higgins
GM2BMJ Mr T D Jardine
GM2FHH Mr L Hardie
RS20428 Mr A R Bunnage
RS9710 Mr F W Adderley
G2AOZ Mr G W F Ashford
G3CSC Mr S J Roddan
G3DWQ Mr G Lancefield
G4AQ Mr E G Filby
G8PG Mr A D Taylor
G2HCG Mr B Sykes
G3BNE Mr G W Alderman
G3INN Mr N S Lilley
GW3JGA Mr J E T Lawrence
G0AEW Mr D T Arlette
G2BRR Mr R G Rugg
G3AUB Mr N R Paul
G3BZB Mr R T Cunliffe
G3EFS Mr W H Borland
GW2FYV Mr M Arthur
VK5CE Mr C Taylor
G0BFI Mr V E Heard
G3CLK Mr K J Vickery
G3CXI Mr P J Cooper
G3ENG Mr J D Mathews
G3FJN Mr J A Barson
G8BFS Mr J F Dudeney

53 YEARS
G2FKZ Mr C E Newton
G2FTK Mr F A Noakes
G3CRH Mr H H A Sanders
G3EEQ Mr K C Gill
G3ESY Mr P W F Jones
G3FEX Mr B C Oddy
G3PFJ Mr J D Harris
G0TTG Mr M Warriner
G2CQX Mr P V Pugh
G3DIT S Hampshire
G3FNJ Mr N F Joly
G3FRN Mr G N Myatt
G2FCA Mr A E Burnard
G2FSA Mr R L Harvey
G3AIU Mr K A H Rogers
G3BHF Mr E C Hasted
G3DXB Mr R Gladwell
G3ESA Mr J H Oakes
G5SD Mr D E Campbell
RS12233 Mr H W Sennett
G2DXK Mr L Knight
G3AFK Mr V A Bagnall
G3BJB Mr E Dandy
G3BKN Mr E W Batten
G3FKJ Mr W F Jeffery
G3IDG Mr F A Herridge
RS12415 Mr H J Wood
G2CHI Mr W G Bailey
G2CKQ Mr R S Trevelyan
G3BHW Mr E J Hancock
G3CHD Mr S R Barker
G3COJ Mr A H B Bower
G3CRR Mr A E Glozier
G3CTQ Mr H Westwell
G3DII Mr J Bell
G3EOO Mr J Hamlett
G3EUS Mr J G Fitzgerald
G3JQI Mr A N Barton
GM3DSD Mr A Trayler
GM3JOA Mr H E Stanway
RS12840 Mr J L Butcher
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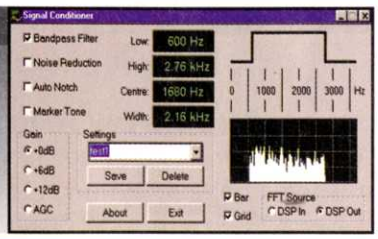

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Construction of internals	WR-1000i/WR-1500i-3100iDSP- Internal full length ISA cards		
Construction of externals	WR-1000e/WR-1500e - 3100e - external RS232/PCMCIA (optional)		
Frequency range	0.5-1300 MHz	0.15-1500 MHz	0.15-1500 MHz
Modes	AM,SSB/CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W	AM,LSB,USB,CW,FM-N,FM-W
Tuning step size	100 Hz (5 Hz BFO)	100 Hz (1 Hz for SSB and CW)	100 Hz (1 Hz for SSB and CW)
IF bandwidths	6 kHz (AM/SSB), 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 9 kHz (AM) 17 kHz (FM-N), 230 kHz (W)	2.5 kHz(SSB/CW), 9 kHz (AM) 17 kHz (FM-N), 230 kHz (W)
Receiver type	PLL-based triple-conv. superhet		
Scanning speed	10 ch/sec (AM), 50 ch/sec (FM)		
Audio output on card	200mW	200mW	200mW
Max on one motherboard	8 cards	8 cards	3-8 cards (pse ask)
Dynamic range	65 dB	65 dB	85dB
IF shift (passband tuning)	no	±2 kHz	±2 kHz
DSP in hardware	no - use optional DS software	YES (ISA card ONLY)	
IRQ required	no	no	yes (for ISA card)
Spectrum Scope	yes	yes	yes
Visitune	yes	yes	yes
Published software API	yes	yes	yes (also DSP)
Internal ISA cards	£299 inc vat	£369 inc vat	£1169.13 inc
External units	£359 inc vat	£429 inc vat	£1169.13 inc (hardware DSP only internal)

PCMCIA Adapter (external): £69.00 inc when bought with 'e' series unit (otherwise: £99 inc)
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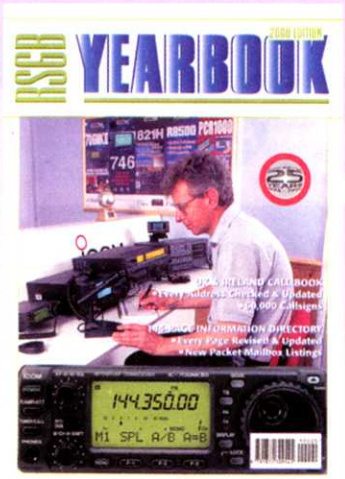

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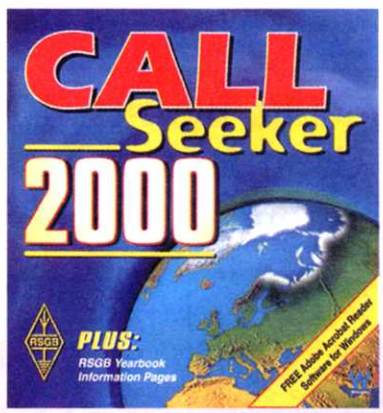

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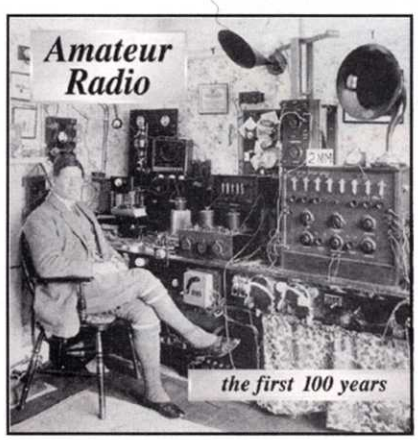

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the last Word

Noisy News

As an avid listener to the Sunday GB2RS News, I am continually amazed at the level of interference from non-UK stations. My suggestion is so simple that you have probably already thought of it, but, for the sake of bringing the matter to your attention, I thought 'why not?' (I am working on the assumption that the RSGB, as our appointed body, has a close working relationship with the respective French, Italian and German National societies).

Would it not be a simple matter for all the societies to publish in their respective publications or any other media, the time and frequencies of any national transmissions, with a request to avoid them even if they cannot hear any transmission?

While no one should claim 'the right' to a frequency, I think that with enough support from the national societies, gentlemanly behaviour could once again prevail.

Could I also, through the medium of this column, thank the volunteers who give their time on Sundays, especially in the evening when they are usually fighting against many kilowatts of QRM.

Richard Ackroyd, G4SYV

[Gordon Adams, G3LEQ, GB2RS News Manager, replies: "To avoid mutual interference with a German regional bulletin, we moved off 3660kHz and stacked our readings up at half hour intervals on 3640 and 3650kHz. Unfortunately, the French regional net on 3640kHz at 9.00am still gives us some problems, so until 10.00am our readers tend to operate 2.5kHz high. 80m and 40m are at their busiest on Sunday mornings, indeed I have counted between 60 and 80 QSOs at any one time. Just to make things even more difficult, some of the NATO data transmissions in the band occupy at least 6kHz."]

HF Column

How sad the letter 'Uninteresting Column', by M0ATN, in 'The Last Word' (January 2000). By his callsign, he has not yet dried out behind the ears. The HF column, its aims and benefits… well, to the discerning amateur, it is a vehicle to transport information from various points to various points. Unfortunately this does often mean that rare and uninhabited (by humans or amateur radio operators) islands form a large part of its content; but so does the contesting aspect, the odd bits of QSL news, where there may be meetings, and the outcome of these meetings with respect to HF. There are from time to time useful snippets of info with respect to operating practices and where to look for DX, mainland or islands, times, freq, modes, etc.

The gripe of M0ATN seems totally without foundation, as most of us actively combing the spectrum for DX/contests/ragchews know the secret; 95% of the DX always stays put and is there for all to do with what they may.

Incidentally, in the morning, propagation will mainly be from the east (VK, ZL, Far East); with Asiatic Russia, BY, HL, etc, later in the morning. In the early afternoon, south is ZS, Z2, etc. Later in the afternoon brings a spattering of South America and the Caribbean. The winter months also contain vast openings to the States. So now there is no need to waste your time reading HF - make another contact instead!

Stuart Lindsay, G0KDS

EMC Saviour

About a fortnight ago my calm and peace was shattered by a telephone call "Your Morse is coming through on my satellite speech and I cannot hear what is being said. This has been for about a month now. I was going to tell you, but I forgot. The football is on and I am missing the commentary". I stopped transmitting immediately, no need to infuriate the neighbour further.

Some years previously I had fitted an AKD HPFS to the same neighbours video input. For the past five years he has had satellite equipment had all been well.

I phoned several co-ordinators and the first one who was available was GM4ILS, in Elgin, some 300 miles north of this QTH. His first reaction was to make sure I had returned to earth and to assure me that all would be well in the future. He duly sent me a set of high quality leads, ie double screened and properly terminated. While waiting on the leads to arrive I advised the neighbour that I was actually doing something about *his* problem, at which point he let slip that some weeks previously, during a visit, his small grandson had either removed all the leads from satellite/video and TV, or had tipped the lot onto the floor and the leads had become disconnected.

The new leads duly arrived with further instructions of certain tests that should be carried out to check where the interference was getting into the system. Leads in hand I set out to be the world's most discerning diplomat. My first task was a visual check. Lo and behold the filter was in the input socket of the satellite converter. This was duly moved to the input of the video recorder and one lead which was in poor shape was changed.

On returning home I telephoned the neighbour and carried out a series of CW checks. All frequencies were clear, with the exception of the 12m band where he stated "a very low level of flicker, but not sufficient to interrupt one's viewing".

He was happy - I was ecstatic.

Gerry Maxwell, GM4BAE

Tackling the RAE

As someone who is tied by work and domestic commitments and is also keen on radio, I am surprised that no one has thought to put the syllabus for the RAE onto video or even CD ROM. I failed the RAE last May, due to trying to pass by studying on my own in my spare time. If the syllabus was on a few instructional videos, we would be able to give radio the time it needs but when it is convenient to study.

I also think that another barrier to becoming qualified is the time in between the exam dates. Surely the answer paper is easy to mark and should not be a barrier to there being more exam dates. When I sat my exam, I had to ring up and find if I had passed or not, as the college failed to notify me. If we are to take radio into the 21st century, we need to enable students to study when working hours permit.

John Davis

[Mike Dennison, G3XDV, Publications Manager, replies: "The Society investigated putting an RAE course onto video some time ago, and a short demonstration tape was produced, but the project proved too expensive. We are actively looking at both a CD-ROM and a web-based course."]

[Peter Kirby, G0TWW, General Manager replies: "The Society has been working closely with both the RA and C&G to establish the 'RAE on-demand' scheme. The scheme is on track to be introduced later this year. This, coupled with the club-based test centre scheme, which is due to be introduced in May, should ensure that everyone wishing to take the RAE/NRAE will be able to do so when they want, where they want, and at a price within their budget."]

Morse's Morse

Regarding 'The Last Word' and 'Credit Where It's Due' (December 1999), according to the *Encyclopaedia Britannica*, and I quote: "He, Morse, conceived the idea of the telegraph in 1932 and probably had completed his first working model by 1835. By 1837 he turned his full attention to the new invention and in 1838 developed the Morse Code. A United States Supreme Court established his Patent Rights in 1854, and he became wealthy". This is also confirmed in *Samuel F B Morse, his Letters and Journals*, by E L Morse, 1914. Morse was involved in legal claims by his partners and by rival inventors, as he was in matters of religion, politics and art, but, as far as the Code was concerned, the Court found in his favour.

In Morse's Notebook, Letters and Journals, there is a photograph entitled 'First form of key'. It is a very basic straight hand key, the forerunner of today's Morse keys, which was later claimed by Vail to be his invention. Perhaps, as Shakespeare wrote in *Much Ado about Nothing*, 'If two men ride on a horse, one must ride behind'.

Don MacLennan, G3KGM

Where The Action Is

Regarding comments from Mr Walton, M0CMG ('The Last Word', December 1999), I would agree that the 2m band is under-used, which begs the question why the change to 12.5kHz? However, returning home at 1am on a Sunday morning, I took the opportunity to monitor 80m and found (in modern parlance) 'wall to wall' CW. Does that beg another question?

V Wood, G3HRF

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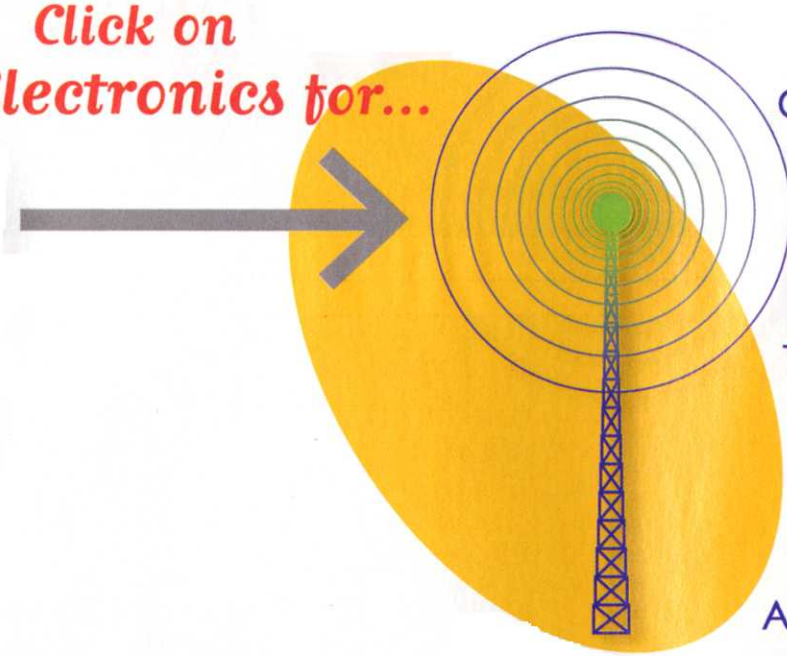

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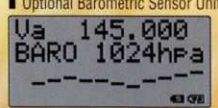

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