March 1986

RADio COMmunication

Journal of the Radio Society of Great Britain

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MARCH 1986

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RADio COMmunication

EDITOR
A W Hutchinson

Editorial assistant
Miss S J Smith

Draughtsman
D E Cole

Editorial secretary
Mrs A M Celand

All contributions and correspondence concerning the content of *Radio Communication* should be addressed to:

The Editor, RSGB,
88 Broomfield Road,
Chelmsford,
Essex CM1 1SS

Tel 0245 84938

Office hours: 0915 to 1715

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RSGB Headquarters,
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CONTENTS

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All articles received are reviewed for technical merit by the RSGB Technical & Publications Committee, or an acknowledged expert on the subject, before acceptance. Payment at high competitive rates will be made for all articles published.

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hf transceivers

TS940S HF transceiver with general coverage receiver
Top of the range, the TS 940S has every operating feature that the discerning HF operator needs. Amateur bands, 160 through to 10 metres plus a general coverage receiver tuning from 150KHz to 30MHz. Modes of operation are USB, LSB, CW, AM, FSK and FM, included as standard. Forty memory channels, each effectively a separate VFO and simple keyboard frequency entry make operation and ownership of a TRIO TS940S a pleasure.

TS940S . . . £1795.00 inc VAT, carriage £7.00

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Much has been said and written about the TS930S and it now has a place high in the affection of those amateurs fortunate enough to own one. Providing full coverage of the amateur bands from 160 to 10 metres and including a general coverage receiver tuning from 150KHz to 30MHz, the TRIO TS930S is ideal for today's crowded frequencies.

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A compact transceiver suitable for mobile or portable operation, yet having all the facilities necessary for effective radio communication. The TS430S has, in addition to the amateur bands from 160 to 10 metres, a general coverage receiver. Modes of operation are USB, LSB, CW, AM with FM optional. Owned by many radio amateurs worldwide, the TRIO TS430S is an ideal way to combine amateur radio with short wave listening.

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TS830S HF amateur bands transceiver
Needing no description, the TS830S, which uses a pair of 6146B valves in the PA is well known on the amateur bands for its superb signal quality. Having variable bandwidth tuning, IF notch, IF shift and provision for various filters, its receive performance is excellent too.

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TS530SP HF amateur bands transceiver
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handheld transceivers

TR2600E and TR3600E 2 metre and 70 centimetre FM handhelds
The latest handhelds from TRIO are a natural progression from the much liked TR2500/TR3500. By adding DCS, the ability to skip particular memory channels, to hold for either timed or carrier when scanning, for the memory to hold whether the channel is simplex or repeater shift and an illuminated "S" meter, TRIO have produced a first class pair of handhelds.
TR2600E . . . £299.00 inc VAT, carriage £7.00
TR3600E . . . £324.36 inc VAT, carriage £7.00

TH21E and TH41E 2 metre and 70 centimetre FM compact transceivers
The TH21E and TH41E are two simple handhelds, each extremely small yet having full repeater facilities including reverse repeater. Power output is one Watt or 150 mulliWatts in the low position and frequency selection is by means of thumbwheel switches. Very small but still convenient to operate, the two transceivers are just right for the amateur who wants to stay in touch.
TH21E . . . £189.30 inc VAT, carriage £7.00
TH41E . . . £220.95 inc VAT, carriage £7.00

vhf/uhf all-mode transceivers

TS780 VHF/UHF dual band transceiver
The TS780 is the ultimate base station for the enthusiastic operator who wants both 70 centimetres and the 2 metre band in one transceiver. Modes of operation are USB, LSB, CW and FM. Full repeater facilities, plus two VFOs, IF shift, two priority channels, memory and band scan combine to make the TRIO TS780 the perfect rig.

TS780 . . . £1061.20 inc VAT, carriage £7.00

TR9130 two metre all-mode transceiver
The TR9130 is now a classic rig—so popular that to have one on the second hand shelf is rare. 25 Watts on SSB, FM and CW, green frequency display, six memories, two VFOs and memory scan make the TRIO TR9130 ideal for either mobile or base station operation.

TR9130 . . . **£544.73** inc VAT, carriage £7.00
TR9300 (6 metres) . . . **£590.49** inc VAT, carriage £7.00

TS711E and TS811E 2 metre and 70 centimetre base stations
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TS811E . . . £895.00 inc VAT, carriage £7.00

vhf/uhf fm transceivers

TW4000A FM VHF/UHF dual band transceiver

To have both 70 centimetres and 2 metres available in one mobile transceiver has been a desire of the VHF/UHF enthusiast for many years. TRIO with the TW4000A have satisfied that need. The transceiver is well known for having an excellent receiver and as those who already own and operate one know, is a delight to use. Compact and producing 25 Watts on both bands, the TW4000A is the enthusiast's natural choice.

TW4000A . . . £580.34 inc VAT, carriage £7.00

TR7930 2 metre FM mobile/base station transceiver

A mobile FM transceiver that also doubles as a piece of shack equipment. Producing 25 Watts and having 21 memories, priority alert, full repeater facilities including reverse repeater, programmable band scan, memory scan and keyboard frequency entry, the TR7930 is ideal for mobile operation using the programmed memories, yet is suitable for shack use with the front panel keyboard.

TR7930 . . . £365.60 inc VAT, carriage £7.00

TM201A and TM401A 2 metre and 70 centimetre mobile FM transceivers

Accepting the fact that there is little space in a modern car for anything other than a radio/cassette unit, TRIO have with the TM201A and TM401A produced the definitive compact transceiver. By removing the speaker and making this separate, TRIO have given you excellent receive audio quality. The TM201A and its 70 centimetre version, the TM401A are ideal for the amateur who wants a high performance rig with ease of operation.

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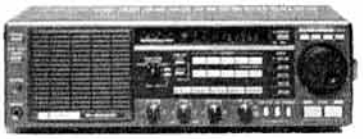
6 metre equipment

TS670	An all mode (FM optional) four band base station transceiver covering 6, 10, 15 and 40 metres. 13.8 volt DC operation/10 watts output. Also available for the TS670 is a general coverage receiver unit covering 500kHz to 30MHz.	
TS670		**£774.13** inc vat, carriage £7.00.
FM430	FM board	**£45.00** inc vat, carriage £1.00
GC10	Receiver board	**£58.75** inc vat, carriage £1.50
TR9300	Simply a 6 metre version of the well known 2 metre TR9130. 10 watts out, 13.8 volt DC operation.	
TR9300		**£590.49** inc vat, carriage £7.00

general coverage receiver

R2000 general coverage receiver

The R2000 general coverage receiver from TRIO covers the frequencies from 150KHz to 30MHz. Modes of operation are AM, USB, LSB, CW and FM. For convenience the R2000 has ten memories, each of which holding frequency and mode information. Memory scan and programmable scan between user designated limits are also included. Provision has been made for an optional internal VHF converter covering from 118 to 174MHz. Operating from either mains or 12V DC the TRIO R2000 is an ideal way to listen to the world.



R2000 . . . £518.73 inc VAT, carriage £7.00
VC10 VHF converter 118 to 174MHz . . . **£139.01** inc VAT, carriage £2.50

station accessories

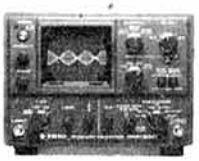
TL922 HF amateur band linear amplifier

The TL922 is a class AB2 grounded grid linear amplifier using two high performance EIMAC 3-500Z tubes. It covers 160 to 10 metres for SSB, CW and RTTY modes of operation. Engineering perfection, those who have seen a TL922 will know what I mean. It is one of the few items of amateur radio equipment which is truly hand built by a specialist engineer.

TL922 inc tubes . . . **£1265.00** inc VAT, carriage £7.00

SM220 station monitor

Based on a wide frequency range oscilloscope, the SM220 station monitor features in combination with a built-in two-tone generator, a wide variety of waveform observing capabilities. The SM220 aids efficient station operation as it monitors transmitted waveforms and it also serves as a sensitive wide frequency range oscilloscope for various adjustments and experiments. When fitted with the optional BS8 panoramic display and connected to one of the following transceivers (TS940, TS830, TS180, TS820 series) signal conditions in the vicinity of the receive frequency can be seen over a 40 or 200KHz range.



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BS8 . . . **£66.11** inc VAT, carriage £1.50

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CWR610E Rx unit RTTY/CW/ASCII
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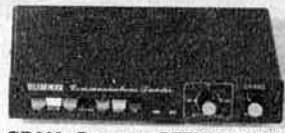

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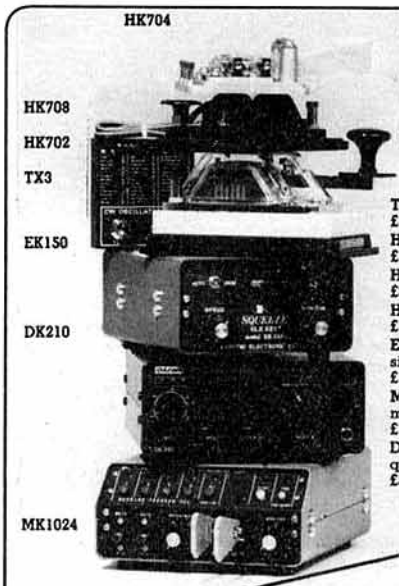

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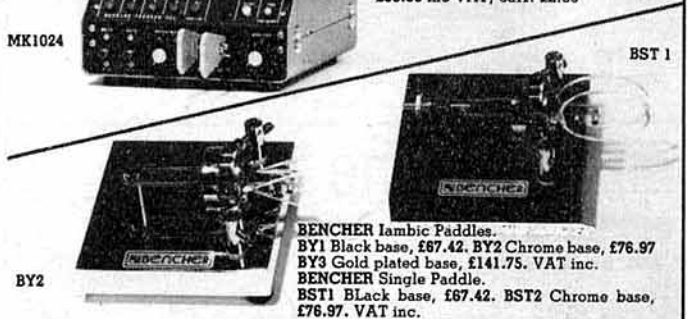

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"as I said to John"

This series on receivers has looked at the way in which shortcomings in receiver design or specification can hamper reception of radio signals. There is, of course, always the case where a signal cannot be received properly because it suffers direct interference from other signals, and this concluding article looks at some of the devices available on receivers to extract the wanted signal.

One popular feature is a NOISE BLANKER. The effectiveness of this is rather variable, depending on the model and the type of interference, but the aim is to reduce audibility of impulse noise, such as ignition and electrical interference. Most types operate by detecting a fast-rising pulse and then muting the receiver for a short period during this pulse. The resulting 'hole' in the signal is about 500 μs long and is often inaudible. More expensive receivers offer noise blankers with adjustable threshold levels and muting times which can be set to best reject noise without generating too much distortion. Note that noise blankers are required only for AM and SSB operation since FM receivers should inherently reject AM and pulse interference.

A particularly useful device, especially for HF band receivers, is a NOTCH FILTER. This strongly rejects a narrow band of frequencies and is effective for removing continuous heterodynes from the received signal. The shape of a notch filter's response is quite critical for good operation. If the notch is too wide audio quality is adversely affected, and if it is too narrow it will be difficult to tune and will not cope with slight drift of the heterodyne frequency. Notch rejection should be about 40dB, and tuning range about 4kHz to cover most interference. Notch filters can exist in the IF or audio sections of a receiver, the IF variant is to be preferred for versatility and audio quality. Many audio notches have insufficient tuning range and produce effects more like the phasing on older pop records.

Many of the other facilities offered on receivers and transceivers can be grouped under 'messing about with the filters'. There are principally two variables controlling receiver filtering: the bandwidth of the filter and the frequency at the centre of the filter's passband. Adjustable or selectable bandwidth is useful to reject interference and still let as much wanted signal through as possible. Selectable bandwidth requires many filters which can be switched in as needed, and as it is very expensive to offer a good range of selectivities with this system most receivers use a variable bandwidth system instead. This is achieved not by changing the bandwidth of the filter element, but by using two filters of similar bandwidths in different IF stages of the receiver. In normal use the centre frequencies of these two filters are the same (relative to signal frequency) so that the signal passes through the whole passband of both filters. When the bandwidth is to be narrowed, the mixing frequencies within the receiver are changed, and the centre frequencies no longer coincide. This means that the common passband through both filters is narrowed. The receiver tuning systems must be designed so that the local oscillator and carrier injection are tuned in step with the filter mixing, so that altering the filter bandwidths does not re-tune the receiver.

The two filter variable bandwidth system lends itself to a very flexible receiver. By adjusting the centre frequencies of either one or both of the controlling filters the receiver can offer variable bandwidth, passband tuning, and upper and lower filter slope control. A fine example of this system is in the TRIO TS930 and TS940 transceivers where filters are used at 8.83MHz and 455kHZ. In AM and CW modes the filter bandwidth can be varied and in SSB mode the frequency of the upper and lower filter slopes can be adjusted independently.

Reception of AM signals in broadcast bands is often impaired by fading after dark. The problem is that multiple propagation paths of signals between the transmitter and receiver cause frequency selective signal cancellation which will reduce the level of the carrier in the AM transmission at periodic intervals. A conventional AM detector will not operate correctly with low carrier levels—the effect is similar to over-modulation—and high levels of distortion are produced. A solution to the problem is to generate a carrier signal within the receiver in synchronism with the transmitted carrier, and then use a product detector to resolve the audio signal. There are at present only a few receivers on the market that use this detection system, which is often called phase-locked AM or exalted carrier reception, but the advent of low cost PLL systems should ensure that it is included in more receivers in a few years time.

This article concludes the technical series on receivers which I hope has been informative to our readers, and explained some of the relevant technical terms. I trust that you have enjoyed reading it as much as I have in writing it. *John*

ICOM

IC-1271E, 1·2GHz Multimode Transceiver

ICOM, a pioneer in 1.2GHz technology are proud to introduce the first full feature 1240 – 1300 MHz base station transceiver. Features include: multimode operation, 32 memories, scanning and 10 watts RF output. The IC-1271E allows you to explore the world of 1.2GHz thanks to a newly developed PLL circuit that covers the entire band, a total of 60MHz, SSB, CW and FM modes may be used anywhere in the band making the IC-1271E ideal for mobile, DX, repeater, satellite or moonbounce operation. The IC-1271E has outstanding receiver sensitivity, the RF amplifiers use a low noise figure and high-gain disc type GaAs FET's for microwave applications. The rugged power amplifier provides 10 Watts which can be adjusted from 1 to 10 Watts. A sophisticated scanning system includes memory scan, programme scan, mode-selective scan and auto-stop feature. Scanning of frequencies and memories is possible from either the transceiver or the HM12 scanning microphone. 32 programmable memories are provided to store the mode and frequency in 32 different channels. All functions including memory channel are shown clearly on a seven digit luminescent dual colour display. The IC-1271E has a dial-lock, noise blanker, RIT, AGC fast or slow and VOX functions. With a powerful 2 Watt audio output the IC-1271E is easily audible even in a noisy environment. The transceiver operates with either a 240V AC (optional) or 12 volt DC power supply.

IC·R7000, 25-2000MHz. Commercial quality scanning receiver

ICOM introduces the IC-R7000, advanced technology, continuous coverage communications receiver. With 99 programmable memories the IC-R7000 covers aircraft, Marine, FM Broadcast, Amateur Radio, television and weather satellite bands. For simplified operation and quick tuning the IC-R7000 features direct keyboard entry. Precise frequencies can be selected by pushing the digit keys in sequence of the frequency or by turning the main tuning knob. FM wide/FM narrow/AM upper and lower SSB modes with six tuning speeds: 0.1, 1.0, 5, 10, 12.5, 25KHz. The IC-R7000 has 99 memories available to store your favouritre frequencies including the operating mode. Memory channels can be called up by pressing the memory switch then rotating the memory channel knob, or by direct keyboard entry. A sophisticated scanning system provides instant access to the most used frequencies. By depressing the Auto M switch, the IC-R7000 automatically memorises frequencies that are in use whilst it is in the scan mode, this allows you to recall frequencies that were in use. The scanning speed is adjustable and the scanning system includes the memory selected frequency ranges or priority channels. All functions including the memory channel readout are clearly shown on a dual-colour flourescent display. Other features include dial-lock, noise blanker, attentuator, display dimmer and S meter and optional RC-12 infra-red remote controller, voice synthesizer and HP1 headphones.

IC-505, 50MHz Transceiver

The IC-505 is a 50MHz band SSB, CW transceiver, and has already gained an excellent reputation worldwide. The dual VFO system has been developed using advanced computer and PLL technology. The IC-505 features 6 channel memories and can be used independent of emission modes, memory scan, program scan which searches only specified frequency band. LCD ensures clear visibility even in sunlight. The R.F. amplifier, a dual gate MOSFET features high gain and low noise characteristics. The IC-505 accepts a standard dry cell pack, rechargeable nicad battery pack (BP10) or 13.8v external power supply, 3 watts R.F. output, 0.5 watts low power, 10 watts at 13.8v. Accessory circuits include split frequency operation, noise blanker, squelch and CW break-in. Options include:- PS45 AC Power Supply and LC10 Carrying Case.

All these features make the IC-505 a great transceiver for operation on the 50MHz band.

IC-R71E, General coverage receiver.

The ICOM IC-R71E 100KHz to 30MHz general coverage receiver features keyboard frequency entry and infra-red remote controller (optional) with 32 programmable memory channels, SSB, AM, RTTY, CW and optional FM. Twin VFO's scanning, selectable AGC, noise blanker, pass band tuning and a deep notch filter. With a direct entry keyboard frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency is altered without changing the main tuning control.

Options include FM, voice synthesizer, RC-11 infra-red controller, CK70 DC adaptor for 12 volt operation, mobile mounting bracket, CW filters and a high stability crystal filter.

The ICOM Control System

If you have a BBC Micro (Model B) or Commodore 64 or 128, the ICOM control system can control up to four (or more) ICOM radios in the range: IC-751, 735, R71, R7000, 271, 471 and 1271 (and 745 with modification). The help menu shows the available functions. The system will be displayed at N.E.C. BCNU.

	H = HELP
FO	Frequency
F1	Select Mode
F2	Freq/Memory Scan
F3	Mode Scan
F4	VFO → Memory
F5	Memory Write
F6	Memory Clear
F7	Set 'SIG' Level
F8	Memory File Read
F9	Memory File Write

↔	Frequency Steps
↑V	Up/Down (arrows)
M	Memory Channel
,.	Memory Up/Down
/	VFO/Memory
B	Bargraph Select
@	Occupancy On/Off
:	Scan Stop Off/On
S	Change Set
DEL	Speech (If fitted)
Q	Quit

Stand D4

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IC-3200E Dual-band

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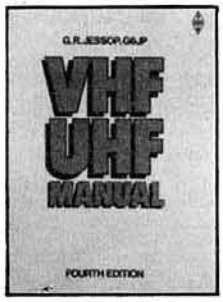

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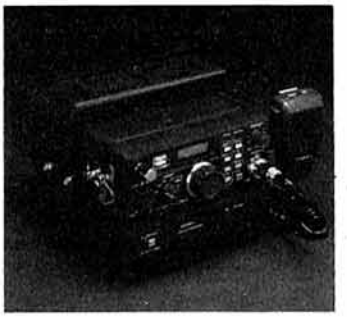

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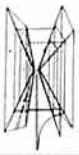

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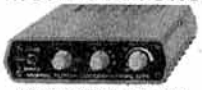

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EDITORIAL

PREPARED FOR EMERGENCIES?

We learnt last month that the mayor of Mexico City had officially thanked the world's radio amateurs for their "fine behaviour" following the twin earthquake disaster which struck the city in September 1985. A total of over 300,000 separate welfare messages were passed, when almost all normal communication to and from one of the world's most highly populated cities was wiped out in less than 48 hours. It is under such conditions that amateur radio can come into its own—on this occasion it did so. News of friends and relatives was relayed to points all over the globe, in most cases relieving great stress.

The Mexico disaster may have had its own unique set of circumstances which provided opportunities, as well as challenges, to radio amateurs, but we can all name other disasters in recent years in the aftermath of which amateur radio has played a significant part. There is nothing new in this, but the role of amateur radio has been developing. On many occasions radio amateurs have been the first to inform the world of some major event, and have provided essential communication for those first tens of hours until more formal relief has been organized. However, even the normal means of communication, once re-established, cannot cope with the aftermath of a major disaster. So the role of amateur radio in providing a means of passing important welfare messages has been developing.

The unique flexibility of amateur radio to provide communication following a natural disaster is recognized by the International Telecommunications Union; the very agency of the United Nations which recommends the frequency bands and rules for amateur radio on an international basis. In the UK, Raynet was quick to respond to the Mexico City disaster, and the Department of Trade & Industry instantly gave its blessing to third-party welfare messages associated with the Mexican situation. Team work, coupled with some supreme individual effort, enabled a fine job to be done; but what of the future?

Every radio amateur should be aware of the potential of amateur radio to provide essential emergency communication. Every amateur in the UK should recognize that practice helps to make perfect, and avoid those few frequencies assigned to Raynet for such purposes. Better still, why not listen to Raynet members practising message handling and join the organization—you never know when **you** may need amateur radio to pass that vital emergency message.

David Evans, G3OUF

FIFTY-SECOND RSGB PRESIDENT INSTALLED

Mr Willie McClintock, G3VPK, was installed as the Society's 1986 President at a social function held on 18 January at Margaretting, near Chelmsford. Over 170 people attended the event, and included a large contingent of past and present members of the President's own local club, the Chelmsford ARS. Also present were Dr J Williams, managing director GEC Research (G3VPK is chief engineer of the GEC Avionics Research Laboratory in Chelmsford) and members of the DTI.

Mrs Joan Heathershaw, G4CHH, introduced G3VPK to the assembly, and spoke warmly of his work for the Society over many years. She concluded by investing Willie with the presidential chain of office, to which he replied by thanking her and the Society for the great honour bestowed on him. He then recounted how his grandfather had introduced him to amateur radio, and how this had led him to make his career in electronics. He also commented on how appropriate it was for his installation to have taken place so close to Chelmsford, the "birthplace" of radio in this country, where Marconi researched and pioneered its early development.

Roy Martyr, G3PMX, president of the Chelmsford ARS (r) presents G3VPK with his honorary life member's scroll

After the installation proceedings, Terry Barnes, GI3USS, Council member for Northern Ireland, presented Willie with a piece of cut crystal-ware from his amateur radio friends in his native Ulster, together with a shillelagh to enable him to keep order during his year of office.

This presentation was followed by another from the president of the Chelmsford ARS, who announced that Willie had been made an honorary life member of that society, and it was his pleasant duty to present him with his honorary member's scroll - and to return his membership fee for 1986!

The formal part of the evening ended with the presentation by the new President of a past-President's badge to Joan Heathershaw, and of Council members' badges to newly-elected Messrs E J Case, GW4HWR; J D Heys, G3BDQ, A McKenzie, G3OSS; and F S G Rose, G2DRT.

Amateur Radio News

QSL Bureau

The Post Office has allocated the following "large user's" postcode to the QSL Bureau: SW20 0UP. The old postcode may continue to be used for a limited period.

RAIBC HF Net, G4IBC

The Radio Amateur Invalid and Blind Club net has been held on Tuesday morning at 10am for over 30 years; frequency around 3,744-3,750MHz. Both licensed members and a large number of swls from the whole of the UK including Northern Ireland take part. It has promoted widespread friendships among disabled amateurs who have joined the club; more than half have lost their sight.

It is becoming increasingly difficult to establish and maintain a clear channel with such a large net spread over such a wide area. Net controller G4EUU offers very sincere thanks to the great majority of radio amateurs who have so generously co-operated by giving RAIBC a clear frequency. To the small minority who have not, please read this and think again. It is only one hour a week. It gives great pleasure to those who take part and treasure their contacts.

"TRANAP"

The author of this article, published in the September 1985 issue of *Radio Communication*, advises that there are two faults in the program. One causes operational amplifiers to be simulated with far too high a gain, and the other is an inconsistency between a program comment and statement. Both are easily fixed, and details can be obtained by sending an sae to: Mr P L Woods, 5 Muswell Avenue, Muswell Hill, London N10 2EB.

G3PAO memorial lecture

The Verulam ARC's G3PAO memorial lecture will this year be given by Peter Chadwick, G3RZP, on "Intermodulation; phase noise and dynamic range". It will take place on 25 March at the RAFA HQ, New Kent Road, St Albans, commencing at 8pm. All visitors welcome. Details from G4OBH, tel St Albans 52003.

Proposed Scottish amateur radio lodge

Consideration is being given to the setting up of a Scottish amateur radio lodge along similar lines to that of the English Radio Fraternity Lodge. Any radio amateurs who are a freemason are invited to contact D Morris (1429) GM3YEW, QTHR.

Pirates at work

The following members have advised that their callsigns are being pirated:

R P Swaffield, G3VM, who operates solely QRP cw. The pirate is mainly on ssb.

E J Attewell, G0ACN. The pirate calls himself "Dave" and claims to be in different parts of London, and is active on all hf bands and 144MHz, mostly on ssb, and also on 28MHz fm.

G Nurse, G1GNQ, is being pirated on 144MHz. The callsign of the Clockwork Amateur Radio Contest Group, G1KMI, held on behalf of the club by G4KZY, is being pirated in the Lee Green area of London, apparently to conduct dubious business concerning computers and software, and frequently on 144MHz repeaters. The CARCG rarely uses its callsign except during contests, and never in the London area.

Stolen equipment

On 19 January from a car in Hangleton Area, Hove, E Sussex: Yaesu FT290R, series number 1K070030. Information to Hove police, tel 0273 778922, or G1GDJ, QTHR.

VACANCIES

EMC Committee
(formerly Interference Committee)

This committee requires additional full members to improve the service to members. Experience in rf techniques covering hf and vhf spectrums is desirable.

The committee deals with a wide range of problems involving rf breakthrough into electronic equipment; represents the RSGB at exhibitions; negotiates improvements in radiation limits with national organizations, eg BSI and BREMA; and prepares technical information for publication. It meets in central London approximately every six weeks on Friday evenings, commencing at 6pm.

If you are interested in assisting the Society, please submit a brief resume of your experience to the EMC chairman, L Hawkyard, G5HD, c/o RSGB HQ.

REGION 14 WORKSHOP 86

Sunday, 13 April

from 1230 to 1630

at the

Wrangholm Hall Community Centre
Motherwell

(Talk-in on S22)

SPEAKERS

John Branegan, GM4IHJ..... "Satellites"
Gordon McKenzie, GM4NUN..... "Computers in amateur radio"
George Burt, GM30XX..... "QRP and homebrew"
Maurice Hately, GM3HAT..... "HF antennas"

The event will consist of four clinics, taking place simultaneously, where the speakers will give short talks and demonstrations continuously, and will be available for advice and any information required on their particular subject.

RSGB Information and Book Stall

Further details from Tom Wylie, GM4FDM, RR14

THE COMMUNICATIONS & ELECTRONICS MUSEUM

The Communications & Electronics Museum was established in July 1984 with objectives of:

1. Establishing and preserving a reference collection of civilian and military communications and electronic equipment from the earliest times, together with relevant documentation.
2. Promulgating the use of the collection for research and educational purposes for students at all levels and young people.
3. Demonstrating the important contribution of British individuals and organizations to the development of communications and electronics in peace and war, through publications, programmes of exhibition, lectures and practical demonstrations.

The museum initially concentrated the major collections of Mr Douglas Byrne, G3KPO, and Dr Graham Winbolt with the professional guidance of Portsmouth City Museums, and the active help of Victory Radio and the South Hampshire Industrial Mission.

The Communications & Electronics Museum exists to seek out for preservation this vital area of our common heritage, and to pass on to future generations the physical and documentary evidence of a period of exceptional intensity in the scientific development of many systems commonplace today.

The museum is unusual in operating mainly through travelling exhibitions from its base in the Portsmouth area, rather than at present through a single, static display. In this way, knowledge of this field of our history can reach the widest possible audience. Research and library facilities will ultimately be made available for interested researchers, although, because of the age and frailty of the documents, the museum does not intend to operate a book or document loan service.

It is a specific intention of the museum that as much of its equipment as practicable should be maintained in an operational state.

Members of the RSGB are invited to help in loaning or passing to the museum any equipment (even if modified), documents, photographs and memorabilia of whatever form related to the development of any aspect of communication and electronics, military, civilian and industrial.

The 1985 President of the RSGB, Mrs Joan Heathershaw, G4CHH, was invited by the museum trust to join supporters of the museum at a luncheon at the House of Commons on 13 December 1985. Guests included many representatives of the fields of communication technology from its inception to the present day. Among them was Professor R Jones, author of *The Secret War*, who addressed those present.

Mrs Heathershaw was invited to present a prize to Paul Newson, the young art college student who won the competition to design a logo for the museum, and she made a short speech in support of the objectives of the museum.

Joan Heathershaw and Paul Newson holding the prize-winning design of the museum's logo

Mobile Rallies Calendar

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

2 March
Doncaster & D Raynet Group Amateur Radio Rally, Adwick Leisure Centre, Welfare Road, Woodlands, Doncaster. Talk-in on vhf and uhf. Open 11am (disabled 10.30am). Details G8XTU, tel Doncaster 531365 home, or 539446, ext 38 work.

2 March
Welsh Amateur Radio Rally, Barry Leisure Centre, off Hotton Rd, Barry, South Glamorgan. Organized by the Barry C of FE RS. Talk-in on S22. Enquiries GW4FOM, tel 0222 565656 (evenings).

9 March
Northern ARS Association Exhibition & Mobile Rally, Belle Vue, Redgate Lane, Longsight, Manchester. Talk-in on S22 and SU8. Morse test. Details G6MEI or G6CGF.

16 March
Pontefract & DARS Components Fair, 11am-4.30pm, Carleton Community Centre, Pontefract, mid-way between Pontefract and Darrington on the A1. Enquiries for bookings to G4ISU, tel 0977 792784.

16 March
South Essex ARS Mobile Rally, Paddocks Community Centre, Canvey Island. Open 10.30am. Talk-in on S22. Details G4FMK, tel 0268 683805.

22 March
The Bredhurst Receiving & Transmitting Society's first Rainham Radio Rally, Parkwood Green, Rainham, Kent (5min from M2 junction 4). Open 10am-4.30pm. Talk-in by GB2RRR on S22. Bar and catering. 50p entrance. Details G4EGH, tel 0634 388760.

23 March
Mid-Devon Rally, Pannier Market Hall, Tiverton. 10am to 5pm. Details G6ZMC, tel 0884 254889 evenings.

23 March
Swansea Rally, Patti Pavilion, next to the county cricket ground, A4067 Swansea-Mumbles coast road. Open 10.30am to 5pm. Talk-in on S22, GB2SWR. CW test. Admission £1 adults, 50p children. Details GW4HSH, tel 0792 404422.

23 March
19th White Rose Rally, The University of Leeds. Details G4NDU or Box 73, Leeds LS1 5AR.

13 April
Lough Erne ARC Rally, Killyherlein Hotel, near Enniskillen. Opens 1pm. Talk-in on S22 and SU8. Details from GI4CZW, 9 Tanmon Brae, Enniskillen, NI, tel 0365 24500.

27 April
Scunthorpe RC's Radio Rendezvous, Hobbies Centre, Grange Farm, Franklin Crescent, Scunthorpe. Open 11am. Talk-in on 144 and 432MHz. Special event station, GB2HRR. Details G6OSA, tel 0427 873827, evenings.

5 May
3rd Anglo-Scottish Rally, Tait Hall, Kelso. Ideally situated for G/GM/GI (GW also welcome!). 11am to 5pm. Talk-in on S22. Details GM4UIB or GM3VLB, tel 0573 24654 or 0573 24664.

11 May
Drayton Manor Rally, Drayton Manor Park, nr Tamworth, Staffs (on A4091 one mile south of A5/A4091 junction). Open 11am to 5pm. Talk-in on 144 and 432MHz, G3MAR/A. Details G8BHE, tel 021-422 9787 or G8GAZ, tel 021-357 1924.

11 May
Swindon Rally, Oakfield School, Marlowe Ave, Swindon, Wilts. Open 10am. Talk-in on S22 and SU8/GB3TD. Morse tests, refreshments. Details G8SFM, tel 066689 307.

18 May
Cambridge Radio Club Rally and Boot Sale, Coleridge Community College, Radegund Rd, Cambridge. Talk-in on S22. Open 10.30am-5pm. Admission 50p. Details G4TRO, tel 0223 353664.

18 May 1986
29th Northern Mobile Rally, Great Yorkshire Showground, Harrogate. Details G3CQQ, tel 0943 602118.

25 May
Plymouth Mobile Rally, Plymstock Comprehensive School, Plymouth. Open 10am-5pm. Talk-in on S22. Details G0BNT, tel 0752 777777.

25 May
10th Annual East Suffolk Wireless Revival, Civil Service Sports Ground, Bucklesham, nr Ipswich. Open 10am. Free parking. Admission 80p. Details J Toothill, tel Ipswich 44047. Stand space from Colin Ranson, G8LBS, 100 Stone Lodge Lane West, Beacon Hill, Chantry, Ipswich.

1 June
Southend & D RS Mobile Rally, Rocheway Centre, Rochford, Essex. Opens 10.30am. On site parking. Talk-in on S22. RSGB morse tests to be advised. Details G6SOH, tel 0702 713211 or G4RDS, tel 03745 50494.

1 June
Spalding & D ARS Rally, Springfields Gardens, Spalding. Opens 10am. Talk-in. Details G4OO, tel 0775 86382.

8 June 1986
Elvaston Castle Mobile Radio Rally, Elvaston Castle Country Park, five miles south-east of Derby on B5010. Talk-in by GB2ECR on 144MHz and 432MHz. Morse tests available. Details from G4PZY, tel 0332 767994 or G4CTZ, tel 0332 799452. Trade enquiries to G4HIJ, tel Ashbourne 43241.

15 June
RNARS Mobile Rally, *HMS Mercury*, Leydene, near Petersfield, Hants. Details G4DIU.

29 June
28th Longleat Amateur Radio Mobile Rally, Longleat Park, Warminster. Preliminary enquiries to G4FRG, tel 0272 848140.

13 July
Sussex Mobile Rally, Brighton Racecourse. Opens 10.30am. Talk-in via GB2SMR on 145·550MHz and 3·5MHz. Details from G8JVE or G4UAW, evenings.

13 July
Worcester & DARC Droitwich Rally, High School, Droitwich. Bring and buy, and events for all the family. Details G8ASO.

20 July
Anglian Rally, Colchester. Further details G6HQI, tel 0206 862403.
20 July
Cornish Radio Amateur Club Rally, Camborne School, Camborne. Open 10am to 5pm. Talk-in on S22. NB new QTH. Details G4MSV, tel 0736 763549.
20 July
McMichael Mobile Rally, Haymill Centre, Burnham, Slough. Open 11am. Talk-in on S22 and SU8. Enquiries to G0BTY, tel 0494 29868.
27 July
Scarborough ARS Rally, The Spa, Scarborough. Open 11am. Talk-in 144MHz (S22), and 432MHz (SU8) and RB0-GB3NY. Details G4UQP.
3 August
RSGB National Mobile Rally, Woburn Abbey.
3 August
Rolls-Royce ARC Mobile Rally, Rolls-Royce Sports & Social Club, Barnoldswick, Skipton. Access from A59 and A56. Open 11am. Morse tests available. Enquiries to G4ILG, tel 0282 813271 ext 337, daytime, or 0282 812288 evenings.
10 August
29th Annual Mobile Rally celebrating the 75th anniversary of the Derby Wireless Club, Lower Bemrose School, St Albans Rd (off Derby Ring Road A5111) Derby. Open 10.30am. Talk-in by GB3ERD. Details G4EYM, tel Derby 556875.
10 August
Hamfest '86, Flight Refuelling Sports & Social Club grounds, Merley, Nr Wimborne, Dorset. Details Ashley Hulme, G0CDY, 71 Victoria Gardens, Ferndown, Wimborne, Dorset BH22 9JQ, tel 0202 872503.
17 August
West Manchester RC Red Rose Rally, Haydock Park Racecourse, Newton Le Willows (one mile from M6 junction 23). Open 10am. Talk-in on S22. Details G1IOO, tel 0204 24104 evenings.
24 August
Preston ARS 19th Annual Rally, Lancaster University. Details G3DWQ, tel 0772 53810.
7 September
Lincoln Hamfest, Lincolnshire Showground. Further details to be published at a later date.
7 September
Vange ARS Rally, Nicholas School, Basildon. Open 10am to 5pm. Talk-in on 144MHz. Details Mrs D Thompson, 10 Feering Row, Basildon, Essex SS14 1TE, or G4OJN.
21 September
Harlow Mobile Rally, Harlow Sports Centre, Hammarskjold Road, Harlow, Essex. Open 10am. Talk-in on S22. Details G4KVR, tel 0279 22365, day, or G3UEG, tel 0279 27788 evenings.
21 September
Peterborough R&ES Mobile Rally, Wirrina Sports Stadium, Bishops Road, Peterborough. Open 10.30am to 5pm. Free car parking. Food in the adjacent Tropicana Restaurant. Bar until 3pm. Details G4PNW.
19 October
South Bristol ARC present the Second Bristol Radio Rally at Hartcliffe Youth Centre, Hareclive Avenue, Hartcliffe, Bristol. Open 10am to 5pm. Talk-in and special event station, GB2BRR. Details G1LDJ, tel 0272 667179.
23 November
West Manchester RC Mobile Rally, Pembroke Halls, Walkden, Worsley, Gtr Manchester. Details G1IOO, tel 0204 24104 evenings.

Special Event Stations

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

1986, GB4MTR
GB4MTR will be operated during 1986 on the 70MHz band by 13 different stations each in a different county. The callsign will be operated from the stations of: G4VOZ, 1-28 January; G4ENA, 29 January-25 February; GW4HBK, 26 February-25 March; G4ENB, 26 March-22 April. Volunteers to run these stations are required, particularly from the north of England. An award will be available. For further details contact G4WND or G4SEU.
1 March, GB2SDD
The Saint David's Day special event station celebrating the National Day of Wales will be operational from midnight 28 February to midnight 1 March. Activity will be on all hf and vhf amateur bands. QSL cards to amateurs making contact with the station and the BSC Port Talbot Sports & Social Club will be pleased to respond to reports sent in by swls. For details of the special award and further enquiries, contact R R Jones, GW4HOQ.
8-11 March
Meopham Parish RC will be operating from the tower of the ancient parish church of St George, Wrotham, Kent during the 3rd Wrotham Arts Festival. Activity will be on hf and vhf amateur bands. Details G4XNU and G1GEY, tel 0732 822541.
5-13 April, GB4WAB
This station is to celebrate the 50th anniversary of Cannock Chase ARS. Operation on all bands. Special QSL cards and award. Details G0BXN, tel 0543 77558.
10-17 May, GB4LI
Six members of the Nene Valley RC will activate GB4LI from the Old Lighthouse, Lundi Island (WABSS14). Operation on all hf bands; limited facilities for 144MHz and 432MHz. Special QSL cards. Details G4NWZ.
June, GB4OH, GB0IOW
GB4OH will be operational from Osborne House, East Cowes, Isle of Wight and GB0IOW will be operational from the Royal Needles Complex, Isle of Wight in commemoration of the 89th anniversary of Marconi Early Experiments 1897, 1898. Both stations will operate for one week in the first week of June, and will have vintage back-up artifacts. There will also be films, animated displays and models of modern equipment. Details V G Scambell, 50 Park Ave, Widley, nr Purbrook, Hants.

Other Events

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

16 March
RSGB National VHF Convention, Sandown Racecourse.

5-6 April
RSGB National Amateur Radio Convention, National Exhibition Centre, Birmingham.

28 September
RSGB HF Convention, Belfry Hotel and Conference Centre, just outside Oxford on the M40.

Courses 1986

All information for inclusion in this column must be sent to the editor, not to RSGB HQ.

Beckenham.
Morse Workshop at Beckenham Adult Education Centre, 28 Beckenham Road, Beckenham, Kent on 1 March. Commences 9.30am. Fee £6. Postal enrolments and enquiries to Bromley Adult Education Service, Aylesbury Road, Bromley, Kent, tel 01-464 5745.
Enfield.
RAE course at Southgate Lower School (Enfield College of FE). Commences 23 April for three terms. 7.30pm. Enrolment on first night but advance notification is needed. Details G4AEZ, tel 01-886 1097.
Mirfield.
The Mirfield Centre intend to start a complete beginners morse class. Commences 7 March, 7pm. The course will run for a 12 week period. Details Mrs K Field, tel 021-783 5898.

OBITUARIES

The Society records with regret the deaths of the following radio amateurs:

Mr R Bridgewater, G8RRB
Roger Bridgewater died on 1 November 1985 and had been interested in radio and electronics since the mid 'fifties. He was involved in the radio activities of the Territorials and was an active member of the Burton-on-Trent Raynet group. He also supported the Leicester Repeater group in its fund-raising activities. Roger was one of the three founder members of the Amateur Radio Caravan and Camping Club.

Mr H P Cooper, G3IRR
Harry Cooper died on 3 December aged 89. He had been a member of the RSGB for 37 years and during this period had worked all bands contacting new friends both at home and abroad. In latter years his use of 144MHz with several friends on net was the highlight of his transmissions.

Mr W C Cox, G3NJC
Bill Cox died on 27 October aged 55. He was a keen cw operator on the hf bands and an active homebrew constructor. He was also a radio controlled model aircraft enthusiast.

Mr S J James, G5JX
Jimmy James died on 4 December aged 83. He was first licensed in this country in 1935, though he had operated for many years prior to that under various callsigns during his RAF service in the Middle East in the 'twenties and 'thirties. He maintained a number of regular contacts, worked both ssb and cw and was a keen homebrew builder. He was active until shortly before his death and his helpful attitude and cheery manner will be missed by many on 3·5MHz.

Mr W Mann, G1ABD
Bill Mann died on 5 January aged 63. He served as a radio mechanic in the war with the RAF, and in recent years was active on vhf. He was a member of Raynet, a local representative of RAIBC and a member of the Gloucester 70cms Repeater Group.

Mr N Morgan, G6WUZ
Noel Morgan died on 29 November aged 60. He was a keen member of the Lymington DARS and had hoped to enjoy his hobby to the full on retirement.

Mr A J Parkes, G3MJT
Alan Parkes died on 7 December aged 51. He had been a member of the RSGB for some years and was a founder member of the Harrogate Repeater Group, GB3HG. He was a keen dxer and a good friend of many local hams, and was always willing to give help and advice.

Mr W Plant, VK4FO
Walter Plant, who died on 1 August, had held the callsigns G3BQC and VQ4FO (Nairobi, Kenya). He emigrated to Australia from Nairobi in the early 'sixties where he had been a very active and well-known member of the then Radio Society of East Africa.

Mr I R Poole, G3MJC
Ivor Poole died on 9 November. He was always very interested in amateur radio and designed and built all his own transmitters.

Mr J W Porteous, G3KNP
Bill Porteous died on 8 January aged 79. He was a founder member of the Scunthorpe ARS. He operated mostly on 144MHz and was always ready to give help and advice.

Mr D J Roe, RS39223
Wing Commander Roe died on 12 September in Rhodes, Greece. He was a very keen radio ham to the very last.

Mr R Silvester, G4SEY
Roger Silvester died on 6 January. He was active on vhf and hf and had been an enthusiastic member of the Harwell Club, despite a severe disability.

Mr R Smee, G3BLA
Ray died on 16 December 1985. He was a keen cw operator who was well-known in the Chelmsford area. His interest in amateur radio began during the war when he served in the RAF as a W/OP in Africa, Sicily and India with G3BLO. He was licensed in 1947 and was active until just before his death.

Also:
Mr R Davidson, G3FG, on 29 November 1985.
Mr G W H Hammock, G6SVS, on 16 December 1985.
Mr J F McLoughlin, G4FOP, in August 1985.
Mr J Olive, ex-G3HQO.

RSGB Presents

THE NATIONAL AMATEUR RADIO CONVENTION

APRIL 5~6

1986

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Members' Mailbag

The views expressed in published correspondence are not necessarily those of the RSGB, and readers are urged to verify independently any factual statements on which they may wish to rely as it cannot be guaranteed that such statements are correct.

THE MAGIC CARPET PLAYBUS

Sir—I want to ask the help of all radio amateurs.

I (reluctantly) attended the Manchester Rally to help my "xyl" (ex-young lad, in this case) with his stall. Dare I say, I enjoyed it! Much tolerance was shown over my total ignorance—and no condescension, which was nice. Everyone was cheerful, friendly and helpful.

At the end of the afternoon, a general appeal was made for the "Children in Need", and that got me wondering if amateurs could help us—that is, the Magic Carpet Playbus. I realize that the RSGB gives support to blind amateurs, and I do not want to detract from this cause in anyway. But I wondered if, in helping the Playbus (which is specially designed for handicapped children), we can also give some help to you.

The Playbus operates in the West Midlands, and its funds run out in March 1986. Is there a radio club who will "Adopt-a-Bus", and wave the banner for us. We can attend some shows and keep the "harmonics" happy—and think of the lift-off from the top of a double decker!

Is there ayone out there who can help? I hope you can.

Frankie Goode
(secretary, Magic Carpet Playbus and xyl of G4SMA) 21 Belstone Close, Kings Heath, Birmingham B14 6UB.

REPEATERS

Sir—GW4RWR's letter in your December issue is an insult to the fine work and time spent by those amateurs who maintain our repeaters on 144 and 432MHz.

Mr Thomas should be reminded that repeaters were built for the aid of mobile working and not as an aid for dx working.

The IARU 144MHz band plan is printed annually in the January issue of *Radio Communication.*

Colin Watson, BRS46598

Sir—I was pleased to read the letter from GW4RWR in your December issue. A great deal of energy is being spent on maintaining repeaters in the 144 and 432MHz bands in this country, and valuable spectrum space is being occupied by them—and for what purpose?

I have recently spent some time listening to the trivial conversations which are carried on by repeater users, and the resemblance to cb operation is striking. Rarely is any matter mentioned which has any direct bearing on amateur radio. So what good purpose does the repeater serve? Surely the most naive vhf operator will get greater satisfaction from a direct 144MHz contact over 50 miles than from a repeater-assisted contact of twice the distance for which he can only claim partial responsibility.

As GW4RWR says, the point has been made, repeaters work, so why not leave it at that and get back to the skill of making good links with distant stations unassisted?

Alas, as the number of holders of amateur transmitting permits increases, so, it seems, does the number of amateur experimenters decline. How many licence holders are in any way using the privilege of a transmitting permit to train themselves in the art of radio communication? How many amateur stations can boast a single first-class piece of *home-made* equipment?

No doubt the widely advertised and powerful Japanese transmitters are for the most part excellent products—but those who buy and operate them can hardly be classed as radio amateurs if their participation is limited to tapping out messages or speaking into microphones. The credit for any results obtained in this way surely lies first with the Japanese designers and engineers.

Would that *Radio Communication* might devote much more space to *simple* constructional articles which the average licensee has a reasonable chance of copying satisfactorily. It is a pity that most of the constructional articles featured today come from the pens and laboratories of professional electronic engineers with the result that not one per cent of the readers can hope to understand and copy them. It is also regrettable that there are so few of our qualified members who are prepared to devise and publish details of simple apparatus.

Sir, is it not time we stopped to ask what amateur radio is all about? Perhaps the Rev George Dobbs has the answer.

W A Scarr, G2WS

Space will always be made available for simple constructional articles. Would that designers and builders of such equipment might put pen to paper and supply us with such articles!—Ed

MAIDENHEAD AND ALL THAT

Sir—I'm somewhat bemused with the controversy that seems to be raging about locators, the latest of which sounds like a good old-fashioned valve base connection (international octal etc). Perhaps we should return to sanity and use latitude and longitude, on which all these locators are based anyway.

For my part, I much prefer "10k S of Oklahoma" etc, at least it teaches us geography, whereas squares teach us nothing!

Rod McMillan, G2CWY, 3k S of Barnet

FRUSTRATIONS

Sir—As one who works away with the regulation dipole at around 30ft, so disposed and distorted as to have a gain little better than isotropic, and who has at his command the usual 100W p.e.p "barefoot" into this magnificent antenna, I cannot say that I have failed to be impressed by those stations that seem to be able to work each other around the world despite bands being marginal or nearly closed, and who give one another very fine reports. In vain have I tried to call any of these stations, who, except when conditions are very favourable, only seem to hear one another.

Listening to them, most would appear to have a "good" antenna (eg a five-element monobander) atop a substantial tower (say, 60ft) and run powers up to the maximum around 2,000W p.e.p (USA levels, of course).

With this equipment in mind, I began to muse how much better they could hear one another than, say, a station like my own could hear another dipole/100W station. The following figures are only very approximate guesses, and I am perfectly willing, in each instance, to concede a few decibels either way. However, a "ballpark" number should emerge.

To start, a doubling in antenna height produces approximately a 6dB gain both in received emf and in transmitted field strength. Thus, if both stations had only the tower (60ft), a dipole and 100W p.e.p there would still be a 12dB improvement in signal reports.

Next, a good five-element monobander can produce around 10dB of gain. This is true both for transmission and reception, so that the overall improvement in signal reports produced by the antennas alone being changed from dipoles to five-element monobanders is in the region of 20dB. Hoist these up to the top of the 60ft tower in each instance and a respectable 32dB of gain emerges.

Lastly there is the use of a 2,000W p.e.p output. This gain of 20 times in power appears only from the transmitting station, so it appears only once in the sum. However, the 13dB that it gives is very respectable.

Add these all together and crank the handle, and out comes 55dB of gain, nearly nine S-units! Put another way, this means that our two "round-the-worlders" put nearly 300,000 times as much power into each other's receivers as do a pair of 30ft up dipole/100W p.e.p stations. In voltage terms, the "round-the-worlders" deliver more than 500 times as many volts into each other's receiver inputs than do we humbler mortals. For every microvolt I generate with my low-tech counterpart they generate half a millivolt! When I manage to achieve S9 with my modest fraternity, the 50μV I achieve is swamped by the fortieth of a volt they can manage.

True, when conditions are good they say DXCC is quite possible with 2W and a bit of wet string. However, when conditions are as they are now, I can only grit my teeth with frustration, examine my bank balance, and go back to calling CQ into the white noise.

J F Hardwick, GM4ALA

VARIATION FEEDBACK

Sir—I was one of the many amateurs who applied for, and was successful in gaining the letter of variation. My comments are: the ability to transmit/receive morse proved very useful in regard to the practice needed and the experience necessary to pass the morse test.

Having read at some time or another that you would like some sort of feedback as to whether or not it has proved a good idea and not receiving many replies, feeling guilty I decided to write—hopefully my letter will be one of many which support and give you a "thumbs up" approach to this idea.

John Pepper, G0CHQ

CORDLESS "PLAGUE"

Sir—Having seen no mention of it so far in your journal, I wonder if I am alone in suffering from a new "plague" on the 3·5MHz band, namely the cordless telephone? Living in a fairly densely populated part of South London, I now find it impossible to use the bottom 50kHz of the band due to the high level of spurious signals emanating from domestic cordless phones.

The offending items appear to have a primary frequency of about 1·77MHz, and a significant second harmonic radiation at about 3·5MHz; this second harmonic radiation would appear to be the cause of the problem.

In no way would I believe my receivers to be infallible, but the problem occurs on both my hf receivers, one being a valve receiver with a 10·7MHz i.f., and the other a modern transistor receiver with 48MHz i.f. Front-end overloading on both receivers by the cordless phone fundamental frequency, thus generating harmonics in the receiver front-end, is of course possible, but not, I would have thought, at the limited power and antenna requirements that these phone units use.

So, are other 3·5MHz users having a problem? Does anyone know the standards laid down for cordless phones with regard to second harmonic radiation, and has anyone within the RSGB ever bothered to actually measure these devices? Or will it be a matter of waiting until it is too late (if it's not already) and another section of an amateur band becomes virtually unusable. I wonder if cordless phone users are starting to use add-on power amplifiers and/or external antennas in an effort to increase their range, as do cbers? I have no evidence of this, but perhaps another amateur can help, or knows if such devices exist.

So, to finish, let me describe the "symptoms", should other amateurs wish to find out if they have the problem. Tune between 3·5MHz and 3·55MHz; the most pronounced and easily-recognized effect is the "pulsed ringing", or dialling pulses. If the phone is "in conversation" then the heterodyne whistle (on an ssb receiver) will be heard, sometimes the speech will be slope detected. The signal can appear to be up to 6kHz wide, and even greater during the "ringing" mode.

In many ways I hope that it is my receivers that are at fault but, if not, then the amateur fraternity should wake up to this new source of interference, and quickly.

W Martin, G4JGB

See TT *item, p188*—Ed

TRIO BY ANOTHER NAME

Sir—As the owner of both Trio and Kenwood equipment, I think I am entitled to ask what is going on, first with Trio and now with Lowe's, in their endeavours to disclaim responsibility for Kenwood equipment.

It seems that certain dealers have found it cheaper to stock up with Trio equipment bearing the Kenwood name by purchasing it from Continental dealers rather than from official UK sources. This is hardly the fault of subsequent purchasers in the UK who buy these products in good faith. It does the Trio/Kenwood name no good at all for the official UK concessionaires to throw their weight around in such a petulant manner by withdrawing service for Kenwood products.

The confusion is further compounded by their lame excuse that "Kenwood" is a trade mark of Thorn-EMI. We all know that. But why should it be quite OK for Kenwood headphones, mics, psus etc to be sold here but not receivers and transceivers? Surely the infringement of a trade mark is serious whether you stamp that mark on a nut or a full blown transceiver? So, come off it Trio!

Further confusion is created by the fact that my Kenwood R600 was sold by the same dealer who supplied my Trio TR9000—a *Trio appointed dealer*. He has no scruples about putting it right if it goes wrong.

It really is a great pity that this matter ever arose, because both Trio and Kenwood enjoy a great reputation for reliability and performance. My humble set-up certainly seems as if it would take a hammer to stop it. So why take such a petty attitude and risk spoiling everything? Especially when Trio have themselves largely to blame for not getting their international price structure right in the first place, instead of upping the ante in Britain compared with the Continent. How else can "grey importing" flourish?

It flourishes because the UK is the silly-soft touch for all importers—cars, cameras, electronics—you name it. Because we do not seem to be able to make these things ourselves, we seem to relish paying silly prices for them. So other tougher markets benefit. I have Jap radio gear and a Swedish car. I also have a £100 British psu—the *third* humming example, with a *fourth* one arriving soon which will hopefully cure the problem. Also sitting in front of me is a new British 50W linear with a pair of relays inside which think they are in a power station. The Volvo, on the other hand, is stuffed full of relays I cannot hear—except one which deliberately clicks to let me know an indicator is on.

Don't rock the boat Trio, you've got it made. Just quietly look after your products from wherever they come. And if they are out of warranty, where is the rub?

L R Williams, G1OLA

Sir—It is with some concern that I read in the advertisements in *Radio Communication* that I now need a "passport" to have Trio-Kenwood equipment serviced. Or put another way, if you don't buy your equipment in the UK then you cannot have it serviced there. I consider this nothing to boast about, and it is fortunate that other international corporations such as Volkswagen, Sony, Pentax, British Leyland etc do not do the same.

As a long-serving member of the Services I have spent many years abroad, and much of my equipment has, through necessity, been purchased outside Britain. Recently I replaced a long-serving transceiver with a new TS430S, and like the TS430S shown in your June 1985 equipment review, my new equipment has on it the brand name "Kenwood" even though it was ordered under the brand name of "Trio". However, as far as I can determine, my new purchase is identical to, and performs in exactly the same way as, any other TS430S purchased in the UK, and, incidentally, it carries a Trio-Kenwood Corporation guarantee.

I thus have difficulty in understanding the advertisements that make such play of the exclusiveness of UK-purchased equipment, and why I, through no fault of my own, should perhaps one day have to suffer. But perhaps the explanation is related to unit costs; the price of my TS430S was £499.50p calculated on the DM/£ exchange rate on the date of purchase. The best price advertised on that day in *Radio Communication* was £720, and once you take account of VAT differences there is still in the region of £150 difference. Presumably, restricting servicing to UK-purchased equipment is one way of protecting such profit margins.

Alex Wickham, G3XHK

AMATEUR RADIO TODAY

Sir—In "Members' Mailbag" in your December issue I notice that both the comments of G4FZZ and G3PPR are inter-related. I agree with both of these gentlemen in every respect. At my local club recently we were discussing the topic of exhibition stations that are put on for local fetes etc, and concluded that the general public no longer considers personal communication as a novelty, and we are often thought of as "that lot playing with cb".

I still recall the day when I was introduced to amateur radio as a boy in the early 'fifties. A friend of my father had installed a top band tx/rx in his car. He had just finished building it, and came round to show us the result of his achievement. He talked to someone 20 miles away, even while he was driving.

Shortly afterwards he took me to a mobile rally, where I bought for the sum of three shillings an ex-government receiver from a chap affectionately called "Bandit Bill" (Bill Lowe). On getting the receiver home I found that I needed to build a power supply and a little valve pa in order to run a loudspeaker. On completion I had the thrill of achieving, by getting it to work. I spent many a happy hour listening to it in my bedroom, all on 14MHz a.m. of course. My next achievement was passing the RAE, having spent 12 months hard study, followed by the conversion of an ex-aircraft uhf tx/rx to run on 432MHz followed by a home-brew 144MHz rig.

By nature, human beings require goals to achieve; this is what, I suppose, makes life interesting. Doing something that not everyone can achieve appeals to the human ego. CB, cordless telephones and even the humble tv remote control can provide "wireless" communication just by pressing a button—but there is no achievement!

What we amateurs should be doing is using our imagination. Today an active radio amateur is not someone who shouts into a fist mic all day and everyday, he is someone who looks around for new and exciting challenges. Only these things will fire the enthusiasm of the general public, and encourage today's youth to become tomorrow's radio amateurs.

Alan Jones, G8AZT

Sir—The depressing picture of amateur radio as an underdeveloped national resource, portrayed by G4FZZ in your December issue, needs considerable clarification. The sole justification for the use by amateurs of that precious resource, the radio spectrum, appears to be that society's "basic human needs" must at all costs be catered for. Such an imprecise, all-embracing goal might be found to be a rather difficult achievement by the average RSGB member, especially if he happened to be old, disabled, limited in mobility or resources, or socially inadequate (a list of qualities carefully compiled by your correspondent); or even worse, if he were not a fully-trained social worker!

The balance of benefits appears to be so heavily weighted against our hobby that a great effort of public relations needs to be undertaken by the RSGB, in order to match the excellent public acceptance of, and interest in, such kindred forms as cb, cellular radio and cordless telephones. Apparently these types of personal communication are able to meet Mr Holme's criterion of "active entertainment" and "public involvement", whereas the more esoteric nature of much of amateur radio is unable to stir public imagination. A letter from G3PPR in the same issue highlights a basic lack of interest in the technical aspects of radio, even among the better-educated members of society, and, even more worrying, perceives the topics of conversation heard in an average QSO to be both banal and arcane. Why is this so, and how can matters be improved?

First, it appears to be a fact that where the public is debarred from getting "hands-on' experience of any facility (eg talking to orbiting astronauts), it will fail to become widely appreciated as being useful or important. We must indeed examine our basic motives for the use we make of a fair slice of the electromagnetic spectrum, and decide what benefits we are prepared to give in return.

Only a small minority could claim original scientific research to be their principal interest, whereas a larger section actively prepares itself to help in emergency situations through the Raynet organization. A much closer relationship with the public could be very effectively established in this area by arranging with the DTI for non-amateur participation in Raynet activities (under supervision) with the promise of full involvement should a real emergency arise. Thus medical staff, members of emergency services, technical experts, relatives of injured people etc would be able to make direct use of the amateur's specialist systems to pass his messages across, without hindrance from either outdated government regulations, or the amateur preoccupation with long-winded and repetitive operating procedures.

Although the vast majority of amateurs contribute little of immediate importance to society, other than the element of self-training leading to the accumulation of experience and expertise, this in itself would seem to be a perfectly valid justification. The situation could be changed radically for the better, however, if only members of the public could be allowed to participate personally by, for example, being allowed to talk to relatives and friends over our radios, or be "patched" via their telephones and the amateur equipment to distant parts of the world. The elitist view of the hobby wins few friends with the public.

Finally, at the more mundane "entertainment" level, the large number of amateurs who simply enjoy human contact via radio, and particularly those using phone transmissions to do this, have a moral duty, I suggest, to avoid irritating and alienating the many casual non-licensed listeners, by desisting from the use of unnecessary and arcane jargon, needless repetitions, long and self-indulgent overs, asking streams of questions but never pausing for a reply. And not least by the self-important inter-locution of callsigns at every possible opportunity—a uniquely comic "operating procedure" found nowhere else throughout the whole gamut of communication by radio.

J R Bird, G3LBW

LOCATORS

Sir—Having just spent two solid days writing a computer program to convert QRAs, locators and latitude and longitude to bearing and distance etc, I would like to throw my two-penn'orth into the QRA *v* Maidenhead debate.

QRA has, over the years and within its limitations, served us well, but on vhf—especially with the advent of 50MHz—the frontiers are being pushed outwards apace, and time and scientific progress have overtaken it.

How, then, can one defend a system which is at best a mathematical and logical absurdity, which cannot be used south of 40N or north of 66N, and which peters out ignominiously in the middle of the Atlantic to the west and somewhere on the Russian steppes to the east? And what is one to say of a grid system where the innermost squares are nine in number, arranged in a spiral? Anyone who has tried writing computer programs to deal with QRA squares will know exactly what I mean. It is possible, but what a palaver! Maidenhead, on the other hand, although in some ways less pleasing aesthetically, does at least have the merit of global coverage. It is also mathematically logical, and it succumbs readily to the computer programmer's art. I have experienced no difficulty using it, and would suggest that with familiarity it can be just as meaningful to the mind of the operator as QRA.

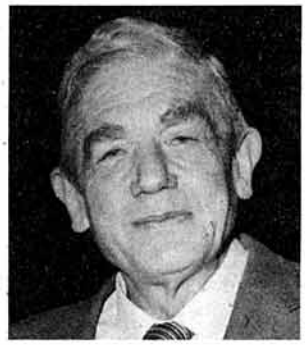
So, if we *must* have a grid system, (I am not convinced of the need, seeing nothing wrong with QTH or latitude and longitude as location identifiers, the latter being the most precise system ever devised), then let's stick with Maidenhead and (not without gratitude!) consign QRA to history, where it surely belongs!

John Sutton, G3YKP

A LINEAR AMPLIFIER UNIT FOR THE HF BAND TRANSCEIVER

Lorin Knight, MIEE, G2DXK*

(Part 1)



Lorin Knight, MIEE, was born in 1922 and became interested in short-wave radio at the age of about 12. He obtained an AA licence shortly before the second world war, and had to wait until 1946 to get his G2DXK callsign. His main activity over the last 20 years or so has been on 21MHz ssb, always using home-built equipment. The earlier part of his professional career was spent with Murphy Radio, but for 30 years he held various technical and managerial posts with ICL. He is now retired and expects to be devoting much more time to amateur radio.

IN 1984 (*Rad Com* June-October) I described a homebrew QRP transceiver for the hf bands. This follow-up article describes a complementary linear amplifier unit which will give approximately 100W p.e.p. output when driven by the transceiver. It includes a preamplifier which enhances the receiver performance, particularly on the higher frequency bands—and it also includes power supplies to operate both the linear amplifier and the transceiver. A simplified block diagram is given in Fig 1.

Linear amplifier

The circuit of the linear amplifier itself is given in Fig 2. As shown, it is capable of operation on any band from 3·5 to 28MHz. Later it will be shown how it can be adapted for operation on 1·8MHz as well.

The design is somewhat unusual for these times in that it uses valves rather than transistors, but I believe that, for a power amplifier, valves are easier for the home constructor to handle. They are much more tolerant to accidental misuse, and they provide a much greater gain than transistors. With just one stage of valve amplification, an output of around 100W p.e.p. is obtained from 0·5W input. The specified valve type is the 6146B, but the 6146 or the 6146A could be used instead (with slightly less output).

The valves are operated in Class AB1 and are driven via the wideband transformer T101, which raises the peak value of the input signal from 7V to 49V. On the higher frequency bands it is essential to tune out the input capacitance of the valves in order to prevent excessive shunting of the transformer. It was consequently decided to have the switch S4 provide a shunt-tuned circuit for every band. The circuit shows eight tuned circuits covering all bands from 3·5 to 28MHz inclusive but, of course, it is only necessary to provide for those bands which are to be used. Miniature ferrite-

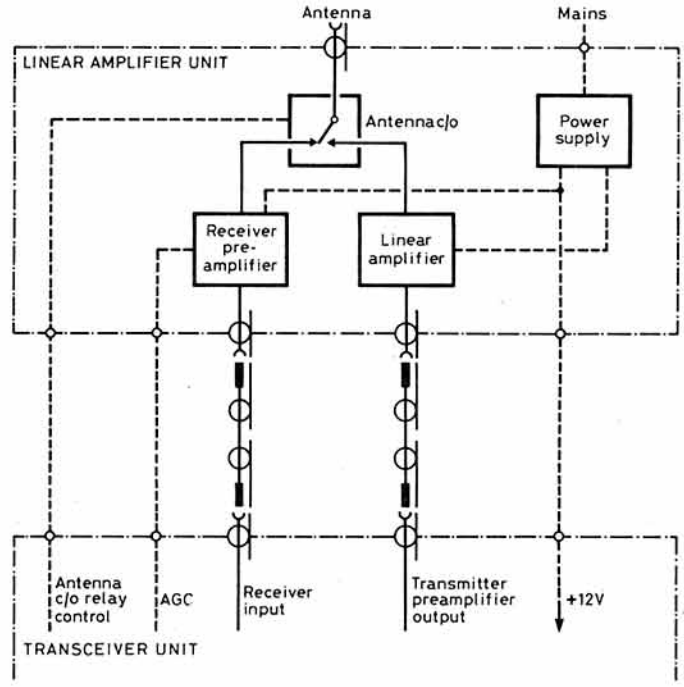


Fig 1. Block diagram of the linear amplifier unit

core receiver-type coils are not suitable for use here because the rf energy present would saturate the ferrite material. Consequently home-wound coils having iron dust cores are used.

The output circuit uses a conventional switched pi network but uses components which are a little easier to obtain (and a little less expensive) than those normally specified. For example, the TUNE capacitor C9 is not a special transmitting-type capacitor; it is a standard 365 + 365pF receiving-type capacitor, with the two sections in series to obtain an adequate air gap. The switch S5 is a small, readily-available Maka-Switch assembly which has proved quite adequate to withstand the rf voltages and currents encountered.

Neutralizing is done by the usual series capacitance method but, instead of C8 being a high voltage variable capacitor, it is an inexpensive disc capacitor and the neutralizing adjustment is done by the lower voltage trimmer capacitor C107.

* 123 Baldock Road, Letchworth, Herts SG6 2EQ.

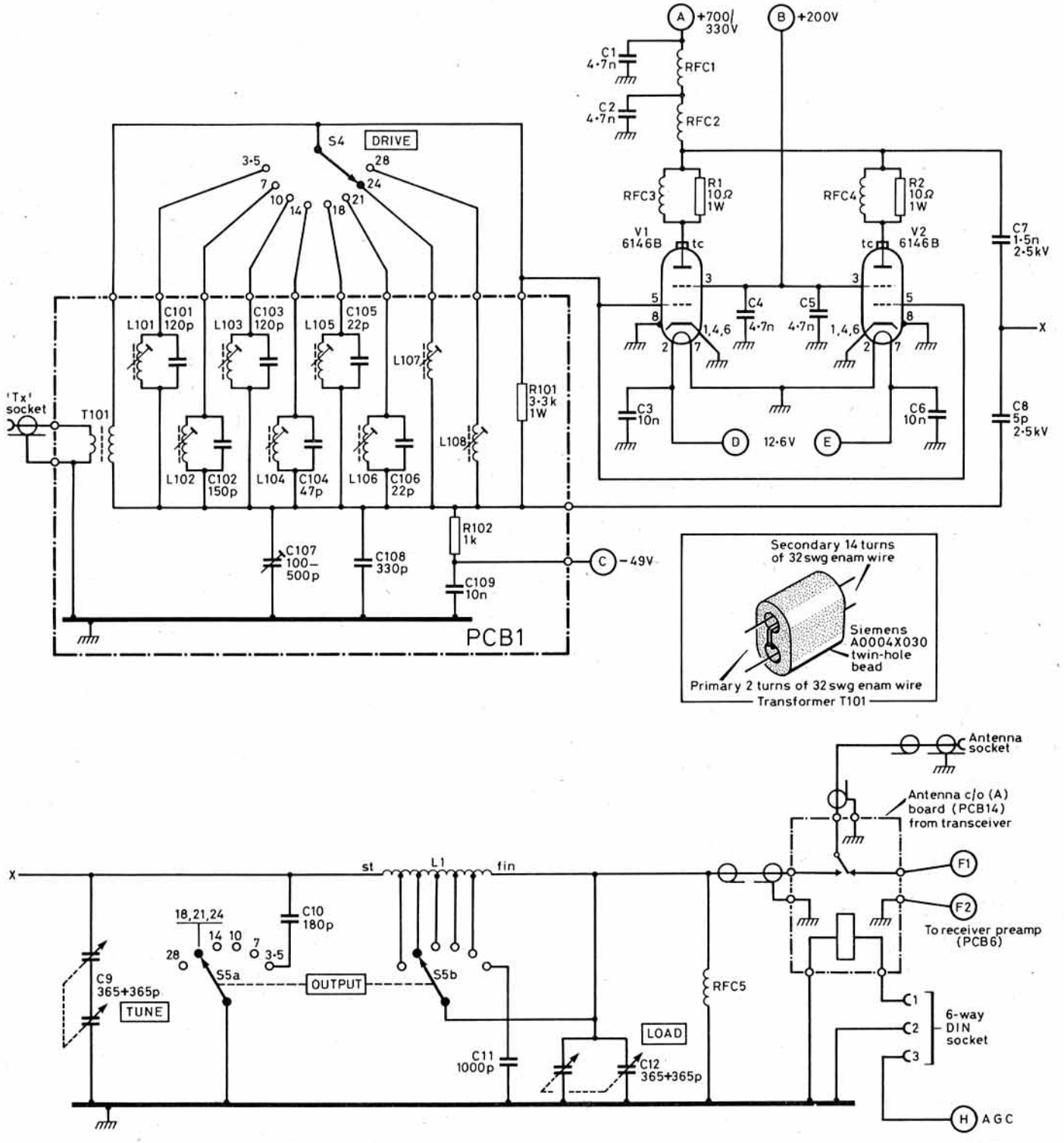


Fig 2. Circuit of the linear amplifier section. Components within dotted lines are on printed circuit boards

In most traditional designs the construction of the anode choke has been quite complex in order to avoid resonances in any of the amateur bands (and this was before the introduction of the 10, 18 and 24MHz bands!). In this design the anode choke RFC2 is a simple long thin coil. This succeeds in giving no resonance between 1·8 and 30MHz, but its inductance is on the low side (around 35μH). This means that an additional 50pF or so is needed to tune out its inductance on the 3·5MHz band (and an additional 200pF or so needed on 1·8MHz)—but this is not a very serious disadvantage. A similar choke is used for RFC5.

Compared with the sophisticated no-tuning circuitry of some modern commercial black boxes, it might seem rather clumsy to have to operate several switches to change bands. In practice, however, it is not usual to spend time hopping around from one band to another, and the inconvenience is not very great. In return, there are some advantages. The tuned circuits attenuate the harmonics (and any other unwanted frequencies) thus making it much less important to use lowpass filters. The separate switches make the construction very much more simple than it would have been with just one multi-section switch.

Power supply

The circuit of the power supply section is given in Fig 3. The main ht supply is provided by the two bridge rectifier circuits D201–204 and D205–208, which are fed from the secondaries of the small toroidal transformers T2 and T3. The lower bridge circuit gives an output of around 330V dc, and the upper one (which uses a slightly different transformer) around 370V. Thus the ht is around 700V with both transformers switched in, and around

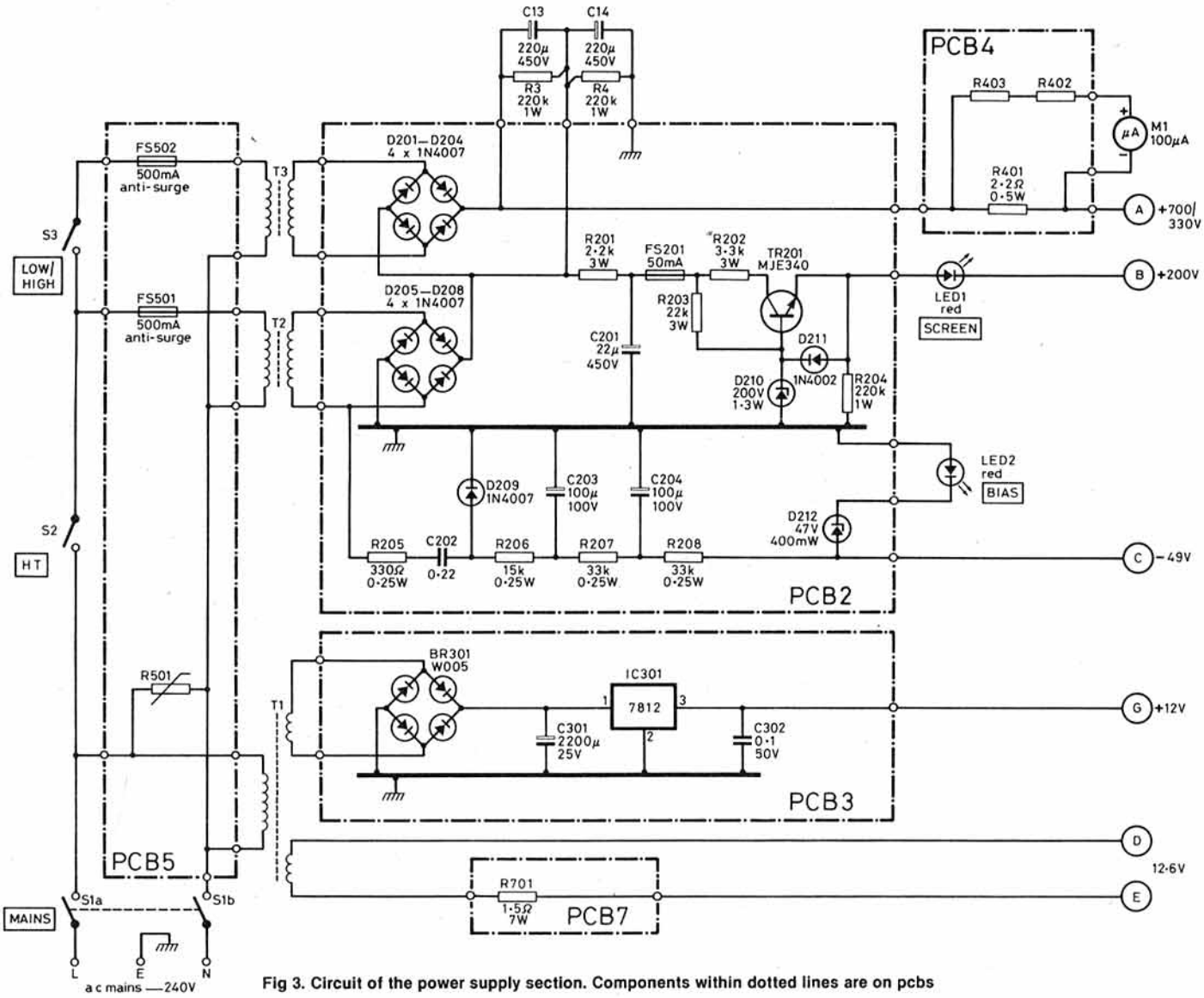


Fig 3. Circuit of the power supply section. Components within dotted lines are on pcbs

330V with only T2 switched in. The lower ht voltage is useful for testing or for operating at low power. Indeed, if the constructor wants to save money he could get by without T3 initially. The ht current is monitored by the meter M1, which has the added shunt circuit R401, R402, R403, to make it read 300mA full scale. A 100µA meter is specified, but one of a different sensitivity can be used if the values of the three resistors are suitably modified.

The ht supply for the screens of the valves is obtained from the lower half of the ht supply, and is stabilized at 200V by the series transistor TR201 in conjunction with the 200V zener diode D210. The resistors R201 and R202 limit the voltage at the collector of TR201 (and hence its dissipation) when the screen current is high. The screen current is monitored (adequately if not precisely) by observing the brightness of LED1.

The bias supply is provided by the half-wave rectifier D209, which is capacitively fed from T2 secondary. The output is stabilized at 49V by the 47V zener diode D212 and the light-emitting diode LED2. The latter not only adds approximately 2V to the output voltage, it also indicates if the valves take any grid current. Under normal circumstances the current passing through D212 and LED2 is around 2mA. However, any grid current resulting from the valves being overdriven will add to this 2mA and produce a noticeable increase in the light output. (In order to obtain a reasonable level of brightness with a current of 2mA it is necessary to use a "high-brightness" led.)

A stabilized 12V supply for the transceiver unit is provided by the bridge rectifier BR301 and the voltage regulator IC301 operating off one 15V secondary of T1. The other 15V secondary, in conjunction with the dropper resistor R601, provides 12·6V ac for the heaters of the two 6146B valves. Each valve requires 6·3V at 1·125A, and their heaters are connected in series. Note that if 6146 or 6146A valves are used these take a higher heater current and R601 will need to be 1Ω instead of 1·5Ω.

R501 is a voltage-dependent resistor specifically designed for suppressing high-voltage transients on the mains supply. This device is included to prevent any possible damage to the ht rectifier diodes.

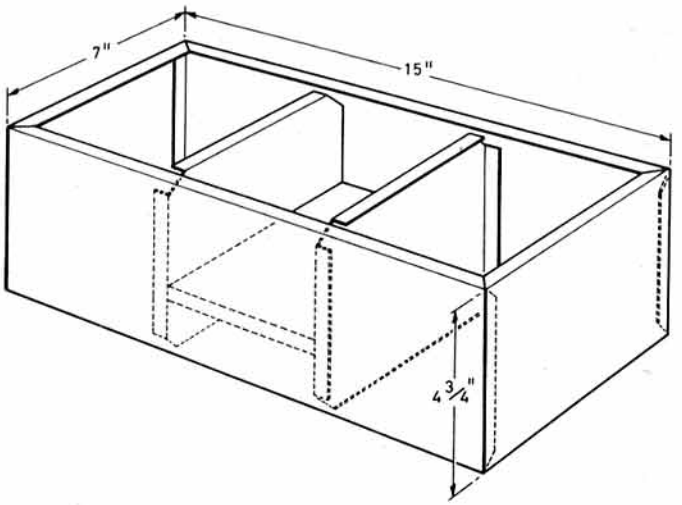


Fig 5. Basic form of the cabinet (lid removed)

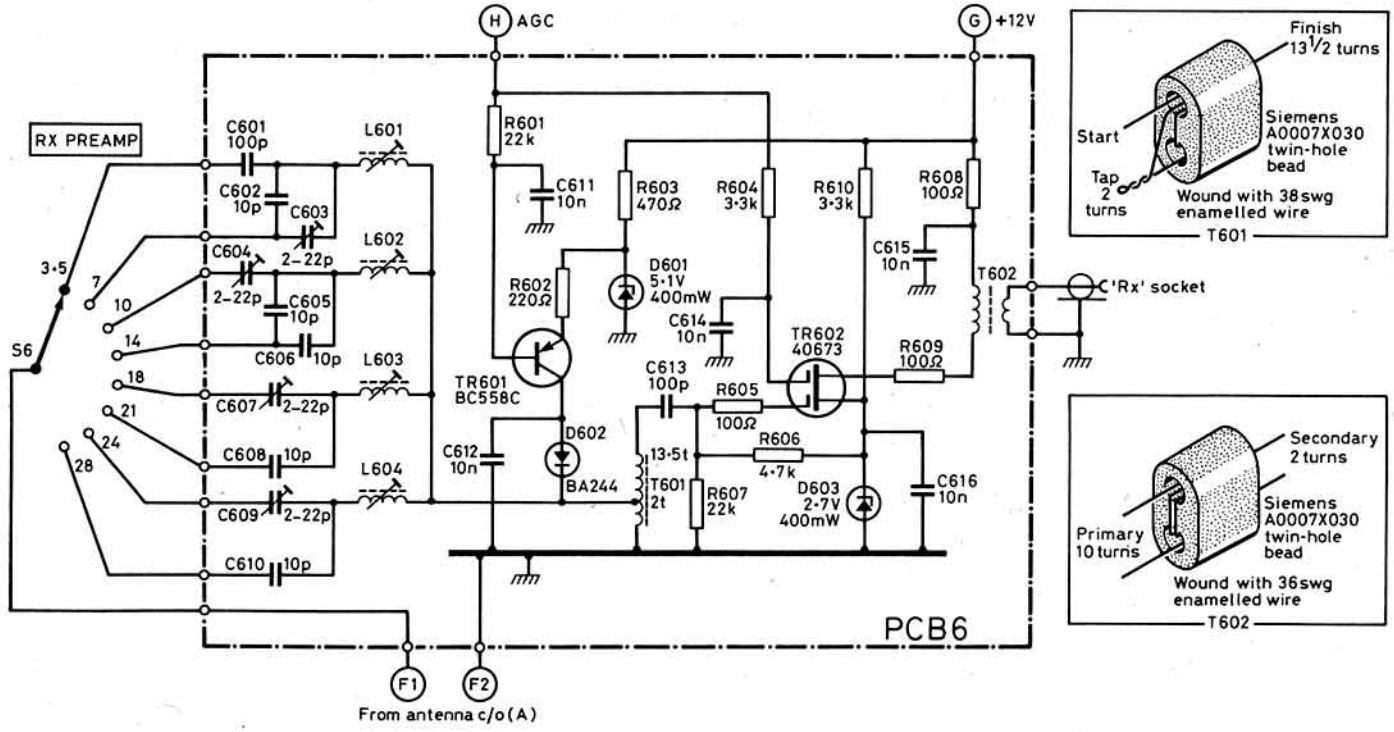


Fig 4. Circuit of the receiver preamplifier. Components within dotted lines are on pcbs. C605 should be in parallel with C604, not as shown

Receiver preamplifier

The circuit of this is given in Fig 4. The basic preamplifier consists of the fet TR602, which has at its input the wideband transformer T601, and at its output the wideband transformer T602. To give some rejection of unwanted frequencies, the switch S6 inserts a series-tuned circuit between the antenna and the input to T601. As shown, all bands from 3·5 to 28MHz are catered for, but the individual constructor can omit the coils and capacitors for those bands in which he is not interested.

The diode D602, in conjunction with the transistor TR601, acts as an rf attenuator which is controlled by the agc line. When receiving a very weak signal the agc line is at +5·6V and TR601 is cut off: no current flows through the diode which consequently has a high resistance. When the received signal is strong enough to drop the agc line to +4·6V, TR601 starts to conduct and the resistance of D602 starts to fall, shunting the input to TR602. With a very strong input signal the resistance of D602 can fall low enough to give around 40dB attenuation. Note that a special switching diode is specified. A general-purpose type such as the 1N4148 will not give such good attenuation.

Cabinet

As with the transceiver, the cabinet is made by bolting together a number of simple aluminium panels and chassis. Fig 5 shows the basic shape of the cabinet (with the lid removed) and Fig 6 gives details of the various constituent parts. The parts for my cabinet were made quite cheaply by H L Smith & Co Ltd, 287/289 Edgware Road, London W2. The two vertical screens were purchased as square-cornered chassis, and I cut off the corners. The initial intention was for the linear amplifier unit to have the same dimensions as the transceiver unit. In fact the original version of the linear amplifier unit was made that size, but it was a

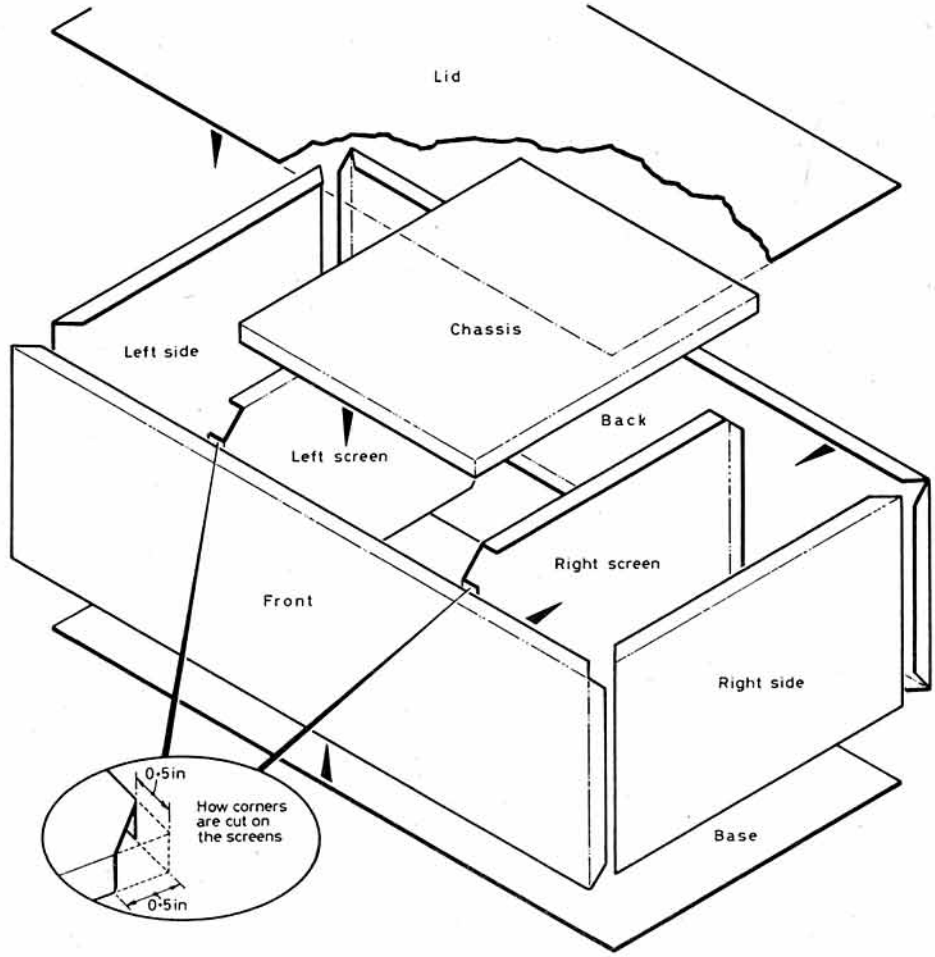


Fig 6. Component parts of the cabinet (made of 18swg aluminium). Base and lid: 15 by 6·875in. Front and back: 15 by 4·75in with 0·375in flanges. (Flanges have a 45° cut at each end.) Sides: 7 by 4·75in with 0·375in flanges on the longer sides. (Flanges have a 45° cut each end.) Screens: 6·937 by 4·75in with 0·375in flanges on each side. These are initially square-cornered chassis. The corners are then cut as shown in the inset. Chassis: 6·937 by 5in with a 0·375in flange on each side

very tight squeeze and, reluctantly, it was decided to make the final version slightly larger.

Fig 7 shows the view looking down onto the assembled unit and indicates the positions of the major components. Fig 8 shows the view with the unit turned upside down. The metalwork should be drilled as indicated in Figs 9 to 16 inclusive, and all the sections (except the lid and base) bolted together using M3 or 4BA bolts (preferably panel headed). When drilling the chassis (Fig 15) it is recommended that a template be made from a suitable piece of graph paper, which can then be pasted onto the chassis and used as a drilling guide.

Note that the screw marked "b" in the top left-hand corner of the front panel is used to hold the output coil L1, and, for aesthetic reasons, it is advisable to have this screw in position before spraying the cabinet. L1 should be wound on a 1·25in diameter former, which is about 2in long. The coil former can be one of the small cylindrical plastic containers such as are used for 35mm film, pills etc. The lid can be mounted behind the panel using a 0·625in high spacer (cut from an old fibre-tip pen) and the coil can be plugged into the lid later.

The next stage in the construction is to cover all the open holes with masking tape on the inside of the cabinet; to fix the lid and base, using self-

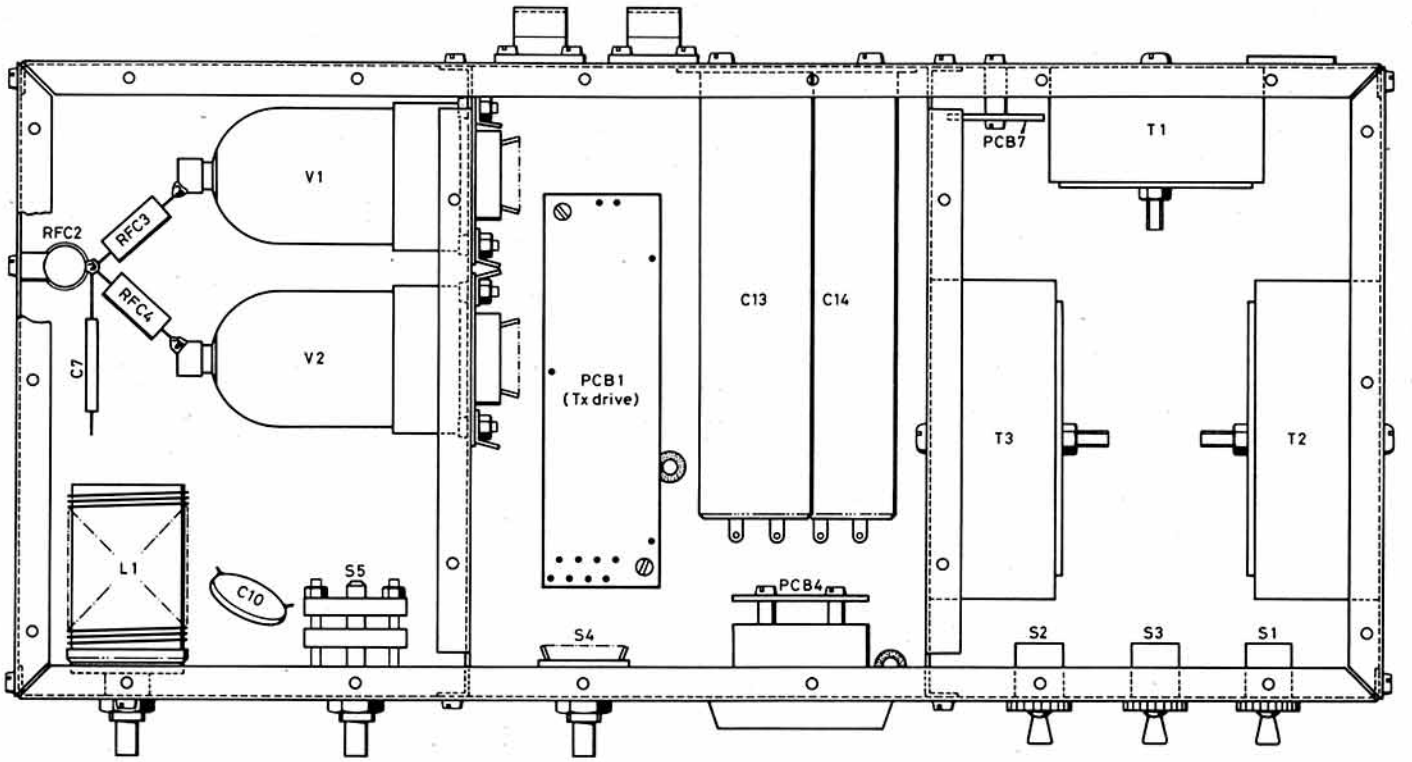


Fig 7. View looking down on the linear amplifier unit (with lid removed)

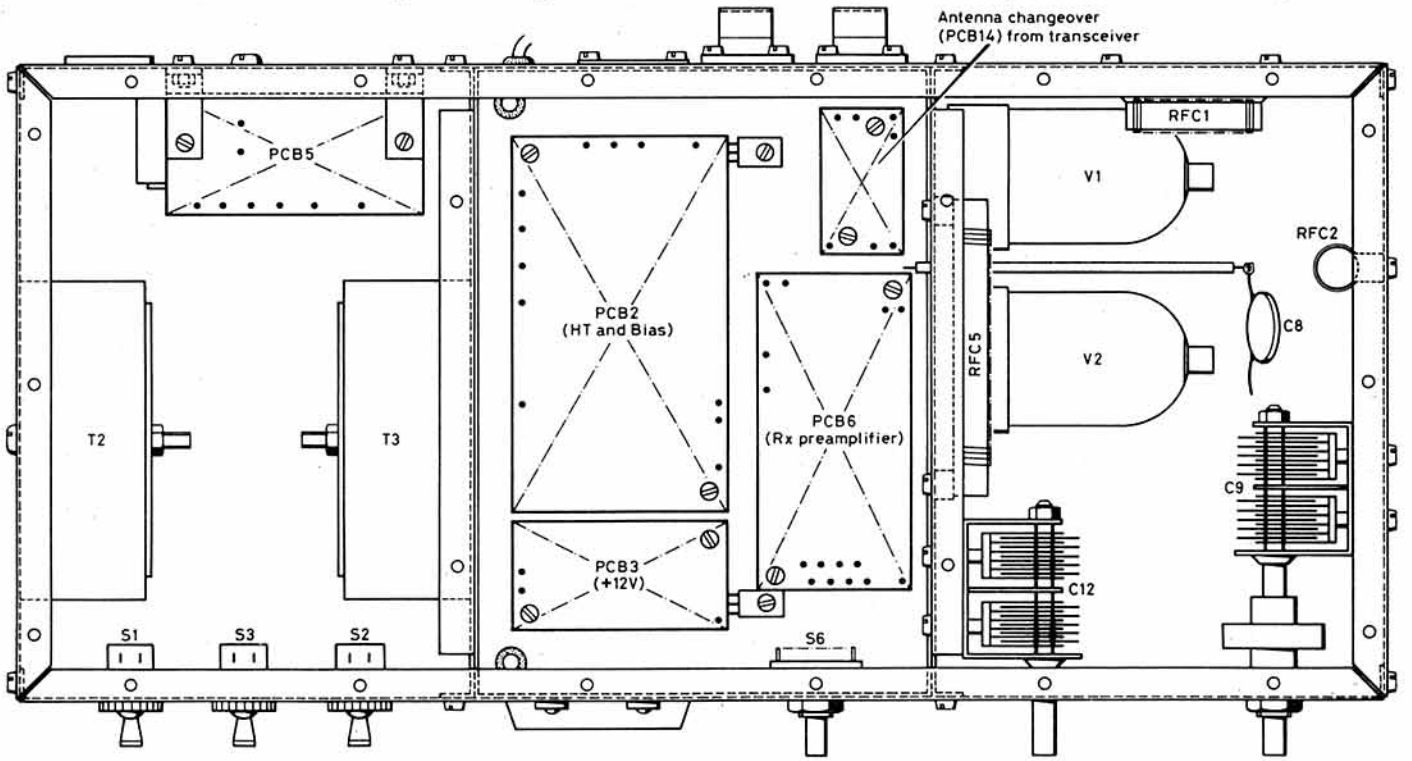


Fig 8. View of linear amplifier unit from the underside (with base removed)

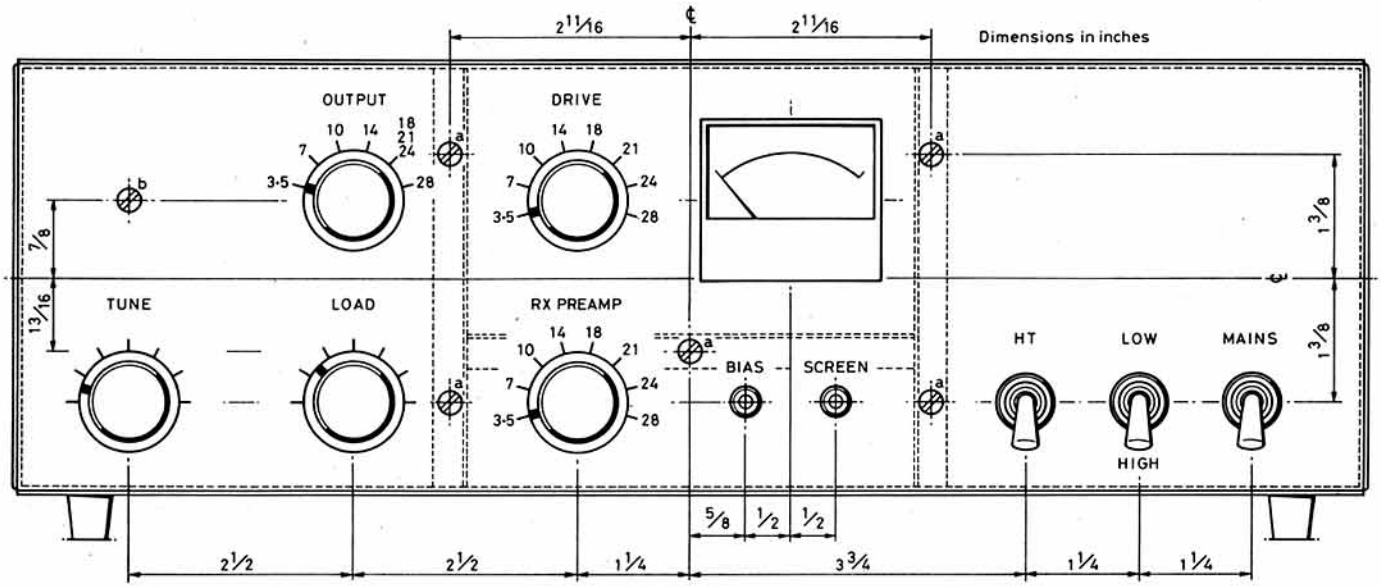


Fig 9. Front panel layout. (a) 4BA or M3 screw holding front panel to screen or chassis. (b) 4BA or M3 screw for fixing L1. (c) LED in plastic mount. The spindle for the *Tune* control passes through a bush fitted in a 0·375in hole. The spindle for the *Load* control passes through a 0·375in hole without a bush fitted

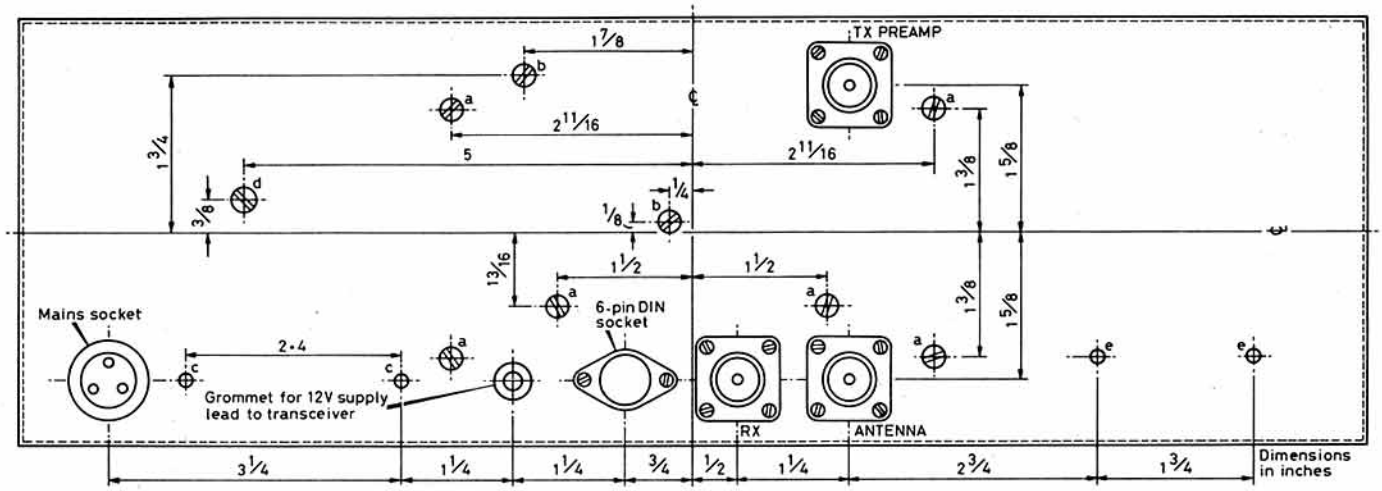


Fig 10. Rear panel layout. (a) 4BA or M3 screw for holding back to screen or to chassis. (b) 4BA or M3 screw for holding electrolytic capacitors, C13 and C14. (c) 6BA screw holding bracket on which PCB5 is mounted. (d) Bolt holding T1 (0·203in dia hole). (e) 6BA screw for holding standoff insulator (and RFC1). (f) Grommet for output lead from the 12V supply (0·25in dia hole)

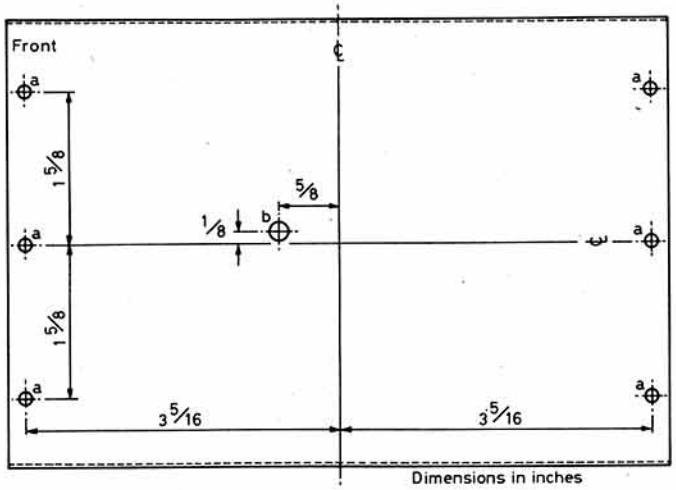


Fig 11. Right-hand side panel (as seen with flanges away from viewer). (a) 4BA clearance hole for bolting to flanges on front and back panels. (b) 0·203in dia hole for mounting T2

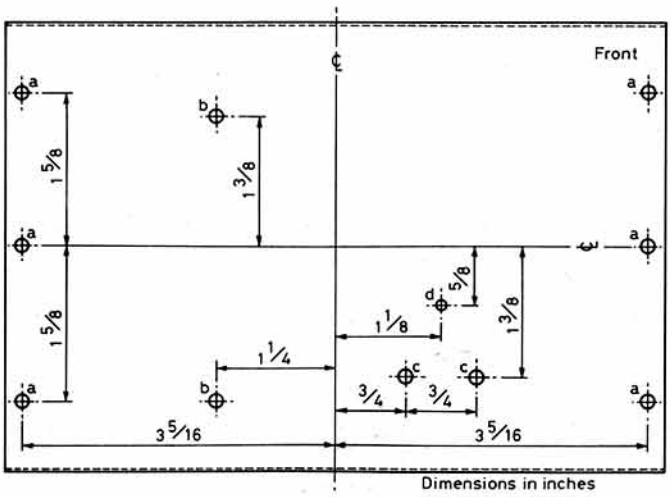


Fig 12. Left-hand side panel. (a) 4BA clearance hole for bolting to flanges on front and back panels. (b) 4BA clearance hole for mounting RFC2. (c) 4BA clearance hole for mounting C9. (d) 6BA clearance hole for fixing solder tag

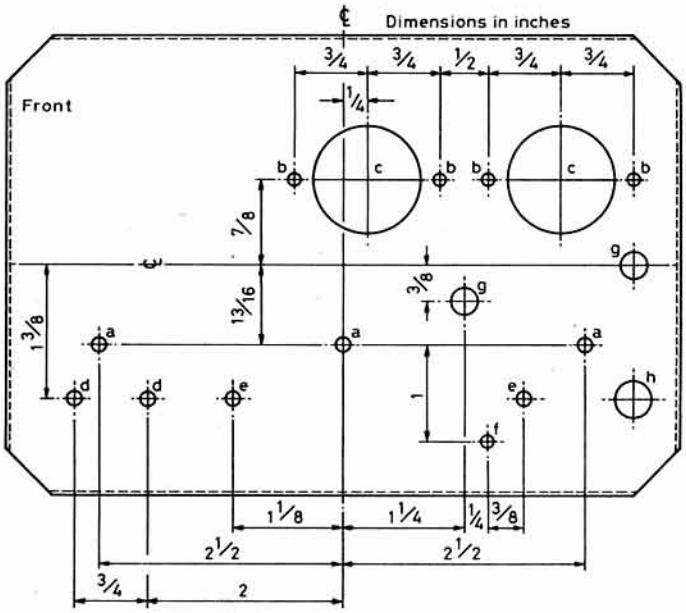


Fig 13. Left-hand screen (with flanges away from viewer). (a) 4BA clearance hole for bolting to chassis. (b) 6BA clearance hole for fixing valveholder. (c) 1·125in dia hole for valveholder. (d) 4BA clearance hole for mounting C12. (e) 4BA clearance hole for mounting RFC5. (f) 6BA clearance hole for fixing earth tag. (g) 0·25in dia hole for grommet. (h) 0·375in dia hole for grommet

tapping screws; and to spray the cabinet with aerosol car paint. The legends can then be put on the front and rear panels, using Letraset stencils and a fibre-tip pen. Finally the cabinet can be given several protective coats of polyurethane varnish.

Fitting the components

The recommended procedure is to concentrate initially on fitting all the components other than printed-circuit boards.

The TUNE capacitor C9 is mounted using nylon 4BA screws and 0·25in high plastic spacers cut from an old ballpoint pen. An insulated flexible coupler must be used to isolate the rotor from the metal spindle which protrudes through the front panel. A suitable bush for the front panel can be salvaged from an old volume control.

The outer rotor plates of this capacitor will be found to be divided into segments which will have been bent by the manufacturer to give accurate tracking. We are more concerned in having an adequate air gap, and any segments which have been bent inwards should be carefully bent back.

The LOAD capacitor C12 is mounted using metal 4BA screws. Care must be taken to ensure that these screws do not short to the stator assembly. The spindle of the capacitor protrudes through the panel without any bush being fitted.

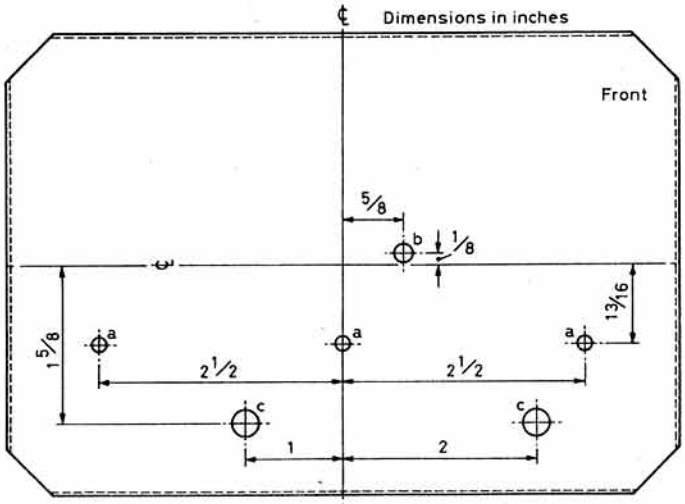


Fig 14. Right-hand screen (with flanges away from viewer). (a) 4BA clearance hole for bolting to chassis. (b) 0·203in dia hole for mounting T3. (c) 0·25in dia hole for grommet

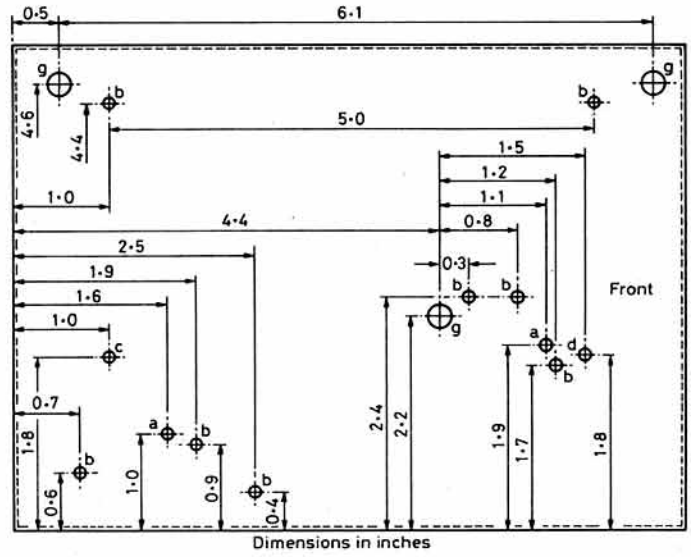


Fig 15. Top view of chassis (flanges underneath). (a) 6BA clearance hole for fixing pillar to top of chassis. (b) 6BA clearance hole for fixing pillar to underside of chassis. (c) 6BA clearance hole for clamping TR201 to chassis. (d) 6BA clearance hole for clamping IC301 to chassis. (e) 0·25in dia hole for grommet

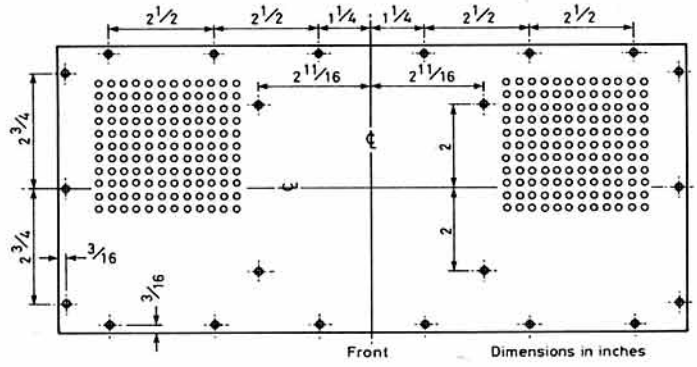


Fig 16. Lid and base. The two blocks of holes are for ventilation. The remainder are for fixing. The base will need four additional holes for fitting plastic feet

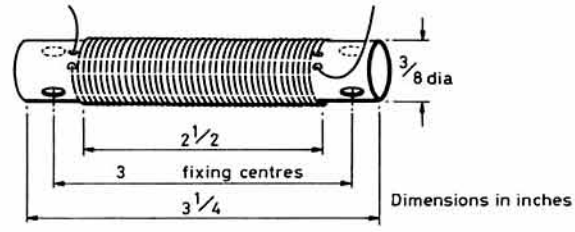


Fig 17. Construction of RFC2 and RFC5. The former is a 0·375in dia plastic tube (eg the barrel of a Pentel ball pen). The winding consists of 28swg enamelled wire close wound over 2·5in

RFC2 and RFC5 are constructed as shown in Fig 17 and mounted on 0·25in high plastic spacers. Self-tapping screws can be used, or the holes in the former can be tapped for M3 or 4BA screws. The upper end of RFC2 will need some kind of solder lug for the connections to RFC2, RFC3 and C7. This lug need be nothing more sophisticated than a short length of tinned copper wire knotted around a hole in the former.

RFC1 is wound on a 0·25in diameter plastic former, 1·5in long, cut from an old ballpoint pen, to which two end-leads of 22swg tinned copper wire have been fixed. The former is filled with 36swg enamelled wire, close wound, and the choke suspended between two stand-off insulators (or small pieces of pcb material fixed onto metal pillars). Under the base of each stand-off there should be a solder tag for earthing the decoupling capacitors.

L1 is constructed as shown in Fig 18. Each end of the winding is secured by threading it through two adjacent 1·5mm holes. Before cementing the turns down it is advisable to fix the lead-out wires (22swg tinned wire is suitable) to the indicated tapping points on the coil. The turns can then be

Components list

PRINTED CIRCUIT BOARD 1

R101	3·3kΩ 1W
R102	1kΩ 0·25W
C101, 103	120pF silvered mica
C102	150pF silvered mica
C104	47pF silvered mica
C105, 106	22pF silvered mica
C107	100–500pF compression trimmer (Maplin)
C108	330pF polystyrene 160V wkg
C109	10nF disc 500V wkg
L101–108	Wound on type 722/2 former (20·5 by 4·8mm dia) with type 4 (4mm) dust core (Maplin). See Table 1 for winding details.
T101	Wound on Siemens A0004X030 twin-hole bead (Electrovalue)

PRINTED CIRCUIT BOARD 2

R201	2·2kΩ 3W
R202	3·3kΩ 3W
R203	22kΩ 3W
R204	220kΩ 1W
R205	330Ω 0·25W
R206	15kΩ 0·25W
R207, 208	33kΩ 0·25W
C201	22μF 450V axial electrolytic
C202	0·22μF 250V ac wkg (eg interference suppression capacitor from Maplin)
C203, 204	100μF 100V axial electrolytic
D201–209	IN4007
D210	200V 1·3W zener
D211	IN4002
D212	47V 400mW zener
TR201	MJE340
FS201	50mA 20mm (and two fuse clips)

PRINTED CIRCUIT BOARD 3

C301	2,200μF 25V axial electrolytic
C302	0·1μF 50V disc ceramic
BR301	W005 bridge rectifier
IC301	7812 (12V 1A) voltage regulator

PRINTED CIRCUIT BOARD 4

R401	2·2Ω 0·5W
R402, 403	Chosen to have total value of (6, 600Ω–meter resistance) 0·25W

PRINTED CIRCUIT BOARD 5

R501	Mains transient suppressor (Maplin, Electrovalue)
FS501, 502	20mm, 500mA antisurge (and four fuse clips)

PRINTED CIRCUIT BOARD 6

R601, 607	22kΩ 0·25W
R602	220Ω 0·25W
R603	470Ω 0·25W
R604, 610	3·3kΩ 0·25W
R605, 608, 609	100Ω 0·25W
R606	4·7kΩ 0·25W
C601, 613	100pF sub-min ceramic plate
C602, 605, 606, 608, 610	10pF sub min ceramic plate
C603, 604, 607, 609	2–22pF miniature film dielectric trimmer (Maplin, Electrovalue)
C611, 612, 614, 615, 616	10nF mylar or sub min disc ceramic
D601	5·1V 400mW zener
D602	BA244
D603	2·7V 400mW zener
TR601	BC558C
TR602	40673
L601–604	Wound on type 722/2 former (20·5 by 4·8mm dia) with type 4 (4mm) iron dust core (Maplin). See Table 1 for winding details.
T601, 602	Wound on Siemens A0007X030 twin-hole bead

PRINTED CIRCUIT BOARD 7

R701	1·5Ω 7W

COMPONENTS NOT ON PRINTED CIRCUIT BOARDS

R1, 2	10Ω 1W
R3, 4	220kΩ 1W
C1, 2, 4, 5	4·7nF 1kV disc ceramic
C3, 6	10nF 500V disc ceramic
C7	1·5nF high-voltage disc*
C8	5pF high-voltage disc*
C9, 12	365 + 365pF Jackson type O two-gang
C10	180pF high-voltage disc*
C11	1,000pF silvered mica
C13, 14	220μF 450V can type electrolytic**
T1	Toroidal, primary 240V, secondary 15 + 15V. ILP Electronics type 12013
T2	Toroidal, primary 240V, secondary 240V 0·2A. ILP Electronics type 22030
T3	Toroidal, primary 220V, secondary 240V 0·2A. ILP Electronics type 21030. (Note that T2 and T3 are not identical)
V1, 2	6146B
RFC1	1·5in length of 0·25in diameter former close wound with 36swg enamelled wire. See text
RFC2, 5	See Fig 17
RFC3, 4	7t 24swg enam wire wound onto R1, R2
L1	See Fig 18
M1	100μA meter approx 45 by 45mm
LED1	Standard 5mm red L.E.D
LED2	High brightness 5mm red L.E.D (eg Electrovalue cat CQV51J)
S1	250V 2A dpst toggle switch
S2, 3	250V 2A spst toggle switch
S4, 6	Rotary switch single-pole 12W
S5	Maka-Switch shaft assembly + two one-pole 12W bbm wafers (Maplin). See text
Misc	Octal valveholders (2) Valve anode caps or 0.375in Terry clips (2)

*These should be at least 2·5kV wkg. They can be obtained from old tv sets or purchased quite cheaply from dealers selling tv spares. For example, East Cornwall Electronics, 119 High Street, Wem, Shropshire, can supply 1·5nF 3kV (for C7), 10pF 8kV (two in series for CB) and 180pF 8kV (for C10).
**Also obtainable from dealers in tv spares; eg Sendz Components, 63 Bishopsteignton, Shoeburyness, Essex, and Post a Part Electronics, 236 Furtherwick Road, Canvey Island, Essex.

Table 1. Details of coils L102–108 and L601–604

Coil	Turns	SWG	μH approx	Coil	Turns	SWG	μH approx
L101	56	40	13	L601	85	40	20
L102	27	32	3	L602	56	36	9
L103	23	28	1·9	L603	35	36	5·5
L104	17	28	1·4	L604	26	32	2·9
L105	18	24	1·0				
L106	14	24	0·8				
L107	13	24	0·75				
L108	10	24	0·6				

All coils are close wound with enamelled wire.

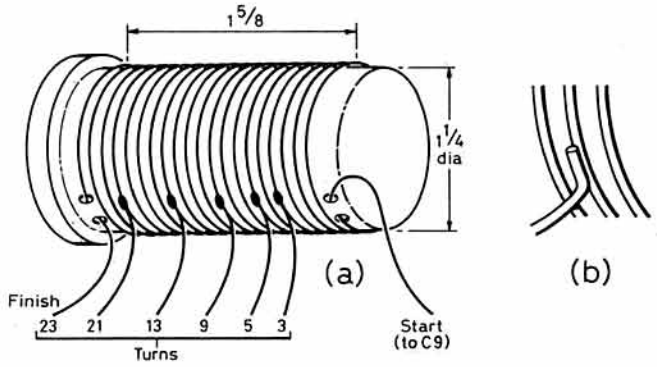


Fig 18. (a) Construction of L1. The former is a 1·25in dia plastic container. The coil is wound with 20swg enamelled wire and spread over 1·625in. (b) Closeup showing how the leadout wire is positioned at a tapping point

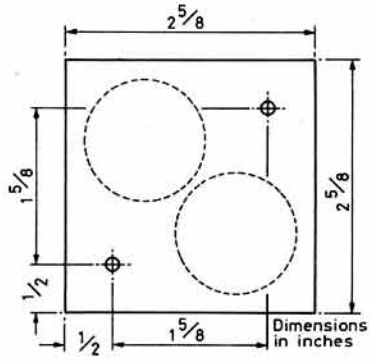


Fig 19. Board for mounting C13 and C14, viewed from the non-coppered side.

spaced out fairly evenly and two lines of polystyrene cement applied, each running the length of the coil, 180° apart. When the cement has become stiff and tacky, the turns can be moved a little, as necessary, to set them to their final positions, and two or three more lines of cement applied. The aim should be to have the windings adequately secured but with as little cement as is practicable.

Before assembling S5 it is recommended that the superfluous contacts be removed from each of the wafers. This can be done by carefully drilling out the rivets.

The two valveholders are fitted so that the valve spigots point away from each other. A solder tag should be fitted under each fixing nut.

The large electrolytic capacitors C13 and C14 need to have their cans insulated. This can be done by wrapping about two turns of card around each, holding the card with two bands of adhesive tape. The capacitors are fixed onto a piece of printed circuit board such as that in Fig 19, which is then bolted to the back panel. The bases of the capacitor cans and the non-coppered side of the board should be cleaned and roughened, using fairly coarse sandpaper, and the capacitor bases glued to the board using Araldite. It is advisable to bind the two capacitors together using another piece of adhesive tape.

TO BE CONTINUED

Next month, Part 2 will give details of the printed circuit boards and will deal with the commissioning and operation of the unit. It will also describe the modifications necessary to include 1·8MHz operation.

A succeeding article will describe several enhancements which can be made to the transceiver unit.

Gamma matching towers and masts at lower frequencies

V C LEAR, G3TKN*

Introduction

Some years ago I erected a three element hf beam on a tower. However, at the same time I still wanted a useful dx antenna for the lower frequencies, so I decided to gamma feed the tower, and so use it as a top-loaded vertical with the beam acting as the top loading.

An advantage of this method of feed is that the base of the tower does not need to be insulated from ground.

In this article, I have tried to outline the procedures I have used in gamma matching my own tower, so that the general principles may be applied to other installations.

Theory

Before proceeding, it is worth looking at the effect of mounting a beam or quad on a tower.

I have a Hygain TH3 Mk3, three element hf triband beam, mounted on a model P60 Versatower, which can be varied in height between 30ft (9m) and 60ft (18m). The TH3 has a 14ft (4·2m) boom, and elements in the region of 27ft (8·1m). The beam acts as a fairly large capacity hat when mounted on the tower, and lowers the natural resonant frequency of the tower.

Vincent Lear became interested in radio while still at school, and obtained his licence, at the age of 15, in August 1964. His main interests have been cw dxing on the lower frequency bands, and experimenting with antennas.

He is head of careers guidance, and also teaches mathematics, in a large comprehensive school. He has also lived and worked in Australia, holding the call VK2EAO.

* 53 Chaplains Avenue, Cowplain, Portsmouth PO8 8QH.

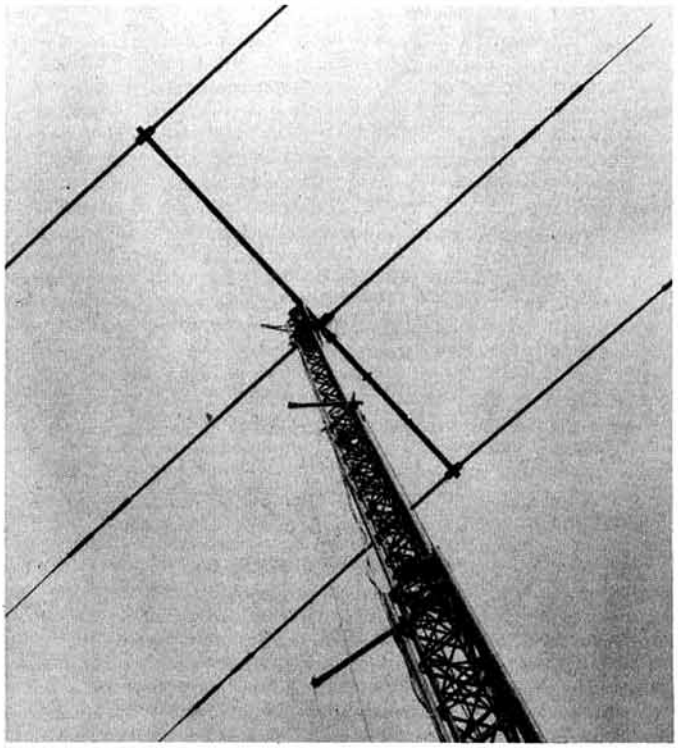


Photo 1. The lower gamma wire is for 7MHz, while the upper one, which is connected to the top of the second section of the tower, is for 3·5MHz. The tower is set at 45ft

If a quad is used in place of a beam, the top loading effect is likely to be less than the all-aluminium tribander because the only part of the quad in electrical contact with the tower would be the boom, assuming the spreaders to be either wood or glass fibre. The driven element would couple into the system by virtue of its feeder, but it is unlikely that the parasitic reflector loop would offer any significant loading.

However, the quad will still give useful top loading. In previous experiments, I found a 21MHz quad lowered the resonant frequency of a 28ft (8·4m) mast from 8·3 to 5·2MHz, thus having the same effect as increasing the mast height by 17ft (5·1m). Despite its small size, this antenna gave very good results on both 7 and 3·5MHz when gamma matched for those bands.

Although it might be of interest to know the natural resonant frequency of a tower plus beam, it is by no means essential, as the structure is tuned to resonance by the combination of the gamma wire and tuning capacitor. As an example, I found that with my tower set at 45ft (13·5m), gamma wire connected 32ft (9·6m) from the base to the top of the second section, and 200pF variable capacitor in series with the gamma wire, the whole antenna could be tuned between 2·5MHz to 6MHz. With the aid of a noise bridge, I measured the resistive impedance to be 40Ω at 3·5MHz.

As a general rule, the electrical height of the whole structure should be no greater than five-eighths of a wavelength at the highest frequency to be used, otherwise high-angle lobes are likely to appear in the radiation pattern.

The gamma feed resembles a section of open wire line, shorted at its far end (ie at the point it connects to the tower), and less than a quarter wavelength long. Such a section of line will have inductive reactance which is cancelled out by placing a capacitor in series with it. At resonance, the resistive impedance at the end of the gamma wire will depend on the height of the connection up the tower, the distance between the gamma wire and the tower, and the ratio of the respective diameters of tower and gamma wire.

I have found that on 3·5 and 7MHz, varying the distance of the gamma wire from the tower does not have too profound an effect. I normally use spacings between 18in (46cm) and 24in (61cm). However, on 1·8MHz I found that increasing the distance between the gamma wire and tower to 6ft (1·8m) at the base, dramatically increased the resistive impedance.

In an earlier experiment with the 28ft (8·4m) mast/quad combination, I was able to increase the bandwidth on 3·5MHz from 150 to 285kHz between the 2:1 swr points by using two parallel-connected gamma wires on opposite sides of the mast.

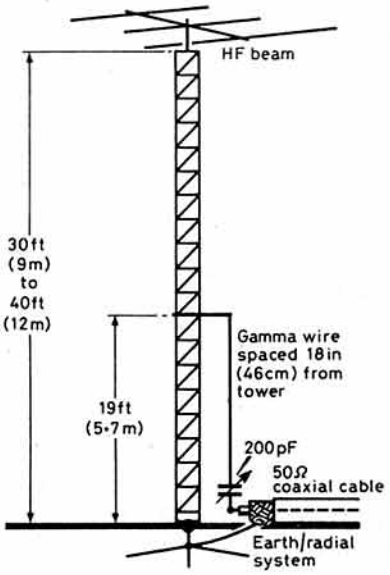


Fig 1. A 3·5MHz gamma matched tower. For tower heights greater than 40ft, the gamma connection should be moved higher up the tower, or alternatively, the omega match shown in Fig 3 should be used. The system will also tune on 7MHz

Preparing the structures

Before a mast or tower can be used as a lower frequency antenna, it is first essential to check that the whole structure makes electrical contact. This can be done by connecting a wire to the top of the structure, and doing a simple continuity check using a test meter. Alternatively, the feeder to any beam may be disconnected at the shack end, and a continuity check done between the outer braid of the feeder and the base of the mast/tower. This assumes that the outer braid makes contact with the boom and mast, as it does on the TH3 through the beta match section. Any metallic guys must, of course, be broken up by insulators to avoid unwanted resonances.

Coaxial and rotator cables must be run straight down the mast or tower to ground level before going off to the shack. This will ensure that the cables are kept at zero rf potential. If problems are experienced with rotator control units, the rotator control leads may be bypassed to rf by soldering 0·01μF capacitors between the leads and earth at the base of the tower. However, I have never found this precaution necessary using a Ham 4 rotator, even with power levels up to 400W p.e.p. The only extra precaution I have taken to prevent any stray rf from getting into the rotator control unit is to wrap about nine turns of the rotator cable about a 2in (5cm) diameter torroid ring just prior to its connection to the control unit.

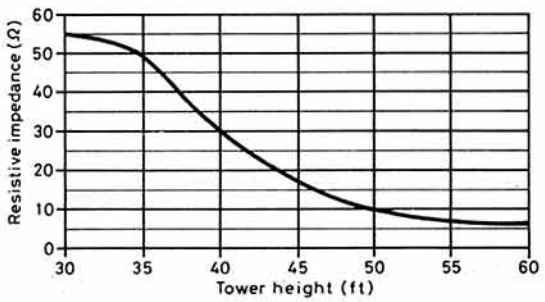


Fig 2. This graph is a plot of the resistive impedance (measured at the end of the gamma wire) against tower height, when the gamma wire was kept fixed at 19ft (5·7m) from the ground. The tower was tuned to resonate at 3·5MHz, for each reading

A practical system

The arrangement in Fig 1 works well on both 7 and 3·5MHz for tower heights between 30ft (9m) and 40ft (12m). The gamma connection is near the top of the first section. However, if the tower height is increased beyond 40ft (12m), the resistive impedance decreases on 3·5MHz to a value which is too low to match into 50Ω, as can be seen from the graph in Fig 2. The solution is, therefore, to use the omega match as shown in Fig 3, or to increase the height of the gamma connection on the tower. I have used both these methods, and both work well.

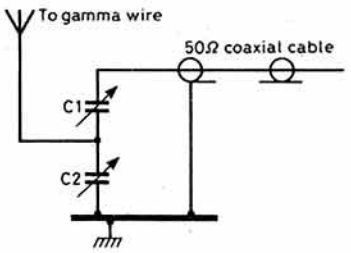


Fig 3. The omega match may be used if the impedance is too low to match into 50Ω. For 3·5MHz, C1 should be about 200pF, and C2 500pF. At 1·8MHz, values of C1 250pF, and C2 1,000pF should suffice

If the gamma wire is connected to the top of the second section, a good match can be obtained using a single 200pF variable capacitor in series with the gamma wire as in Fig 1, when the tower is set at heights above 40ft (12m). It should be remembered, of course, that when the gamma wire is connected at this point, the height of the gamma connection above ground also increases as the tower is cranked up.

On 7MHz it was possible to obtain a match for tower heights between 30ft (12m) and 60ft (18m) with the gamma connection 19ft (5·7m) above ground, and a single 200pF variable capacitor to tune the system.

If no noise bridge is available for tuning the gamma match, an rf ammeter may be placed in series with the gamma wire, and the capacitor tuned for maximum indicated rf current. An swr bridge placed in the feedline at the base of the antenna should indicate a good match if the correct position has been found for the gamma connection.

It is important to remember to set the transmitter at a low power level so as not to cause any damage to the power amplifier if this method is used.

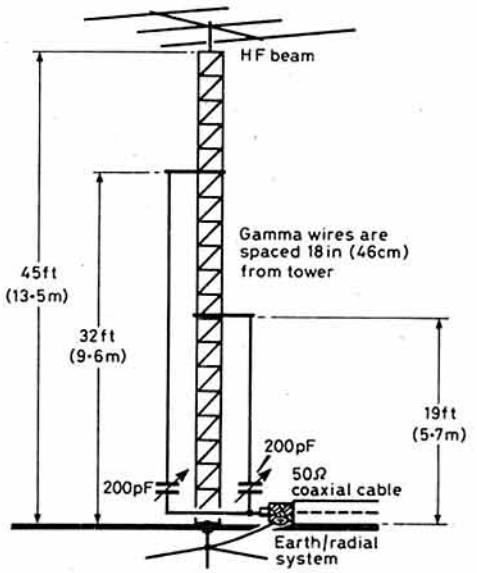


Fig 4. Twin gamma matches for 3·5 and 7MHz enable the system to operate on both bands from one feeder

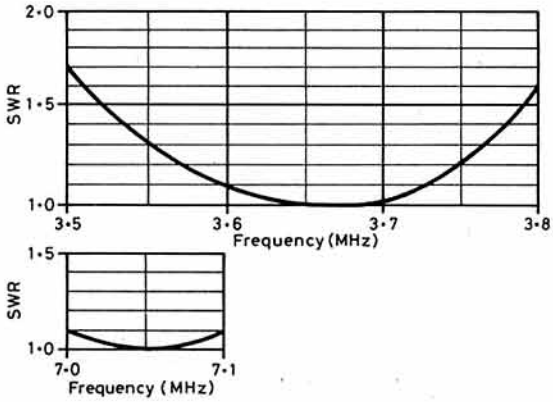


Fig 5. SWR curves obtained from the arrangement shown in Fig 4

The omega match can be quite critical to adjust. C2 in Fig 3 should be set to minimum capacitance, and C1 tuned across its range, looking for resonance and a good match. C2 should then be increased very slightly and again C1 tuned across its range. This process should be repeated until the desired match is achieved.

Multiband operation

Operation on both 7 and 3·5MHz is possible by connecting two gamma wires as shown in Fig 4. This arrangement was a little more critical to set up, but produced the swr curves shown in Fig 5 using a common feeder.

To tune the system, the 3·5MHz capacitor should be set to minimum, and the 7MHz capacitor adjusted for resonance. The 3·5MHz capacitor is now resonated, and the whole procedure repeated until a satisfactory match is obtained on both bands.

The use of a gdo and/or noise bridge saves a lot of time and frustration.

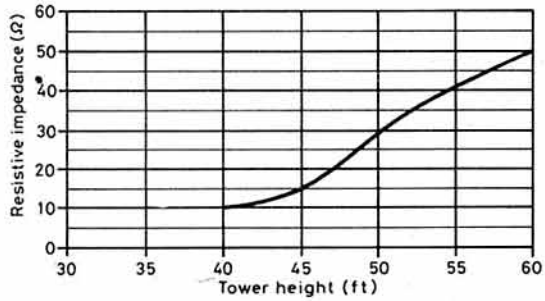


Fig 6. This graph is a plot of the resistive impedance (measured at the end of the gamma wire), against tower height, when the gamma wire was connected to the top of the tower, and the system tuned to resonance on 1·8MHz for each reading. Measurements were not taken for tower heights below 40ft

1·8MHz

The graph in Fig 6 was produced by connecting the gamma wire to the top of the tower, and taking readings of the resistive impedance at the end of the gamma wire for tower heights between 40ft (12m) and 60ft (18m) when the system was tuned to 1·8MHz.

When the tower was at 60ft (18m), and the gamma wire spaced 18in (46cm) from the tower, I measured a resistive impedance of only 15Ω at resonance. However, pulling the bottom of the gamma wire out 6ft (1·8m) from the base of the tower increased the resistive impedance to 50Ω, which produced an excellent match into 50Ω coaxial cable.

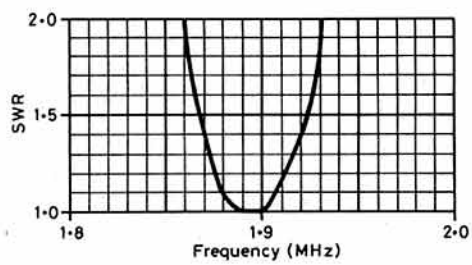


Fig 7. SWR curve obtained on 1·8MHz with tower at 45ft, and gamma wire connected to the top of the tower. The system was tuned for mid-band using the omega match circuit of Fig 3

At heights below 60ft (18m) the resistive impedance decreases quite rapidly, even with the gamma wire pulled away from the tower, and it is necessary to use the omega match circuit in Fig 3.

The swr curve in Fig 7 was obtained using this arrangement and the tower set at 45ft (13·5m). It is perhaps interesting to note that this technique does not include any lossy coils in the antenna system.

Construction

I have used various methods to connect the gamma wire to the tower. Aluminium tubing with diameters of approximately 0·5in (1·3cm) may be connected at right angles to one leg of a tower or aluminium mast, by the use of tv (or similar) mast-to-boom-clamps. I have also used stainless steel hose clips clamped around the horizontal struts on the tower.

The gamma wire may be held on the tubing by a hose clip, and connected electrically to the aluminium tubing by a solder tag/self-tapping screw arrangement. The other end of the gamma wire may be attached via insulators to aluminium outriggers secured to the bottom of the tower by hose clamps, as shown in the photograph.

With tubular masts, angle aluminium may be attached at right angles to the mast with the aid of U-clamps. The tuning capacitors may be housed in a plastic food container.

Once the gamma connection has been made, it should always be checked for electrical continuity.

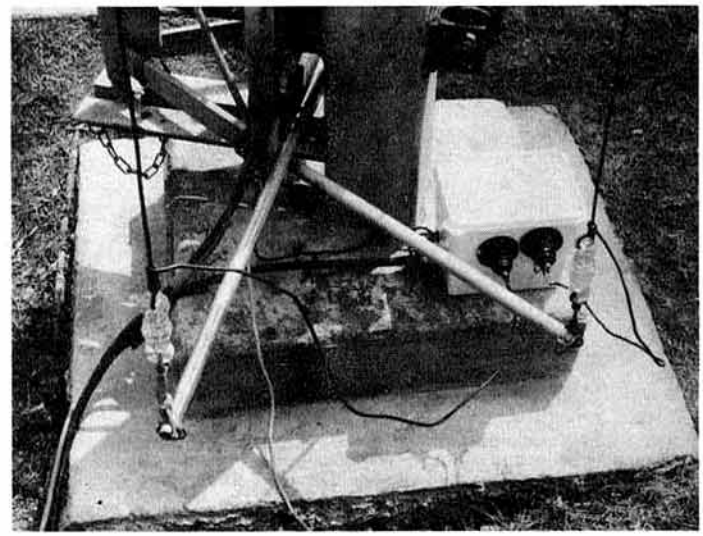


Photo 2. The 7MHz and 3·5MHz gamma wires are anchored to aluminium tubes clamped to the bottom of the tower as shown. The tuning capacitors are housed in the plastic food container to the right of the photograph

Earth/radial system

A good ground system is important with any vertical antenna. I use about 60 buried radials, going out in a radial fashion from the tower, and varying in length between 30ft (9m) and 70ft (21m). The radials are soldered to a 0·5in (1·3cm) diameter copper tube, bent to form a square around the base of the tower.

The base of the tower should be connected to the earth system by soldering wires from the earth system to solder tags, which can then be fixed to the tower legs by brass self tapping screws.

Results

The gamma matched tower has proved to be a good dx antenna, and has provided contacts with all continents on 3·5MHz (including VK/ZL and JA). On 7MHz it has given a good account of itself for long haul dx, but can be considerably down on a dipole for high-angle contacts around Europe, as one would expect.

Only a limited amount of 1·8MHz operation has been undertaken, but when operated at 60ft (18m), it was evident from the few reports received that it was working particularly well. At 45ft (13·5m) results were still very acceptable with good reports around G and Europe.

Conclusion

For those amateurs who already have a mast or tower supporting an hf beam or quad, this method of utilizing the existing structure as a low frequency antenna offers what I believe to be one of the most economical and effective uses of existing resources. □

ACTIVE ELLIPTIC AUDIO FILTER DESIGN USING OP-AMPS

(Part 2)

D H G Fritsch, G0CKZ*

Biquad elliptic highpass calculations

Calculate each second-order highpass stage in turn, as per the following step-by-step example: HP fc = 760Hz.

(1) Find the circuit's angular frequency wc = W = 2*PI*fc = 4,775·22Hz (for ease of repetitive use).

(2) Find the pole-pair frequency fp = (1/Fp)*fc = (1/0·52445)*760 = 1,449·14Hz.

(3) Find the stage zero frequency fz = (1/Fz)*fc = (1/1·626828)*760 = 467Hz (rounded figure for tuning purposes).

(4) Select a standard value for capacitors C1 and C2.
For moderate K and Qp let C1 = C2, preferably near 1E4/f.
C1 = C2 = 10,000/1,449·14 = 6·9nF.
Selected C1 = C2 = 10nF for all stages, because of size and availability.

(5) Select a standard value for resistors R6 and R8, preferably near 1/(W*C1).
R6 = R8 = 1/(4,775·22*10*1E-9) = 20,941Ω.
Selected R6 = R8 = 20kΩ for all stages.

(6) R1 = C/(K*B*W*C1).
R1 = 0·275048/(1*0·244509*4,775·22*10*1E-9) = 23·56kΩ.

(7) R2 = A/(K*Fp*W*C2).
R2 = 2·646568/(1*0·52445*4,775·22*10*1E-9) = 105·68kΩ.

(8) R3 = Fp/(W*C1).
R3 = 0·52445/(4,775·22*10*1E-9) = 10·98kΩ.

(9) R4 = K*R1.
R4 = 1*23·56 = 23·56kΩ.

(10) R5 = R6/K.
R5 = 20/1 = 20kΩ.

(11) R7 = (C1*R3)/C2.
R7 = (10*1E-9*10,980)/10*1E-9 = 10·98kΩ.

Repeat calculations for the second and third stages, starting at (2), since fc remains the same. The formulas above are used for all biquad elliptic highpass filter calculations.

The first-order stage in our case has unity gain, therefore the inverting input to the selected op-amp can simply be linked to the output of the same, (pins 8 and 9, see Fig 1(c)), where C1 = 10nF.

(12) R1 = C/(W*C1) = 0·152661/(4,775·22*10*1E-9) = 3·2kΩ.

In this case the following values were selected new: R1 = 27kΩ and C1 = 1·2nF, to increase the stage input impedance, and for the convenience of using standard value components.

R2 and R3 are only necessary, should more than unity gain (K > 1) be asked for.

(13) R2 = (K*R1)/(K-1).

(14) R3 = K*R1.

A first-order stage only produces one pole and no zero. Its frequency is:

(15) fp = (1/FP)*fc = (1/0·390719)*760 = 1,945Hz.

Select standard value resistors and capacitors as close as possible to the calculated values.

Construction and tuning of the stages

The sensitivity of an active filter is a measure of how accurate its op-amp, resistor and capacitor tolerances have to be to get the response within certain limits of the one desired. For best results the choice of component elements would have to be considered, especially so if one of the four following terms or a combination thereof becomes high: cut-off frequency, gain, quality factor and order.

From the list of well-known op-amp manufacturers, ie Fairchild Semiconductor, National Semiconductor, Motorola, RCA, Signetics Corporation and Texas Instruments, the choice of op-amps is plentiful and the data sheets should provide adequate information about parameters, including open loop voltage gain, input resistance, input offset voltage, input offset current, input bias current, slew rate, drift with temperature coefficients, full power bandwidth etc.

The dc offset voltage and its drift at the op-amp output become important when a large number of stages are cascaded in higher-order filters. Output noise from the filter is due to the internal voltage noise and current noise generated by each individual op-amp. Current noise may cause greater noise outputs than voltage noise if the op-amp currents are flowing through large resistances. Fet op-amps have very low bias currents and also low current noise. The slew rate of an op-amp represents the limiting value of output voltage swing at a given frequency and is usually a number given in V/μs. The open loop gain is neither infinite nor constant for all frequencies and is given as the figure of full power bandwidth.

Since each second-order stage requires three single op-amps, the choice falls to a quad package for reasons of size and drift being contained on one substrate. Here the Texas Instrument bifet TL074 has been chosen for its superior performance, which is pin compatible to the TL084 of the same family with slightly inferior noise performance. The low-power TL064 and single-supply version TL094 can also be used in less critical applications, where slew rate and full power bandwidth are traded off against lower power consumption and single-rail applications, respectively. National Semiconductor types LM124, LM224, LM324 and LM348 are also pin compatible and may be used where the slew rate and input resistance are not of prime importance.

Other devices are the MC3403 from Motorola, the HA4741 or HA5144 from Harris, and so on, leaving plenty of scope for substitution or replacement.

Resistors present the least problem in filter design. Carbon composition types of 5 or 10 per cent tolerance should only be used in low sensitivity circuits. Metal-film resistors having a 1 or 2 per cent tolerance, 50ppm/°C temperature coefficient and lower noise figures should be preferred for high-performance applications.

In the case of capacitors, mica, polystyrene and polypropylene types offer properties of high stability, high insulation resistance, small temperature drifts and power factors. The merit of a capacitor from the point of freedom from losses is expressed in terms of the power factor. The power factor is the sine of the angle by which the current flowing into the capacitor fails to be 90° out of phase with the applied voltage. The tangent of this angle is called the dissipation factor. The reciprocal of the dissipation factor is called the Q, and is the ratio of the capacitor reactance to the equivalent series resistance.

Silvered mica capacitors offer the best temperature drift coefficients and tolerances with an inferior power factor, compared to the other two types, but their size and cost make them unsuitable. Polystyrene foil capacitors made by Suflex are available in 2·5 per cent tolerances with values up to 10nF, but with a slightly higher power factor than polypropylene types.

For practical reasons it is well worth spending a moment or two studying capacitor specifications before a choice is made, since capacitors present a more severe problem to high-sensitivity filter design (large Qp).

Best overall results were obtained using the Fkp2 series, a polypropylene film or foil constructed capacitor with a tolerance of five per cent, made by Wima. Its temperature coefficient is specified as ±100ppm/°C and its power factor smaller than 0·0004 at 1kHz, together with a very high insulation resistance of greater than 5*5*1E10MΩ. The working voltage is 63V, and it comes in a very small size of only 7·2 by 4·5 by 6mm (L,W,H) for values from 220pF to 2·2nF, with a standard pcb lead spacing of 5mm. The body colour is green and the largest value available from Farnell in Leeds is 10nF. Capacitors with five per cent, or even 2·5 per cent tolerance limits open avenues for errors in higher sensitivity circuits, but can still be put to very good use if their values are measured and then inserted as the formula values for capacitors C1 and C2.

The selected components used for the described lowpass and highpass filters were of the following preferred standard values:

LP 1,000Hz	1-stage	2-stage	3-stage
C1 and C2	10nF	10nF	10nF
R1	620kΩ	1M + 200kΩ in series	680kΩ + 110kΩ in series
R2, R3, R7	30kΩ	18kΩ	16kΩ
R4	62kΩ	120kΩ	390kΩ + 15kΩ in series
R5	200kΩ	200kΩ	39kΩ
R6 and R8	20kΩ	20kΩ	20kΩ

First-order stage C1 = 10nF and R1 = 100kΩ.

*6 Stanton Road, Thelwall, Warrington WA4 2HS.

Table 3. Normalized elliptic lowpass filter data, continued . . .

N	PRW	MSL	TW	A	B	C	Fp	Qp	Fz	Fm	Km
7	3.0	40	0.0254	1.190991	0.252082	0.513589	0.716651	2.8429	1.091325	0.661226	1.773
				2.238663	0.062408	0.896966	0.947083	15.1757	1.496216	0.944681	9.122
				1.061054	0.010289	0.994598	0.997295	96.9283	1.030075	0.996475	6.148
				*	*	0.238606	0.488473	*	*	*	*
7	3.0	45	0.0425	1.274060	0.255789	0.460612	0.678684	2.6533	1.128743	0.627333	1.830
				2.579873	0.074990	0.868304	0.931828	12.4260	1.606193	0.928789	8.271
				1.100306	0.014007	0.992457	0.996221	71.1231	1.048955	0.995266	7.036
				*	*	0.218823	0.467785	*	*	*	*
7	3.0	50	0.0657	1.377775	0.256657	0.416609	0.645453	2.5148	1.173787	0.597627	1.876
				2.979224	0.086497	0.840331	0.916696	10.5980	1.726043	0.913051	7.636
				1.153728	0.017901	0.990174	0.995075	55.5877	1.074117	0.994020	7.935
				*	*	0.202913	0.450459	*	*	*	*
7	3.0	55	0.0955	1.505082	0.255807	0.380296	0.616681	2.4107	1.226818	0.571842	1.912
				3.446897	0.096765	0.813967	0.902201	9.3236	1.856582	0.898000	7.149
				1.223507	0.021808	0.987853	0.993908	45.5858	1.106123	0.992786	8.326
				*	*	0.189998	0.435888	*	*	*	*
7	3.0	60	0.1325	1.659515	0.253994	0.350411	0.591955	2.3306	1.288222	0.549615	1.940
				3.995157	0.105768	0.789748	0.888678	8.4021	1.998789	0.883976	6.768
				1.312029	0.025586	0.985577	0.992762	38.8010	1.145488	0.991608	9.694
				*	*	0.179438	0.423601	*	*	*	*
7	3.0	65	0.1771	1.845308	0.251707	0.325825	0.570811	2.2678	1.358421	0.530552	1.962
				4.638605	0.118567	0.767917	0.876909	7.7162	2.153742	0.871163	6.465
				1.422015	0.029161	0.983407	0.991669	34.0067	1.192483	0.990494	10.523
				*	*	0.170752	0.413221	*	*	*	*
7	3.0	70	0.2297	2.067529	0.249253	0.305577	0.552790	2.2178	1.437890	0.514260	1.980
				5.394521	0.120266	0.748512	0.865166	7.1938	2.322611	0.859681	6.222
				1.556654	0.032472	0.981381	0.990647	30.5077	1.247659	0.989473	11.304
				*	*	0.163574	0.404443	*	*	*	*
7	3.0	75	0.2908	2.332220	0.246818	0.288368	0.537464	2.1776	1.527161	0.500370	1.993
				6.283299	0.125986	0.731445	0.855246	6.7884	2.506651	0.849371	6.024
				1.719727	0.035492	0.979522	0.989708	27.8854	1.311384	0.988548	12.028
				*	*	0.157618	0.397011	*	*	*	*
7	3.0	80	0.3607	2.646568	0.244509	0.275048	0.524450	2.1449	1.626828	0.488549	2.004
				7.328972	0.130851	0.716553	0.846495	6.4691	2.707207	0.840327	5.863
				1.915736	0.038211	0.977841	0.988858	25.3789	1.384101	0.987720	12.692
				*	*	0.152661	0.390719	*	*	*	*
7	3.0	85	0.4399	3.019103	0.242382	0.263589	0.513409	2.1182	1.737557	0.478502	2.013
				8.559849	0.134979	0.708637	0.838831	6.2145	2.925722	0.832411	5.729
				2.150047	0.040635	0.976335	0.988097	24.3164	1.466304	0.986984	13.294
				*	*	0.148522	0.385386	*	*	*	*
7	3.0	90	0.5290	3.459928	0.240462	0.254063	0.504047	2.0962	1.860088	0.469967	2.019
				10.009279	0.138475	0.692487	0.832158	6.0094	3.163744	0.825521	5.619
				2.429044	0.042776	0.975000	0.987421	23.0835	1.558539	0.986336	13.836
				*	*	0.145059	0.380866	*	*	*	*
7	3.0	95	0.6235	3.980998	0.238752	0.246126	0.496111	2.0779	1.995244	0.462723	2.025
				11.716544	0.141434	0.682895	0.826375	5.8428	3.422944	0.819552	5.528
				2.760309	0.044656	0.973825	0.986826	22.0984	1.661418	0.985770	14.318
				*	*	0.142155	0.377084	*	*	*	*
7	3.0	100	0.7391	4.596441	0.237245	0.239498	0.489385	2.0628	2.143931	0.456576	2.029
				13.727921	0.143936	0.674667	0.821381	5.7066	3.705121	0.814399	5.452
				3.152835	0.046298	0.972796	0.986304	21.3084	1.775622	0.985276	14.745
				*	*	0.139717	0.373787	*	*	*	*
8	0.1	30	0.0227	1.052604	1.152436	0.567982	0.753646	0.6540	1.025965	*	*
				1.594174	0.382202	0.874711	0.935260	2.4470	1.262606	0.804470	1.358
				8.276329	0.093121	0.985816	0.992883	10.6623	2.876861	0.990107	9.409
				1.133635	0.016936	1.012252	1.006107	59.4064	1.064723	1.004848	6.431
8	0.1	35	0.0364	1.083222	1.084425	0.488806	0.699147	0.6447	1.040780	*	*
				1.759678	0.422272	0.822693	0.907024	2.1480	1.326529	0.773513	1.370
				9.760872	0.118048	0.974679	0.987258	8.3682	3.124239	0.982941	7.548

LP 880Hz	1-stage	2-stage	3-stage
C1 and C2	10nF + 6·8nF parallel	10nF + 6·8nF parallel	10nF only
R1	390kΩ	820kΩ	910kΩ
R2, R3, R7	20kΩ	13kΩ	18kΩ
R4	43kΩ	82kΩ	470kΩ
R5	91k + 2·7kΩ in series	100kΩ + 5·1kΩ in series	39kΩ
R6 and R8	10kΩ	10k	20kΩ

First-order stage C1 = 10nF and R1 = 120kΩ.

HP 760Hz	1-stage	2-stage	3-stage
C1 and C2	10nF	10nF	10nF
R1 and R4	24kΩ	110kΩ	510kΩ
R2	110kΩ	180kΩ	39kΩ
R3 and R7	11kΩ	18kΩ	20kΩ + 240Ω in series
R5, R6, R8	20kΩ	20kΩ	20kΩ

First-order stage C1 = 1·2nF and R1 = 27kΩ.

HP 820Hz	1-stage	2-stage	3-stage
C1 and C2	10nF	10nF	10nF
R1 and R4	22kΩ	110kΩ	470kΩ + 20kΩ in series
R2	100kΩ	100kΩ + 68kΩ in series	36kΩ + 1kΩ in series
R3 and R7	10kΩ	16kΩ	18kΩ + 1kΩ in series
R5, R6, R8	20kΩ	20kΩ	20kΩ

First-order stage C1 = 1·2nF and R1 = 24kΩ.
All capacitors were of five per cent tolerance, and resistors one per cent.

Fig 12 shows the block diagram of a seventh-order lowpass filter, where one first-order stage is followed by three second-order stages in cascade. The input resistor shown is only necessary if no dc return to ground is provided, eg in case of capacitive coupling to a first-order lowpass stage, then a value up to 1kΩ should be inserted. Under conditions where the input is taken direct from a low impedance speaker source to ground, the input resistor can be deleted. The filter output is capable of driving high-impedance loads direct (ie >600Ω headphones), but should have an additional audio amplifier to match low-impedance speaker loads. An LM380 requires the least external components, but will contribute to increase the noise floor.

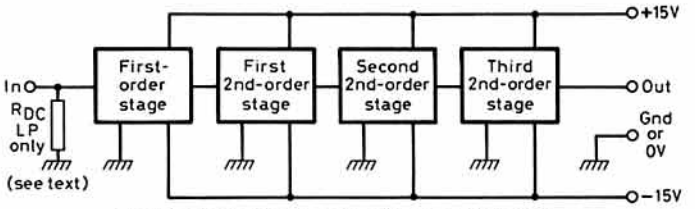


Fig 12. Block diagram, seventh-order filter stages

Fig 13 shows the block diagram of the cw filter in its entirety, and Fig 14 indicates where each of the 12 second-order stages, plus the four single-order stages are located.

The construction of the filters is less critical, since rf is not directly involved. However, for best results the filters should be housed in a small diecast box, measuring 120 by 95 by 34mm (source: Farnell), which allows a mounted pcb, toggle switches and sockets, plus optional extras to be fitted.

The mounting of components could be carried out on "breadboard" or matrix board, where connections are made using component leads.

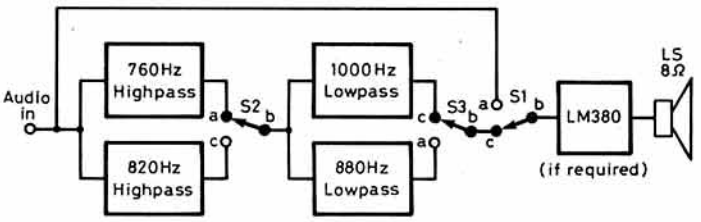


Fig 13. Block diagram, cw bandpass filter

Table 4. G0CKZ's computerized biquad elliptic lowpass active filter design summary

To design a seventh-order biquad elliptic **lowpass** filter, select standard value resistors and capacitors as close as possible to the calculated values and construct the filter, or its stages, in accordance with Fig 1(a) and Fig 1(b).

fc = 1,000Hz
fs = 1,361Hz
TW = 361Hz

N = 7
PRW = 3·00dB
MSL = 80·0dB
K = 1 or 0dB

Coefficients used

A	B	C
2·646568	0·244509	0·275048
7·328972	0·130851	0·716553
1·915736	0·038211	0·977841
		0·152661

First-order stage results (see Fig 1(b))
C1 = 10·000nF
R1 = 104·25kΩ
fp = 391Hz

Second-order stage results (see Fig 1(a))

	1-stage	2-stage	3-stage
Qp	2.14	6·47	25·9
fp	524Hz	846Hz	989Hz
fz	1,627Hz	2,707Hz	1,384Hz
fm	489Hz	840Hz	988Hz
Km	6·04dB	15·4dB	22·1dB
Km	2·00	5·86	12·7
C1	10·000nF	10·000nF	10·000nF
C2	10·000nF	10·000nF	10·000nF
R1	626·33kΩ	1·24MΩ	816·02kΩ
R2	30·35kΩ	18·80kΩ	16·09kΩ
R3	30·35kΩ	18·80kΩ	16·09kΩ
R4	65·09kΩ	121·63kΩ	416·52kΩ
R5	192·44kΩ	204·56kΩ	39·18kΩ
R6	20·00kΩ	20·00kΩ	20·00kΩ
R7	30·35kΩ	18·80kΩ	16·09kΩ
R8	20·00kΩ	20·00kΩ	20·00kΩ

Comments
(a) The performance of the filter remains unchanged if all the resistors are multiplied and all the capacitors are divided by a common factor.
(b) The input impedance of the op-amp should be at least 12·44MΩ; its open loop gain should be at least 50 times the amplitude of the filter at fc = 1,000Hz; and the desired peak-to-peak voltage at fc should not exceed 1E6/pi*fc times the slew-rate of the op-amp. A dc return path to ground should be provided at the filter input.
(c) Tuning of the circuit may be accomplished by adjusting R5 to set the stage zero frequency at fz, adjusting R3 to set the stage peak frequency fm, adjusting R4 to set the stage pole-pair quality factor Qp, and adjusting R1 or R2 to set the stage gain Km.

Table 5. G0CKZ's computerized biquad elliptic highpass active filter design summary

To design a seventh-order biquad elliptic **highpass** filter, select standard value resistors and capacitors as close as possible to the calculated values and construct the filter, or its stages, in accordance with Fig 1(a) and Fig 1(c).

fc = 760Hz
fs = 559Hz
TW = 201Hz

N = 7
PRW = 3·00dB
MSL = 80·0dB
K = 1 or 0dB

Coefficients used

A	B	C
2·646568	0·244509	0·275048
7·328972	0·130851	0·716553
1·915736	0·038211	0·977841
		0·152661

First-order stage results (see Fig 1(c))
C1 = 1·200nF
R1 = 26·64kΩ
fp = 1,945Hz

Second-order stage results (see Fig 1(a))

	1-stage	2-stage	3-stage
Qp	2·14	6·47	25·9
fp	1,449Hz	898Hz	769Hz
fz	467Hz	281Hz	549Hz
fm	1,556Hz	904Hz	769Hz
Km	6·04dB	15·4dB	22·1dB
Km	2·00	5·86	12·7
C1	10·000nF	10·000nF	10·000nF
C2	10·000nF	10·000nF	10·000nF
R1	23·56kΩ	114·68kΩ	535·90kΩ
R2	105·68kΩ	181·31kΩ	40·57kΩ
R3	10·98kΩ	17·73kΩ	20·71kΩ
R4	23·56kΩ	114·68kΩ	535·90kΩ
R5	20·00kΩ	20·00kΩ	20·00kΩ
R6	20·00kΩ	20·00kΩ	20·00kΩ
R7	10·98kΩ	17·73kΩ	20·71kΩ
R8	20·00kΩ	20·00kΩ	20·00kΩ

Comments
(a) The performance of the filter remains unchanged if all the resistors are multiplied and all the capacitors are divided by a common factor.
(b) The input impedance of the op-amp should be at least 5·36MΩ; its open loop gain should be at least 50 times the amplitude of the filter at fc = 760Hz, and the desired peak-to-peak voltage at fc should not exceed 1E6/pi*fc times the slew-rate of the op-amp. A dc return path to ground should be provided at the filter input.
(c) Tuning of the circuit may be accomplished by adjusting R5 to set the stage zero frequency at fz, adjusting R3 to set the stage peak frequency fm, adjusting R4 to set the stage pole-pair quality factor Qp, and adjusting R1 or R2 to set the stage gain Km.

1 LP stage 880Hz plus single-order	3 HP stage 820Hz	2 HP stage 820Hz	1 HP stage 820Hz plus single-order
2 LP stage 880Hz	1 HP stage 760Hz plus single-order	2 HP stage 760Hz	3 HP stage 760Hz
3 LP stage 880Hz	3 LP stage 1000Hz	2 LP stage 1000Hz	1 LP stage 1000Hz plus single-order

(viewed from track side)

Fig 14. Individual filter stage locations

Veroboard with copper tracks running in one direction is another choice, but tracks will have to be cut in order to prevent short circuits. Fig 15 shows the track side of a pcb layout in double size, where a total of 12 second-order sections, or 12 ic locations are marked (three rows of four ICs each). The centre row runs opposite to the outer ones, and care should be taken when mounting components on to the pcb. The accompanying component layout can be seen in Fig 16, where links are marked to indicate the untracked op-amp pin 11, going to its negative rail. Ground or 0V is the only rail connected to all appropriate ic pins, and both the positive and negative rails will have to be bridged across the tracks with a length of insulated wire. IC sockets are recommended but not essential, to save cost. Care should be taken to position each ic correctly, since reverse polarity rails will lead to the destruction of four op-amps. After building the first section, one quickly becomes familiar with the process and it becomes routine to copy the remaining eleven stages. Increasing the value of a resistor to obtain, for example, the odd 416kΩ needed in the third 1kHz lowpass second-order stage, put a 390kΩ and 27kΩ preferred-value resistor in series, by inserting both into the location of R4, joining them together above the pcb with a spot of solder. To decrease a resistor value for tuning purposes, put the second resistor on the track side, in parallel with the original one.

At least two additional components are required to build a first-order stage. The 1kHz lowpass, for example, uses the three vacant ic pins 8, 9 and 10, where its first second-order stage is located. There, a 10nF capacitor is fitted to the track side, going from pin 10 to the centre rail of 0V. The 100kΩ filter input resistor is left standing on the component side, one end only connected, to ic pin 10. A jumper wire links pins 8 and 9.

Again, bare jumper wires are used on the component side to link the filter input and output stages. Here, some cut-off resistor lead-end pieces can be

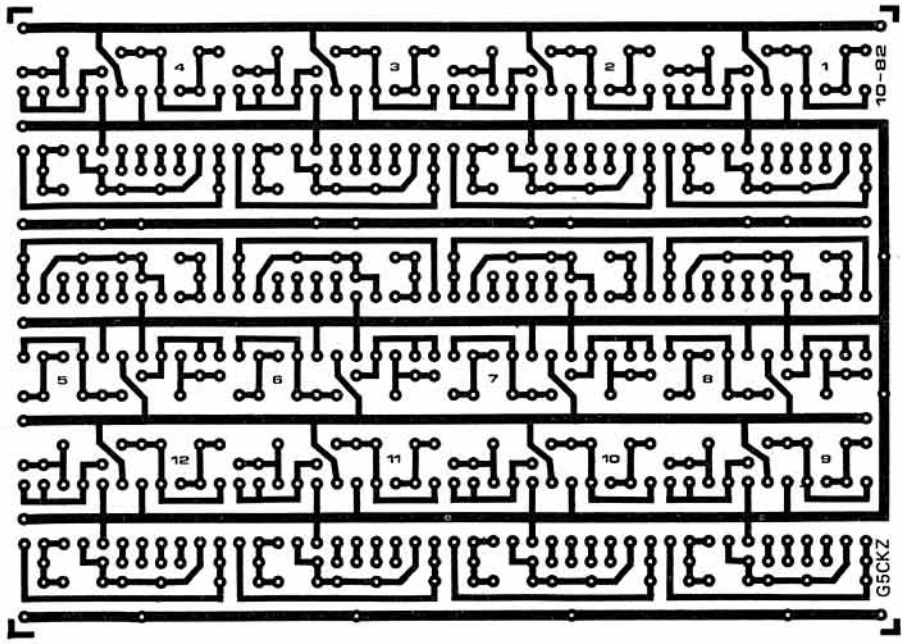


Fig 15. PCB track layout

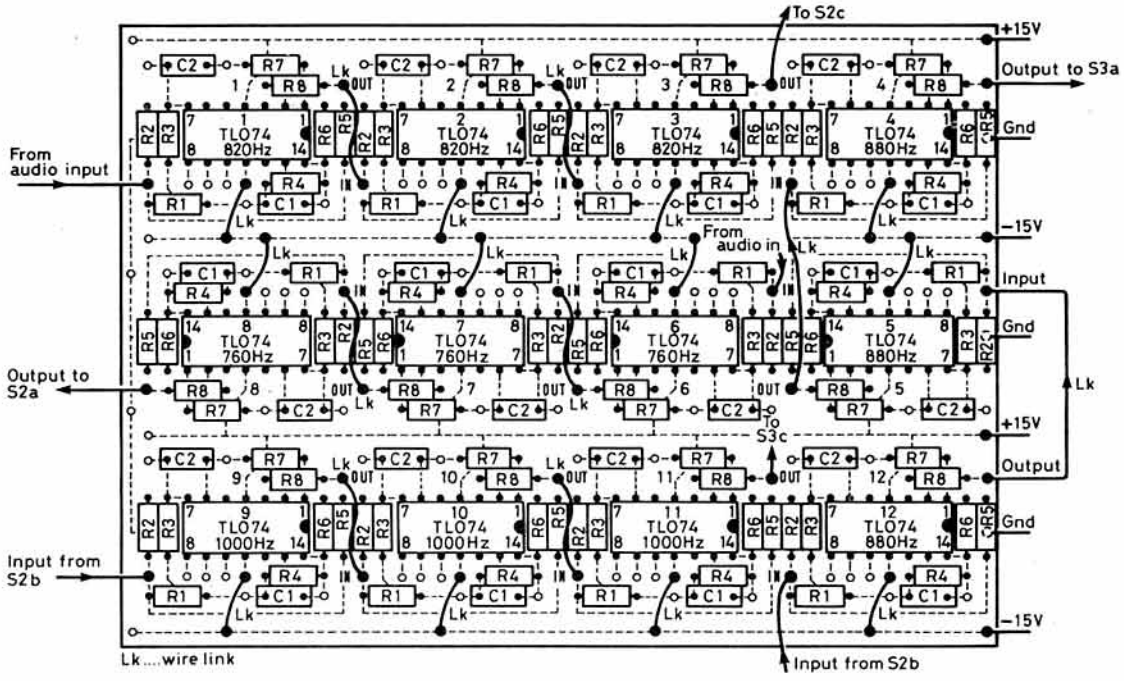


Fig. 16. PCB component layout

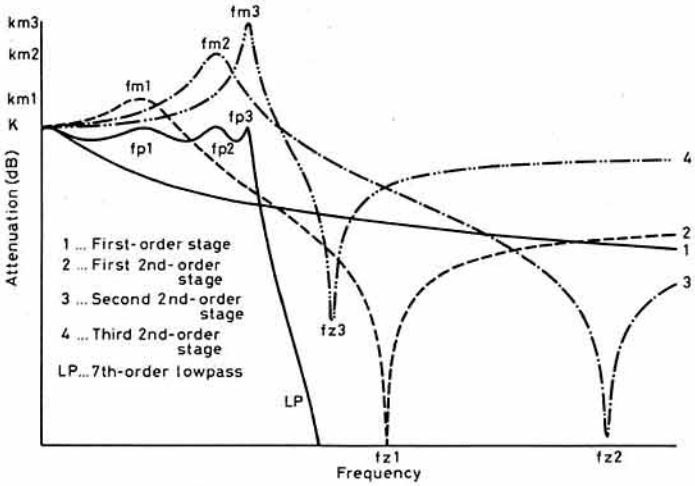


Fig 17. Lowpass tuning responses

put to good use by soldering one of them into each of the holes marked i/p and o/p, then temporarily joining the ends above board for easier accessibility when the circuit function is being verified, or to isolate a stage for tuning purposes. One pair is needed to join the o/p from the first-order stage to the i/p of the first second-order stage, a second pair to link the o/p of the first stage to the i/p of the second stage, and finally a third pair from the o/p of the second stage to the i/p of the third.

For cmos or ttl it is good design practice to tie unused inputs to one rail in order to prevent unforeseen problems. The same can be said for op-amp design. The unused pins 8 and 9 of spare op-amps should be linked together, and the non-inverting input (pin 10) taken to ground. Apart from first-order stages (see Figs 1(b) and 1(c)), the vacant op-amp pins can be utilized for other circuit functions. A rail divider is shown in Fig 1(d), where the ratio of the two resistors on the non-inverting input determines the output voltage from a low-impedance source. If these resistors are made equal in value, say 100kΩ each, then the resulting output voltage will be half of the voltage applied. That is, if the filter were to be used on a single + 12V supply (ie car battery), it could provide the reference voltage for all non-inverting inputs, rather than have them go to ground. Care would have to be taken in coupling the filter input and output sections, because of a plus 6V dc level shift.

Other applications may include a summing amplifier or a buffer circuit like those in Figs 1(e) and 1(f). The summing amp for example, would produce a notch filter if its inputs were connected to the outputs of a highpass and a lowpass.

Circuit details of a power supply have been omitted, since voltage variations have little or no effect on the performance of the filter. Any dual-power supply providing a positive and a negative rail from as low as 3V, and as high as 18V, can be used. Voltages in the range of 12V to 15V are recommended for best dynamic performance. The current consumption of a filter using TL074s or TL084s may be estimated by allowing a maximum supply current of about 2·5mA per op-amp. In our case the dual supply should be capable of delivering 4*12*2·5mA = 120mA total current.

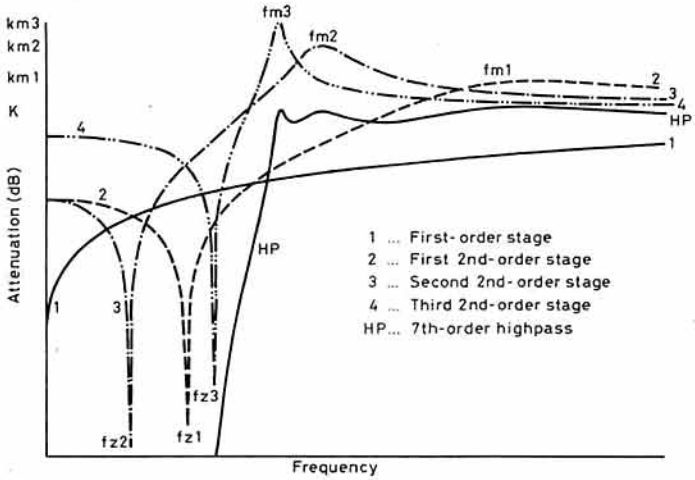


Fig 18. Highpass tuning responses

The effect of cascading is best demonstrated graphically. For example, Fig 17 shows the seventh-order lowpass tuning responses, where each stage exhibits its own individual, non-interacting characteristic and contributes to the overall desired lowpass transfer function. Each second-order stage has its own specific peak frequency (fm1, fm2, fm3) at the level (km1, km2, km3), and zero frequency (fz1, fz2, fz3) to make up the overall lowpass response with its pole-pair frequencies (fp1, fp2, fp3) at the level K.

The first-order stage only has a shallow monotonically-descending slope, starting at the reference level K. Even-order filters (N = 2,4,6 . . .) produce a starting level, which is equal to the amount of passband ripple subtracted from K.

Fig 18 shows the individual and overall responses for a seventh-order highpass. Tuning is best accomplished by isolating a particular second-order stage and measuring its zero frequency. This can be done using an audio generator and a sensitive oscilloscope by adjusting the generator for minimum amplitude display. If the generator accuracy is doubtful, then its output should be measured with a frequency counter. The aim then is to adjust the resistor marked R5 until the calculated zero frequency agrees with the measured generator frequency.

If at all necessary, zero frequency tuning will suffice in this particular design. Additional trimming is possible where needed, ie in close tolerance filters (PRW = 0·1dB).

More tuning details are provided in Tables 4 and 5, under (c) in comments.

Measured results

All results were taken with a network analyzer, allowing for two input measurements in the frequency domain, ie phase and group delay measurements. Hardcopy of the enclosed results was obtained from a video plotter, directly interfaced to the analyzer display. These plots confirm that the designed cw bandpass filters really do live up to the standard of their specifications. The plotted lowpass filter ripples in Fig 4 occupy the top third of the plot, where the frequency starts to scan as indicated at 10Hz (left), and ends 90s after at 1,010Hz (right). The vertical scale for the passband ripple is calibrated in 1dB per major division, and we notice the maximum deviation being three major divisions of 3dB, with its cut-off frequency at fc = 998Hz. The stopband ripple is superimposed into the same display window, but a different decibel and frequency range apply, where each major division on the vertical axis now becomes 5dB, totalling a stopband ripple width of greater than 30dB. The frequencies scanned cover the range from 1·3kHz to 3kHz; 2kHz of the lowpass filter shape being displayed on a linear frequency scale in Fig 3. The measured transition width between the two points marked with an asterisk is TW = 360Hz, and the minimum stopband loss is MSL = 80dB.

Fig 19 shows the sort of response one is likely to find in sales literature, because the slopes appear to be steeper than those in Fig 8, but indeed are identical. Here the analyzer start frequency is 100Hz and stop frequency 10kHz, producing a dissimilar logarithmic scale, and displaying perfect symmetrical slopes. The highpass responses are displayed in Figs 6 and 7,

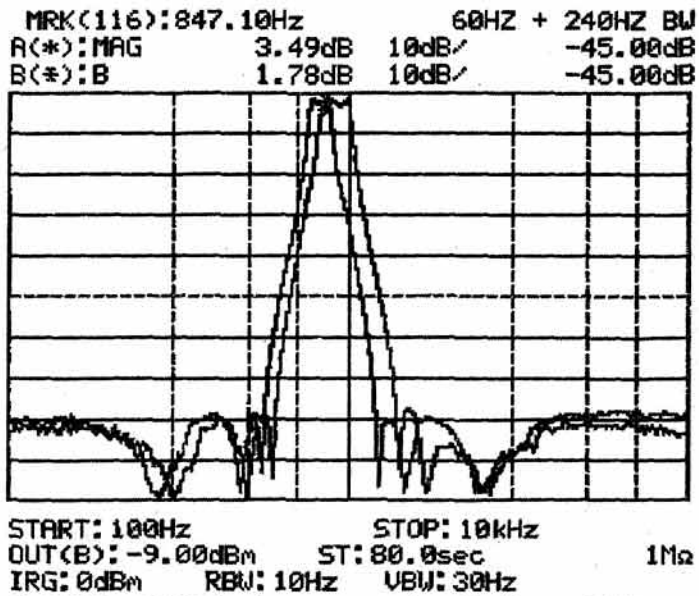


Fig 19. 60Hz and 240Hz bandpass responses (logarithmic), cascaded lowpass and highpass filters. N = 7, prw = 3dB, msl = 80dB

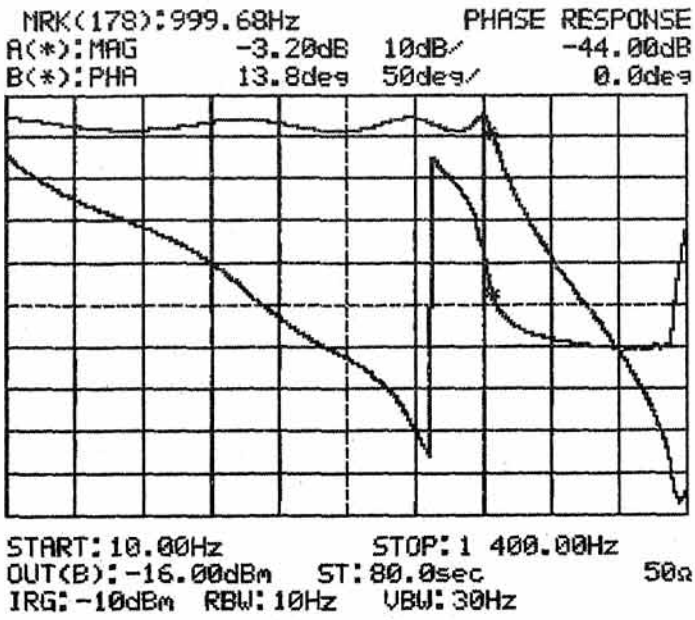


Fig 20. 1kHz lowpass phase response

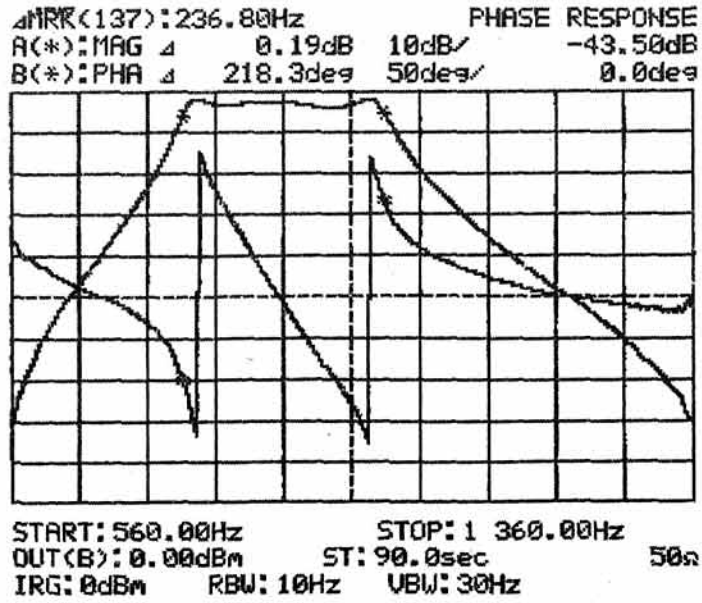


Fig 22. 240Hz bandpass phase response

and the bandpass in Figs 8 and 9. Special responses not normally found in general filter specifications are displayed in Figs 20 and 22, for the phase response inside the pass- and transition bands. Delay responses are shown in Fig 21 for the 1kHz lowpass, and Fig 23 for the 240Hz wide bandpass where a maximum delay coincides with the filter stages of maximum gain, near fc. Linearity becomes a prime requirement for phase in allpass filters and constant delays in time-delay filters, and are of less importance in frequency selective filter design. As a final set of the measured bandpass performance data, find the actual shape factors for all four possible combinations:

			Shape factors		
	Range (Hz)	Bandwidth	30/3dB	60/6dB	80/6dB
BP1	820-880	60Hz	4·2	6·6	7·8
BP2	760-880	120Hz	2·4	3·9	4·7
BP3	820-1,000	180Hz	1·9	3·2	3·9
BP4	760-1,000	240Hz	1·7	2·8	3·2

Conclusion

It is my intention to make available the necessary data for active elliptic audio filter design. Aiming to stimulate home construction for the novice and expert alike, by shedding some light on obscure theories and making it user-orientated, by keeping its maths to an absolute minimum.

The mathematical involvement could deter some constructors, but tedious calculations are quickly solved by calculator or home computer. Formulas in the previous step-by-step calculations were written in such a fashion that they could easily be adapted as "one-liners" in any Basic language.

The active filters described can be designed for any audio frequency and, indeed, well above if faster op-amps are used. Fixed-frequency filters lend themselves to applications like cw and rtty, plus many more, where only the receiver main tuning dial determines the signal to which we are listening. Here, a combination of lowpass and highpass elliptic filters were used to create a bandpass response, as was practically demonstrated.

The total hardware and component cost incurred to build this high performance cw filter has been estimated to reach about £40.

Should demand justify the etching of a universal pcb, I will try to make one available. Any requests or suggestions on this subject matter are welcome—please send saes.

References

[1] "A cw filter for the radio amateur newcomer", Edward E Wetherhold, W3NQN. *Rad Com* January 1985.

[2] "Elliptic lowpass audio filter design using miniature preferred value components", S Niewiadomski, BRS54049. *Rad Com* October 1984.

[3] "Simplified elliptic lowpass filter construction using surplus 88mH inductors", Edward E Wetherhold, W3NQN. *Rad Com* April 1983.

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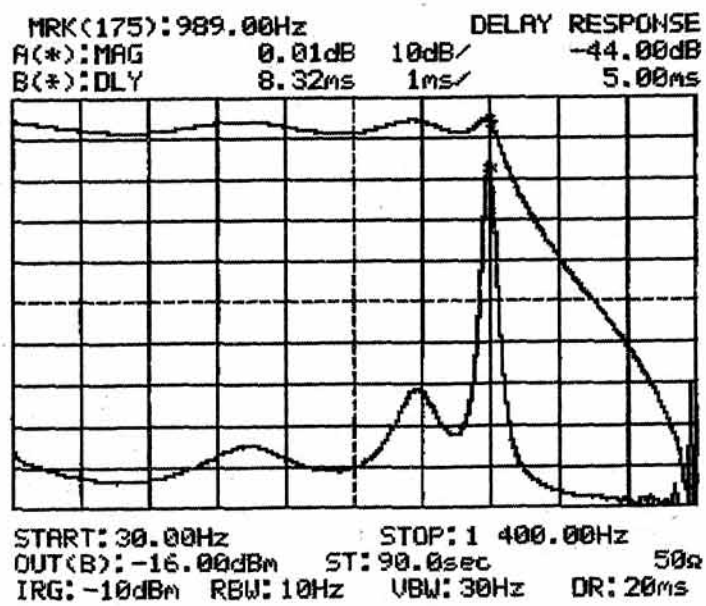


Fig 21. 1kHz lowpass delay response

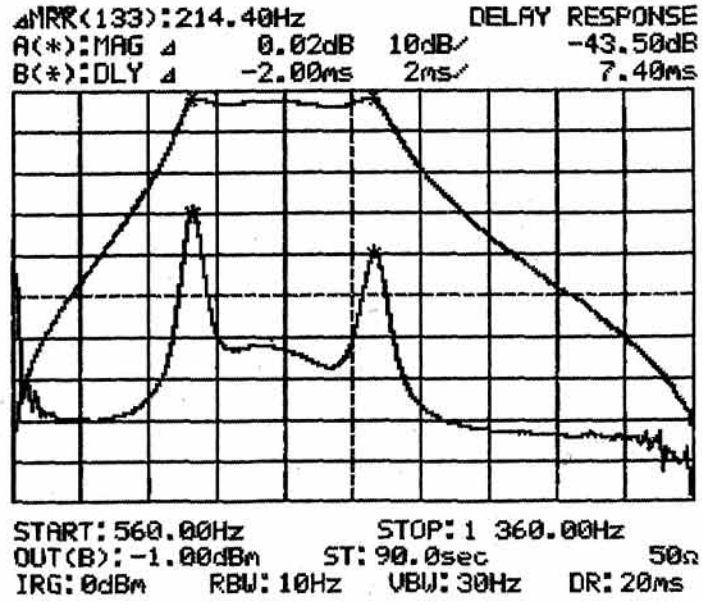


Fig 23. 240Hz bandpass delay response

Technical Topics *by Pat Hawker, G3VA*

LETTERS CONTINUE TO ARRIVE expressing concern at the way home-construction and improvisation are becoming a declining art, though most stress that it is difficult to oppose market forces that persuade us to buy new facilities, such as a multiplicity of hf "memories", that add relatively little to on-air operation.

Phil Horwood, G3FRB, in reply to GM3BST's comment on the low re-sale price of home-built gear, points out that in earlier times "we didn't ever consider selling home-built gear, we just tore it down and built something else". But then it has to be admitted that modern constructional techniques, based on printed circuit boards, do not lend themselves to easy re-use of components.

Rules of the game?

John Gardner, GW4KUJ, one of the many amateurs who have taken up the hobby after retirement from another branch of engineering, stresses that factory-built rigs do provide an incentive "to assimilate microamperes, picofarads and rf impedances. After a lifetime of heavy current and ehv, this is not easy for those in their 60s". But it is clear from his letter that at least he has made a serious attempt to put up wire antennas etc. The problem is that some newcomers now show little or no interest in the technical aspects of radio communication.

As the Rev W J McKae, G4ILA, puts it: "The satisfaction of getting things to work is one thing, but just as important is the knowledge picked up on the way . . . The confidence and skills picked up while constructing equipment more than compensates any financial loss."

Jack Coomber, G4GYG, built up a company employing 500 people based on the following rules:

(1) Everything you want to know is in a book somewhere. The difficulty is finding the right b..... book.

(2) Whatever bits you want, however unusual, someone, somewhere, is making them in thousands and can't sell them.

(3) Drawings are practically useless, they include all your design mistakes plus the draughtsman's. (Hopefully not always true of Derek Cole's excellent *Rad Com* drawings!—*G3VA).*

(4) If you have found two design faults in an equipment, there is always one more you haven't found.

(5) The cheapest product is one designed as if you made it on the kitchen table—in early days we did just that.

And finally the key rule to improvisation:

(6) Almost anything designed specifically for one job, will do even better for another one.

Improvised rf components

Jack Coomber, G4GYG, is one of several amateurs who have submitted useful tips on improvising rf components now difficult to locate. Some ideas are being held over for the moment, but G4GYG writes as follows:

"Any re-use of disposable hypodermic syringes amazes and alarms me. It is all too easy to contract hepatitis etc.

"Almost every amateur has a source of polythene rod, ideal for antenna spreaders, in his junkbox in the form of the inner from old 0·5in coaxial cable. The trick is to remove the wire from the centre.

"Cut the cable into the required lengths, plus 0·5in, having first removed the outer sheath and braid. Carefully remove 0·5in of the polythene, leaving 0·5in of wire sticking out. Put all your cut lengths into a shallow baking tray, and, preferably, if appropriate with the permission of 'she who must be obeyed', put in the hot drawer or plate warmer of the cooker (*not* the oven). When good and warm, remove one by one and pull the wire out with pliers. A piece of metal with a slot or hole in it helps to pull the polythene (an eating fork would do if you can get away with it).

"It is at this stage that the pieces can be nicely straightened out before they harden again. A couple of self-tapping screws and some thin wire can be used to fasten the spreader to the feeder in the usual way.

"The same principle can be used very successfully to make stand-off insulators, choke and coil formers. For larger coil formers, the small tubes used by chemists for pills are very useful. My local chemist charges me only 1p each. They appear to be made of styrene which is an excellent rf insulator. The material dissolves in carbon tetrachloride or Thawpit, so it is easy to secure the turns. Modelmakers' styrene cement is also useful and enables two pill-tubes to be stuck end-to-end if required. Since the tubes are rather brittle the safest method of drilling them is with a small drill in a pink-chuck held in the hand.

"For very large formers for antenna loading coils and the like, Paxolin tube used to be popular. Today it is expensive and difficult to obtain. I have seen plastic drain pipe used successfully, but take care; there is a type of pvc which does terrible things to the *Q* of coils.

"My answer is postal mailing tubes, which come in many sizes and are widely used for mailing large drawings, posters, certificates etc.

"Travel agents receive many and usually throw them away and may be persuaded to throw them your way. I keep a small stock in an airing cupboard (so they don't absorb excessive moisture). When needed, cut off the required length and put in a closed tin with 50 per cent yacht varnish and 50 per cent white spirit. Leave for several days with an occasional shake, then hang up to dry. When hard, finish off with a spell in the hot drawer (seize a suitable opportunity when nobody is around since the smell is terrible). After this treatment the tube looks like Paxolin and very nearly is Paxolin."

G4GYG sent along examples of rf components made from coaxial cable "inners" and pill-tubes, including an excellent-looking plug-in coil (four in-line pins, the former horizontally mounted).

Power transformers

One of the problems in keeping abreast of the changes that have flooded into radio technology in recent decades is that many standard handbooks tend to treat "fundamentals" primarily on the basis of long-established techniques. This can be justified on the grounds that fundamental "principles", by their very nature, do not change. But "practice" *does* change.

Then again some components are more interesting than others, more sexy, to use current parlance. Solid-looking lumps of ironwork such as high-wattage mains transformers or the audio transformers once commonly used in high-level amplitude-modulated transmitters tend to be taken for granted, despite such developments as grain-orientated "C" cores and the re-emergence of the now popular toroidal mains transformer.

In basic terms, the core of a low-frequency transformer is designed so that as much as possible of the magnetic flux developed by the primary winding encloses the secondary windings(s), using closed magnetic loops which concentrate the flux. Core design depends on the frequencies involved and whether the transformer is intended to operate at a specific frequency (eg 50 or 60Hz) or over a range of frequencies as for audio transformers. Conventional transformers designed for one specific frequency usually have an air gap in the core.

It is also usually highly desirable for the core to be arranged to minimize losses due to eddy currents induced within the core itself. For power and audio transformers those losses have been traditionally minimized by building up the core from a series of thin plates (laminations), stamped out in various standard shapes (Fig 1), and each insulated from its neighbours. The greater the cross-area of the core the greater the power handling capacity of the transformer without the core saturating. A core is said to be saturated when increased current in the primary ceases to produce any increase in magnetic flux so that, for example, a sine-wave input signal results in a distorted output waveform with flattened peaks.

The commonly-available plates of Fig 1 are formed from silicon steel having low hysteresis loss, or from nickel-iron alloys having very high permeabilities. About 30 years ago there emerged the C-core made from

Fig 1. Typical shapes of laminations from which conventional power transformer cores are usually built up, including a gap

silicon-iron sheets rolled so as to have greater permeability in one preferred direction. The practice is to cut this material into strips with the direction of major permeability along the major axis. Such cores are generally cut into two equal "U" shapes, with the windings inserted on the limbs, resulting in the so-called C-core. When required, a gap can be inserted between the two halves. Because of the greater permeability, a given core size is capable of handling more power than with non-grain-orientated cores, resulting in more compact and lighter transformers.

For power transformers involving the transfer of appreciable amounts of power between low-impedance circuits, core losses become the major consideration. This loss is expressed as watts per kilogram (or per pound) of core material as a function of maximum flux density with sine-wave excitation. If flux density is increased too much, rising core losses result in excessive core temperatures. The design of a power transformer is thus to some degree a matter of compromise. The alternative to high flux density is to use more turns per volt; for a given core size this results in the use of smaller diameter wire and hence greater resistive losses.

The toroidal power transformer

An alternative to the C-core transformer, while retaining the advantages of grain-orientated steel strip, is the use of toroids, and this can have very significant advantages in overall size, and in the reduction of external magnetic fields which can induce hum into low-level signals; the gapless toroid also has the advantage of generating much less acoustic hum, which in conventional transformers tends to come from vibration of the laminations.

The toroid is, in fact, the oldest form of transformer core, dating back to Michael Faraday! Nevertheless there remains, for most of us, an air of unfamiliarity and perhaps a danger of claiming too much for this approach. Its revival stems from the development of toroid winding processes and better wire technology and associated better insulation.

John Brown, G3EUR, formerly chief development engineer with Avel-Lindberg, is the author not only of that company's leaflet, *The ins and outs of toroidal transformers*, but also a useful guide to "Using toroidal transformers" in *Mercury*, The Royal Signals Amateur Radio Society Journal No 81, 7/85, and the following notes stem from these sources.

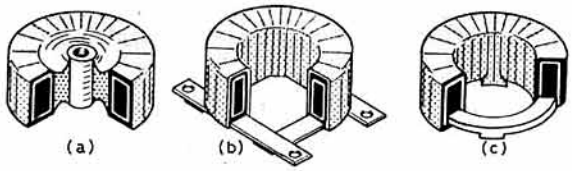


Fig 2. Mounting methods for toroidal transformers. The centre fixing of (a) is the most common arrangement

The toroid is exceptionally well-suited for use on printed circuit boards in view of the usual centre hole fixing (Fig 2), the low centre of gravity, and the pcb-compatible pins, which allow it to be mounted at the same time as other major components and then flow-soldered. G3EUR is careful to warn against the dangers of overkill by appearing to claim too much for the toroidal transformer. Nevertheless they are now being widely used in compact solidstate equipment, especially where the low external hum-field radiated from a toroid is of importance; for example in oscilloscopes and audio amplifiers.

Advantages of toroids

(1) In the general case, toroids, compared against traditional stacked laminated types, come out about 50 per cent lighter and 50 per cent lower volume—simply because they are more efficient.

(2) Because there is no air gap, there is far less reluctance (magnetic resistance) and consequently low magnetizing VA—important when used in "instant-on" circuitry. A toroid can give savings of 90 per cent open circuit power.

(3) A continuous strip (gapless) core can be wound at a controlled tension which gives a stacking factor of 95 per cent of its theoretical weight. All the molecules lie in the "preferred direction" along the strip, and this enables grain-orientated silicon steel to be used to give operation at a high flux density with very low iron losses, resulting in much higher efficiency.

(4) No air gap also means an 8:1 reduction in electrically-induced noise (hum) because most of the fringing flux which causes this trouble is concentrated at the air gap of stacked laminated types.

(5) With a toroidal core the windings completely envelop the core and thereby reduce audible noise caused by magneto-striction.

(6) The high efficiency which can be obtained with toroidal transformers enables them to be conservatively rated without incurring size penalties.

(7) Inherent in the toroidal type of construction is a low height profile which is compatible with components now being used in power supplies for contemporary "slimline" electronic equipment.

G3EUR writes: "The eight-to-one lower radiated field and the acoustic quietness are self-evident when the method of construction is investigated. A working flux density of 1·7 Tesla (17,000 Gauss) for the all-in-line grain-orientated toroid, as against 1·3 Tesla (13,000 Gauss) for a conventional transformer, is inherent in the design; as are iron losses of typically only 0·46W/lb (Fe) as against 1·25W/lb (Fe). The absence of the air gap means the toroid only requires a magnetizing current of one-tenth of that needed by a transformer with a gap. Centre-hole, single-point mounting, coupled with the ability to mount the toroid directly onto a pcb, make the production engineer's life easier. The typically 50 per cent lower weight and volume, with the lower height profile, must also contribute to easing the designer's ulcer when space is at a premium in high-component density equipment."

Using toroidal transformers

John Brown stresses that two points should always be observed when using toroidal transformers:

(1) Do *not* use toroids in half-wave rectifier circuits, since there would then

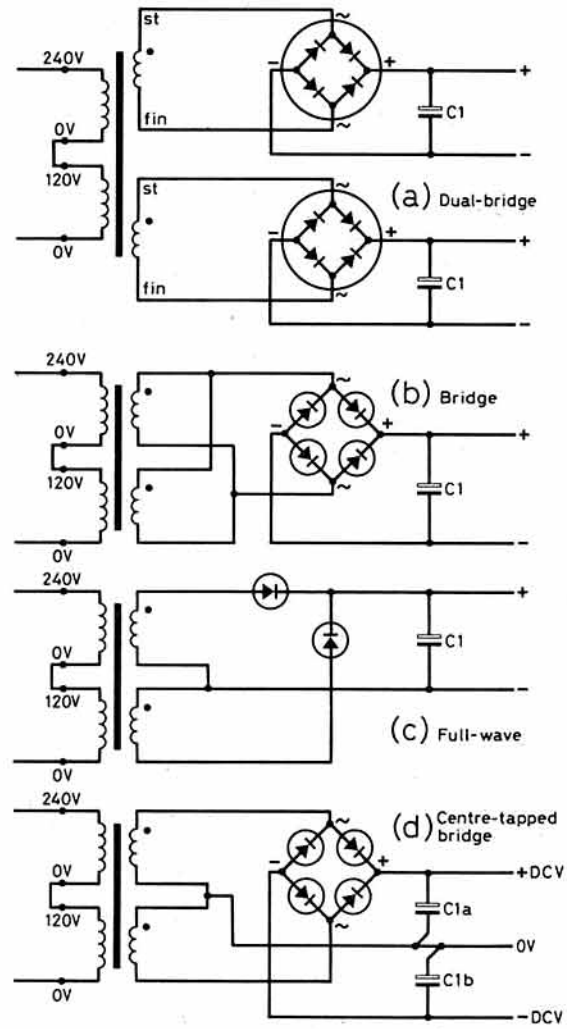


Fig 3. Four of the more common ways of using dual-winding toroidal transformers (other possible arrangements include dual and triple supplies, tripler, quadrupler etc). (a) Separate bridge rectifiers with minimum interaction. Either can have positive or negative earthed supply lines and can be used with a variety of ic or discrete voltage regulators. (b) Both windings in parallel to give single heavy current output. Note that the reservoir capacitor needs to be twice the value for (a) and a rule of thumb is 100μF/A at 12V dc, 2,000μF/A at 6V dc etc. Ripple-current rating may be taken to equal the direct current, and it is highly advisable to use computer-grade capacitors with stated ripple ratings of voltage rating preferably twice the rms voltage of the transformer secondary windings. (c) Alternative bi-phase arrangement using only two diodes. This is a better arrangement for low voltage psus (5 to 10V ac) where diode voltage-drop becomes more significant. A bridge has a 1·8V drop, two diodes about 0·7V but use bigger (higher current rated) diodes. (d) Centre-tapped bridge can give both positive and negative outputs, with different output currents. Treat each output as for (c)

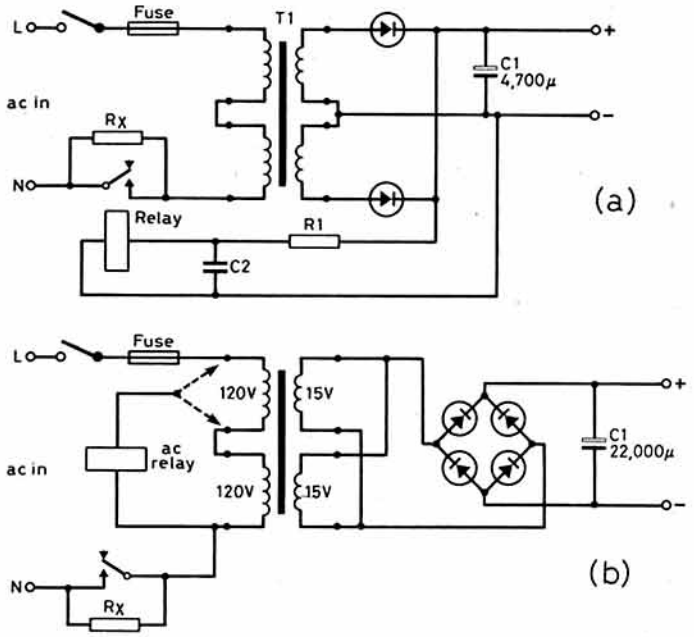


Fig 4. "Soft-start" systems based on dc and ac relays. In (b) a 110V or 240V relay can be used (240V across the whole primary, 110V across one half). The delay should be about 100ms

be an average (dc) current flowing in a winding. The gapless core of the toroid would become biased, resulting in saturation of the core and excessive heating. Even conventional laminated cores will not cope with much dc flowing in the windings.

(2) The very low impedance of a toroid transformer when used with silicon diodes and large capacitance filter capacitors results in high in-rush currents when the equipment is switched on. Unless some form of soft-start in-rush protection is used, fuses rated for normal load current will tend to blow. It is advisable to use "anti-surge" fuses of the correct rating, usually rated about 150 per cent of normal full load. In a large power supply unit, rated at, say, 100W or over, it is worth using a soft-start circuit or relay.

Many of the off-the-shelf toroidal mains transformers, suitable for home-construction, are wound with dual primaries (120V) which can be connected in series for 240V supplies or in parallel for 117V mains. The two secondaries can similarly be in series or parallel and used in "centre-tapped" full-wave configurations or in separate or joint bridge arrangements. This leads to great flexibility as indicated in Fig 3, derived from G3EUR's *Mercury* article, where he shows the large number of available options. Fig 4 indicates a relay approach to soft-starting, although, as indicated previously in *TT*, other techniques can be used.

Loop antenna amplifier

The directional characteristics of a tuned loop antenna make this an effective technique for sorting out weak dx signals on 1·8 and 3·5MHz. Eric Sandys, GI2FHN, provides information on a loop amplifier found to be the most effective of any that he has tried: Fig 5.

He writes: "It uses an MC1350 ic in the push-pull mode with output taken from pin 8. Additional amplification is provided by a hybrid cascade amplifier using a common-source jfet amplifier (TR1) driving a common-base amplifier (TR2). The loop itself is a conventional two-turn screened loop using coaxial cable on a frame made from 22mm polypropylene tubing, and covers both 1·8 and 3·5MHz when tuned with a 500pF capacitor. The loop is connected to a screen 'stereo plug' via a small diecast-aluminium box. A screened line socket mounted on the rear panel of the amplifier permits 360° rotation. As I am also interested in medium-wave dx, a separate loop is available for this band. The usual American and Canadian broadcast stations have been received at night, and during the day Radio Devon can be received here in Bangor as a signal of entertainment value. Some of the other loop amplifiers that have been published seem unnecessarily complex or require inconvenient power supplies."

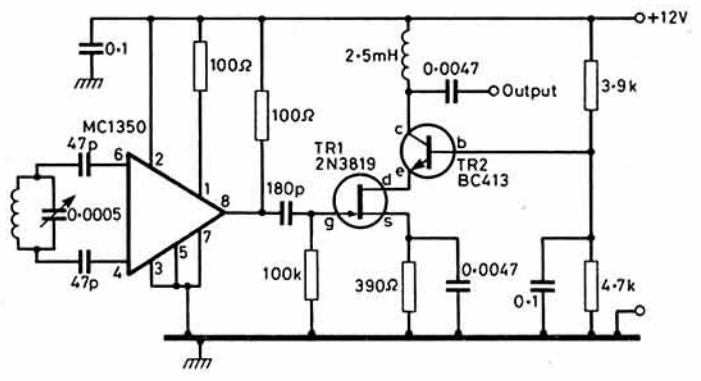


Fig 5. GI2FHN's receiving loop amplifier for medium waves, 1·8MHz and 3·5MHz

The search for dynamic range

Even before the introduction of solidstate devices into communications receivers, it was being persuasively argued that the performance of high-grade valve receivers in the presence of very strong signals left a lot to be desired. The first bipolar transistor receivers in the 'sixties were a veritable disaster, putting back performance, at least in terms of dynamic range, by several decades. The reason was that the bipolar transistor is basically a steep slope device with no equivalent of the variable-mu pentode valve.

For some 10 years enormous efforts were put into bringing the dynamic range of solidstate receivers to the standard possible in thermionic designs, at least to those without such "special" valves as the 7360 beam-deflection valve. There was an added requirement resulting from the general adoption of broad-band input circuits and the growing use of a first "up-conversion" mixer (I have still to be convinced that this configuration is the optimum approach for receivers for the amateur bands).

But certainly, with care and the use of suitable devices, it is today possible to achieve good strong signal performance, with high-cost solidstate receivers. The use of 28V supplies rather than 12V for front-ends, combined with much better balanced or doubly-balanced active or passive mixers, has brought a great improvement. Limitations today tend to be oscillator jitter/noise and the use of broad "roofing filters" that result in the differential between the dynamic range when measured with closely spaced carriers and that when measured with signal generators off-tuned by 20, 50 or even 100kHz (see *TT*, August 1984).

But even today it is not easy to provide a mixer with a really high intercept point without driving this with a relatively high-power square-wave switching signal from the local oscillator. The drive required from some synthesized local oscillators is more appropriate to QRP transmitters!

Ed Oxner, KB6QJ, of Siliconix, did a lot of work in the early 'seventies on balanced mixers based on power junction field effect (Mospower) transistors, and his pioneering work was frequently reported in *TT* and subsequently *ART*.

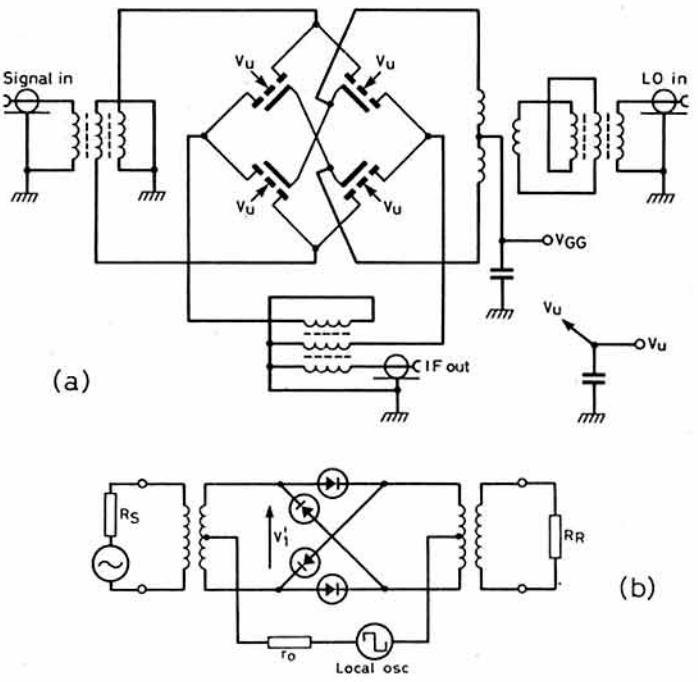


Fig 6. Typical high-performance mixers using conventional broadband transformers

Recently he kindly sent me details of new work on "A commutation (switching) double-balanced mosfet mixer of high dynamic range". His first paper on this subject is due to be presented at the 1986 RF Technology Expo, and will be published in the Conference Record.

To quote from the introduction to this still unpublished paper:

"Dynamic range remains the principal goal of hf mixer design. The intermodulation performance and overload characteristics of a mixer are fundamental qualities used in the evaluation of a good design.

"Heretofore, most mixers sporting a high dynamic range have been either the passive diode-ring variety (available from several sources) or the active fet mixer: Fig 6. The latter, not being commercially available, is often implemented from earlier published design notes (Ed Oxner, "Fets work well in active balanced mixers" *EDN*, Vol 18, No 1, 5 January 1973, pp66–72 and Ed Oxner, "Active double-balanced mixers made easy with junction fets" *EDN*, Vol 19, No 13, 5 July 1974, pp47–53).

"Common to both the diode and fet is their square-law characteristic so important in maintaining low distortion during mixing. However, equally important for high dynamic range is the ability to withstand overload that has been identified as a principal cause of distortion in mixing (H P Walker, "Sources of intermodulation in diode-ring mixers", *The Radio and Electronic Engineer* (UK), Vol 46, No 5, May 1967, pp247–255). Some passive diode-ring mixer designs have resorted to paralleling of diodes to effect greater current handling, yet the penalty for this apparent improvement is the need for a massive increase in local-oscillator power.

"This report examines a new fet mixer where commutation (switching) achieves high dynamic range without exacting the anticipated penalty of increased local-oscillator drive. Using the Siliconix Si8901 monolithic quad-ring small-signal double-diffused mosfet, third-order intercept points upward of +39dBm (input) have been achieved with only +17dBm of local oscillator power."

KB6QJ tells me that the figure of +39dBm, remarkable though it is, is proving conservative. One well-known communications firm claims that, under laboratory conditions, intercepts of +43dBm are being achieved. The Siliconix Si8901 is a commercially-available ic, suitable for use as a mixer at hf and the low-vhf region. A surface-mounted version may later extend performance to somewhat higher frequencies.

Si8901 as a commutation mixer

The design of this mixer is treated fully in KB6QJ's paper, which may appear later also as a Siliconix Application Note.

A few brief notes must suffice for the moment:

"To achieve a high intercept point the local oscillator drive must: **(1)** approach the ideal square wave; **(2)** ensure a 50 per cent duty cycle; and **(3)** offer sufficient amplitude to measure a full *on* and *off* switching condition, as well as to offer reduced r_{DS} when *on*.

"Furthermore, to maintain superior overall performance—both in terms of conversion loss, dynamic range (noise figure) and intercept point —some form of image frequency termination is highly desirable even though this restricts the bandwidth of the mixer.

"Consequently, the principal effort in the design of a high dynamic range commutation mixer is two-fold. First, and most crucial, is to achieve a gating or control voltage sufficient to ensure a positive and hard turn-*on*, as well as a complete turn-*off*, of the mosfet mixing elements. Second, and of lesser importance, is to terminate properly the parasitic and harmonic frequencies developed by the mixer.

"Local oscillator injection to the conventional diode ring, fet, or mosfet double-balanced mixer is by the use of a broadband, transmission-line transformer (C L Ruthroll "Some broad-band transformers", *Proc IRE*, August 1959, pp1,337–42), as shown in Fig 6.

"A major goal is the conservation of (oscillator) power. This goal cannot be achieved using the conventional design. Simply increasing the turns ratio of the coupling transformer is thwarted by the reactive load presented by the gates. The solution is to use a resonant gate drive. The voltage appearing across the resonant tank, and hence the gates, is $V = (P.Q.X)^{\frac{1}{2}}$ where P is

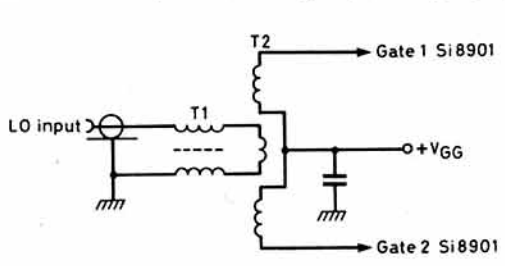


Fig 7. Resonant-gate drive transformer (T2) which resonates with C_{GG} of the Si8901 mixer ic and permits the use of significantly less oscillator drive

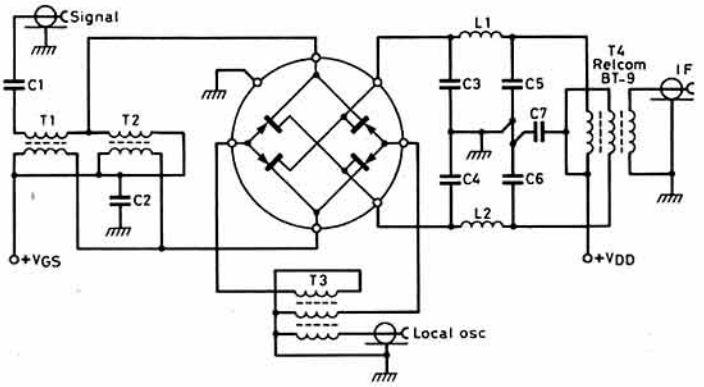


Fig 8. Ed Oxner's commutation double balanced mixer with resonate-drive transformer

the power delivered to the resonant tank circuit, Q is the *loaded* Q of the tank circuit; and X is the reactance of the gate capacitance.

"The gate capacitance of a mosfet is voltage dependent, so that the reactance of the gate becomes dependent upon the impressed excitation voltage. If this were permitted it would severely degrade the imd performance of the mixer; it can be minimized by using a combination of substrate and gate bias. A gate bias is, in any case, needed to ensure the required 50 per cent duty cycle.

"Implementing the resonant gate drive may take several forms. The resonant tank circuit may be merged with the oscillator, or it can be a varactor-tuned Class B stage, or, as in the present design, an independent resonant tank as shown in Figs 7 and 8.

"To ensure symmetrical gate voltage in 180° anti-phase, if the local oscillator drive is fed by unbalanced coaxial cable, an unbalanced-to-balanced must be used (see Fig 8), otherwise capacitive un-balance results with attendant loss in mixer performance."

Ed Oxner's paper goes into the theory, design and measurements made on this type of mixer in considerable detail at a technical level directed at professional designers, but it is felt that these notes will provide *TT* readers with at least an outline of this interesting design that could further improve the strong-signal performance of receivers. To quote his conclusions:

"Achieving a high gate voltage to effect high-level switching by means of a resonant tank is not a handicap. Although one might, at first, label the mixer as narrowband, in truth the mixer is wideband. For the majority of applications, the intermediate frequency is fixed, that is, narrowband. Consequently, to receive a wide range of frequencies the local oscillator is tuned across a similar band. In modern technology the tuning can be accomplished by numerous methods, not the least might be electronically using variactors. The resonant tank also may take several forms. It can be part of the oscillator or it can be a varactor-tuned driver electronically tracking the local oscillator.

"If the local-oscillator drive were processed to offer a more rectangular waveform, approaching the idealized square-wave, we might then anticipate even greater dynamic range."

EMC and the cordless telephone

Cordless telephones began to be used in the UK about five years ago, at first illegally. Subsequently an interim allocation of frequencies was made specifically for cordless telephones, and the use of units conforming to these frequencies and power limits became legal. In general, the base-handset links operate between 1·6 and 1·8MHz; between 49·8 and 49·9MHz is used for the return handset-to-base path. They are normally single-channel fm sets, the channel to be used being preselected at the factory from five or eight possibilities.

With only five or eight channels available and a nominal range of upwards of 100m, clearly severe problems of mutual interference will soon arise in urban areas. It has been estimated that by the year 2000 the number of cordless telephones in use may amount to some 10 per cent of conventional wired telephones. British Telecom are developing units operating at around 900MHz with digital modulation techniques, and foresee a need for some 6MHz of spectrum.

The use of cordless telephones seems likely to pose increasing problems of electromagnetic compatibility to radio amateurs, both in the form of rfi to the telephone units and, conversely, interference from the telephones to amateur reception. Clearly a 49·9MHz base receiver may prove vulnerable, for example, to local 50MHz transmissions, while the 1·7MHz receivers may be vulnerable to very strong local signals on virtually any band, though no cases have yet come to my attention.

On the other hand there are already reports of quite severe interference to reception between 3·5 and 3·6MHz from harmonics of 1·6 to 1·8MHz base transmitters. Some amateurs are already reporting difficulty in using the cw end of 3·5MHz, although it is uncertain how much of such interference results from legal units and how much to models not conforming to the DTI specification. But it would hardly be surprising if any low-cost local 1·7MHz transmitter radiates sufficient second harmonic to cause interference on the 3·5MHz band, and quite possibly spurious signals at other frequencies: 1·750 to 1·800MHz, unfortunately, is harmonically related to the 3·5, 7, 14, 21 and 28MHz amateur bands!

I have no information on whether the RIS or BT are preparing to take any action to recognize and/or minimize this problem, which is still largely confined to a few areas. It seems odd that telephone users who react so strongly to any suggestion that their telephones may be "tapped" seem to be quite willing to let their private conversations be picked up (with slope detection in the absence of an fm discriminator) at a considerable distance! Perhaps they have no idea how far their words are winging! Even a few milliwatts do not stay within a user's own estate! Perhaps if they were made more aware of the facts of radio there would be far less than the millions of users anticipated by the year 2000, at least on the 1·7/49MHz bands.

Multiway 6A adapters

While some of us still live in houses having the old round three-pin 15A, 5A, 2A mains wall sockets, the majority must by now be using the standard flat-pin 13A socket. This often implies the use in the shack of a quite large four- or six-way junction box, or at least the rather cumbersome three-way 13A adapter.

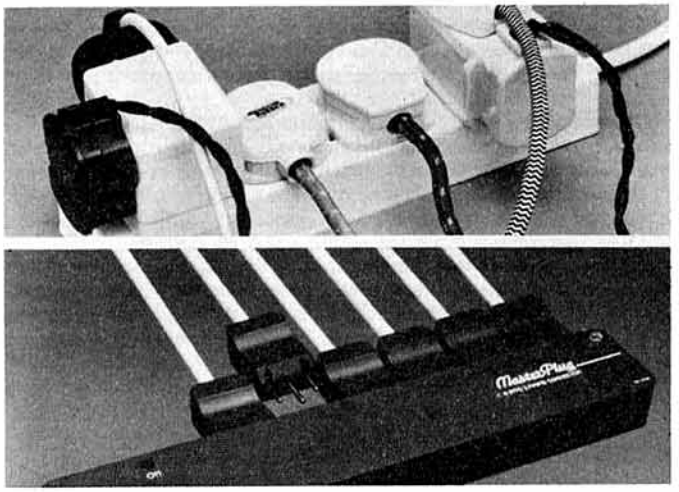


Photo 1. (Top) Conventional six-way junction box adapter with 13A sockets. (Below) The Conblock six-way adapter

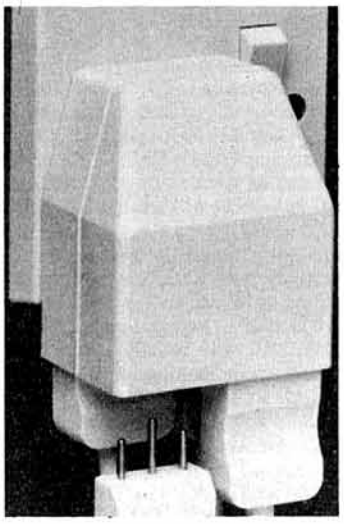


Photo 2. The new Conblock plug-adapter providing four outlets with 6A sockets

A recent press release, issued on behalf of Conblock Electrical Ltd (0686-27100) of Newtown, Powys, sings the praises of two new adapters, sold complete with plugs. They provide compact three-pin 6A sockets, so making for much smaller and lighter units for the many applications where the individual loads do not really require the use of 13A plugs/sockets (ie loads of less than about 1kW), and particularly where there are several separate units.

Conblock claim the new adapters are available at most electrical high street outlets and confirm fully with BS5733 and the latest electrical equipment safety regulations.

An in-line adapter for use with 13A sockets provides six in-line 6A shuttered sockets. They are also making a wallplug adapter that plugs into a 13A socket and provides four of the 6A sockets.

That earphone filter!

The January *TT* included an item on putting a resonant reed as the effective part of the diaphragms of a high-impedance as described in the Australian *Radio Experimenter,* of unknown date. I expressed reservations about this idea, particularly the "lag". It all seemed a little too good to be true. What I did not realize, until reminded by Eric Sandys, GI2FHN, was that exactly the same idea had been previously published in *QST*, but with a few significant differences! It was in the *April* (1976) issue and was ascribed to "Tin Ehres, WH0OP". Quite clearly it was one of the traditional semi-believable *QST* April Fool jokes!

My apologies to readers for including this idea in a January rather than an April issue—and thanks to GI2FHN.

There is, of course, no fundamental reason why the output transducer or impedance matching transformer should not constitute an effective filter. Douglas Byrne, G3KPO, writes:

"A horn loudspeaker from the 'twenties makes an excellent af filter for cw. Its 800Hz peak can be much improved by bunging a large wad of cotton-wool right down the aperture! Most of these early loudspeakers had high-impedance windings (about 2,000Ω) but can be fed from low-Z sockets via almost any small output transformer wired backwards (ie with the low-Z winding connected to the receiver)."

The German "diplomatic" suitcase set (*TT* September 1985) used the technique of resonating the output transformer, and in a pre-war *T & R Bulletin* an article showed how by cutting a gap in the core, the *Q* could be improved and the output peaked at the required frequency. □

ACTIVE ELIPTIC AUDIO FILTER DESIGN USING OP-AMPS

(Continued from page 184)

[4] "An introduction to elliptic filters for the radio amateur", John Wilkinson, G4HGT. *Rad Com* February 1983.

[5] *A Handbook of Active Filters*, D E Johnson, J R Johnson, H P Moore. Prentice Hall 1980.

[6] *Synthesis of Passive Networks*, E A Guillemin. John Wiley & Sons 1957.

[7] *Manual of Active Filter Design*, J L Hilburn, D E Johnson. McGraw-Hill 1973.

[8] *Active Filter Cookbook*, Don Lancaster. Howard W Sams & Co 1979.

[9] *Solid State Design for the Radio Amateur*, W Hayward, D DeMaw. ARRL 1977.

[10] *Operational Amplifiers—Design and Applications*, J G Graeme, G E Tobey, L P Huelsman. McGraw-Hill 1971.

APPENDIX

In order that the author can process your personal filtering requirements and to generate the calculated printouts as mentioned in this article, a suggested format for specifying these requirements should be adopted. Find below the described 1,000Hz lowpass as an example:

CUSTOM DESIGNED ACTIVE ELLIPTIC AUDIO FILTERS

Specify your filter requirements as follows:

(1) Tick filter type: LOWPASS HIGHPASS BANDPASS NOTCH				
(2) Passband frequency:		fp	1,000	Hz
	or	fp1	.....	Hz
	and	fp2	.....	Hz
(3) Stopband frequency:		fs	1,361	Hz
	or	fs1	.....	Hz
	and	fs2	.....	Hz
(4) Maximum allowable passband ripple: (select 0·1, 0·5, 1, 2 or 3dB)		PRW	3	dB
(5) Minimum stopband loss: (between 30dB and 100dB)		MSL	80	dB
	or	MSL1	.....	dB
	and	MSL2	.....	dB
(6) Maximum allowable filter gain or loss:		K	0	dB
	or	K	1	
(7) Source impedance: (if known)		Rs	600	Ω
(8) Load impedance:		Rl	600	Ω
(9) Maximum input signal level:		Vin	3	Vpp
(10) Available supply voltages: (usually dual rails, between 3V and 18V)		Vdc	+/−15	V

(11) Special points to consider:.....
eg low Qp, limited complexity of the filter, restricted size, close tolerance in attenuation or ripple values, critical phase or delay characteristics in the passband, DC drifts and offsets.

□

NEWS & VIEWS

HF

*John Allaway, G3FKM**

THE MENTION of listener reports in the January column has led G4UZN to draw attention to the fact that during two years on the air, and after having made 10,000 QSOs, he has so far never received a report from anywhere other than eastern Europe on his cw signals. Once upon a time it was felt that cw reports were more likely to attract a QSL—has anything changed? Years ago many could not afford phone transmitters, and much rare dx was only to be heard on cw. Maybe time to stop answering phone reports?

Two reports of piracy have arrived—one from G6VS who has been receiving QSLs for a very poor "VS6DO", who appears to be ignorant of the fact that VS6 stations are in Hong Kong and not in Taiwan, and who has also misread the information on Phil's real QSL route which is via G5VS! The second is from G3ESP who is receiving QSLs for cw contacts which he has not made and referring to him as Alex and suggesting that he is in Croydon. More information would be welcomed. (G3ESF?-*Ed*)

Some earlier requests for the present whereabouts of holders of former choice dx callsigns have already borne fruit—GM3ITN is now looking for VS9ASP and ZD4BM, and G3UKH for VP6LX and VP7NS. Any information would be appreciated please.

Maritime mobile callsigns

A notification has been received from the Radio Society of The Gambia, to say that it has come to its attention that "C53/MM" calls are increasingly being used by maritime mobile operators. The Gambian licensing authorities point out that they are not issuing any /MM licences, and that none is in existence. Furthermore, C53 callsigns are issued only to permanent residents in The Gambia, and are valid only for the period of residence for fixed base operations. Renewal of licences is only legal if registered with the Gambian authorities and payment of a licensing fee does not constitute any renewal unless legalized by the Gambian licensing authorities.

News from overseas

Phil Weaver, VS6CT, was due to visit Macao again early in January, and wrote to me commenting on the problems caused to the HARTS QSL Bureau by those who send QSLs for CR9 and V8 QSOs there. This causes serious problems as it is necessary to find out who was the operator in Macao and return everything to him. In the case of Brunei cards they have to be sent to another V8 amateur for forwarding. What all this means is that QSLs for amateurs in countries where there is no QSL bureau should be sent only by the route given by the dx station. Phil has two QSL managers—JA4ENL for Asian and Oceanian QSOs, and G5VS for the N and S American and European contacts. Finally, he expresses the view which was aired by several societies at the recent IARU Region 3 Conference: that QSLing from rare locations is a serious problem. There are now 300 licensed amateurs in Hong Kong—some 200 of whom belong to HARTS.

A group of Hong Kong amateurs at JOTA HQ Hong Kong on 19 October 1985. All are VS6s and are from l to r: (back row) EL, XRD, XOE, XRE, XPJ, XDS, CT, XMQ, GW and CN. (Front row) XLN, TM, LG, XRL, XON and TX (KG6TN)

RSTG (see previous item) wishes it to be known that a station using the callsign C53J was active during the 1984 CQ WW DX Contest (CW) and that this callsign has never been issued. The user was later given a guest licence as DL7AH/C56 which was his only legal call. More news of Gambian activities has arrived via G4DYO—this describes the visit of Olli Rissanen, OH2BBM, late last year. While there, Olli presented a complete Yaesu station to the RSTG on behalf of he Northern California DX Foundation. He operated from club station C53AA during the CQ WW DX contest, and made more than 3,000 QSOs covering six bands and by using a bamboo and wire "antenna farm". RSTG is setting up facilities at the French School, and has C53AU as president, C53EU as secretary, and C53FG as treasurer. Fr Mike, C53M, an old-timer, serves as hon president. The authorities have granted RSTG the right to process licence applications from visitors. Further development of C53AA is anticipated with the aim of establishing a versatile West African radio site to serve The Gambia and the world.

Ed Campbell, formerly KB6DAW/KH2, is now AH2BE and reports that he made some 6,200 contacts during his seven days on Wake Is as KB6DAW/KH9. He worked 122 countries, WAS, and 36 zones. Propagation was good to everywhere except Europe, and Ed hopes that this will be taken care of on his next trip and will hopefully have two other operators with him. He also intends next time to use a two bands per day schedule, so that more sustained operating can take place on each. He expects to go to Korea and may possibly become HL9MM, and may also visit father-in-law 8P6JQ—in which case an 8P9 call will be applied for. Wherever he is, look for him on the VK9NS or W7PHO nets.

Stephen Ayling, G4ASL, operated as SO5ASL during a visit to family in Poland at Christmas time, and used a low-power cw transceiver on 14MHz. Twenty countries were worked with 1W output, and G4MQC worked when the latter was running 3W. Further activity from Komorow is planned.

Royal Netherlands Navy Radio Amateur Club

MARAC was founded in June 1985 and is very similar to RNARS in the UK and MF-Runde in FR Germany. It is open to active or ex-naval personnel of the Royal Netherlands Navy or of Allied navies. Membership costs £3 a year and members will receive four newsletters yearly. Last October a MARAC Award was instituted—a five-coloured certificate available to dx stations who have contacted five members and to Europeans who have worked 10. This costs £2 and applications have to be sent with certified QSO list to: MARAC Award Manager, W de Bode, PD0NUY, Frida Katzerf 44, 3315 VH Dordrecht, Netherlands. Applicants for membership should also apply to the same address.

DX news

"SM4PDD/C9" has been worked from the UK asking for QSLs "direct", but there has been no indication in official circles that amateur radio is now allowed in Mozambique. Hopefully this is not another case of illegal operation in a very sensitive country. 9G2XX has been on 14MHz ssb and passed along the information that while transmissions in the amateur bands are generally forbidden, operation by special stations is permitted on 14,309kHz and that "more licences would be issued soon . . ." S90AS was active on several bands from Sao Tome. The operator, Sal, is IT9AZS, and believed to be a doctor who is experimenting with the transmission of electrical body readings by radio. He was expecting to proceed to Benin, Togo, Congo and Burkina Faso, and the only callsign known at the time of writing is 5V7AS. *DX'press* says that "S92AA" was a pirate, but that the genuine S92LB is often to be found around 14,183kHz.

7Q7LW is often with a group of African dx stations on 21,245kHz at 1500. According to the *Long Island DX Bulletin* he will arrange schedules for 0300 on 3·5 and 7MHz.

JH5EES/JD1 visits Minami Torishima fairly frequently and operates on all bands and modes while there. The activity from XU1SS is not as great as previously, but the station may be found mostly at weekends on 14,020 or 14,180kHz around 0700–0800. There is another new station on the air from Mongolia—JT0XC—and this is OK1XC who should be there for three years. According to *DX News Sheet*, those looking for stations in Zone 19 on 3·5MHz should listen on 3,649kHz from 2100.

Francis, FW8AF, keeps a schedule daily on 14,285kHz at 0815 with F8RV, G4VHB, or QSL manager F6IJV. He has also been reported on 14,305kHz.

Stations currently active from Franz Josef land include UA1OT, UV1OO and RZ1OWA. UA1OT has been worked on 1·8MHz and UV1OO has been on the low end of 7MHz on cw in the very early hours.

No news of threatened activity from Peter I Is has reached me recently. KD7P, whose name has been associated with such a venture, is believed to

*10 Knightlow Road, Birmingham B17 8QB.

QTH CORNER

A25/W6KG	Yasme Foundation, Box 2025, Castro Valley, Cal, 94546, USA.
BV0BG	via W3USS, Capitol Hill ARS, Box 73, Office of the Senate Supt, Washington, DC, 20510, USA.
GB4JLM } **GB0JLM** }	via G4VKV, 69 Elizabeth Rd, Liverpool L10 4XL.
JT0XC	via OK QSL Bureau.
JW0A	(alternative) via LA5NM, M Bjerrang, Box 500, N-0170, Longyearbyen, Svalbard.
EI9FG/OD5	via WA3HUP, RD2 Box 5A, Yorkhaven, Pa, 17370, USA.
P4/KQ2M	PO Box 743, Stoney Brook, NY, 11790, USA.
SO5ASL	via G4ASL, S Ayling, 115 Winifred Rd, Coulsdon, Surrey CR3 3JG.
SU1s ER, MR, RR, SR	PO Box 78, Heliopolis, Cairo, Egypt.
TJ1AF	via SP7EWL, Z Adamski, ul Grochova 23 m 8, 25-606 Kilece, Poland.
UV1OO	via UA9LBR.
VK9NJ	via VK2ANO.
K1CLN/VP2M	Bill Welch, Box 866, Truro, Mass, 02666, USA.
VP8WTW	via G4ZCN, 76 Wharton Tce, Hartlepool TS24 8NX.
ex-VS9MPH	P Hicks, G4DVP, 10 Becket Drive, Worle, Weston-super-Mare, Avon BS22 0TW.
3D6QL	Yasme Foundation, Box 2025, Castro Valley, Cal 94546, USA.

be still at home in the USA. A combined Italian/Norwegian scientific team arrived on Terra Nova Is (in the Ross Sea area) at the end of December. The team will establish three camps, and LA9WT will be on the air from one of them using an FT757GX and two-element 14MHz beam, as well as an inverted-V for 3·5 and 7MHz. His callsign may be either LA9WT/3Y or 3Y9WT but please note that he will *not* be located on Bouvet Is.

The island of Aruba underwent a change in political status on 1 January. Separate DXCC status is expected in due course and the prefix is now P4. *DX'press* believes that it is possible that the current PJ2, PJ3 and PJ4 may become a deleted country and that the two new countries may well be PJ2 with PJ3 and P4.

Grenada was due to be activated by a group of W amateurs from 12 February until 5 March. The callsign J38A had been requested but otherwise the group will use their own calls/J3.

VK9NM/LH is now VK9LM and has been working into the UK on 7MHz ssb. He returned to the island early in December to find his 3·5MHz antenna destroyed. Some of his mail appears to have been lost during a postal dispute in October, so those who think that their card may have gone astray at that time are asked to re-apply. Alan, T31AT, was due to return to Tarawa in mid-January and hoped on his return to be more active, particularly on the lower frequencies, antennas permitting.

3Y9WT will leave Antarctica this month. He is located in the part of the continent near Terra Nova Bay in the Ross Sea. LA9WT is his home callsign, and operation will mostly be near 3,507, 7,010 and 14,010kHz.

A new Chinese station is on the air from Nanjing. This is BY4RN, who has been reported on 14MHz cw and ssb.

Two new prefixes are now available in the Cayman Is: the island of Little Cayman is ZF8, and Cayman Brac is ZF9.

Operation Raleigh

More news—this time from Nick Perrott, G4TAW, one of those taking part. He was due to leave on 27 December for Chile and has a reciprocal licence to operate there as G4TAW/CE7, but thinks it more likely that he will be heard as GB0SWR/MA/CE7, or G4TAW/MA/CE7 from the *Sir Walter Raleigh*. Nick gives a list of dates and locations for the expedition which are as follows:

23–28 May, Juan Fernandez Is (CE0Z) first stop; 29 May–2 June (CE0Z) second stop; 10–13 June, Easter Is (CE0A); 18–24 June, Henderson Is, (VR6); 25–28 June, Pitcairn Is (VR6); 4–11 July, Mauke, Mitiaro and Atiu (ZK1); 12–16 July, Mangaia (ZK1); 17–20 July, Raratonga (ZK1); 21–24 July, Palmerston Is (ZK1); 26 July–3 August, Tutuila and Manua Group (KH8); 4–12 August, Savai's and Upolu (5W); 14–18 August, Tongatapu and Eua (A3); 20–30 August, Fiji (3D); and 6 September onwards—New Zealand.

(Late news via G6CSY—Nick is now licensed with a CE4 call to operate from his base in Chile, and has also been granted permission to sign /CE0 from Easter Is and Juan Fernandez Is.)

Miscellany

Ron Cross, RS84869, reports that Radio Nederland gave out the following item on 16 January: "In connection with the possibility of being able to see Halley's Comet, WB6FNI/P between 1 February and 31 March invites contacts on the following schedule: 0500–0700 Europe/Africa, 0700–0900 Pacific area, and 0900–1000 Asia. Transmissions will be on 7,228kHz and listener reports would be welcomed to Box 576, Rightwood, Calif, 92397, USA.

Paul Newman, G4INP (3 Red House Land, Leiston, Suffolk IP16 4JZ), reports that a new hf propagation predictor program is now available for owners of the Sinclair QL. This is WOTSON, by John Branegan, GM4IHJ, and predicts the percentage probability of making a contact into a chosen area on either a 4h or 12h basis, forecasts "what's on", requires simple input and gives easy-to-understand graphic output. It costs £3 plus formatted microdrive cartridge. All enquiries to G4INP with sase please.

10MHz TABLE

	All-time	1985
G3IGW	101	73
G4UZN	72	52
5B4DN	36	32
G4VDX	34	33
G4OBK	30	17
G4YWG	8	8
G5LP	59	–
G4UYR	33	–
G4RWP	4	–

28MHz TABLE

	1985		1985
G3VOF	– 119	G4OBK	– 46
G3XQU	– 115	G4NXG/M	– 43
G4XAH	– 97	G0AGP	– 39
G4JBR	– 91	GW4TEJ	– 39
G4MUW	– 78(ssb)	G4RWP	– 37
G4RAB	– 78(ssb)	G4YWG	– 30
5B4DN	– 59	G2FQR	– 27
G4DXW	– 52	G4FVK	– 16
G4VPD	– 49		

1986 28MHz scores so far: G4JBR, 8; G3XQU, 7; G4XAH, 6; G4OBK, 1.

1985 ALL BAND TABLE No 6

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3NAS	43	109	126	175	135	73	661(all ssb)
G4OBK	98	83	102	164	127	46	620
G3KDB	48	83	119	156	127	57	590(all cw)
G4OTU	40	56	102	144	105	45	492(all cw)
GM3YOR	–	92	133	76	71	38	410(all cw)
G3SXW	–	66	76	107	50	24	323
GW4RHW	–	63	126	71	39	18	317
G4XKR	19	19	39	116	63	24	280
G3TXF	29	55	50	86	39	16	275(all cw)
G4GOF	12	25	30	56	55	46	224

Band leaders are in bold type. 1986 Table No 1—entries to reach **G3GIQ no later than 15 March.**

ALL-TIME TABLE WITH DELETIONS No 11

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3KMA	125	231	303	332	333	318	1,642
G3GIQ	68	201	252	334	332	310	1,497
G3MCS	49	208	257	321	322	306	1,463
G3UML	29	213	225	334	298	255	1,354
G4DYO	59	169	219	311	303	285	1,346
G3XTT	124	187	226	279	277	247	1,340
G3HTA	69	182	233	311	291	249	1,335
G2DMR	52	165	174	308	310	265	1,274
G3ALI	2	211	220	315	278	235	1,261
GW4BLE	25	171	183	282	270	245	1,176
G3XQU	39	148	175	288	270	242	1,162
G3VIE	41	109	160	290	287	252	1,139
G3TXF	60	163	182	260	252	211	1,128
G3NOF	4	84	82	343	324	278	1,115
G3RUR	1	142	179	284	259	225	1,110
G4LJF	28	178	199	272	227	201	1,105
G3YMC	76	101	166	234	237	184	998
GW4OFQ	50	192	181	207	189	135	954
GM3YOR	61	117	165	207	191	180	921 (all cw)
GM3PPE	48	125	149	182	167	138	809
G4OBK	108	90	114	167	142	121	742
Average	53	161	192	279	265	232	1,184

Band leaders are in bold type. Next deadline—current all-time—to reach **G3GIQ no later than 15 April** please. Please note that participants are allowed two consecutive failures to update before being dropped from any "all-time" table. When not updated, the score brought forward will only be from a table of the same type: ie "current" or "with deleted".

Welcome

The Society was very happy to enrol the following overseas members during December: EA7AG, EI2FL, JY5CD, KD2IR, KD4GS, NY6U, VK2ZDW, W2KN, YC0XB, ZS6ALA, and Mr T Chotisorayuth (HS).

Contests

SP DX Contest

1500 5 April to 2400 6 April

Phone only. 1·8 to 28MHz. Exchanges consist of RS and serial QSO number (from 001). Polish stations will give RS plus two letters which indicate their province. Each SP QSO counts three points and the multiplier is the total number of provinces worked—each counting once only. There are single-operator, single- and multi-band, and multi-operator multi-band, and listener sections. Post logs before 30 April to: PZK, SP DX Contest Committee, PO Box 320, 00-950 Warszawa, Poland.

In the **1985 HA DX Contest** single-operator multi-band section, G3ESF came 12th with 86,553 points. Other UK entrants were G4OKN (23,892), G8VF (14,454), and GM8SQ (7,176). On 3·5MHz, G3TXF scored 3,726 points, on 14MHz, GM3MHG was 13th with 6,441 points, and G6NK (5,940), G3URA (1,680), and G2AJB (820) were also listed.

CQ WW WPX SSB Contest

0000 29 March to 2400 30 March

1·8 to 28MHz. QSOs with own continent count two points on 14, 21 and 28MHz and four on 3·5 and 7MHz. With other continents, three and six respectively. Own country may be worked for multiplier credit only. The multiplier is the total number of different prefixes worked—each counts once only. Exchange RS and serial QSO number (from 001). There are single-operator, single- and multi-band, and multi-operator multi-band single-transmitter classes. The last must have one transmitter only, and stay on a band for at least 10min at a time—changing band to work a multiplier is not allowed during this time. There is a QRP section for stations running no more than 5W output, and in this case entries must be very clearly marked "QRP". Single-operator entries may only operate for a maximum of 30h and may take up to five rest periods. To qualify for an award, single-operator

entrants must take part for at least 12h (24h for multi-operators). Score is total QSO points times number of prefixes worked. Logs must show date, time, station worked, numbers sent and received, if new prefix, and points claimed. A prefix check list must be included. Entries must be posted before 12 May and sent to: *CQ* Magazine, WPX Contest, 76 N Broadway, Hicksville, NY, 11801, USA.

Please mark entries very clearly on envelopes "SSB" as there is a cw contest later.

Awards

Cuba Award
For working all eight Cuban districts, CO1–CO8, any missing district up to a limit of three can be substituted with a club station contact (a call with a three letter suffix). Submit log extracts certified by club official or two licensed amateurs.

America Award
For working 45, 50, or more countries on the American continent (KG4 does not count).

Caribbean Award
For working at least 20 of the countries in the Caribbean (including XE, V3, TG, HR, HT, TI, HP, HK and YV). Cuba must be included.

Cuba DX Group Award
Work four members (including foreign members)

For all awards, any mode/band may be used and the charge is US $2 or 10 ircs. Send applications (certified list plus fee) to: Federacion de Radioaficionados de Cuba FRC, PO Box 1, Habana 1, Cuba. Life membership of the Cuba DX Group is open to foreigners, and costs US $10 or 30 ircs. This brings postcards, a rubber stamp, lapel pin, pennant, and other interesting items. Apply to: The President, FRC, PO Box 1.

Band reports

Some quite interesting conditions were noted during the period under review—the most unusual being found on 1·8MHz at about 2230 on 12 January. G3SED and others noticed very long echoes on his own and other locals' signals. These were long enough for him to be able to hear his own voice saying "ver" after saying "over" and cutting carrier; he wonders if this was due to trapping of signals in the auroral area around the north pole and their return? It was also noticed that there was a major enhancement on the same night of signals to UA9 and UA0.

The regular reporters returned this month, and thanks are due to the following for information received: G3YY, G5JL, GM3CSM, G3s GIQ, GVV, GM3ITN, G3s KSH, LPS, GW3NNF, G3s PJT, SED, G4EHQ, GW4KGR, G4s OBK, SFU, UKH, UOL, UYR, UZN and XAH, and RSs 10906 and 84869.

Stations listed in italics were using A1A.

1·8MHz. **0000** *CN8ES, PY1MAG, RI8BP,* ZD7CW. **0100** *JW0A,* VP9BO, VU2GDG. **0200** *UM8MLA.* **0300** ZF2JB. **0400** JY4MB, 4X4NJ. **0600** KH5X, *UA1OT,* YV2IF, *ZB2FK.* **0800** CP8HD. **1900** *UA1OT, UG6GAW.* **2100** *T77C.* **2300** *UA0BL,* 5N8BAV.

3·5MHz. **0000** *CV0U, FM5BH, UH8DC, ZS5BK.* **0100** *J28EI, UA0BL.* **0200** TA1E. **0300** *FM5WD.* **0500** HK5ISX. **0600** *C30LDB, CO2PY,* NU5Y, *UA0BCV, N2AIR/VP2V, W6, ZF2FK, ZL1LZ.* **0700** W1-W5, *XE2FR,* ZL. **0900** TI8CBT. **1000** *YB0TK.* **1800** *UI8IF.* **1900** *JA2ODS, UI8AGP.* **2000** YC0SY, ZS4PB, 6W2EX. **2100** *HB9CRV/CT3,* PY7CB. **2200** J88BK, *JA5CPI,* SU1ER, UA0s FCV, FDX, FF. 7X2HM, 5B4JE. **2300** C30BAB, S90AS, RY0FA, *VP2MDY.*

7MHz. **0000** *JA5ACN, UH8AAC.* **0100** *XE3AAF.* **0200** *A22BW,* J88AR, J73AH, VU2GDG. **0300** HC1HC. **0600** N7ERL, ZL3OE. **0800** *JA* (until 1000), *KG6GF, SV1SQ/SV9, VK9LM,* ZL7AA, 3Y9WT. **0900** *JJ2BBZ, JA7HMZ, KL7s U, Y, W6, VS6DO, W7FU, UA1s OO, OT.* **1000** *P4/KQ2M.* **1100** *UA0TO.* **1300** *UM8UCF.* **1400** *JQ1FEF, JA6VU, KV6M, N7NG, UV1OO, VU2BK, W6YA, YC8VCE.* **1500** *BV2DA, KD6TB/DU2, JA, UA0ZQV, VU2GSM, W6s, W7s OAM, GKF, 9V1TL.* **1600** *G6ZY/EA6, K7UR, K5MM/7, UM9MWW, W6TC, W7LR* (Mont), *9M2AX, 9V1TL.* **1700** *VK2FAA, Z23JO.* **1800** *HB9CRV/CT3, OX3XR.* **2000** *EI9FG/OD5, UA0BAP, VI3MR, VK5KL.* **2100** *TR8IG, N2AIR/VP2V.* **2200** *C31ON, RL8PYL, UH8EA.* **2300** ZS6QU. *4K1ZZ.*

10MHz. **0000** *TA1MX, ZS6CEV.* **0100** *FM5CB.* **0800** *TU4BP/MM, VK2BKH, ZL1HY, ZL3GQ.* **0900** *FM5WO, HL9TM, ZL3ADG, ZM3RK, ZM4QY.* **1200** *C30BLV, OY2J, WA1OSJ.* **1300** *N5VV* (N.M.). **1400** *N7ET/DU7, W4NL, 5B4OG.* **1600** *W2GDV, W7GL* (Mont.) *5B4DA.* **1800** *HH3BH, ZL4ADX.* **1900** *CU2AR, SV0AH, ZS6CEV, 3B8FP.* **2000** *TA1C, VK3MR.* **2100** *J37XC, HZ1HZ, ZS6USH.*

14MHz. **0800** HL9TW, *JA,* JR2FOE/JD1, VS6DQ, ZL1-4, 3D2OG, 3X0HAB. **0900** AH2BE, BVs 2DA, 0CRA, BY1SK, *EL2EI7,* H44IA, *HL1LW,* KH0AC, *UM8DX,* VK9NJ, *ZL1-3,* 9M2TY. **1000** BV2B, BY1QH, NY6M/KH2, *VK4XA,* VK9s NJ, NO, VR6JR, VS6CX, ZL3QN. **1100** *JT0XC,* JY50BE, KL7Y, VU2KJ. **1300** VS6DO, ZL2GH. **1400** *FT8XB,* JY5DM, *OX3UD,* ST4BCB, V85GF, VS6DO, *JH4EIY/5N1,* 5Z4EJ. **1500** S79CW, VQ9MG, *3D6QL,* 5X5GK. **1600** FR7ZD, J37AH, TI8CBT, W5-7, *ZL2, 3B8CF,* 3D6QL. **1700** AL7EL, KP2AH, NI7J (Mont.), K7EHI/T32, T77C, VE7, VY1CA, W7, G3PHR/W0, 5T5SL, 8R1RPN, 9Y4NW. **1800** VK0DJ. **1900** D68AM, TZ6FS, 5R8AL. **2000** J28EI, VP8RX, ZD8MG, ZL4JO. **2100** TR8RAL, VP8BGU, 7P8KG. **2200** PY1VOY/PY0T, 3X0HAB.

18MHz. **0900** *DL, G, HB.*

21MHz. **0900** S90AS, *TA2G,* VK. **1000** VU2ZAP. **1100** C53EE, CV0U, *LU9CV,* VK3, *VK6CI,* YC2VTW, YC6LD, ZS3GB, 5X5GK. **1200** A4XYQ, OA4BCZ, *TU2CV,* VK6BA, *VS6DX, ZS6BYL,* 3D6QL. **1300** VK6VB. **1400** *H5AYB,* 5Z4DV. **1500** A25/W6KG, V44KAC, Z21BP, *ZS3/W6QL.* **1600** VP8ML. **1700** W5-7.

28MHz. **1200** ZS3/W6QL. **1400** SM. **1600** F, YU. **1700** DL, EA, HA, I, OZ, SM, Y.

Acknowledgements to the following for items extracted: *Lynx DX Group Bulletin* (EA2JG), *DX'press* (PA0GAM), *CQ Magazine* (W1WY), *DXNL* (DL3RK), *Long Island DX Bulletin* (W2IYX), *DX News Sheet* (G4DYO), the *Ex-G Radio Club Bulletin* (GI3OEN/W6), and *Long Skip* (VE3XN).

All items for **May** issue **to reach G3FKM** no later than **27 March**. □

HF f-layer propagation predictions for March 1986

Using the table

For each route, the **bands** appear vertically and the **time** horizontally, as indicated in the left-hand **KEY** blocks of the top two rows.

The probability of signals being heard is given on a 0 (indicated by a dot) to 9 scale; the higher the number the greater the probability, with 1 meaning 10 to 19 per cent of days, and so on. Additional 50 and 1·8MHz openings are indicated by a plus (+) sign in the 28 and the 3·5MHz rows respectively.

KEY TO BANDS	MOSCOW	MALTA	GIBRALTAR
28 MHz .	.....	.....	.....
21 MHz .	.....111....	....11121...	.....
14 MHz .	...2566663..	...16677771.	....4555661.
10 MHz .	...55555683.	111665567872	...27666687.
7 MHz .	544422224686	886532234788	465753334686
3.5 MHz .	++3.....3++	+++2.....4++	+++52....3++

KEY TO TIMES GMT	ICELAND	OSAKA	HONGKONG
000001111122	.....	.....	.....11.....
024680246802	.....23433..	....332.....	...1444211..
.....	....3566675.	...1422223..	....222235..
.....	21.353334674	....1...143.	1452
.....	+++42...235+	.....4.	242

BANGKOK	SINGAPORE	NEW DELHI	TEHERAN
.....	.....	.....	.....
....1221....	....12221...	....1222....	....23331...
...13554....	...1355552..	...234552...	...4345562..
....1222111.	12224621	1.1..2224221	312211224632
1.....1464	1.....1565	51.....1466	852.....1578
.....244	244	4.....24+	+3.....25+

COLOMBO	BAHRAIN	CYPRUS	ADEN
.....	.....	.....1....	.....111....
....23331...	...133442...	...1455541..	...134564...
...2235562..	....4335562..	1..66666772.	...3223565..
.....1224632	4222..224633	644533345875	6121...24744
21.....1578	852.....1478	985211113688	852.....1478
4.....25+	+3.....25+	++2.....3++	+4.....24+

SUVA/S	SUVA/L	WELLINGTON/S	WELLINGTON/L
.....	.....	.....	.....
.....	.....	.....	.....
.....122.1..	...1511..14.	....12332...	....2.....4.
....222225..	..144211.53.	...1322234..	.11241...33.
...21...14..	...31...14..	...21...141.	...21....31.
.....	.....	.....	.....

SYDNEY/S	SYDNEY/L	PERTH	HONOLULU
.....	.....	.....	.....
.....1.....	.....	....333.....	.....
...2553221..	....31....2.	...3555321..	.....2..
...2422245..	....42....51	1..122224631	.....111231.
....1...153.	....2....23.	1.....1574	...11...11..
.....2..	.....	252	...2.....

SEYCHELLES	MAURITIUS	NAIROBI	HARARE
.....111....	.....112....	.....1231...	.....1342...
....34564...	....45675...	....456761..	....456872..
...22245661.	...32355671.	...32225672.	...33225683.
611...124764	6311..224764	6412...24774	5512...24784
841.....1478	841.....1478	883.....1478	884.....1478
+2.....24+	+2.....4+	++.....4+	++.....4+

CAPETOWN	LAGOS	ASCENSION I.	DAKAR
.....1453...	.....14541..	.....11131..	.....1221..
....357885..	....356786..	....244576..	....145666..
...24335685.	.1.15323686.	....6422367.	....6433467.
43241..24684	36.52...3683	164141...483	154242..1483
8851....1478	7943.....478	78841....168	78841....168
++3.....4+	5++.....4+	+++2.....3+	+++2.....3+

LAS PALMAS	8th SHETLAND	FALKLAND I.	R DE JANEIRO
.....	.....11..	.....1121..	.....1.11..
....134455..	.....4565..	.....156661.	.....343551.
....7766787.	....1445565.	....1555455.	.....542246.
255564334685	1543322222342	1533232221232	1452221..143
899632111379	57841.....13	68841.....14	68841.....26
+++3.....4+	35+2.....	4++2.....	+++2.....3

BUENOS AIRES	LIMA	BOGOTA	BARBADOS
.....11..	.....	.....	.....
.....244551.	.....1123..	.....1112..	.....11123..
.....553345.	.....43223.	.....43223.	.....442234.
14512221.132	.12.1.21..12	111.2221..12	.12.132...33
68841.....13	47831.....1	57722.....2	67731.....4
5++2.....	3++2.....	4++2.....	++52.....

JAMAICA	BERMUDA	NEW YORK	MEXICO
.....	.....	.....	.....
.....12..	.....12..	.....1..	.....1..
.....43333.	.....143344.	.....34343.	.....14322.
....1121..12	2211133	1221122	....1.221..1
56521.....2	66511.....3	4531.....2	24311.....
3++2.....	5++2.....	3++2.....	.4+2.....

MONTREAL	DENVER	LOS ANGELES	VANCOUVER
.....	.....	.....	.....
.....	.....	.....	.....
.....23343.	.....2321.	.....321.	.....111.
.....1221232	122111	.....2311.	.....1321.
4421.....2	121.....	.1..1...1...	.1.1....1...
3++2.....	.3+2.....	.252.....	..42.....

The provisional mean sunspot number for December 1985 issued by the Sunspot Index Data Centre, Brussels, was 17·2. The maximum daily sunspot number was 66 on 16 December, and the minimum was 0 on 1, 4 and 23–31 December. The predicted smoothed sunspot numbers for March, April, May and June, are respectively: (classical method) 8, 7, 6 and 5; (SIDC adjusted values) 0, 0, 0, 0.

VHF/UHF

*Ken Willis, G8VR**

Shetland . . . a separate country?

By the same post, two letters came from operators in the Shetland Islands referring to a comment in January's *VHF/UHF*. In that issue, Dave, G4DHF, was asking whether Shetland might be classed as a separate country for awards and scores purposes. In reply, Colin Roberts, GM0AVR (Brae), writes: "Radio amateurs resident in the Shetland Islands are continually being asked why Shetland does not have its own prefix, like many islands around the UK coast that are closer to the mainland than Shetland". He goes on to comment that the "closeness" of Shetland to the mainland is best explained by the fact that the only ferry, Lerwick to Aberdeen, takes 14h to make the trip and sails only three times weekly. The distance is 200 miles. Alternatively, one can fly from the mainland at a cost of some £150 return trip, so he makes the point that it is cheaper, quicker and easier to get to GD, GU, GJ and GI than to Shetland.

Writing in similar vein, Bruce Spence, GM4FNE (Cullivoe, Island of Yell) says that Shetland amateurs tried some years ago to achieve the recognition of a separate callsign for the islands, but "were turned down by RSGB, yet CQWW and WAE organizations recognise Shetland as a separate country for contest and other purposes". Bruce and Colin both say that a new campaign is being launched to get their islands recognized as a country in its own right, radio-wise, and I must say I fully support their views. However, this is a matter which I will refer to the Licensing Advisory Committee. Input from amateurs residing in Shetland would not come amiss if the situation is to be properly aired, and they can write to me or preferably co-ordinate their comments through their regional representative (if you don't know him, look him up on the editorial page of *Radio Communication*).

How's your antenna working out?

Last month I promised to publish some antenna gain figures sent to me by W1GXT, for which many thanks Lew. They were measured at the Dayton Hamvention, Ohio, in April of last year and have now been co-ordinated by Joe Burke, WA8CGS. The test range used was 225ft in length, the antennas measured being at a height 14ft above ground. The comparison antenna was 30ft offset to one side of the antenna under test, while the source antenna was four wavelengths above ground.

Source antennas were:

144MHz	1·69λ	6-element Yagi
432MHz	1·60λ	8-element Yagi
1,296MHz	8·94λ	28-element loop Yagi

For a transmit source, 1,000Hz modulated 28MHz 200mW drive was used to separate transverters for each band (they also covered 220MHz, not published here). A battery-powered PRD 277D swr meter (similar to the Hewlett Packard 415e) was used, this having a scale marked in 0·05dB increments! Attenuator pads were placed between the test antenna and the diode detector.

I mention all of this to get people thinking, because it would be good if we could provide antenna measuring facilities at some of our conventions and meetings. I saw a similar system in use at Nashua, New Hampshire, and was very impressed by the speed of measurement and the repeatability which it was capable of.

Here are the results:

144MHz			
K1WHS	4·19λ	18-element Cushcraft 4218XL	14·95dBd
KB8RQ	4·09λ	21-element modified Boomer	14·95dBd
WA3YON	2·92λ	15-element Cue-Dee	12·70dBd
WB4PUB	2·27λ	14-element Cushcraft 214B	12·25dBd
WB4PUB	2·27λ	11-element Quagi	11·85dBd
WA8OGS	0·75λ	6-element W2PV design	8·08dBd
N4VC	0·40λ	3-element Quad	7·85dBd
432MHz			
K0DAS	5·49λ	19-element K2RIW design	15·70dBd
K0DAS	5·49λ	19-element K2RIW	15·20dBd
WB9UWA	2·89λ	14-element	13·70dBd
WA3YON	1·75λ	8-element Quagi	10·80dBd
WB9UWA	1·37λ	7-element WA9HIR design	8·45dBd
WB4PUB	2·14λ	11-element Quagi	8·40dBd
WA8OGS	Reference dipole 1·65λ in front of square reflector		6·80dBd

The 1,296MHz figures have been passed to Mike, G3PFR, since they are more appropriate to his feature. The importance of the above figures is not so much that UK operators may wish to use similar antennas of USA origin, but rather that the tables give an interesting comparison of antennas with widely different boom-lengths and design criteria. For example, there could be many uses for a dipole placed ahead of a simple square reflector which yielded a gain of almost 7dBd, while data which shows that an increase in boom-length of 5λ2 provides only 1·5dBd gain, is something to ponder when wondering whether the neighbours will accept that big new antenna most of us dream about.

Repeater news

Writing from Co Antrim, Irwin Brown, GI1JUS, reported hearing the first GB2RS newscast over GB3NI repeater, and he enjoyed the arm-chair copy. He said also that after the transmission, news-reader GI3TLT received reception reports and complimentary comments from GD, GM and EI, so Irwin's first impressions are that the service will prove extremely popular.

From Holland, Arie Bol, PA0QHN (isn't that the callsign of a 1,296MHz beacon?) has written to say that the frequencies of the repeater PI2RGK in Zandvoort are changing to 431·850MHz (input) and 430·250MHz (output). He says that those concerned "do not like to do so, but we are forced to make this change by the 'Repeater Bureau' in our country".

The January 1986 newsletter of the Aylesbury Vale Repeater Group is now available (G8BQH, QTHR) and contains status reports on GB3VA, GB3AV, GB3BV and GB3VB. It also mentions the possibility of a 1·3GHz atv repeater to be located near Brill, and the fact that the committee has decided not to pursue, for the present, plans for a 432MHz repeater at Banbury. G8BQH was recently forced to operate a hand-held from a hospital bed while recovering from a painful accident. The group comments in the newsletter that it is their view that a repeater co-sited with GB3BV at Hemel Hempstead will cover the London end of the M1 as well as surrounding areas not currently covered by existing repeaters (this in response to *4-2-70* correspondence suggesting that some groups are proposing new 144MHz repeaters for this purpose). Aylesbury Vale rejects the request for a joint approach by the groups proposing to provide coverage in these areas, on grounds that they already have the equipment and site available, and RMG has had their proposal "in house" for some time. With the London repeaters occupying four channels, and four more used by repeaters too close to Hemel Hempstead, G8BQH comments that "12·5kHz spacing may not be so far away", but he recognizes the technical problems this would raise.

50MHz

We go to print too early to give any reports on initial operation on this band, but at zero hour, 0001 1 February, there was much activity, including operation from headquarters station GB3RS. Incidentally, beacon GB3NHQ will be moved to a new site about a mile away to prevent interference with the headquarters station, and until this occurs the beacon will be off the air while they are transmitting. It is sad to report that some amateurs are openly blaming the RSGB over the air for the fact that 50MHz facilities are not initially open to Class B licence holders. In fact, everyone involved did everything possible to obtain a general allocation and will continue to press for this in future.

Locators yet again

I had hoped to stay out of the locator controversy, and I said as much previously. Some correspondents, however, have taken the view that I have a duty to publish the various views which are represented, while others seem to have taken the stance that if I do not print what they write, then I must be concealing their input for (presumably) sinister reasons.

We have, through our elected representatives, accepted an IARU resolution to use *Locator* (the Maidenhead scheme), so as a Society we cannot just drop the whole thing, though if there were proved to be a sufficiently large body of European amateurs opposed to it, the matter could be raised again at IARU.

IARU can only recommend in a matter such as this; operators will not be in breach of their licence conditions if they use neither *Locator*, nor the old system. G3MEW feels that it is sufficient to tell stations that he works when he is "in Portsmouth". This is acceptable, but for awards and those who are really keen on square-chasing, this is insufficient. (The rider is, that in a casual QSO between two UK stations, "Portsmouth" is a lot more sensible than spelling out a whole list of numbers/letters when they are not needed).

Ivan Cline, G3EMU, is one who feels that I should publicise the locator controversy, "if I have a large enough following that disapproves of it". Ivan says that he, for one, refuses to accept the new system. His QTH (Canterbury), though quite a long one, requires very few more dots and dashes to send than the new Locator identification. Ivan thinks that direct

*6 Lerryn Gardens, Broadstairs, Kent CT10 3BH.

latitude and longitude information is barely more lengthy than "Maidenhead" and says "do shipping, aircraft etc, resort to these obscure systems?"

Folke Rosvall, SM5AGM, one of the originators of the new system, naturally wants to encourage its use, and feels very strongly that a few dissenters are tending to throw the method into disrepute and ill-favour, whereas the majority of operators have accepted it and prefer it to the earlier ambiguous system. He also disputes that the system was introduced in cavalier fashion, since it was discussed for a very long time before its introduction. I have to say, however, that not a lot of this discussion came to the notice of the "average" vhf operator. Folke wants us to stay with the new method until it becomes as easy to use and understand as the earlier one.

OZ7IS feels so strongly about DL7QY's attack on Maidenhead through the columns of *Dubus*, that he refuses to continue handling the circulation of that journal in his country, since he feels it would indicate his acceptance of this "undermining of IARU Region 1 authority" by so doing. Ivan, OZ7IS, refers to some "objective" polls to test the popularity of Locator. The official Norwegian poll produced 36 replies, of which 45 per cent supported and 55 per cent were against. At the Scandinavian vhf-uhf-shf meeting, approximately 90 were polled with a percentage result similar to the Norwegian figures. The yearly Danish opinion poll on vhf/uhf matters, organized by the Danish vhf committee, showed 71 per cent in favour and 23 per cent against, and this list included "all contest and toplist participants"; 182 questionnaires were sent out and a 52 per cent return was received. Ivan says these polls show "quite a distance from the 90 per cent against the Locator as claimed by DL7QY".

This matter is far from over yet I fear.

Comets and vhf

Apologies are due to readers, and to John Branegan, GM4IHJ, for losing all his references to Comet Giacobini-Zinner which spoiled his fascinating story "Halley's Comet and meteor scatter" (*VHF/UHF* January 1986). Brevity, always important and necessary in a column, sometimes results in confusion, as on this occasion. The one good thing to emerge from it was that the topic served to identify some able astronomers among the readership. I will let one of them, Alastair McBeath (Northumberland) explain (he is not a radio amateur, but reads this feature to obtain information which he uses in comparing visual with radio data):

"The ICE probe passed successfully through the tail of comet Giacobini-Zinner on 11 September 1985, *not* comet Halley, and again it was the orbit of Giacobini-Zinner that the earth was due to cross on 8 October 1985. Giacobini-Zinner has produced some spectacular meteor storms in the past (in 1933 and 1946, visual meteor rates were briefly as high as 5,000/h), and Don Yeomans of the Jet Propulsion Laboratory had predicted that 1985 might see some possible Giacobinid (also known as Draconids) activity on 8 October peaking at around 1300gmt, the time that the earth was due to cross the comet's orbit. Since then, visual reports have come from Japan and some parts of the USA, indicating that a mini-storm occurred then with rates briefly in excess of 200/h, reaching a maximum at about 0935–0940gmt, with enhanced visual activity seen from about 0700–1300gmt, albeit at a lower level. Dr John Mason, of the British Astronomical Association's Meteor Section, was at the time using a forward-scatter meteor radar from southern England, and I understand a paper on the subject for the association's journal is in the pipeline."

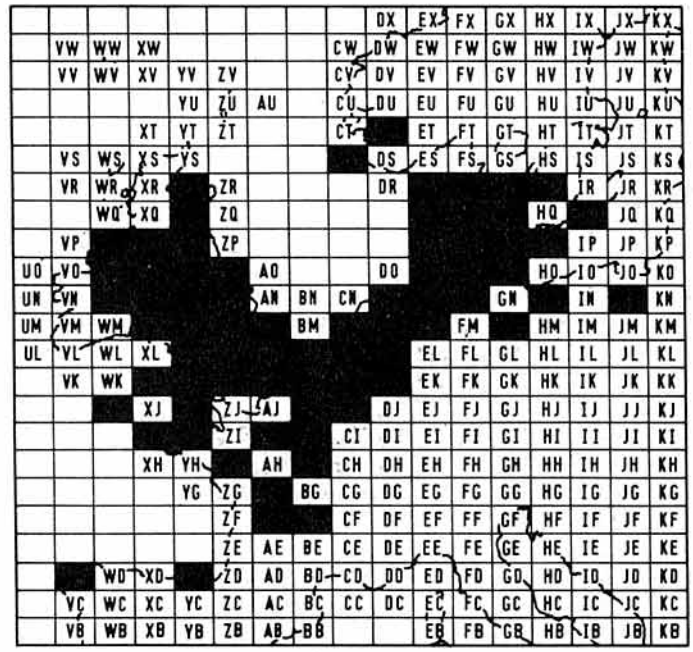
Similar information was forthcoming from Andrew McConachie, G8RUP (Bristol), who added "ICE (formerly ISEE-3) was launched in 1978 and was re-directed on 22 December 1983 towards comet Giacobini-Zinner. It intercepted Halley's comet in September last and on 11 September sent back data from comet Giacobini-Zinner".

Both correspondents have provided other information of a general nature which should be of great interest to radio amateurs who study propagation in all its forms, and it is hoped to include some of their comments next month. This sort of input can obviously be very useful, and we hope that more of the same sort will be forthcoming in future.

John Branegan is well known for his space-related interests, and he has many more "goodies" in preparation, of which more in due course. Meanwhile, the January story, read in conjunction with the above, provides a thrilling account of an astronomical event which had considerable radio implications.

Tropo

Reports are still coming in for the major tropo opening last October (see illustration of GI1JUS's results). Nick, G4KUX, sent photocopies of his log sheets for the event which make astounding reading. He thinks that the opening was the biggest since 1975, and certainly he has experienced nothing like it since he was first licensed in 1977. On 144MHz, he contacted



GI1JUS worked 71 squares and 19 countries in the big tropo event last October. Compare this with the SM7FJE results in the January issue for an impression of the size of this opening

no fewer than 23 countries and 114 squares during the opening (18 being new locators), which took him to an all-time squares total of 296. Nick says that he was listening to some of the big German stations working scores of RB5s "in mouth-watering locations", and occasionally received pings from these stations which will encourage him to try ms with some of them if he can get skeds. DK3LL apparently worked into TH square, while DK0TU in Berlin worked a UA6 in WG. On 432MHz, RB5AL worked PA0RDY. These are incredible tropo contacts.

Meteor scatter

Jeremy, G3IMW, has produced an excellent report on a year of ms operation at his station, which is especially interesting as he, like many others, "found" the mode through operation on 50MHz. It is hoped that *Six News*, the beautifully-presented journal of the Six Metre Group will publish some of his findings, though I will do so myself if space permits in a later issue.

Gerald Peck, G4OIG (Northampton), said that the Quadrantids 1986 were being reported as "the worst for years", though he completed four skeds out of nine, these being HG7PL (JH), HG8VF (JG), HG6NQ (JI) and HG2NP/0 (KH). I wish I knew how he gets these skeds, I never hear such stations on the vhf net.

John Branegan, GM4IHJ, reports that the shower was "quite strong at times, but was a bit of a stop-go event", so he has no idea precisely when it peaked. I found the shower to be very interesting since it produced some very strong, but extremely short reflections, causing me to ponder why intense ionization in the trail (strong reflection) should disperse so rapidly (short reflection), but maybe this is "first-grade physics" and someone more knowledgeable will enlighten me of the true nature of such phenomena.

Alastair McBeath comments that the Quadrantids appear to have peaked at around 1900gmt on 3 January, or even earlier, though "the low radiant altitude in the early evening makes accurate visual rates tricky to calculate".

With 50MHz now open to a larger group of operators we should expect ms to play an important part in communication on this band. A simple dipole, having a broader polar diagram, can be very effective on 50MHz for ms contacts between GM and stations further south, since the distance is short by ms standards and high-angle radiation is needed to intercept meteor trails. If you don't like this method, try back-scatter—both stations beaming on some chosen square—for a high-gain beam is not so good using this mode over short-range paths.

Aurora

Unless you live in northern parts of the UK, auroras are pretty rare events these days, and will probably remain so until solar activity picks up. However, for those with time to monitor the band, these and related events still occur from time to time. John Branegan, GM4IHJ, who is well-

situated to catch what is going reports:

27 November 1430–1555gmt, Wick radar and Arctic tv; then at 1515, Wick up to S8 and part of a QSO heard between OH3MF and an LA station —OH never previously heard via aurora at this time of day; 224·004MHz radar also heard, believed to be Tromso Eiscat.

Further auroras on 29 November, 1, 4, 13, 19, 27, 28, 30 December, 1, 6, 9 January, mostly Wick radar and Arctic tv, but some auroral Es on 1 and 13 December.

Somewhat earlier, on 2 November, Jeremy Whitfield, G3IMW, heard beacon GB3RMK at 549 for 13min on direct beam heading, while other stations were reporting short skip conditions on 28MHz. G4JCC heard GB3SIX peaking on heading 240, as well as LA5TEN. Jeremy thought his reception to be normal Es, but later noted that an aurora was predicted for 2 November, so he connected the two pieces of information. On 30 November G3WZT worked LA9DT with 559 each way, while on 27 December G3ENY worked LA6QBA with 59 each way. Jeremy says that consequently we should be very much aware of the solar rotation map to get the most out of the 50MHz band, and these thoughts took him back to the USA openings last July, which were 28 days apart. He wonders if Es and auroral-E were acting together on these occasions.

In a later report, GM4IHJ said that an aurora on 21 January (1536 to 2152gmt) was "the best for quite a while", while GI0JUS describes the aurora on 6 January as a "Scottish type". So keep monitoring, there is much of interest but you must be in the shack to take advantage of it.

From the postbag

Paul Thompson, G6MEN (Shrewsbury) caused me to smile when he referred to recent comments in this feature about an amateur renowned for sending out QSL cards. Paul suggests that this information be printed in *The Royal Marine* magazine, so that its readers may be told about it in traditional fashion. Maintaining this military connection, I will simply comment, "no names, no pack-drill"!

Writing from Valletta, Malta, Walter Gatt, 9H1DU, who is the local awards manager, says that the comments in November's *4–2–70*, about a new (Falcon) award offered by a group of Maltese amateurs, fails to make the point that MARL, the Maltese Amateur Radio League, is the only organization on the island recognized by IARU as being representative of amateurs residing there. MARL issues two awards, which are the 9H Diploma and the DIP MED Award. I will forward details of these awards to anyone sending me an sae, or alternatively you can write to Walter at: PO Box 575, Valletta, Malta.

G3MEW (Portsmouth) is not convinced that G4DHF has achieved very much (*VHF/UHF*, January 1986) from his "down-town" location at sea level. He comments that if Dave uses legal power, and his set-up is only small, what on earth do the big guns on 144MHz use? That, of course, is entirely another question which won't be answered here, but if bandwidth of transmitted signal were to be directly proportional to erp, one could make a few guesses. (This relationship, "Lid's Law", does hold in the case of some transmissions, incidentally.) Returning to the G4DHF case, however, G3MEW says that Lincolnshire is generally flat, so being at sea-level is no great disadvantage since Dave would have an excellent take-off. All this is true, but to operate a legal limit station in a built-up area in the centre of town, and to do so during tv hours as Dave often does, shows a remarkably clean signal and suggests that he knows what he is about. I often listen to Dave, and others like him, who can be heard calling the weak and rare ones before most of us are aware anything is happening on the bands. Anyone who meets Dave soon realizes that they are in the presence of a very unassuming, dedicated vhf operator, who has done much to push forward the frontiers of weak-signal work on the vhf/uhf bands, and one suspects he would try to do it from the depths of a coal-mine if this were the only place he could set up his rig. There are lots more like Dave, which is why this country is so highly regarded as the place where vhf/uhf flourishes and sets a pace for other countries to follow. But to take G3MEW's point, it would be good to hear more often from those who work under really appalling conditions and yet still bring in the dx contacts.

Arend Janssen, DG1BP, of Norden, West Germany, is concerned at a decision taken at the DARC Council 19/20 Convention, "to enter a proposal at the next IARU Conference to squeeze the 144MHz beacon band in Region 1 from the present 145kHz allocation, to just one channel, 144·9MHz plus/minus 10kHz, in order to accommodate more fm local channels within Germany"! (see *Dubus*, 4/85, p407). Reports that several West German amateurs are contemplating selling equipment and entering monasteries, cannot, at the moment, be confirmed. Arend goes on to say that all German dx-operators are astonished, especially as DARC Council did not publish their intentions in their own house journal. DG1GP seeks the assistance of all vhf dx operators to take whatever action is possible to prevent this coming about, one way being for as many protestors as possible to write to the DARC chairman before the Austrian (Vienna) conference this March. RSGB will have a contingent at this conference, among them its vhf and microwave managers, to whom this matter will be referred.

Stop Press: Arend now informs me that things are getting even sillier. A revised suggestion from DARC is to move *all* beacons from 144·845–144·990MHz to 144·050–144·150MHz, "because the cw band is not so much in use". Their words.

The 1986 Barking Radio & Electronics Society 144MHz Contest, an annual affair, is scheduled this year for 6 April 1986 between 1300 and 1700gmt. All modes can be used on the band, with two classes, full legal limit as maximum, or 20W p.e.p. maximum. Stations exchange RS(T) reports plus serial number and their administrative county (Scottish stations send their region number). One point for each contact, contacts with club stations G3XBF/G8XBF counting 10 points. Final score is the number of points times the number of different counties worked. Countries outside the UK are counted as separate counties. There is also a listener section, and awards for all classes. Entries by 21 April to: Michael Toms, 32 Wellington Rd, Rayleigh, Essex SS6 8EZ.

Ivan, G3EMU (Canterbury) says his son Shaun, G4MDZ, wrote recently about Syledis, and asks if I have ever heard it at full blast when it "takes over the whole band in the southeast". Having just moved close to North Foreland, I enquired of G3AAJ (who is knowledgeable in these matters), just what was the function of all those vhf/uhf antennas plastered all over the lighthouse. He says that some are for a Syledis system! I have not yet heard one in full cry, but it seems that day may not be far off!

It was slightly with tongue in cheek that I asked in January if any reader had heard, by any mode, a Russian vhf beacon—I should have known better. Laurence, GM4DMA (Aberdeenshire), heard beacon UB4YWW on 8 June 1984 at 2000gmt via sporadic-E, and at the same time copied its locator as MI60e; its frequency was 144·370MHz, which checks with the information published in *Radio*. Laurence has moved to a new QTH, still in Aberdeenshire, and hopes to set up a station on an oil platform eventually.

Jack Hum, G5UM, reports *two* husband and wife claims for the 432MHz Monday Night Award, namely to (ladies first) G1NRA/G6NXD (Warks) and G6HKM/G3PMX (Essex). Jack also says that GJ4ICD, Geoff Brown, is the first operator to obtain a 100-squares worked certificate on 432MHz, though *Dubus* shows several British stations with scores above 100, including G3LQR (151), G3LTF (147), G3SEK (144), G4FRE (119), G3PBV (106), G4MAW (105) and G3COJ (101), but maybe they are still waiting for confirmations. Jack says that on the QSL front the French operators are generally regarded as the worst offenders.

It's a long haul, but with the sporadic-E season not too far off, it is good to hear via SM6EOC/SM6AFH that Turkey is now represented on 144MHz in the form of TA1B, TA1C and TA1D, all reported active. They work mostly through repeaters but are equipping themselves for dx operation. QTH is Istanbul, OB square, so with Greek stations putting in S9-plus signals last summer, maybe that little extra bit of ocean can be crossed to give a very exotic country for the 144MHz band.

Another good one, 4X4IF (RS square), is reported active on ms using a nine-element antenna and 130W, but with maximum cw speed 200lpm. 4X4 was worked on Es by G3VYF a few years back—at least this was assumed to be the mode. □

MICROWAVES

Mike Dixon, G3PFR*

From another publication

Dubus (4/85) arrived some time ago with the reminder that 1986 subscriptions (at a rate of £7) are now due. The address for subscriptions is: Ken Hatton, G4IZW, "Thorneycroft House", Shield Hill, Haltwhistle, Northumberland NE49 9NW, tel 0498 21372.

The latest issue contains an interesting design for a "pill-box" or "cheese" antenna (in effect, a sector of a parabola which gives a wide radiation pattern in one plane, and a narrow pattern in the other, rather like a sectoral horn), a 10GHz cavity filter made from 22mm copper tubing, and a high-powered 1·3GHz amplifier based on a valve in the Thomson-CSF TH308 series. Part three of the dual-band transceiver is also described.

*"Woodstock", Gaze Bank, Norley, Warrington, Cheshire WA6 8LL.

Newsletter

Regular subscribers will have received their renewal reminders, and it would be appreciated if subscriptions could be sent to HQ as soon as possible. This year's subscription has had to be increased to £6, the price having been held for the last two years. Higher costs and a larger number of pages have necessitated this increase. New subscribers should send their subscriptions to HQ, marked "Microwave Newsletter Subscription".

On current controversies

No sooner had January "Microwaves" appeared than I received a phone call from Don, G3JHM, and a letter from Arie, PA0EZ, both taking me to task for my observations on the two topics discussed in that issue.

Don made the point (which I had touched on) that it is impossible to work French stations on 10·38GHz, since the French do not have that frequency allocated. His second point was that many people in his area were using home-constructed microwave "heads", in contrast to further north, where the majority are using modified doppler units. These, he suggested, would not successfully re-tune so high in the band (although this is completely contrary to my experience). His next comment was that "there is a high level of high-powered narrowband activity in the area", and that there could be problems in operating wideband modes close to the narrowband section; ie, spurious images of the narrowband station (presumably from "dirty" Gunn oscillators used with low i.f. receivers) causing interference to wanted signals. His final comment was that the interested operators along the south coast had no intention of moving away from 10·1GHz, the change having been brought about "without consultation".

His argument on the second point of debate seemed to centre round operators being keen on collecting letters, rather than numbers, while "square-hunting". In fairness, I must say that his main argument was neither for QRA nor Locator, but for a "non-bastard" system using either lat/long or utm directly. Again he voiced the opinion that the change had taken place without consultation.

I feel that Don's observations cannot be recorded without some additional comments. First, the change to Locator was made over a considerable length of time. This was pointed out by Ken Willis, G8VR, in the vhf bands feature in January's issue of *Radio Communication*: the proposed change was aired over a period of no less than five years (1980 to 1985) before being accepted by the IARU conference for introduction in January 1985—surely enough time for feedback?

Similarly, the proposed change of recommended 10GHz wideband operating frequencies was notified in the *Microwave Newsletter*, and discussed at various round tables in plenty of time to allow feedback. Indeed the move had already been notified, in effect, by the fact that new wideband beacons have been appearing on 10·4GHz nominal for some considerable time. The only feedback which I can remember was; from the south, "we won't be able to work French stations"; and from the midlands/north (which does amount to a large proportion of operators of simple wideband equipment), "a good idea". Let us not lose sight of the fact that this is a recommendation and therefore not mandatory. The fact remains that the vast majority of wideband operators have made the transition successfully, and that the re-tuning of equipment has proved far less difficult than was envisaged by many. I am unaware of any incompatibility problems between wb and nb elsewhere, but feel certain that the Microwave Committee would be more than interested in such problems (and also any documented instances of interference to or from other services if, indeed, they do arise).

It appeared that Don was under the misapprehension that the majority of midlands and northern wb operation was by the full duplex mode, using low i.fs. This is not so, and duplex operation still is the exception, for there is no "common" i.f. The more successful operators seem to employ separate transmitters and double-conversion receivers (30MHz plus 10·7MHz i.fs) or well-calibrated "in-line" devices and double conversion. Thus it is quite in order to use additional frequencies below 10·368GHz, especially where 30, 70 or 100MHz i.fs are in use. The only "reserved" areas are 10·368 to 10·370 for narrowband and nb beacons, and frequencies above 10,400MHz which are allocated to space communications. "Serious" bandplanning, other than in broad outline, has not been undertaken yet, although it may well need to be if the deteriorating licensing situation in some European countries continues.

Arie's letter takes me to task for suggesting that the QRA locator system is difficult to work on a computer. He points out that he is able to use both on a Casio PB200 pocket micro, using a program of a little over 1·4kb, although he does admit that more bytes are required in the translation of QRA to lat/long than for Locator. The point I have been trying to make is not so much the ease, in terms of program, of the two systems, but more the logicality of a true decimal system which should appeal to operators in countries which have used the metric system since Napoleonic times! Not only that, but the Locator system is capable of as high an accuracy, worldwide, as its users care to make it.

Operators' further comments on all these matters are probably best thrown open to further debate via the *Microwave Newsletter*, where space is less at a premium than here. Both editors, G8AGN and G3PHO, are QTHR and always looking for (printable!) comment. The answer to both problems seems to me to be for the more enlightened (?) operator to be able to use either of the 10GHz sub-bands, and to offer both Locator and QRA references if asked for them, in this way, all parties can be satisfied.

Components service

Readers are also reminded that the components service is still in full operation, and a recent list was sent with the last issues of the *Newsletter*. Current lists can be obtained from HQ, and, at the time of writing, the only item out-of-stock was WG20. Suggestions for additions are always welcome, and some suggestions already received are currently being researched by the committee as to availability and price.

Deadlines and a plea!

Deadlines for the remainder of this year are 24 February, 20 March, 18 April, 16 May, 16 June, 14 July, 17 August, 22 September, 27 October and 21 November. News and views will be welcomed, preferably by about two weeks in advance of these dates. There is a working relationship between this column and the *Newsletter*, so that your news and views will be directed to the more appropriate organ.

Both this column and the *Newsletter* are in danger of becoming too devoted to 1·3GHz and 10GHz (wb) news. We seldom seem to get news of what is going on, either in operation or technically, on most of the other bands. Somebody, somewhere, must be doing something of interest! How about news on eme, tv and data, fixed-link and troposcatter experiments and so-on?

This would all make interesting reading and would help to create an impression that something really is happening out there!

Late news

Arie, PA0EZ, mentioned that he and PA0EHG, both had a 10GHz nb contact with SM6HYG during the October opening, a distance of 780km. Signals were also heard by OK1AIY/P, but no two-way contact resulted. Arie added: "I am always QRV for skeds, and have so far worked, in UK, only AM and AL squares, but have been heard by G3JHM/P in ZL". His equipment generates 800mW from an MGF2124 GaAsfet, and the receiver uses an MGF1402 with nf about 4dB, the antenna being a 75cm dish 20m agl, 40m asl.

3·5GHz licences continue to be available in Holland during 1986, but only for the band 3,456 to 3,458MHz.

Special licences for 2,308 to 2,312MHz appear to be available in Switzerland, and HB9AMH/P is reported to be active. □

SWL

Bob Treacher, BRS 32525*

The tables

Congratulations are again due to Robert Small, BRS8841, who topped the countries table for the fourth consecutive year. Eight swls bettered the year's average, and hopefully the others will set 355 as their goal for this year.

A comparison of the winning scores for the last nine years shows some interesting statistics: in 1977 the winner had 813 points; in 1978–839; 1979–952; 1980–1,037 (including 221 countries on 28MHz and 244 on 21MHz, but only 36 on 1·8MHz); 1981–1,045; 1982–958; 1983–934; 1984–883; and last year 830 (with only 222 countries heard on 28 and 21MHz combined). This year, I suspect we will be at the lowest point of the 10 years, and the winning score will be unlikely to be much above 800. Only time will tell. The rules for this year's table were given in the December column.

I have had several queries about entry into the all-time table. With a starting score of 750, it is open to any swl who has heard at least this total number of countries. The table will next appear in the September issue of *Radio Communication*.

*93 Elibank Road, Eltham, London SE9 1QJ.

1985 HF Countries Table

Final placings

Station	DXCC	28	21	14	7	3·5	1·8	Total
BRS8841	233	60	162	219	168	163	58	830
BRS52543	206	60	136	168	136	146	67	713
BRS25429	214	54	108	175	137	154	76	704
ORS45992/7Q7	232	99	138	214	121	88	7	667
BRS31879	199	60	134	159	130	115	59	657
BRS32525	196	37	95	116	119	151	76	594
BRS1066	167	36	101	143	112	80	71	543
BRS87259	190	18	65	164	65	121	27	460
FE8957	132	38	90	71	45	66	22	332
BRS31976	151	7	13	70	30	120	50	290
BRS20249	130	8	45	101	58	57	19	288
BRS50134	119	0	0	0	105	108	62	275
BRS44083	137	22	47	125	21	51	4	270
BRS86386	122	6	9	99	34	77	8	233
BRS44984	99	19	29	75	41	54	0	218
BRS48909	112	0	0	0	73	92	43	214
BRS40292	—	10	31	53	35	24	3	156
BRS28198	84	0	0	0	46	72	35	153
BRS44395	71	0	0	0	52	51	38	141
BRS87725	—	0	11	75	7	35	1	129
BRS62088	77	0	0	53	16	42	16	127
BRS85124	74	8	10	41	13	38	15	125
BRS86766	39	1	4	33	9	2	0	49
Average for 1985:	142	24	53	94	68	83	33	355

All Time Countries Table

(Entry score 750)

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS25429	280	314	337	258	241	105	1,535	ssb
BRS32525	268	306	320	264	265	100	1,523	ssb
BRS8841	256	293	317	239	222	68	1,395	ssb/cw
BRS48909	216	255	275	205	189	80	1,220	ssb
BRS52543	195	241	259	201	185	80	1,161	ssb
ORS45992	215	259	275	159	134	16	1,058	ssb
BRS1066	195	210	269	171	121	88	1,054	ssb/cw
BRS18529	155	210	263	177	139	50	994	ssb
BRS44395	168	219	235	138	78	59	897	cw
FE8957	203	197	232	75	98	33	838	ssb
Average:	215	250	278	189	167	68	1,167	

This table will next appear in the September issue. Please ensure updates are sent to arrive by 7 July.

Here and there

Dave Burt, BRS85613, reported that to obtain a QSL from A4XRS, it is necessary to put the operator's own callsign on your QSL. He also mentioned QSL returns from HC8E for a 3·5MHz report and VP5GT and LZ5A, operating at the International Children's Assembly in Sofia. He had also claimed the 4U Award, and the Great West Railway and Tudor Rose Awards.

R J Northcott, BRS87801, wrote for the first time. An ex-cber, he is now hooked on chasing dx on the higher frequency bands. He uses a Trio 9R59DS and an AD270 active antenna, because he cannot erect antennas outside. Also in the shack is a Heathkit GR110, which has been modified for use on 144MHz.

Mick Toms, BRS31976, provided details of the Barking RES 144MHz Contest. It will be held on 6 April, and has been opened up to swls again this year, although lack of entries will probably see it disappear from the calendar again. Full details from: Mick Toms, 32 Wellington Road, Rayleigh, Essex SS6 8EZ.

Harold Moss, BRS18529, had been QRT due to a move of QTH. He was hoping to be back with a vengence by the time this is read.

Brad Bradbury, BRS1066, had not only been under the weather, but he lost his antennas during a spell of high winds.

Lower frequency conditions

An improvement in conditions was noted at the turn of the year, with some good dx available on 7, 3·5 and 1·8MHz. Reports from BRSs8841, 20249, 25429, 32525, 52543 and 62088 helped to formulate the following—7MHz: exceptional conditions to JA most mornings from 0850, ZLs, VKs. Central and South America. Little from the Pacific Islands was heard, the exceptions being KC6IN, VK9LM and VR6JR. In the early evenings, conditions to Africa had been good with 9Q5MA (via PA0GAM), 5N8BAV (via I2ZGC), 5V7AS (via VE5WA), Z22JE, S90AS (via IT9AZS) and 5R8AL heard. 3·5MHz: the notable points from this band were the fine conditions to the west coast of the USA, not only at our sunrise, but also between 0130 and 0215, and the appearance of several Pacific Islands. Good conditions to the USA west coast were noted on 25 December, 2, 3, 4, 6 and 11 January. From the Pacific, VR6JR (via G3OKQ), ZM8OY and 3D2DM were heard. KL7NT was 55 at 0814 on 6 January. JAs had also been good copy at our sunrise. At our sunset, openings to the USA west coast had been poor, with only scratchy signals on a handful of days. However, several G stations with exceptional antenna systems did make valid QSOs. BV0BG had been heard on cw later in the evening, as had KH0AC (via K7ZA), while S90AS was audible on several occasions from 2200 to 0100. 1·8MHz: Once again, this band continued to delight keen top-band listeners. Best dx was probably the appearance of VU2GDG around 0100 every night, with signals on ssb ranging from 44 to 57. CE8ABF, at 0142 working Ws, was another prize catch, taking me to No 100 on ssb on the band. Who will be next to the magic three figures? Conditions on 9 January were particularly good. Between 0040 and 0230, 15 Ws, 3 VEs, HH7PV, VU2GDG, PT7BZ and UA9MS were heard. Rumours were rife at the time of writing, about activity from 4U1UN, PY0F, OD5 and SV9. On cw 5H3ZR, 9M2AX and UA1OT (Franz Josef Land) had been worked.

News from overseas

Stan Porter, ORS45992, will be back in the UK by the time this is read. We are hopeful of an eyeball QSO during his vacation.

1985 ended with an extended tune around 28MHz, trying in vain to log country No100 for 1985. Returning via Rio de Janeiro, our intrepid 7Q7 swl intended to stop off at various shacks to collect some "missing" QSLs. I hope he rescues my CE0AA cards along the way! Once back home he has to collect the RNARS swl plaque for their Activity Award 1984/85.

For the UBA Contest Stan scored over 150,000 points, included in which were loggings of A25FXT, VE3FXT/ZS4, ZS3/W6QL, 7P8KG and 3D6QL. Also reported were BV0CRA, BV2FA and BV9CR; all on 14MHz.

Peter Destoop, ONL5923, is the editor of the swl column of the Belgian national magazine *CQ QSO*. His equipment consists of an ICR-70, 40m longwire, Dentron atu and a Datong FL2 audio filter. For rtty he uses a Tono 350 decoder and a Tono crt 1200g monitor. He is 26 and has been an swl since 1978.

Michel Monteil, FE8957, had been concentrating his efforts on 1·8MHz, in view of the wide mention of its dx potential. At the end of 1985 he had logged 22 countries, the best of which were, EA8AAU, IS0PLQ and RQ2GFN. On the QSL scene, cards had been received from EA3CBM/6 (JM19), F8OP (JN26) and IS0DKU/IS0 (JN40), to bring his confirmed total to 42 in 11 countries on 144MHz. On hf the star turn was a card from 5A3TX (via WA3HUP) for a report sent back in 1969! Others included DL0MAR/9G1, DL7FT/SV9 and TZ6FS. From 1 November 1985 the French Post Office administration decided to allocate callsigns to swls in the F11 and three letters series. Michel has therefore become F11ATZ.

HF news

This can be covered quite quickly this time, with reports only from BRS8841 and 87259. Everyone else seemed to have been monitoring the lower frequency bands. Mick Hudson noted A4XRS (note the QSL information earlier, Mick). VU2GI, JY9RL, VP5RP, XU1SS and VS6CT on 14MHz. Robert Small had been on the lower frequency bands, but mentioned VK9LM, BV0BG and J28DS on 14MHz, together with

Peter Destoop, ONL5923, editor of the swl column in *CQ QSO*

AP2AM, OD5PL, PZ1AV and 3D6QL on 21MHz. There is nothing to report this month on 28MHz.

On the QSL front we have J5WAD received via UA4PW, 9U5JB (via ON5NT), VP2EC, HH7PV, VK9XZ, 6W6NJ, DJ9ON/S9, FR4ZD, VK9NM/LH (now VK9LM), J28EI/S, 5R8AL (7MHz), TI2BEV and 3D6AN (3·5MHz).

Brad Bradbury, BRS1066, had, in the first eight days of the year, logged 93 USSR oblasts. Chasing oblasts is a pastime which many of the top dxers are keen on at present. There is certainly much activity, including several UA0s active from rare oblasts in Z19. The high spot of Brad's letter was the receipt of a QSL direct from KH6AT for 1·8MHz, while he was /MM off VQ9.

VHF news

Surprisingly, perhaps, 16 December saw a tropo lift to northern Spain. Dave Whitaker, BRS25429, collected his first EAs on tropo in four years listening. The QSLs keep on coming. This time he mentioned square No 141 on 144 in the shape of EA1ED (VD). On 432MHz, the score went up to 66, thanks to SM7NNJ (IQ22j), OE2CAL (GM16c), EA1BLA (VD39e), DK2NH (FN37b) and SM6CMU (FR50b).

Mick Toms wrote his contribution to the column while monitoring ms signals on 144MHz around 12 December. Signals were copied from EA1OD, TK5EP (a new country—No 27 in 1985), IK5EHR, F8OB, SP9EWV, I4YNO, IK2EAD, IV3GBO, OK1KRE, HG8VF, EA3BTZ and LA9BM. The peak of the event appeared to be about 2200 on 13 December. He was awaiting the Quadrantids in early January, and we all await Mick's report. G6CSY's plea for GM swl reports had paid dividends—he had a letter from GM, and G6CSY has provided details of when he is QRV.

Late news

The following provides a short report of 1·8MHz conditions during the *73* Magazine SSB Contest. Dave Whitaker and I spent a good deal of time on the band and came up with four new countries each. 4U1UN and TG9NX were new for us both. Dave also heard VU2GDG and a station from Corsica. I added LU2FFD. We now stand on 109 and 104 respectively on the band—all ssb. It would be interesting to know if any other listeners (or transmitting amateurs) have yet reached 100 countries on 1·8MHz ssb. Overall, conditions were good. Apart from the stations mentioned above, the following were also audible: 5N8BAV (0018), HH2MC (0112), ZF2JB (0220), YV5HNI (0224), PY1RO (0227), JY4MB (0342), HK0HEU (0512), CO2CB (0605) and 5T5CJ (0702).

Finale

News, views and 1986 table scores for the May issue should reach me by 15 March, with late copy by 24 March. □

SATELLITES

Bob Phillips, G4IQQ*

Uosat

Believe it or not, two years ago on 1 March 1984, Uosat Oscar 2 was launched on a Delta 3920 rocket from California. I am sure many of the observers at that time would not have predicted that the satellite would still be around today, particularly after the major difficulties of the first 10 weeks of its life. Instead, the satellite is in fact in a very healthy state and looks set to continue for some considerable time yet.

NK6K, who carried out much of the digital communications experiment work at the University of Surrey, has now returned to his home QTH in California. Watch out for increased use of the DCE store and forward messaging system on the satellite in the future.

All is well on Uosat Oscar 9, except for occasional difficulties in loading the weekend news bulletin. Several improvements have been made to the relevant software, and this task is now carried out more rapidly and therefore is less subject to problems of short access periods. The schedule for the satellite is varied slightly from time to time to permit particular observations, so it is difficult to give an accurate version here. However, the news bulletin is usually loaded on Fridays and transmitted throughout the weekend period.

*Transvaal Cottage, New Barn Road, Swanley, Kent BR8 7PW.

Oscar 10

Observers of the message blocks on the 145·810MHz beacon will have seen the discussion of a failure in a small part of the on-board memory of the satellite. A great deal of effort has gone into trying to identify the specific areas affected, though it does not appear that the fault will have any major impact on the satellite operations or its lifetime.

The operating schedule for the satellite has undergone so many changes over the last months that I will not attempt to forecast the current situation. You can obtain the information either from the Oscar 10 bulletin transmissions, or those from Uosat Oscar 9 at weekends.

On 2 March, Oscar 10 reaches its most southerly position, and from then on the situation for operators in the northern hemisphere should improve. While the situation of the orbit has not been too good over the last six months or so, there have been some very interesting effects to be observed. Last month I noted the occurrence over several days of extended periods of satellite visibility. Similar situations occur during March, as can clearly be seen on Fig 1. From the 5th to 9th, and again from the 24th to 27th of this month, the satellite will be visible for almost the whole duration of the afternoon/evening orbit. As an example, I have plotted the elevation angle for the satellite on 26 March, orbit 2096 (Fig 2). Perigee occurs at 0619, and at this location the satellite should be in range about 10min later. Satellite apogee occurs at around mid-day and could give rise to some interesting dx if the transponder is operational. Needless to say, that with such low elevations involved, the situation at any particular location will be governed by the latitude of the location and the local skyline. I would be very interested to hear if these unusual conditions produce any claims for new records.

Reference values for major satellite parameters are as follows:

Date	Orbit No	Perigee (utc)	Argument of perigee
1 March	2045	1143	89·8

The satellite ephemeris used to derive this data is based on that provided by KA9Q, which gives orbit numbers two in advance of some other published data; but this is of little consequence except for the purist or those who might arrange a schedule by orbit number.

Amateur satellite software

The range of software for amateur satellite applications continues to increase, both for telemetry decoding and orbit prediction, and coverage display. Paul Newman, G4INP, sent details of a satellite prediction program for the Sinclair QL, entitled *SATS*, which is written by John Branegan. It provides the most important data as well as a world footprint to show graphically the coverage of any satellite at a particular time. Further details from: G4INP, 3 Red House Lane, Leiston, Suffolk.

If you have a BBC micro, then Amsat-UK has a good selection of software which has received a very good press and has been recently

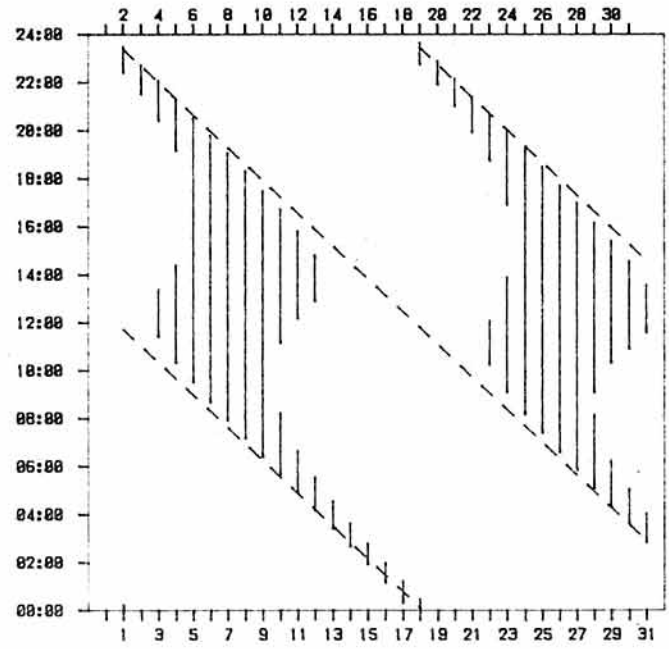


Fig 1 OSCAR 10 VISIBILITY (London area) - MARCH 1986

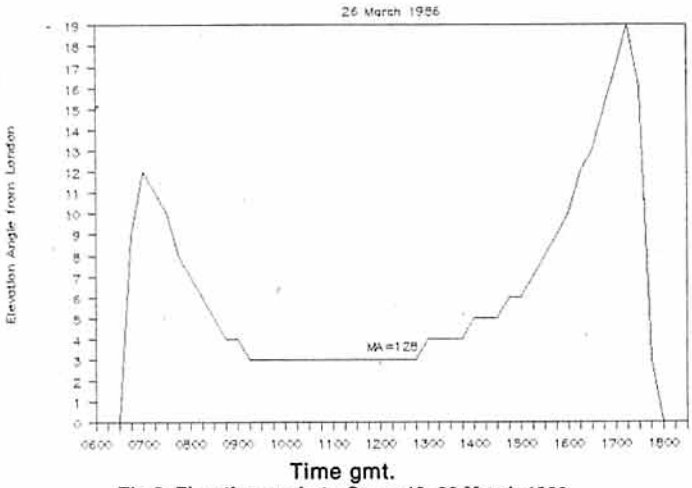


Fig 2. Elevation angle to Oscar 10, 26 March 1986

updated. There is a new suite of programs which is to be used as the official software for the Satellites in Education project, mentioned in this column last month. Details of this and other software can be obtained from: Amsat-UK, London E12 5EQ, on receipt of an sae. I will try to include a summary of what is currently available in a future issue.

RS satellites

At the time of writing there was no new information concerning the launch of the two new satellites RS9 and RS10. The beacon frequencies for RS10 have been confirmed as 145·957, 145·997 and 435·395MHz. Similarly, the fate of Iskra 4, which is due to be deployed from the Soviet space-station is not very clear at this time. There is also some talk of amateur operation from Salyut 7 itself, though this is not yet confirmed. □

QRP

*by Rev George Dobbs, G3RJV**

Encouragement to use low power on the hf bands

There is a somewhat mistaken view about, that radio amateurs who are keen on QRP are engaged mainly in building up little transmitters or simple transceivers and then being pleased to work someone in the next town. The "I've worked 30 miles on a single BFY51" view of QRP operation is far from the case. Low-power operation presents a viable and enjoyable way of being an active radio amateur on the bands. The QRP operator can be a dx chaser, a contest operator, or simply someone who enjoys a full range of QSOs on a variety of bands. The operating aspect of QRP is encouraged by a whole series of contests and awards. It is possible to set considerable achievement targets, and collect paper and trophies as a QRP operator. I offer a sample of a variety of incentives for QRP operation.

International QRP Day

Each year, 17 June is the IARU Region 1 QRP Day. It is a day set aside to encourage all radio amateurs in the region to try operation on the hf bands with low power. To encourage operation on this day, a member of the G QRP Club has donated an annual prize of a book token for £15 and a keepsake plaque for the Suffolk Trophy. The rules are as follows:

1. Eligibility. Any member of the G QRP Club.
2. When. Annually on Region 1 QRP Day, 17 June.
3. Period. Any six hours during the day, taken in not more than two periods. Start/finish times of periods to be shown in the log.
4. Contacts. Contacts with any station in IARU Region 1 count.
5. Form of contact. Normal QSOs, there are no special contest exchanges.
6. Bands. Any bands for which the operator is licensed.
7. Power. Not to exceed 3W rf output (cw) or 10W p.e.p (ssb).
8. Scoring. Each Region 1 country contacted on each band counts one point. The claimed score should be the total of IARU Region 1 countries contacted on all bands used. For example, six countries on 7MHz and 16 on 14MHz give a score of 23. Only one contact per country per band is allowed, irrespective of mode.
9. Entries. These should give name, address, call, power and mode used, brief equipment details, and the callsign, time and band of each contact claimed for scoring purposes. A summary giving the claimed score for each band and the overall claimed score must be included.

Entries to: A D Taylor, G8PG, 37 Pickerill Road, Greasby, Merseyside L49 3ND, to be received by 17 July. Any received after that date will be disallowed.
10. Awards. At the discretion of the committee the winner will receive a memento trophy and a book token for £15. Second and third place will receive merit certificates.

*St Aiden's Vicarage, 498 Manchester Road, Rochdale, Lancs OL11 3HE.

An award for the average QRP operator

The G QRP Club has an annual award designed to suit the average radio amateur using low power. The winner will hold a trophy presented by G6BAI, and also receive a keepsake plaque.

The Chelmsley Trophy
1. Duration. 1 January to 31 December each year.
2. Bands. Contacts may be made on all authorized bands between 1·8 and 28MHz.
3. Modes. CW and/or ssb.
4. Power. CW—not exceeding 3·3W rf output (5W dc input).
SSB—not exceeding 10W p.e.p output.
5. Antennas. (a) No antenna used shall exceed 35ft (10m) in height above ground.
(b) No antenna used shall exceed 132ft in length.
(c) Entrants may change the antennas in use during the year, but at any given time not more than one horizontal and one vertical antenna shall be used.
(d) All antennas used shall consist of only a radiating element, without reflectors or director.
6. Logs. For each band used the log submitted will consist of:
(a) A list of all DXCC countries contacted in alphabetical order of prefixes, with figures showing the total number of DXCC countries contacted below.
(b) A similar and separate list of all countries worked using two-way QRP.
(c) A note drawing attention to any contacts which, by virtue of very low power used, rarity or other reason, the entrant considers to be outstanding.

In addition, a separate sheet shall be provided giving details of the transmitting, receiving and antenna equipment used during the year. Should any entrant consider that during the year he has done work of importance in the field of simple antenna design or propagation studies, a note outlining such work briefly, should also be included.
7. Submission of entries. Entries must reach the communications manager by 15 February of the year after the contest year. Entries received after that date will be disqualified.
8. Disputes. In the event of any dispute regarding these rules, the decision of the club committee will be final.
9. Proof of contact. If they wish, the club committee may ask for written proof of any contact.
10. Awards. At the discretion of the club committee, the entrant submitting the most outstanding log will be awarded the Chelmsley Trophy for one year. The two runners-up will receive certificates of merit.

A contest for two-way QRP operation

The German organization AGCW (Activity Group Telegraphy) is organizing an annual contest for May Day of each year to promote two-way QRP operating. The contest is short (6h) by some marathon contest standards, which might encourage more people to join in the fun of two-way QRP traffic.

The AGCW-DL QRP/QRP Party
1. Date. 1 May of every year.
2. Time. 1300-1900gmt.
3. Frequencies. 3,530-3,580kHz, 7,010-7,040kHz.
4. Mode. CW only.
5. Classes. A = input maximum 10W, or output maximum 5W.
B = input maximum 20W or output maximum 10W.
C = swl.
6. Call. "CQ QRP".
7. Exchange. RST plus QSO No/class. QSO No starting at 001. Example: 579001/A.
8. Scoring. One point per QSO with one's own country, and two points per QSO outside one's own country. Each station may only be worked once per band. SWL logs must show both callsigns per QSO heard plus at least one complete report.
9. Multipliers. Each DXCC-land = one multiplier.
10. Band results. QSO points × multipliers.
11. Total score. Sum of band results.
12. Logs. To be submitted by 31 May (postmark) to: Wolfgang Kuhl DL 1 DAL, Schultenstrabe 12, D-4780 Lippstadt.
13. List of results. Against sae plus irc.

An award specially for the beginner on the hf bands

For some time the G QRP Club has funded an award, originated by Angus Taylor, G8PG, to encourage the amateur radio newcomer to use cw in the first year of licensed operation. The award is open to anyone in their first year of Class A operation (or Class B operation with the letter of variation).

The CW Novice Award
1. Eligibility. The award is open to stations during the first 12 months they are licensed.
2. Period of award. All contacts claimed for the purpose of the award must be made during the first year. Contacts may be made on any amateur band for which the applicant is licensed; they must all be on cw.
3. Required contacts. For the purpose of the award, the applicant must have contacted 50 other amateur stations.
4. Classes. The award will be issued in two classes. For the Class A award, all contacts must have been made when the applicant was using a dc power

input not exceeding 5W or 3W rf output. For the Class B award, any power not exceeding that for which the station is licensed, may be used.
5. Award application. Applications shall consist of a list of the stations contacted including date and band used. The list must be signed by the applicant and countersigned by one other licensed amateur who has seen the log entries. For Class A, the applicant must also include a signed statement that his dc input did not exceed 5W, or 3W output when making the contacts claimed.
6. Application fees. UK applicants must send 50p in UK stamps with their application. Overseas applicants must send three ircs.
7. Address for applications. Applications must be addressed to: Communications Manager, G QRP Club, 37 Pickerill Road, Greasby, Merseyside L49 3ND, England.

Add to this list other events like: The RSGB Low Power Contest on 20 April (see February issue for rules), AGCW-DL Summer QRP Contest on 19, 20 July and the RSGB 3·5MHz Field Day on 20 July, and even the most avid hf band operator can see that QRP offers considerable challenges for the active radio amateur. □

DATA COMMS

*Ian Wade, G3NRW**

FIRSTLY, MANY THANKS to all of you who have written to me. Now that the column is becoming established, the volume of letters is steadily growing, and they make interesting reading. Here is a selection of your news and views:

Tim, G1JOV, says that dc is alive and well in the Maidenhead area. There is a regular net on 144·725MHz every Sunday at 1930 for discussing and experimenting with data, and a "datacast" of 1,200 bps Ascii is transmitted at 2000. Anyone wishing to join in will be warmly received.

Chas, G3XTL, is a Raynet county training officer. He says that the use of rtty for Raynet is sadly insecure, and would like to hear from other Raynet groups trying amtor or packet, particularly on the lower hf bands. Chas also says that we should adopt an internationally accepted packet standard, such as AX.25, a view shared by many other readers.

A most interesting letter comes from Ed, G3VPF, about AX.25 developments in the southwest of England. He says that there are now five stations active: G1DII, G3VPF, G4VBY, G8BCH and G8IMB, and several others impatient to get on. Ed has handwired three TNC-1 terminal node controllers (tncs), but at three weeks per board he is unlikely to do any more. He has a copy of the WA8DED multi-connect software for the TNC-1, and can supply copies on two 2764 eproms or on an IBM PC-compatible disk, for the cost of the media plus postage and packing. He is now handwiring a TNC-2, but using a Texas TCM3105 chip instead of the standard TNC-2 modem, and hopes to get it onto a single Eurocard. Ed's ongoing main project is to develop his own tnc from scratch. It will be a complete dc terminal with two packet channels, several RS232 ports, and a parallel printer port. Main operator interface will be a crt display and keyboard. The main cpu is a 68000, with a 6809 providing the vdu functions.

John, GM4DQD, would like to find out more about data fax, not using conventional fax machines, but displaying high resolution pictures direct on the micro screen. The only references I know of are in *QST* (June 1985—an article by K2LAF on weather fax on an IBM PC) and in ARRL's experimenters' newsletter *QEX* (December 1985—an article by K6DYX on Telefax on an Apple). Can anyone else help?

Final news item: the experimental AX.25 digipeater, GB3AX, is undergoing final tests, and will eventually be located near Hemel Hempstead. Subject to DTI approval, operation will be on 433·650MHz, horizontally polarized. The driving force behind the project is RSGB general manager David Evans, G3OUF. More details when available.

Packet primer part 2: digipeaters

You will recall from the diagram in last month's column that a packet frame contains the callsigns of the stations participating in the QSO. To set up these callsigns you need to tell the tnc your own callsign, and then the callsign of the station to which you wish to "connect". Using a typical AX.25 tnc, the commands would be something like: "MYCALL G3NRW" and "CONNECT G1KTT". These callsigns are then automatically inserted into the address field of each frame (see Fig 1a). In other words, the address field specifies the "routeing" of the frame.

However, what makes packet really interesting is that as well as point-to-point QSOs, you can also specify routeing via intermediate repeaters, known as "digipeaters". For example, to route frames via digipeater GB3AX, the connect command now becomes "CONNECT G1KTT VIA GB3AX", and the address fields are set up as shown in Fig 1b. Frames sent by G3NRW are received by GB3AX, which verifies the frame check sequence and callsigns in the same way as described last month, and then retransmits the frames to G1KTT. Frames from G1KTT to G3NRW take the reverse path.

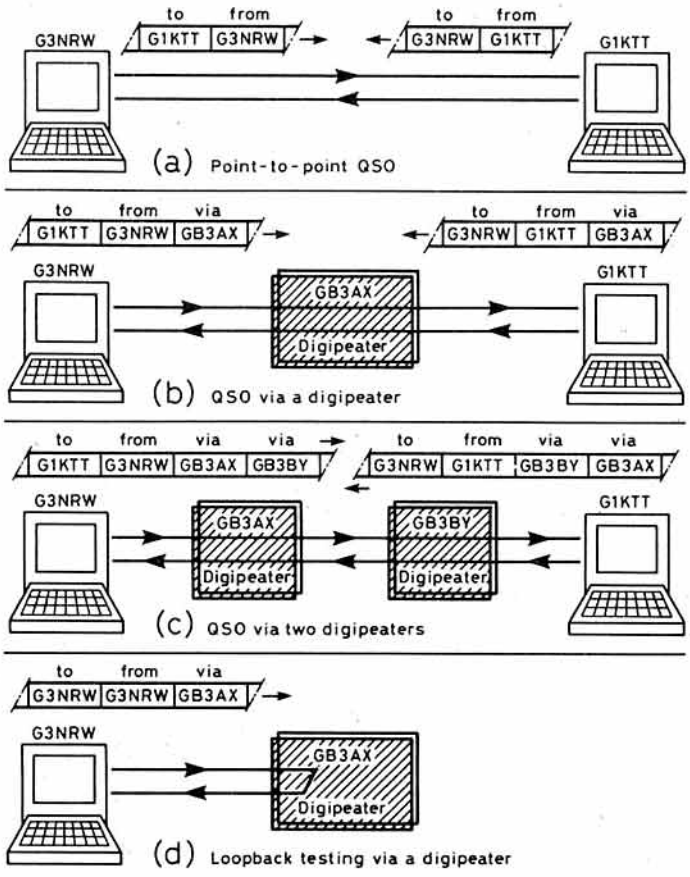


Fig 1. Packet QSOs via digipeaters. The "to", "from" and "via" callsigns are in the address field of each frame. The digipeaters relay the frames by continually switching between rx and tx on a single common frequency

Digipeaters vs rtty repeaters

The first point of difference between digipeaters and conventional rtty repeaters is that the digipeater only needs a few seconds to receive a frame, check it, and then retransmit it, and the remaining free time is available for repeating frames from other stations. In other words, the digipeater is not locked up for minutes (or hours!) on end, relaying data between just two stations. Thus many independent QSOs can be routed through the same digipeater at the same time—ideal for Raynet.

A second difference is that digipeaters usually operate on only one frequency, whereas rtty repeaters require separate transmit and receive channels. In other words, digipeaters continually switch between transmit and receive, retransmitting incoming frames on the same frequency. Using a single frequency in this way considerably simplifies the design of a digipeater. Virtually any radio can be used, and there is no need for expensive and difficult-to-adjust filters and cavities.

Multiple hops

AX.25 is not limited to one digipeater in the route; in fact, you can specify up to eight of them! While eight digipeaters are not used very often, it is quite common for two or three to be included in the route (Fig 1c), and the connect command becomes something like "CONNECT G1KTT VIA GB3AX, GB3BY". Digipeaters need not be local vhf/uhf boxes; they could be hf stations on the other side of the world, or even satellites.

Digipeaters can also help in checking out your own station. By giving the command "CONNECT G3NRW VIA GB3AX" (Fig 1d), all frames are routed back to where they came from—an awesome way of talking to yourself if the digipeater happens to be 3,000 miles away across the Atlantic! □

*7 Daubeney Close, Harlington, Dunstable, Bedfordshire LU5 6NS.

Contest News

1,296/2,320MHz Cumulatives results

This year's cumulative contest was enjoyed by all, with a marked increase in the number of entrants. There were 197 stations active on 1·3GHz and 54 on 2·3GHz. The introduction of the 2·3GHz cumulative being run concurrently with the 1·3GHz cumulative was generally accepted, although some comments were received as to whether there should be some form of incentive applied to encourage stations to be active on both bands. This will be reviewed before next year's contest.

Session 1 provided the best conditions, with stations working over 1,000km on both bands. This increased activity was evident in the overall results, with this one session alone providing over 65 per cent of the total points. The remaining sessions were generally described as poor.

Log-keeping was satisfactory, but some stations submitted incomplete cover sheets or missing summaries.

Equipment used on 1·3GHz was similar to that used last year, and on 2·3GHz the power used varied from 200mW to 50W, with the 2C39A family of valves being popular on both bands. Various combinations of antennas were used, from a single 23-element Yagi through 66-element quad loops, to the large dishes.

Congratulations to GM6MGS/A in Aberdeen for doing so well on 1·3GHz with only 2W. Certificates go to GW8TFI/P, G4CBW and G4NVA/P on 1·3GHz, and GW8TFI/P and G4CBW on 2·3GHz.

GM8MJV

1,296MHz CUMULATIVES

Posn	Callsign	Pts	Loc	Pwr(W)	Antenna	Best dx	Dist	Sessions
1	GW8TFI/P	1,038	IO81	200	55-el	SM6GWA	1,170	1,3,4
2	G4CBW	1,004	IO83	180	1·8m Dish	DD8DA	669	1,3,4
3	G4NVA/P	816	IO93	20	2m Dish	DF7VX	745	1,2,3
4	GM6MGS/A	630	IO87	2	15/15 Yagi	G4DCV	697	1,3,–
5	G6OYL/A	609	IO93	50	1·4m Dish	SM6HYG	945	1,3,4
6	GW8ACG/P	533	IO83	70	2 × 24 Q Yagi	—	—	1,2,4
7	G4MGR	482	IO83	120	23-el	G4CQR	333	1,3,4
8	G4NBS	470	JO02	10	4 × 23-el	GM6MGS/A	556	1,2,4
9	G3XDY	447	JO02	200	4 × 23-el	HB9AMH/P	688	1,2,5
10	G8IFT	355	IO82	150	4 × 23-el	SM6HYG	1,070	1,3,4
11	G4FRE	347	JO01	80	Dish/ Yagi	GI8AYZ	563	1,4,5
12	G4ZTR	306	JO01	80	23-el	GM6MGS/A	611	1,3,4
13	G8ZQB	262	IO92	40	27 Q Yagi	—	—	1,4,5
14	G2LO	235	IO91	50	15/15 Yagi	GI4OPH	471	1,2,5
15	G4JTJ	206	IO92	90	23-el	G4MGR	221	1,4,5
16	G4PRJ	175	JO00	2	23-el	G4CBW	310	1,2,4
17	G6CSY/P	161	JO01	1	23-el	G4CBW	255	1,2,4
18	G4TAW	158	JO01	2	23-el	GM6MGS/A	651	1,3,5
19	G8XCY	76	JO00	2	23-el	G4CBW	310	2,3,5
20	G3XEB	30	IO91	1·4	15/15 Yagi	GW8TFI/P	208	1,2,5

Checklogs received from G3YKI/A, PE1EWR
Disqualified G0AWP/P (rule 2)

2,320MHz CUMULATIVES

Posn	Callsign	Pts	Loc	Pwr(W)	Antenna	Best dx	Dist	Sessions
1	GW8TFI/P	339	IO81	50	1·2m Dish	SM6HYG	1,160	1,2,5
2	G4CBW	326·5	IO83	40	1·8m Dish	DD8DA	669	1,3,4
3	G4NVA/P	195·5	IO93	0·2	1·2m Dish	PE1CKK	490	1,3,4
4	G4FRE	147·5	JO01	20	42 Q Yagi	GW8TFI/P	299	1,4,5
5	G3XDY	134	JO02	6	44 Q Yagi	GW8TFI/P	295	1,2,3
6	G4TAW	65·5	JO01	0·5	66 Q Yagi	G4CBW	251	1,2,3
7	G8IFT	57	IO82	0·2	4 4 Q Yagi	G3JXN	153	1,3,4
8	G8ZQB	4	IO92	0·2	27 Q Yagi	—	—	1,–,–
9	G2LO	1	IO91	—	Q Yagi	G4TAW	48	2,5,–

28MHz CW Cumulatives results

From the 149 UK callsigns in 30 counties that appeared in entrants' logs, only 40 operators in the transmitting section and one in the receiving station sent in their logs for checking. It was a disappointment to the committee that the swl section was so poorly supported, and that more of those that were active did not enter or send check-logs. One non-entrant appears in nearly every log and certainly would have been on the "leader-board" if he had entered.

Most entrants found that conditions were variable, and although a number of extended ground-wave contacts were made in all the five sessions, the majority of contacts were within a 50 to 80 mile radius. This clearly benefited the entrants who were located in the south, the midlands and the home counties. One dx contact (with LU) was made during the first session and several entrants worked ON and F during the last session. A number of London and southern stations had contacts with GM3YOR in Fife via meteor-scatter during several of the sessions, and other GM stations were heard by G6LX and others during the last session, but the "pings" were of too short a duration to permit QSOs.

G4BLX, the phone winner, also managed to make the highest score in the cw section, with 717 points and 21 different counties from Ditchling. As for the ssb event, he used a TS830S and 4-element Yagi, and is to be congratulated for his double! In second place from Lichfield was G3KDB, who managed to work 24 different counties using a TS930S and 3-element Yagi. G3PIE, from Bucks, was third and he also used a TS830S and a 3-element Yagi. The only receiving entry was from RS20249, who heard 51 stations in 20 counties during the contest.

As for the phone event, logs were excellent with no unmarked duplicates and a minimum of errors. However, a few entrants omitted to give their name and address on the logs, county code sent, and one even forgot to put the callsign. In future all entrants will be required to submit a declaration with their logs. Every entrant who commented on the event seemed very pleased with the rules and the arrangements. As for the earlier phone contest, there was a substantial number of requests for additional sessions in the spring or early summer, and the committee will arrange for a further set of sessions, possibly during April and May.

G4RWW

TRANSMITTING SECTION

Posn	Callsign	CNTY	21 Oct	29 Oct	6 Nov	14 Nov	22 Nov	Total (best 3)
1	G4BLX*	SXE	—	255	—	233	229	717
2	G3KDB*	SFD	218	240	ck	189	—	647
3	G3PIE*	BKS	ck	214	217	207	ck	638
4	G4RCG	YSW	217	224	ck	195	ck	636
5	G3TCT	SRY	—	195	ck	193	192	580
6	G4WJS/A	BRK	—	184	184	200	ck	568
7	G4UMS	LDN	—	187	187	—	160	534
8	G4BJQ	SRY	—	173	—	174	134	481
9	G4WVX	BKS	—	—	210	171	89	470
10	G4OGB	HBS	143	197	ck	127	ck	467
11	G5LP	NHM	156	172	ck	130	—	458
12	G2UG/A	YSW	ck	165	125	146	ck	436
13	G4SZI	HFD	ck	—	158	142	135	435
14	G2HLU	BRK	—	160	125	—	144	429
15	G4VCO	HFD	—	133	147	143	—	423
16	G0AEV	WLT	123	143	ck	151	ck	417
17	G3MCX	LDN	ck	161	126	122	ck	409
18	G4SLE/P	SXE	—	162	—	97	127	386
19	G4PUR	HFD	134	ck	128	ck	123	385
19	G2PA	HFD	ck	135	ck	126	124	385
21	G3LZQ	HBS	—	167	—	108	96	371
22	G3BXS	BRK	ck	114	ck	114	129	357
23	G3GHY	?	ck	133	96	110	ck	339
24	G3ICH	DVN	ck	130	84	92	ck	306
25	G3BFP	LDN	—	—	—	140	151	291
26	G4ZFQ	?	76	94	90	ck	—	260
27	G0BON	LDN	—	91	77	81	—	249
28	GM3YOR	FFE	75	78	—	94	—	247
29	G4ZGA	HPH	57	88	—	88	—	233
30	G4UZN	YSW	69	80	—	64	ck	213
31	G3WP	ESX	65	63	ck	ck	78	206
32	G4OCU	HBS	62	76	—	67	—	205
33	G4NFX	HBS	—	—	47	84	62	193
34	G4XPE	DYS	70	60	ck	62	ck	192
35	G3ILO	GLR	—	—	—	73	48	121
36	G3SB	SOM	33	35	ck	24	ck	92
—	G6LX	LDN	ck	ck	—	—	ck	ck
—	G3IGW	YSW	—	ck	ck	ck	ck	ck
—	G3OLB	HPH	—	—	—	—	ck	ck
—	G0AGP	NOR	—	—	—	—	ck	ck

RECEIVING SECTION

1	RS20249	LDN	—	78	69	100	—	247

*Certificate winners.

70MHz Fixed Station Contest results

With conditions reported slightly above average a total of 22 entries were received for this contest. Nearly 70 per cent of the stations taking part had best dx over 300km. G3RSI worked GB2WQ at a distance of 701km and was the best dx of the contest.

A number of complaints were received of poor signals. Corrective action appears to have been taken in the cases reported. It is important to note that if offending stations have a number of substantial claims against them with no corrective action taken, they will be disqualified.

As is usual with 70MHz, all entrants enjoyed this contest and look forward to many more in years to come.

Congratulations go to the winner G4ANT. This station together with runners up G4ZAP receive certificate awards.

G4HWA

Posn	Callsign	Score	QSOs	QTH	Best dx	Km
1	G4ANT	530	65	JO02QQ	GB2WQ	648
2	G4ZAP	498	73	IO93DC	GU2HML	412
3	G4RFR	482	69	IO90AS	G3BW	431
4	G3RSI	470	72	IO91OF	GB2WQ	701
5	G4MGR	440	57	IO83KH	G3OJ/A	330
6	G4ASR	396	60	IO81MX	G4ANT	304
7	G3UKV	362	58	IO82RR	GM4ZUK/A	482
8	G4APL	316	65	IO91WH	EI2CA	430
9	G3ZNU	278	45	JO02OB	G4MGR	325
10	G3VIP	270	33	IO93XN	EI2CA	453
11	G3TCU	239	46	IO91QE	EI2CA	390
12	G4LNV	232	49	IO91MK	EI2CA	391
13	G3PSP	212	49	IO91TP	EI2CA	418
14	G3BPM	202	33	IO80OW	G4ANT	320
15	G4FOH	194	38	IO92XI	EI2CA	417
16	G4CIZ	158	38	IO83KH	G4MGR	257
17	G4MUT	138	32	IO91NK	G4MGR	258
18	G4YTL	120	30	IO91JU	G4MGR	207
19	G4FMC	98	21	IO92DM	G3OJ/A	210
20	G4NVR	86	13	IO93VJ	G3RSI	243
21	G5UM	46	10	IO92MP	G3RSI	153
22	G4XFD	30	9	IO83RE	G3RSI	249

Check logs from GM4ZUK/A, G3OHC and G4ZTR/P gratefully acknowledged.
GM4ZLL/A was disqualified, rule 4(B)

VHF/UHF Listeners Championship 1985 results

Apologies to listeners for the omission of swl sections in the August 144 and 432MHz Low Power events. These will be restored in 1986.

Scores this year have been calculated using rule 8b, normalizing each score to the winner on each band =1,000pts. This removes the problems encountered in 1984 due to the use of different scoring systems. Despite the enthusiasm of the regular entrants, it was disappointing to see a fall in the number of swl logs during 1985 from the peak in 1984, and it is again emphasized that the VHF Contests Committee welcomes listener logs. Hopefully, more listeners will submit logs in 1986.

Congratulations to Martin Parry, RS52543, who will again receive the Hansen Trophy, and commiserations to David Whitaker, RS25429, who has been steadily gaining on Martin since 1983. It is pleasing to note that both these stations are situated in the north of England, showing what can be done from up here!

Thanks to all the listeners who took part in 1985, and the best of luck in 1986. *G4JLG*

Posn	RS no	Mar 144/432	Apr 70	May 144	June 432	VHF NFD	Sep 70	Sep 144	Total
1	52543	1,960	1,000	659	1,000	2,912	—	634	8,165
2	25429	1,947	—	1,000	574	1,811	—	597	5,929
3	28198	1,703	295	—	—	392	1,000	435	3,825
4	32525	—	—	—	—	1,800	—	1,000	2,800
5	46296	153	—	—	—	506	—	—	659

Second 1·8MHz Contest 1985 results

As a participant in the 1·8MHz contests over many years, your adjudicator felt particularly honoured to receive the logs for this event. Comparison with the same contest of 10 years ago reveals a 10 per cent rise in UK entries, yet a 25 per cent decrease in activity. Overseas entries have seen a 400 per cent increase with activity climbing to almost the same level. In the 1985 event, there were 120 UK and 110 overseas stations on the band. Possible explanations may be that 1·8MHz no longer holds the awe that inspired many amateurs in the UK, whilst overseas, interest in the band is generally higher since many countries have only recently gained the use of "topband".

In addition, the low λ/4 or λ/2 end-fed is no longer a competitive antenna.

Conditions were reasonable but not spectacular, although Europe, Africa, Asia and North America were all worked, notably TK5, T77, C56, EA8, UA9 and W1-5. UK winner was Bob Henderson, G3ZEM, and second place went to GM3ZSP. Overseas winner was EI5DI. Congratulations and a certificate go to G2MJ, who heads the senior citizen entries.

Log presentation was good with few duplicates. Entrants who included their dupe sheets are thanked for making the adjudicators task easier. Subject to Council's approval, G3ZEM will be awarded the Victor Desmond Trophy. *G3SJJ*

Analysis of the leading 10 UK stations:

Callsign	Rx/tx	Antenna	G QSOs	Non-G QSOs
G3ZEM	R4C/T4XC	300ft EF @ 85ft	98	103
GM3ZSP	FT107M	Dipole apex 60ft	104	88
G3MXJ	SB301/401	Dipole apex 60ft and 80ft vertical	109	75
G4BWP	TS830S	Dipole apex 60ft	98	85
G3FXB	R4C/T4XC	Dipole apex 58ft	102	81
G3SJJ	TS930S	Dipole apex 50ft	107	66
G4BUO	Omni-D	Dipole apex 70ft	94	75
G3PDL	H/B	Dipole apex.85ft	105	60
G3TXF	TS930S	Dipole apex 60ft	97	62
G4WQN	FT757GX	5λ/8 wave sloper	84	76

BRITISH ISLES

Posn	Callsign	Total QSO	Bonus QSOs	Final points
1	G3ZEM*	201	69	942
2	GM3ZSP*	192	69	909
3	G3MXJ*	184	66	879
4	G4BWP	183	65	871
5	G3FXB	183	64	866
6	G3SJJ	173	67	850
7	G4BUO	169	65	829
8	G3PDL	164	63	804
9	G3TXF	159	65	801
10	G4WQN	160	59	775
11	G3JKS	144	61	737
12	G4OBK	136	62	718
13	G3RVM	130	58	677
14	G4KHC	125	59	663
15	G4GIR	132	56	652
16	G3OZF	121	53	628
17	G4ODC	127	52	624
18	G4FAM	119	53	622
19	G2MJ†*	109	54	597
20	G3XTT	106	55	592
21	G3SWH	104	48	562
22	G5LP	107	47	552
23	G3VYI	94	45	504
24	G4SFY	83	48	489
25	G2ANT†	86	40	458
26	G5MY†	73	46	449
26	G3OLB	80	42	449
28	G3LZQ	80	41	445
29	GW3JI†	77	43	444
30	G4OGB	76	43	442
31	G4AZN	74	41	416
32	G3BPM	70	40	407
33	G3SJX	67	39	396
34	G4OTU	64	41	391
35	G4EBK	72	36	390
36	G3MCX	63	38	379
37	G3BGM	62	38	367
38	GM4SID	65	32	355
39	G3YLC	57	39	351
40	G4ECI	61	32	342
41	GM3UM	51	36	330
42	G4SLE	45	33	297
43	G3ZRZ	44	31	287
44	G3KSH†	44	29	277
45	G3ILO	42	29	271
46	G3GMM	34	22	193
47	G3WRJ	24	19	167
48	G3YLA	22	20	166

OVERSEAS

Posn	Callsign	Total QSOs	Bonus points	Final points
1	EI5DI*	84	39	447
2	OZ1W*	65	40	393
3	HB9AGA*	60	37	360
4	UP2XX*	60	35	346
5	F2DV*	57	33	330
6	UQ2OC*	53	31	301
7	DF2XJ*	47	28	270
8	RR2RX*	42	28	263
9	OK1DVK*	40	28	260
10	EA7DMF*	42	26	248
11	UC2WBP*	39	25	233
12	OK3CZM*	34	25	221
13	OL1BLN	31	24	194
14	RW3DA*	28	21	189
15	UZ4WWB	25	22	183
16	UA3XDD	26	21	181
17	OH7VR*	26	20	177
18	UA3DHP	24	21	175
19	G6ZY/EA6*	25	18	161
20	UA4SBW	21	19	157
21	SP5HS*	22	18	156
22	DF7XZ	22	18	152
23	RT5UY*	23	17	147
24	OK1PGF	20	17	142
25	UA9AJO*	21	16	137
26	UA9CR	17	16	131
27	PA3AMA*	14	13	107
28	OK2BQU	11	8	88
29	RA4NBG	16	10	86
30	UC2LCQ	11	10	80
31	UZ3QWX	19	4	75
32	OK1DRO	9	8	67
33	DL1SN	8	8	64
34	UA9MR	8	7	59
35	UB5EOA	17	5	59
36	UA9ANN	7	6	54
37	UA1ZF	7	6	48
38	UO5OB*	5	5	40
39	UB5VK	4	4	31

* = Certificate winner
† = Senior citizen

SWL SECTION

Posn	Station	Total QSOs	Bonus points	Final points
1	BRS1066*	86	50	508
2	UA2-125-927*	39	28	251
3	UC2-006-43*	30	24	208
4	UA9-134-128	18	16	127
5	UA3-155-28	17	16	135

Check-logs received from GM3NCS/P, G3IGW, OL6BNW, OL6BOL, UA4LCH, NL-7484.

144MHz & SWL Contest rules

1400—1400gmt, 17/18 May 1986

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply. There will be three sections, section S for single operators, section M for multi-operator stations, and an swl section.

A multiplier system will be used in this contest. Contacts should be scored using the radial ring system, and the final score multiplied by the total number of counties and countries worked. Where more than one station is worked in a particular Scottish region, additional multipliers can be claimed for each contact, up to a maximum of three multipliers per region. County code letters shown in the "Operating Guide" supplement, or the full county name, should be included in the contest exchange and recorded in column vi (QTH received) in the log. Each new multiplier claimed must be clearly marked in the log and listed with the QSO serial number on a separate multiplier check list.

All entries and check logs to: VHF Contests Committee, c/o T Melvin, GM8MJV, 2 Dudley Avenue South, Edinburgh, Scotland.

Contests Calendar

1 Jan-31 Dec	UBA SWL *(Rules in December* SWL News)
1 March	BYLARA *(Rules in February* HF)
1-2 March	ARRL DX Phone *(Rules in February* HF)
1, 2 March	144/432MHz and SWL *(Rules in February issue)*
8, 9 March	Commonwealth *(Rules in September 1985 issue)*
9 March	70MHz Cumulative *(Rules in January issue)*
15 March	Town & County *(Rules in February issue)*
15 March	S Manchester Quad Night DF *(Rules in March issue)*
15-16 March	Bermuda *(Rules in February* HF)
22-24 March	BARTG Spring RTTY *(Basic details in March issue)*
23 March	70MHz Cumulative *(Rules in January issue)*
29, 30 March	CQ WW WPX SSB *(Rules in March* HF)
1 April	BATC April Fools Fiesta *(Details G6IQM)*
5, 6 April	SP DX *(Rules in March* HF)
6 April	432MHz CW *(Rules in February issue)*
13 April	Ropoco 1 *(Rules in March issue)*
20 April	70MHz and SWL *(Rules in April issue)*
20 April	Low Power Fixed *(Rules in February issue)*
May-Sept	Microwave Cumulatives *(Rules in March issue)*
May-Sept	10GHz Cumulatives *(Rules in March issue)*
1 May	AGCW-DL QRP/QRP Party *(Rules in March* QRP)
3, 4 May	432MHz-24GHz *(Rules in March issue)*
5 May	BATC Mayday Microwave *(Details G6IQM)*
17, 18 May	144MHz and SWL *(Rules in March issue)*
18 May	Region Round-up *(Rules in March issue)*
31 May	1,296MHz Trophy
1 June	432MHz Trophy and SWL
7, 8 June	HF NFD *(Rules in February issue)*
28, 29 June	Summer 1·8MHz
5, 6 July	VHF NFD and SWL
5, 6 July	BATC Summer Fun *(Details G6IQM)*
12, 13 July	HF SWL
20 July	Low Power FD
26 July	144MHz Low Power and SWL
27 July	432MHz Low Power and SWL
3 August	Hopscotch
24 August	1,296/2,320MHz
31 August	Ropoco 2
6, 7 September	144MHz Trophy and SWL
6, 7 September	IARU Region 1 SSB FD
13, 14 September	BATC International *(Details G6IQM)*
21 September	70MHz Trophy and SWL
4, 5 October	432MHz-24GHz
7 October	432MHz Cumulative
12 October	21/28MHz SSB
15 October	1,296/2,320MHz Cumulative
19 October	21MHz CW
23 October	432MHz Cumulative
26 October	70MHz Fixed
31 October	1,296/2,320MHz Cumulative
1, 2 November	144MHz CW
8 November	432MHz Cumulative
8, 9 November	Second 1·8MHz
9 November	BATC Autumn Vision *(Details G6IQM)*
16 November	1,296/2,320MHz Cumulative
24 November	432MHz Cumulative
2 December	1,296/2,320MHz Cumulative
7 December	144MHz Fixed and AFS
10 December	432MHz Cumulative
14 December	70MHz CW
18 December	1,296/2,320MHz Cumulative

432MHz—24GHz Contest rules

1400—1400gmt, 3/4 May 1986

The general rules published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply. There will be two sections, section S for single operator stations using the same callsign on all bands, and section M for multi-operator stations which may operate all bands concurrently using different callsigns. Scoring will be by the radial ring system on 432MHz and 1·3GHz, and at 1pt/km on all other bands. Half points may be claimed for crossband contacts. QTH information need not be exchanged. Individual band and overall tables will be published.

All entries and check logs to: VHF Contests Committee, c/o A J Collett, G4NBS, 10 Quince Road, The Limes, Hardwick, Cambridge CB3 7XJ.

10GHz Cumulative Contest rules

0900-2000gmt 13 April, 11 May, 15 June, 13 July, 17 August, 14 September.

Except where modified below, all the general rules for VHF/UHF/SHF Contests published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply.

Three activity periods will count towards the final score. Entrants unable to be active for three periods are strongly encouraged to send in their logs as a record of their activity, but will not be eligible for an award. Such logs will be recorded in the results.

Entries from outside the UK will be accepted, whether or not they are RSGB members.

There will be two sections; wideband and narrowband, which are scored separately. Stations may operate in both sections if they wish, provided that separate equipment is available for both modes (excluding preamps, power amps and antennas). A given station may be contacted twice, once on narrowband and once on wideband, to count for both sections. In the case of crossmode contacts, the contact should be included in the section appropriate to the equipment used at your end. Serial numbers start at 001 and advance by one for each contact, irrespective of section. An award will be made to the winner, runner-up, leading foreign station and leading fixed station in each section.

During each activity period, a station may change its location once.

For the purposes of this contest the "location" is defined as any point within a 5km radius of a fixed point. Contestants may start from a new location for each activity period.

Contacts will be scored at one point per kilometre. Half points may be claimed by both stations for a crossband contact if two-way communication cannot be established on the same band. A full contest exchange should be given on both bands. All crossband contacts must be clearly marked as such in the respective logs.

Entries should be postmarked no later than 1 October 1986. Please do not send in logs until after the last event.

All entries and checklogs to: The VHF Contests Committee, c/o D J Robinson, G4FRE, 15 Ferry Lane, Felixstowe, Suffolk IP11 8UR.

Fifth South Manchester Quadruple Night DF Event

Date. 15 March 1986
Map. OS Sheet 109 1:50,000 series (Manchester).
Assembly. 1900gmt for start at 1920gmt.
Location. Car park at Sale Moor Community Centre, Norris Road, Sale. NGR 798909.

Competitors requiring supper after the event please notify D C Holland, G3WFT, tel 061-973 1837 or D Bolton, G8UQC, tel 061-998 4245 of numbers.

28MHz Phone & CW Cumulative Contests 1986 rules

At the request of entrants a further set of activity contests has been arranged using the same rules as for the 1985 sessions.

1. The general rules for RSGB HF Contests as published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply.

2. Dates and times. Each session will commence at 2000 and finish at 2200. Phone sessions: 7 April, 15 April, 23 April, 1 May and 9 May, 1986. CW sessions: 9 April, 17 April, 25 April, 28 April and 6 May.

3. Sections. Single-operator, multi-operator and swl. All entrants, including each operator of a multi-operator entry, must be fully paid-up members of the RSGB. Portable or /A entries are acceptable, but entrants must operate from the same location for all sessions.

4. Frequencies. Phone 28·5-28·8MHz, cw 28·0-28·2MHz. Entrants are asked to spread out within the specified segments.

5. Exchange. RS(T), number (starting at 001 for each session) and RSGB county code (see "Operating Guide"). For QSOs with overseas countries, RST and serial no (when given). SWL section, see rule 11 below.

6. Scoring. Each session is scored separately and the sum of the three highest scoring sessions to count. Each completed contact is worth three points and a bonus of five points can be claimed for the first contact in each session with a new county or country. Contacts with any station (worldwide) count for points. Subject to the limitations in rule 11, swl entrants score on the same basis as transmitting entrants.

7. Single log for each mode covering all sections entered. This to show: date of session, call RS(T), serial number sent and received, county code, points and bonus claimed. Logs must be fully scored and totalled, and should also show the county code sent. A separate list of counties/countries worked in each session should be included. RSGB hf contest log sheets (or equivalent) should be used. Incomplete logs will not be accepted. A standard RSGB declaration must be completed and included with the entry. This must show the County Code sent.

8. Entries should be sent to: HF Contests Committee, c/o Mrs R L Glaisher, G4RWW, 279 Addiscombe Road, Croydon CRO 7HY.

9. Entries should be postmarked not later than Monday 19 May 1986.

10. Awards. Certificates will be awarded to the leading three entrants in each section for the phone and cw contests, subject to a minimum of 10 entries being received in transmitting sections and five in the swl section.

11. SWL section. Rules as transmitting section, except as detailed below:

(a) Entrants. British Isles RSGB members only, who do not hold a Class A transmitting licence.

(b) Logs must be headed date, time, call heard, call of station being worked, report, number and county code of station heard, points and bonus (where applicable). **Note:** The call of the station being worked may only appear once in every three contacts logged, unless it is a new county for bonus.

Region Round-up CW Contest rules

TRANSMITTING SECTION

1. The general rules for RSGB hf contests published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply.

2. Eligible entrants. All paid-up members of the RSGB resident in the British Isles (G, GD, GI, GJ, GM, GU and GW) holding a Class A licence. Single operator entries only.

3. When. 0700-1200 Sunday 18 May.

4. Contacts. CW only in the 3·5 and 7MHz bands. Entrants are requested to confine their 3·5MHz operation within the IARU Region 1 contest-preferred segment 3,510-3,560kHz. RST and serial number (starting from 001) must be exchanged, followed by R and the number indicating the operator's RSGB region—eg 579001 R03.

5. Sections. (a) Up to 150W input, (b) QRP—up to 10W input.

6. Scoring. Three points for each contact with a station within the British Isles. Each station may be contacted for points only once on each band. The final score is the total points on each band, added together and then multiplied by the total number of RSGB regions worked on each band added together.

7. Entries. Separate log sheets must be used for each band. It would greatly help the adjudicator if standard log sheets (form HFC1) were used. A cover sheet and signed declaration (Form HFC2) must accompany the logs, which must be sent to RSGB HF Contests Committee, c/o John Bazley, G3HCT, Brooklands, Ullenhall, Solihull B95 5NW, and postmarked no later than 2 June 1986.

8. Awards. Certificates of merit will be awarded to each of the three leading stations in each section.

RECEIVING SECTION

1. Transmitting section rules 1, 2, 3, 6 and 7 will apply, with the addition that holders of British Class B licences may enter.

2. A station may only appear once in the column headed "Station heard". The callsign of the station being worked may only repeat once in every three contacts logged, except when the station is a new multiplier. Entrants should log the time, callsign of the station heard, RST, serial number and region given by that station, and the callsign of the station being worked.

3. Awards. Certificates of merit will be awarded to the leading three receiving stations.

Ropoco 1 1986 rules

To avoid a clash with the NEC Exhibition, this year's contest has been moved to Sunday 13 April 1986.

1. The general rules for RSGB hf contests, published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply.

2. Eligible entrants. All paid-up members of the RSGB resident in the British Isles holding a Class A licence. Single-operator entries only.

3. When. 0800-1000gmt, Sunday 13 April 1986.

4. Contacts. CW in the 3·5MHz band only. Entrants are requested to confine their operations to 3,510-3,590kHz. Send RST for the first contact, plus entrant's own postal code; for the second and subsequent contacts, the postal code received in the previous contact. Contacts with European stations will not count for points.

5. Scoring. 10 points per contact.

6. Entries. Logs must be sent to: Mr R A Treacher, BRS32525, 93 Elibank Road, Eltham, London SE9 1QJ, postmarked not later than Monday 28 April 1986.

7. Awards. Certificates will be awarded to the first, second and third placed entrants.

Microwave Cumulative Contest rules

0900—2000gmt 13 April, 11 May, 15 June, 13 July, 17 August, 14 September.

The following bands will be active on these dates: 3·4GHz 13 April, 15 June, 17 August; 5·7GHz 11 May, 13 July, 14 September.

Except where modified below all the general rules for VHF/UHF/SHF Contests, published in the "Operating Guide" supplement, *Rad Com* January 1986, will apply.

Each band will be scored separately and contain only one section for all classes of entry. Two activity periods will count towards the final score for each band.

During each activity period, a station may change location once. For the purposes of this contest the "location" is defined as any point within a 5km radius of a fixed point. Contestants may start from a new location for each activity period.

Contacts will be scored at one point per kilometre. Half points may be claimed by both stations for a crossband contact if two-way communication cannot be established on the same band. A full contest exchange should be given on both bands. All crossband contacts must be clearly marked in the respective logs.

Entries should be postmarked no later than 1 October 1986. Please do not send in logs until after the last event.

All entries and checklogs to: The VHF Contests Committee, c/o D J Robinson, G4FRE, 15 Ferry Lane, Felixstowe, Suffolk IP11 8UR.

BARTG Spring RTTY Contest rules

0200gmt 22 March—0200 24 March

Operation on 3·5, 7, 14, 21 and 28MHz with separate categories for single-, multi-operator and swl stations. Rules for this contest may be obtained by sending an sae to: Peter Adams, G6LZB, BARTG Contests Manager, 464 Whippendell Road, Watford, Herts WD1 7PT.

Club News

The following is the latest information received by RRs from RSGB affiliated societies, clubs and groups in time for inclusion in this issue. Basic unchanged information on other affiliated organizations will be published again in **July 1986**.

RSGB affiliated organizations are requested to report all programmes and new items to their regional representatives regularly. Information for inclusion in the **May** issue should reach them by **14 March** and for the **June** issue by **12 April**.

Club programmes are given in order of date, subject, time and place of meeting. All callsigns of club secretaries and other contacts are QTHR (correct in the current *RSGB Call Book)* unless otherwise stated.

All clubs welcome visitors and would be pleased to hear from potential new members.

REGION 1—RR B Donn, G3XSN, 7 Thurne Way, Liverpool L25 4SQ. Tel 051-722 3644.

Barnoldswick (Rolls-Royce ARC)—5 March (Construction Contest), 2 April (Talk by G3ATH). 8pm. Rolls-Royce Sports & Social Club. Sec G4ILG, tel 0282 812288.

Barrow-in-Furness (South Lakeland ARS)—6 March ("Fault finding techniques", G8JAG), 20 March ("Sat, comms and secret listeners", RSGB videos), 3 April (Club night). 8pm. Norweb Sports & Social Club, rear of the Ormsgill Hotel. Sec G6LKB, tel 0229 54982. The society also intends to operate a special event station on Spring Bank Holiday weekend from Piel Island, off Barrow-in-Furness during the crowning of the "King of Piel" ceremonies. Piel Island has a ruined castle and has associations with Cromwell and a local monastery. The King of Piel is traditionally the landlord of the only pub on the island. This event takes place only infrequently when the landlord is changed and is usually covered by tv etc. We hope to operate vhf and hf. Callsign GB2PI has been applied for.

Bury (BRS)—11 March (TBA), 8pm. Mosses Youth & Community Centre, Cecil St, Bury. PRO G1PKO, tel 061-764 5018.

Carlisle (C&DARS)—Meetings every Monday (except Bank Holidays). 7pm. Upperby Parish Hall, Upperby Rd, Carlisle, Sec G4WOQ, tel Scotby 500.

Ellesmere Port (EPDARS)—9 March (Belle Vue Rally), 10 March (Natter night), 24 March (TBA), 7.30pm. The Grosvenor Hotel, Ellesmere Port. Sec G4STZ, tel 051-339 7201.

Fylde (FARS)—4 March ("Amateur radio's newest frontier", W5LFL, video), 18 March (Informal and morse). 7.45pm. The Kite Club, Blackpool Airport, Sec G8GG, tel 725717.

Liverpool (L&DARS)—4 March (Quiz with Ellesmere Port ARS), 11 March ("Face behind the callsign"), 18 March (TBA), 25 March (Junk sale), 1 April (AF 57?). 8pm. The Churchill Conservative Club, Church Rd, Liverpool 15. Sec G1EXJ, tel 051-728 8811. The society also runs morse and RAE classes starting 7pm as above.

Macclesfield (MDRS)—Meetings every Tuesday, 8pm. The Fermain Club, Oxford Rd, Macclesfield. Sec G1NUS, tel 0625 24534.

Penrith (Eden Valley RS)—20 March (AGM). 7.30pm. The Ullswater School, Penrith. Sec G1FBD, tel 0772 88260.

Sale (South Manchester RC)—7 March (Visit to Jodrell Bank—names required before-hand), 14 March ("Radio aurora", G3USF), 21 March (Junk sale, non-radio items welcome), 28 March (Closed), 4 April (Mystery talk by G8TYY). 8pm. Sale Moor Community Centre, Norris Rd, Sale. Sec G3WFT, tel 061-973 1837.

Southport (S Raynet Group)—Details from group controller, G4RQX, tel 25172.

Stockport (SRS)—12 March ("Strip line circuits", G8TYY), 26 March (Junk sale). 8pm. Magnet Inn, Wellington Rd (A6), Stockport. Sec G4FFW, tel 061-224 7880.

Thornton Cleveleys (TCARS)—3 March ("Amateur radio on a shoestring", Rev George Dobbs, G3RJV), 10 March (Informal/club on air), 17 March ("Antennas", Q & A session chaired by G3AOW), 24 March (Informal/club on air), 31 March (No meeting). 7.45pm. 1st Norbreck Scout HQ, Carr Rd, off Fleetwood Rd, Bispham, Blackpool. Sec G4BFH, tel 0253 853554.

Warrington (WARC)—4 March (Preparation for NARSA exhibition, Organizer, G6OXX), 11 March (Natter night), 18 March ("Micros", G6VGH), 25 March ("70cms", G3OGQ), 1 April (AGM), 7.30pm. Grappenhall Community Centre, Bell House Lane, Warrington. Details G Wood, tel 0925 8420.

Woodford (RATEC)—17 March ("Propagation", G3HZM). 8pm. British Legion Club, Moor Lane, Woodford, Nr Bramhall, Cheshire. Details G4SFU, tel 061-485 3912.

Welcome to The Northern AR Confederation; BBC Skelton ARC; North Cheshire RC; Bolton ARC; Manchester Ariel RC; Marple Contest Group and Glossop & DARG. Thank you to Ellesmere Port DARS and Stockport RS for their hospitality. *RR1*

REGION 2—RR P R Sheppard G4EJP, 9 Elvington Crescent, Leconfield, N Humberside HU17 7LX. Tel 0401 50397.

Denby Dale (DD&DARS, G4CDD)—5 March (Noggin and natter night), 12 March ("Planning for the radio amateur", G4GJB), 19 March (Noggin and natter night), 26 March (Open discussion on items topical). 7.30pm. Denby Dale, Pie Hall. Details G3SDY, tel 0484 602905.

Doncaster (D&D Raynet Group)—11 March (Monthly meeting). Sypte Club, North Bridge. Details G4NZX, tel 0302 854985.

Goole (GR&ES, G8HSG)—7 March (Natter night), 14 March ("Trends in atv", G8VHL), 21 March (Film night), 28 March (Construction evening). The Pavilion, West Park, Goole. Details G6REL.

Halifax (H&DARS, G2UG)—18 March (Junk sale). The Running Man PH, Pellon Lane. Details G0DLM, tel 0422 202306.

Hornsea (H&DARC, G4EKT)—5 March (Construction project). The Mill, Atwick Rd, Hornsea. Details G4YTV, tel 0401 62498.

Leeds (White Rose ARS, G3XEP)—5 March (Construction project, judging and prizes), 12 March (Natter night), 19 March (Rally briefing), 26 March (Natter night). Moortown RUFC, Moss Valley, Kings Lane. Details G6NIZ.

Pontefract (P&DARS, G3FYQ)—6 March (Natter night), 13 March (Final brief for Components Fair), 16 March (Sixth Annual Components Fair), 27 March (Project evening). Carleton Community Centre. Details G0AAO, tel 0977 43101.

Sheffield (SARC)—3 March (Practical night), 10 March ("Chinese experience", G3RKL), 17 March (Committee meeting). Meetings first and second Mondays, Firth Park Clock Tower, third Monday, Sheaf House PH, Bramwall Lane. Details G3PHO, tel 0742 68126.

Spen Valley (SVARS, G3SVC)—6 March (Film), 20 March ("Things to do with tv", G4OTL). Old Bank WMC, Mirfield . Details G4PHR, tel 0924 499397.

Todmorden (T&DARS)—3 March ("The IARU", G3PSM), 17 March ("Astronomy", E Lord). 8pm. Queen Hotel, Todmorden. Details G6MDB, tel 070681 2494.

UK FM Group (Northern)—2 March (Monthly meeting). 7.30pm. Royal Hotel, Barnsley. Details G4UNA.

Wakefield (NWRC, G4NOK)—6 March ("HF operating procedures", G4RCG), 13 March (Visit to Skelton Grange Power Station, 7pm), 20 March (George Dobbs Lecture at Pontefract), 27 March (Monthly meeting). 8pm. White Horse PH, East Ardsley. Details G4RCH, tel 0532 536633.

REGION 3—RR G Ross, G8MWR, 81 Ringwood Highway, Coventry CV2 2GT. Tel 0203 616941.

Atherstone (ARC)—10 March ("The RSGB", G8MWR), 25 March ("Satellites", G4ROA). Sixth Form College, Long St, Atherstone. Sec G6YQU, tel Chapel End 393518.

Birmingham (Aston University RS)—17 March ("Packet radio", G4JCP). Meets lunchtime. Sec G1KTH, tel 021-359 3611 ext 5115.

Birmingham (Midland ARS)—18 March ("Operation Raleigh", G4AAL). Unit 5, Henstead House, Henstead St (off Bromsgrove St). Sec G8BHE, tel 021-422 9787.

Bromsgrove (BARS)—11 March (Shelsley Walsh lecture), 25 March (Open evening). 8pm. Hundred House, Stourbridge Rd, Bromsgrove. Sec G4LVK.

Evesham—It is intended to form a new club in the Evesham area. Would all those who are interested in joining, please contact G4UXC, tel 831508.

Halesowen (MEB RC)—11 March ("GDO" G4IMI), 25 March (Open meeting). 8pm. MEB Social Club, Mucklow Hill, Halesowen. Sec G4RWH, tel 021-747 8784.

Hereford (HARS)—7 March (Talk by G8OHH), 21 March (Informal evening). 8pm. The Civil Defence HQ, Goal St, Hereford. Sec G3WRQ, tel Hereford 54064.

Kidderminster (KARC)—12 March (Committee meeting), 18 March ("Keep it clean", G4MO). 8pm. Vice-Presidents Club, Harriers Football Ground, Hoo Road, Kidderminster. Sec G8WOX, tel 0562 751584.

Shropshire (Salop ARS)—6 March ("Gunpowder", G6NUL), 20 March (Foxhunt). 8pm. Old Bucks Head, Frankwell, Shrewsbury. Sec G6OMJ, tel 0743 67799.

Stafford (SARS)—4 March (AGM). 8.30pm. Coach and Horses, Pasturefields, Staffs. Sec G4RWQ, tel 0785 714963.

Stone (Brit Tel ARS)—4 March (23cm construction), 11 March (Activity night), 18 March (Foxhunt), 25 March (Field day planning). 7.30pm. College. Sec G8ATB, tel 0785 762593.

Stourbridge (SARS)—3 March (Informal meeting), 17 March (AGM). 8pm. Robin Woods Centre,

First annual dinner of Mid-Beds Contest Association. L to r, back: G4ALR, G4DRS, G4BWP; front: G4GIR, G4KQD, G4JQL

Norwich ARC presentation of the Rosebowl Award for home-construction. L to r: G4LUA, G4TNR and G4MCA, contest winner

School St, off Enville St, Stourbridge. Sec Mr Williamson, tel 392006.
Stratford Upon Avon (SuA ARC)—10 March ("Buying used gear", G4LVK), 24 March (AGM and film). 7.30pm. Baptist Church, Payton St, Stratford on Avon. Sec G8OVC, tel 750584.
Wolverhampton WARS)—4 March (Antennas and feeders), 11 March (Decibels explained), 18 March (RTTY homebrew), 25 March (Night on the air). 8pm. Electricity Sports Club, St Marks Rd, Chapel Ash, Wolverhampton. Sec K Jenkinson, tel 0902 24870.
Worcester (WARC)—3 March (Surprise night), 19 March (Informal meeting). 8pm. Oddfellows Club, New St, Worcester. Sec G4RBD, 14 Oakleigh Heath, Hallow, Worcester.

REGION 4—RR M Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey DE3 2BJ. Tel Derby (0332) 556875.

Buxton (BARS)—The agm has given the society a new sec; Tony Briggs, G8YHX, tel Buxton 6800. Club meets second and fourth Tuesday in each month, the Haddon Hall Hotel, London Rd, Buxton.
Derby (DADARS)—5 March (Junk sale), 12 March (AGM), 19 March (No club meeting—Faraday Lecture at the Assembly Room, Market Place, Derby), 26 March (Night on the air, GB3ERD). 7.30pm. 119 Green Lane, Derby. Sec G4EYM, tel 556875.
Grantham (GARC)—18 March (Natter and noggin night). 7.30pm. Shirley Croft Hotel, Harrowby Rd, Grantham. Sec G8WWJ, tel Grantham 65743.
Grimsby (GARS)—6 March (Satellite night), 20 March (Guest speaker). 8pm. Cromwell Social Club, Cromwell Rd, Grimsby. Sec G4EBK, tel 887720.
Glossop (GADARG)—25 March ("The Winter Hill Television Transmitter", G4YZE). 8pm. Nags Head Hotel, Charlestown Rd, Glossop. Sec G4GNQ.
Mansfield (MARS)—4 April (Construction Contest). Victoria Social Club, Princes St, Mansfield. Sec G1DZH.
Melton Mowbray (MMARS)—21 March ("Aspects of model engineering", B Moore of the Melton Model Engineering Club). 7.30pm. St Johns Ambulance Hall, Asfordby Hill, Melton Mowbray. Sec G3NVK, tel 63369.
Nottingham (ARCON)—6 March ("Modern radio equipment", SMC), 13 March (Talk on meteor scatter), 20 March (Activity night and Constructors' Contest), 27 March (Path losses). 7.30pm. Woodthorpe House, Mansfield Rd, Sherwood, Nottingham. Sec G4JAE, tel 232604.
Worksop (WARS)—11 March (Darts and dominoes with Worksop branch of the Sub-Aqua Club). 7.30pm. The Maltkins, Gateford Rd, Worksop. Sec G4ZUN, tel 486614.

REGION 5—RR J S Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT. Tel 0582 508515 or at work on 0582 21151.

Bedford (B&DARC)—6 March ("Amateur tv", G8MGP), 20 March ("Beyond the Slim Jim", G6EDB). 8pm. Allen's Club, Hurst Grove, Queenspark, Bedford. Sec G4VHF, tel 0234 751763.
Cambridge (C&DARC)—7 March (Talk, tba), 14 March (Informal evening), 21 March (Constructors' evening), 28 March (AGM). 7.30pm. Visual Aids Room, Coleridge Community College, Radegund Rd. Sec G4TRO, tel 0223 353664.
Dunstable (DDRC)—Each Friday, 8pm. Chews House, High St South, Dunstable, Beds. Sec G6EES, tel 0582 607623.
Leighton Buzzard (LLRC)—First and third Monday of each month. Vandyke Community College, Leighton Buzzard. Sec D Jones, tel 0908 649238.
March (MADRAS)—Each Tuesday, 7.30-9.30pm. The Neale Wade Adult Education Centre, Station Rd, March, Cambs. Sec G4KPZ.
Milton Keynes (MK&DARS)—13 March (Second-hand equipment sale). Sec G3ZPA, tel 501310.
Nene Valley (NVRC)—Wednesdays at the Prince of Wales PH, Well St, Finedon, nr Wellingborough, Northants.
Northampton (NRC)—Thursdays, 8pm. The Kingsthorpe Community Centre, Northampton. Sec G4YJP.
Peterborough (PR&ES)—21 March (Wine and natter night). 7.30pm. Brook Street Institute, Brook St, Peterborough.
Greater Peterborough (GPARC)—Fourth Thursday of each month. 7.30pm Southfields Junior School, Stanground Peterborough. Sec G4NRJ.
Shefford (S&DARS)—6 March ("Bird brains", a talk on Oscar 10 management and control, G3RUH). 13 March ("Spark transmitters", G3WLM), 20 March ("Radio controlled cars, boats and planes", K Hutson), 27 March (Natter night), 22/23 March (Hobby and Model Show at the Samuel Whitbread School, Shefford, where the club will have a demonstration station), 3 April (Questions and answers). 8pm. The Church Hall, nr Fish & Chip Shop, Ampthill Rd, Shefford, Beds. Sec G4PSO, tel Hitchin 57946.

REGION 6—RR F S G Rose*, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.

*Acting until post is filled.

Reading (RADAC)—For details please contact new sec, Simon Wilson, G6BOX.
Slough (Burnham Beeches RC)—3 March (AGM), 17 March ("Electronic newsgathering", G4XMJ), 7 April (TBA). 8pm. Haymill Youth and Community Centre, 112 Burnham Lane, Slough. Details G6EIL, tel Maidenhead 25720.

REGION 7—RR R Sykes, G3NFV, 16 The Ridgeway, Fetcham, Leatherhead, Surrey KT22 9AZ. Tel 0372 372587.

Ashford (Echelford ARS)—10 March ("QRP", G4BUE), 27 March ("CW Contest operating", G3KKQ). 8pm. The Hall, Kingston Crescent, Ashford, Middx. Sec G4VAZ, tel Sunbury 83823.
Bexleyheath (North Kent RS)—4 March ("Transistor design", G4DIB), 18 March (Natter night), 1 April (Junk sale). 8pm. The Pop-in-Parlour, Graham Rd, Bexleyheath. Sec G6CUE, tel 01-309 7214.
Cray Valley (CVRS)—6 March (Surplus equipment evening), 20 March (Natter night), 3 April (Construction contest). 8pm. Progress Hall, Admiral Seymour Rd, Eltham SE9.
Croydon (SRCC)—3 March (Surplus sale). 8pm. TS Terra Nova, 34 The Waldrons, South Croydon, Surrey. Sec G8IYS, tel 01-657 0454.
Crystal Palace (CP&DRS)—15 March ("Some aspects of long distance communication", G4CSB). 8pm. All Saints Parish Room, Upper Norwood SE19. Sec G3FZL, tel 01-699 6940.
New Cross (Clifton ARS)—7 March (Bus location), 21 March (Cellular radio). 8pm. Telegraph Hill Community Centre, Kitto Rd SE14. Sec R Hinton, 42 Sutcliffe Rd, Welling, Kent.
Sutton and Cheam (S&CRS)—21 March (Construction Contest). 8pm. Downs Lawn Tennis Club, Holland Ave, Cheam, Surrey. Sec G4BOX.
Thames Ditton (TVARTS)—4 March (AGM). 8pm. Thames Ditton Library, Watts Rd, Giggs Hill, Thames Ditton. Sec G3ENI.

REGION 8—RR M Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE Tel 0795 70132.

Canterbury (East Kent ARS)—6 March ("Meteor scatter", Ken Willis, G8VR), 20 March (Natter night). 8pm. The Cabin, Kings Rd, Herne Bay. Details G4RIS, tel Whitstable 262042.
Chichester (CARC)—4 March ("Emergency planning communications", M H Rogers, Deputy County Emergency Planning Officer), 18 March (AGM. Presentation of Talbot Trophy). 7.30pm. North Lodge Bar, County Hall, Chichester. Details G4EHG, tel 789587.
Dartford (DDFC)—4 March (Pre-hunt meeting), 9 March (Club hunt, Dartford Heath). Pre-hunt meetings held after 9pm. Horse & Groom PH, Leyton Cross, Dartford Heath. Details G8DYF, tel Greenhithe 844467.
Eastbourne (Southdown ARS)—3 March (Junk sale), 8 March (Combined SARS/HERC dinner-dance at the Horseshoe). 7.30pm. Chaseley Home, Bolsover Rd, Eastbourne. Tuesdays and Fridays, 7pm. The Clubrooms, Wealden Council Offices, Vicarage Fields, Hailsham. Details G1BAB, tel 890234.
Gillingham (BRATS)—20 March (AGM), 22 March (Rainham Radio Rally, see Mobile Rallies calendar). 8pm. Parkwood Community Centre, Parkwood Green, Wigmore, Gillingham. Details G4ZTF, tel Medway 374670.
Horsham (ARC)—6 March (Grand spring junk sale, 7.30pm). 8pm. Guide HQ, Denne Rd, Horsham. Details G4LKW, tel 64580.
Maidstone (MYMCAARS)—7 March (Morse lecture, C Harris and friends), 21 March (Junk sale). 8pm. YMCA Sportscentre, Melrose Close, Cripple St, Maidstone. Morse classes and RAE lectures, Friday, 7.30pm. Details G4AXD, tel 0622 29462.

REGION 9—RR A H Hammett, Rosehill, Ladock, Truro, Cornwall TR2 4PQ. Tel 0726-882 758.

Cornwall (Mid-Cornwall Beacon and Repeater Group)—GB3NC is working on field trials until further notice at 10W and GB3HC is working at 25W. Both repeaters are at the same site—330m asl west of the old location.
Exmoor (ERC)—Thursdays, 7.30pm. Loughrigg, East St, South Molton. On the second Thursday of each month they meet other amateurs from nearby areas at the Imperial Hotel, Barnstable.
Plymouth (PARC)—3 March ("Antennas and Pye equipment mods for Ham use", D L Reeves), 17 March ("BT Goonhilly", G3KJK). 7.30pm. Plymouth Albion RFC, Beacon Park, Peverell, Plymouth. Sec G4SCA, tel 0752 337980.
Plymouth (P Polytechnic ARS)—For details contact D Salter, G1ERM, 92 Alma Rd, Pennycomequick, Plymouth PL3 4HD.
Plymouth (West Devon Raynet Group)—On the air 7pm, Sundays on S9. Details G3TGR.
Redruth (CRAC)—6 March (Three short talks by G4ZUI, G4WQL and G4USB), 10 March (Computer Section, "General principles of machine code", G3OCB), 17 March (Constructors' workshop). 7.30pm. The Church Hall, Treleigh, Redruth.
St Austell (ECC ARS)—24 March ("Interference and its regard to the licensing conditions", G3VWK). 7.30pm. ECC Laboratories, Pentewan Rd, St Austell.
Torbay (TARS)—8 March (Annual dinner dance at Templestowe Hotel, Torquay. Tickets £7.50 from G1EUA). Usual monthly meeting (Talk on digital recording). 7.30pm ECC Social Club, Ringslade Rd, Highweek, Newton Abbott. Sec G1EUA.

Past and present members of the Chelmsford ARS who attended the installation of RSGB President Willie McClintock (r), a long-time member of their society

REGION 10—E J Case*, GW4HWR, 2 Abbey Close, Tyrhiw, Taffswell, Mid-Glam. CF4RS tel 0222 810368.

*Acting until post is filled.

Cardiff (CRSGBG)—10 March ("Practical aspects of treating tvi", GW3NWS). Will members please note that the talk will commence at 7.30pm so that there will be plenty of question time. Pantmawr Hotel, Tyla Teg, Pantmawr Estate, Whitchurch, Cardiff. Sec GW0CUM, tel Cowbridge 3212.
Rhondda (RARS)—6 March ("Worked all Britain", talks with slides, GW3XHG *et al*), 20 March (AGM followed by OGM), 3 April (Clubs get together). 7.30pm. National Union of Mineworkers' Club, Tonypandy. Sec GW4BUZ, tel Tonypandy 432542.
Swansea (SARS)—23 March (Swansea Rally). 10.30am to 5pm, Patti Pavilion, for details see Mobile Rallies Calendar. Sec GW4HSH, tel 0792 404422.

REGION 11—RR B H Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Colwyn Bay (Conwy Valley ARC GW6TM)—13 March (Home Construction Competition), 27 March (Open meeting), 10 April (Talk by Dr D Last). 8pm. Green Lawns Hotel, Bay View Rd, Colwyn Bay. Sec GW4VVW, tel 0492 636376.
Deeside (Alyn & DARS)—March: ("RAE electronics and beyond", GW1KMV), ("All at sea with electronics", part 1, GW3PRA), (Same, part 2), April: (AGM). 8pm. Shotton Social Club, Shotton Lane, Deeside. Sec GW1ILZ.
Dolgellau (Meirion, ARS)—6 March (Constructional Contest). Dolserau Hall Hotel, Dolgellau. Sec GW3KOR.
Wrexham (WARC)—4 March (Club project), 18 March (Exchange and Mart), 2 April (DF Hunt on 144MHz). 7pm. Friends Meeting House, Holt Rd, Wrexham, Clwyd. Sec G4HRH, tel 0948 5161.

REGION 12—RR M R Hobson, GM8KPH, 17 Well Brae, Pitlochry, Perthshire PH16 5HH. Tel 0796 2140.

Aberdeen (ARS)—7 March (Junk sale), 14 March ("Shortwave listening", GM4SID), 15 March (RSGB Town and County Contest), 21 March (RSGB films; "Two pioneers of radio" and "VU7 Dxpedition"), 28 March (Beetle drive and tasteless tie competition. Ties to be worn all evening), 4 April (Junk stall). 7.30pm. Clubrooms, Thistle Lane, Aberdeen. Details GM4GXD, tel 04676 251.

REGION 13—RR A J Scott, 2 Manderston Grove, Duns, Berwickshire TD11 3PP. Tel 0361 83221.

Berwick on Tweed (Border ARS, GM0BRS)—7 March ("Meteor scatter", G1FFF), 21 March (Safety in the shack). 7.30pm. Tweed View Hotel, Berwick On Tweed. Sec GM1IRN, tel 0289 82491.
Dunfermline (DRS, GM3IDS)—Meetings 7.30pm at recently upgraded QTH, Outh Wireless Station, Knockhill, Dunfermline. Sec GM4WYR, tel 0383 736401.
Galashiels (G&DARC, GM4YEQ)—30 March (Outing to Tweedbank Bowling Club, 4pm). Other meetings, Wednesday 7.30pm at the Focus Centre. Details GM0AMB, tel 0896 55569.
Kelso (KARS, GM4KHS)—Each Monday, 7.30pm at Club Station, Abbey Row Community Centre. Details GM3VLB, tel 0573 24664.
Leslie (Glenrothes & DARC, GM3ULG, GM4GRC)—26 March (Visit to Mills Observatory, Dundee). Provosts Land, West End, Leslie. Details GM4TNP, tel 0592 755958.
Lothian (LRS, GM3HAM)—Second and fourth Wednesday of each month. 12 March (Talk, tba), 26 March (Junk sale). The Harwell House Hotel, Ettrick Rd, Colinton Rd, Edinburgh. Details GM4YPL, tel 0506 890177.
Scottish Borders (SB Repeater Group)—Covers GB3SB, HK, BT. AGM planned for early April. Details GM4BDJ, tel 0541 80018.

REGION 14—RR T G Wylie, GM4FDM, 3 Kings Crescent, Elderslie, Strathclyde PA5 9AB. Tel Johnstone (0505) 22749.

Ayr (AARG)—7 March ("Repeater Mystique", GM4COX), 21 March (Bring and buy sale). 7.30pm. Community Leisure Centre, Wellington Square, Ayr. Details GM3THI, tel 42313.
Glasgow (WoSARS)—7 March ("Getting started in QRP", GM3OXX), 21 March ("Those were the days", display of WW2 surplus equipment, GM2CHN). 154 Ingram St, Glasgow.
Loch Lomond (LLARC)—Wednesdays, 7pm. High Dykes Primary School, Bonhill. Details GM4LKJ, tel Dumbarton 64223.
Mid-Argyll (MAARC)—First Monday in each month. The Stag Hotel, Lochgilphead, Argyll. Details GM4VXA, tel 0546 3173.
Motherwell (MLARS)—14 March ("Test equipment", GM8BBA). Details GM4UXX, tel 0698 350926.
Stirling (SDARS)—NB new meeting place and time: The Argyll Centre, Princes St, Stirling, on second and fourth Thursday in each month, 7.30pm. RAE & CW classes, Tuesdays, 7.30pm. Details GM0BFS, tel Alloa 217702.

Tuesday 17 December saw the annual competition for the "The Bright Sparks Trophy" organized by the Kilmarnock and Loudoun ARC in The Broomhill Hotel, Kilmarnock. Teams from through-out the region took part: Stirling ARS, West of Scotland ARS, Cunninghamme and District and Mid-Lanark ARS and the hosts Kilmarnock and Loudoun.

After a very hard fought contest the holders, West of Scotland, had to undertake a tie-break situation with the Mid-Lanark ARS. Mid-Lanark won and took home the beautifully hand-made trophy to Motherwell. The winning team was Captain Ian Swan, GM8BSE, Tom O'Neil, GM4PRO and Gordon Hunter, GM3ULP.
Commiserations to the losers and a hearty vote of thanks to the chairman and committee of the Kilmarnock club for organizing the event and first class raffle. *RR14*

REGION 16—RR A Owen, G4HMF, 102 Constable Road, Ipswich, Suffolk IP4 2XA. Tel 0473 51319.

Braintree (B&DARS)—3 March (TBA). 8pm. The Community Centre, Victoria Rd (next to Bus Station), Braintree. Sec G6THE, tel 0376 25587.
Chelmsford (CARS)—4 March ("New developments in mobile radio", G3YTE). 7.30pm. Marconi College, Arbour Lane, Chelmsford. Sec G4KQE, tel 0376 83094.
Colchester (CRA)—6 March ("RSGB", J Nelson), 20 March ("Crime prevention", J Gavin, CPO). 7.30pm. Colchester Institute, Sheepen Rd, Colchester CO3 3LL. Sec G3FIJ, tel 0206 851189.
Felixstowe (F&DARS)—10 March ("Halleys Comet", P Whiting), 24 March (AGM). The Feather PH, High Rd, West, Felixstowe. Sec G3MJS, tel 27246.
Loughton (L&DRAS)—14 March (DF hunt). 8pm. Loughton Hall, Rectory Lane, Loughton. Sec G6LWR, tel 0279 29457.
Norwich (NARS)—5 March (Junk sale), 12, 19, 26 March (Technical topics). 8pm. Valley Drive Community Centre. 79 Plumstead Rd, Norwich. Sec G4WTR, tel 0603 610874.
Stanford Le Hope (SLH&DARC)—3 March (RTTY night), 10 March (HF night), 24 March (Project night). 8pm. St. Joseph's Parish Rooms, Scratton Rd, Stanford Le Hope. Sec G4OVG, tel 0375 642312.

REGION 17—RR T Emery, Wilverley, Old Lyndhurst Road, Cadnam, Southampton SO4 2NL. Tel 0703 812435.

Basingstoke (BARC)—3 March (Film show). Forest Ring Community Centre, Sycamore Way, Basingstoke. Sec G4WIZ, tel Tadley 5185.
Blackmore Vale (BVARS)—11 March ("Amateur tv"). 7.45pm. The Bell and Crown, Zeals (on the A303). Sec G1GRS, tel 0963 70969.
Bournemouth (BARS)—7 March (Natter night). 21 March ("Mutek front end design", G4DGU). 7.30pm. Kinson Community Centre, Kinson, Bournemouth. Sec G4EKE, tel 0202 877945.
Eastleigh (Itchen Valley ARS)—14 March (AGM), 28 March (Natter night). The Scout Hut, Brickfield Lane, Chandlers Ford, Hants. Sec G6DIA, tel 0703 863039.
Fareham (F&DARS)—5, 19 March (Natter nights), 12 March ("An update on 50MHz", G4JCC), 26 March ("Amateur radio in France", FE5GC). 7.30pm. Portchester Community Centre, Portchester, Hants. Sec G4ITG, tel 234904.
Guernsey (GARS)—14 March (Homebrew Competition for GARS Trophy). 8pm. The Lodge, La Corbinerie, Oberlands, St Martins, Guernsey. Sec GU1PMY, tel 0481 26392.
Liphook (Three Counties ARC)—5 March ("Microwaves", by G8NDJ), 19 March, ("The case for 'F' units", G3UUS). 8pm. The Railway Hotel, Liphook. Sec G0BTU, tel Petersfield 66489.
Portsmouth (Marconi EARS)—Last Tuesday in each month, 8pm. Broad Oaks Canteen, Portsmouth Airport. Watch for information on Marconi Anniversary during second week in June. Sec G3FWE.
Swindon (S&DARC)—6 March ("Electric power generation by nuclear means", G8SFM), 13, 27 March (Natter nights), 20 March ("Radio officer at sea", G3JUW). 7.30pm. Oakfield School, Marlowe Ave, Swindon. Sec G4YQZ.
Weymouth (SDARC)—4 March (Bring and buy sale and Constructors' Contest), 1 April (AGM). 7.30pm. Army Bridging School, Wyke Regis. Sec G6HKD.
Wimborne (FRARS)—Results of recent agm; chairman, G0API; treasurer, G6AKG. Meet every Sunday, 7.30pm at Flight Refuelling Social Club, Merley, Wimborne. Sec G0CDY, tel 0202 872503.
Winchester (WARC)—Third Friday each month, Red Cross HQ, Winchester. Please note change of venue and date. Sec G4ZNO, tel 0703 772191.

REGION 18—RR Ian Gibbs, G4GWB, 61 The Gables, Widdrington, Morpeth NE61 5QZ. Tel 0670 790090

Aycliffe & Shildon (ARC-G4ZKZ)—Meetings Tuesday evenings, Scout HQ, 4 Cross St, Shildon. RAE, morse tuition and constructional projects, last Tuesday monthly. **NB** new sec G3LUC, tel 0388 774466.
Berwick (Borders ARS, G0BRS)—7 March ("Meteor scatter" G1FFF), 21 March (Computers in radio, rtty and morse), 4 April (Visit, tba). Tweed View Hotel, Tweed St, Berwick. Sec GM1IRN, tel 0289 82491.
Consett (Derwentside ARS, G4PFQ)—3 March

(Natter night, RAE and morse tutorials), 10 March (RSGB videos, "The secret listeners" and "W5LFL shuttle"), 17 March (Natter night and RAE and morse tutorials), 24 March (Spectrum analyser night, bring along your rig for a sproggy check), 31 March (Natter night and RAE and morse tutorials). Consett Assocn FB Club, Belle Vue Park, Consett. Sec G3KMG, tel 0207 504198.

Easington (EARS, G4APN/G6APN)—27 March (Demonstration of 24cms tv, Mid-Durham TV Repeater Group, GB3AF). Easington Workmen's Club, Seaside Lane, Easington. Sec G4RIK, tel 0783 815331.

Morpeth (Northumbria ARC, G4AAX, G6AAX)—6 March (Business meeting), 20 March (Debate, Maidenhead v QRA). Old Telephone Exchange, Cresswell Rd, Ellington, Morpeth. Sec G6IIA, tel 0670 513026.

South Shields (South Tyneside ARS, G3DDI)—Meetings Monday evenings, Marine & Tech, College Club, South Shields. **NB** new sec G4XWR, tel 0632 543955.

There will be an official regional meeting in the Moat House Hotel, Coast Rd, Wallsend, Newcastle upon Tyne on Sunday 16 March at 2pm. Details from your area or regional representative. *RR18*

REGION 19—RR R J C Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Boreham Wood (Bears)—March (AGM). 8pm. The Wellington, Theobold St, Boreham Wood, Herts. For full details of venue contact T King, tel 01-207 3809.

Cheshunt (CDARC)—2 March ("HF propagation and sw antennas," C Griggs), 12 March (Natter night), 19 March (Junk sale), 26 March (Natter night). 7.45 for 8pm. Church Rooms, Church Lane, Wormley, Herts. Secs G4VMR and G4VSL, 51 High St, Ware, Herts, tel 0920 84250 evenings. Morse classes are also held.

Chiswick (ABCARC)—18 March (Members test equipment). 7.30pm. Chiswick Town Hall, High Rd, Chiswick, London W4. Sec G3GEH, tel 01-992 3778.

Edgware (E&DRS)—13 March (TBA), 27 March (AX 25 Info). 8pm. Watling Community Centre, 145 Orange Hill Rd, Burnt Oak, Edgware. Details G4SYI, 5 Dovercourt Gardens, Stanmore, tel 958 9868.

London (Civil Service ARS)—3 March ("Kent Repeater Group", G3TXF) 17 March (Lunch-time natter). **Advance notice,** 7 April (AGM), 12.30pm. Chair station manager, B Treacher, tel 01-212 8823, or sec G6IMM, tel 01-698 4437.

St Albans (Verulam ARC)—11 March ("Intermodulation, phase noise and dynamic range", G3RZP. This is the G3PAO Memorial Lecture). 7.45pm for 8pm. RAFA HQ, New Kent Rd, St Albans. Details G Wimpenny, tel 52003.

Southgate (SARC)—13 March ("TV and video equipment techniques", G8NGF). **NB** New QTH, Holy Trinity Hall, Green Lanes, Winchmore Hill, London N12. PRO R F Snarry, 12 Borden Ave, Enfield, Middx.

Stevenage (SDARS)—4 March (Receiver alignment) 18 March (AGM). SITEC Ltd, Ridgemond Rd, Telford Park, Stevenage. Sec G3OVT.

Welwyn (WDARC)—3 March ("Dummy Loads", G3BYG), 17 March (Informal and workshop). Sec GOAII, QTH 2, Sandpit Rd, Welwyn Garden City, Herts.

REGION 20—N F O'Brien,* G3LP, 26 Southfield Road, Gloucester GL4 9UD.

*Acting until post is filled.

Bristol (RSGBG)—24 March (Lecture by Bristol Weather Centre). 7.30pm. Small Lecture Theatre, Bristol University. Details G4SQQ, tel 0272 508451, or G4ROX, tel 0272 513573.

Bristol (South Bristol ARC)—5 March (Films—"GWR Locomotives in Steam", R Gardner), 12 March ("Contest planning evening", G4KUQ), 19 March ("ATV activity night", G0DRX), 26 March ("VHF activity night", G1OBI), 2 April ("CW in a foreign language", G4WUB). 7.30pm. Whitchurch Folk House, East Dundry Rd, Whitchurch, Bristol BS14 0LN. Details G4RZY, tel Whitchurch 834282.

Gloucester (GARS)—5 March ("Radio interference", talk by DTI), 12, 19, 26 March (Natter nights), 2 April (Construction Contest). 7.30pm. RAE and morse classes every Wednesday, 7pm. St John Ambulance HQ, Heathville Rd, Gloucester. Details, G6AWT.

Weston-super-Mare (WsMARS)—10 March ("The work of an aircraft controller"). 8pm. Rugby Club (off Drove Rd), Weston-super-Mare. Details G1DJW, tel 0934 514429.

Yeovil (Y&DARC)—6 March ("Semiconductor diodes", G3MYM), 13 March ("FET circuits", G3MYM), 20 March ("Modulation", G3GC), 27 March ("Natter night"), 3 April ("j notation", G3MYM). 7.30pm. Recreation Centre, Chilton Grove, Yeovil. Sec G3GC, tel 0935 75533.

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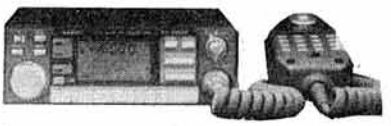

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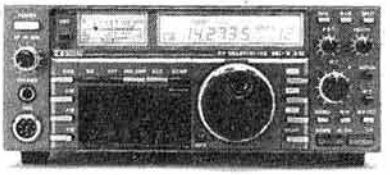

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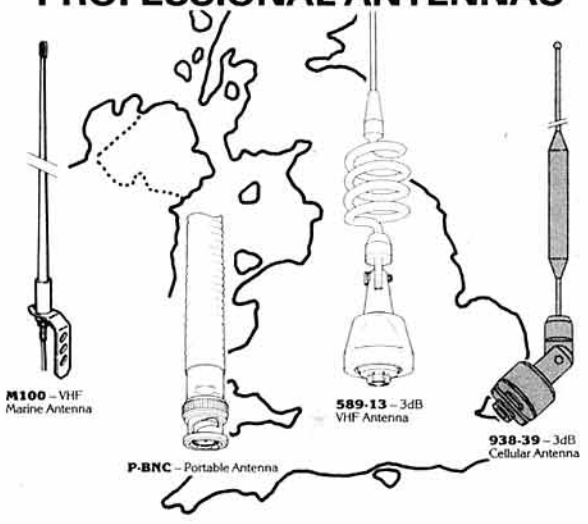

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The receive preamplifier uses one of the latest dual-gate GaASFETs in a noise-matched configuration. The technique together with careful optimisation of overall gain makes the preamplifier ideal for use ahead of any popular 2 metre transceiver. The sensitivity of most current transceivers is such that a preamplifier gain of 12dB is sufficient to ensure an excellent overall system figure. A preamplifier with gain excess of this figure will prove unduly detrimental to the strong signal handling performance of the transceiver. All circuitry is constructed on high quality glass-fibre printed circuit board and protection against reverse polarity is included. The unit is housed in a highly durable extruded aluminium enclosure, RF connectors are located on the rear panel together with the power lead and PTT phono socket. All necessary plugs are supplied.

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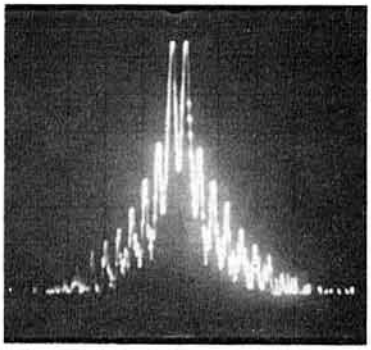
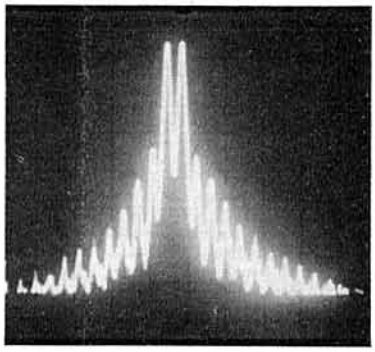


Two spectrum analyser photographs showing the excellent transmit intermodulation performance of a TVVF 50a driven well into alc. The left hand photo shows the performance at around 50.6MHz, whilst the other was taken at 52.6MHz. Equipment used; two-tone source (muTek), TVVF 50a s/no 11781, 30dB 100W attenuator, Hewlett Packard 141T with 8555A and 8552B spectrum analyser. Power output—12Wpep, tone spacing 2kHz, 10dB div^{-1} vertically.



This month I'd like to introduce you to a new piece of muTekery: the GMFA 144e 144MHz masthead preamplifier. Why have we introduced a new 2m preamplifier? Performance!

The GMFA 144e uses a pair of newly available large signal GaAs mosfet in a "noiseless feedback" configuration. This allows a rather respectable input third order intercept point (we measured around +15dBm in our prototypes!) along with a noise figure (again measured on our prototype) of around 0.7dB. The bandpass filtering is, of course, up to our usual standards!

We've designed the GMFA 144e to handle very large powers in the transmit mode. In many of our export markets the power levels allowed are very much greater than in the UK. As an example, US amateurs are now permitted to generate up to 1.5kW. We've yet to complete evaluation of the power handline performance as we're test equipment limited! Our pair of 8874's won't produce much more than 1.1kW into the termaline, but the relays we've chosen will handle this comfortably, and we expect to be able to rate this unit to take into account the US power limits.

Not only will the GMFA 144e handle large through powers when used in conjunction with one of our sequencers, but it can also be used at lower powers in an rf switched mode! Here up to around 250W can be handled. You can buy a GMFA 144e, use it with rf switching initially. As you upgrade, the addition of a sequencer will allow you to handle powers to the UK legal limit.

As I write this, we've not yet completed our pricing, but we expect the GMFA 144e to sell for a little more than the old SBLA 144e and less than the GFBA 144e. A phone call will bring full information.

Transverters

I gather that you'll see in this issue of Radcom a review of our TVVF 50c. We're not entirely happy with this, and are convinced in our own minds that in at least one aspect the review transverter was faulty. We do sometimes make mistakes and this may well be one! If you'd like to see another review of this design I'd suggest that you obtain either a copy of Amateur Radio April 1985 or the forthcoming RSGB 'Good Rig Guide'. The spectrum analyser pictures show the performance of a TVVF 50a and TVVF 50c taken from recent production. 'Nuff said?

. . . and Prices

The price list below contains several revisions. They're not all increases!!! Where we have been forced to raise prices the increases are usually below inflation. It's thanks to those people who have bought so many of our products that we have been able to streamline our production processes and to pass the savings on.

Chris Bartram, G4DGU

The range

		£
TVHF 230c	Very high performance 2m to all 9 hf band transverter	299.90
TVVF 50c	Very high performance 2m to 6m transverter	209.90
TVVF 50a	Very high performance 10m to 6m transverter	249.90
TVVF 144a	Ultra high performance 10m to 2m transverter	249.90
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SLNA 144s	Rf switched 2m preamplifier	41.95
SLNA 145sb	Optimised preamplifier for the FT290R	31.90
GMFA 144e	Ultra high performance 144MHz environmentally cased masthead preamplifier	119.90
GLNA 432e	Masthead mounting 430-440MHz high performance gasfet preamplifier. 0.9dB typical noise figure 250W through power. Supplied with ATCS 500 sequencer controller	159.90
GLNA 433e	Masthead mounting 430-440MHz high performance GaAsfet preamplifier. Rf switching. 50W through power. 1dB noise figure	89.90
BLNA 432e	Sub-miniature 70cm preamplifier. 1.3dB typical noise figure. Requires external filtering	14.90
BBBA 500u	High dynamic range 20-500MHz preamplifier. Ideal for scanners.	34.90
RPCB 144uB	Complete replacement front-end for FT221 and FT225	84.90
RPCB 251ub	Complete replacement front-end for IC211 and IC251	89.90
RPCB 271ub	Complete replacement front-end for IC271 (e and h)	94.90
GDIF 107ub	Gunn diode WBFM back end board	59.90
LBPF 144u	Low-loss 144-148MHz two-pole bandpass filter 0.3dB typical insertion loss. 120W through power	24.90
LBPF 432u	Low-loss 430-440MHz two-pole bandpass filter 0.3dB insertion loss. 100W through power	24.90
XBPF 700ub	Microstripline bandpass tvi filter	4.40
ATCS 500	Sequencer controller	34.90
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Carriage/postage rates		
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Access VISA

GUIDE TO UTILITY STATIONS 1986 (4th edition—December 1985) including *GUIDE TO RADIOTELETYPE STATIONS (12th edition)* 460 pages. £19.00 or DM60.—ISBN 3-924509-86-7

The fully revised new edition now includes additionally the VLF and LF frequency band from 0 to 150 kHz which is covered by most general coverage receivers, as well as a new chapter listing the transmission schedules of all meteorological FAX stations with full details. The 1985 revision of the 1982 Radio Regulations, as well as the new CCITT gentex and telex service codes in force since 01 October 1985, are also listed.

This unique manual covers the complete shortwave range from 3 to 30 MHz, plus the adjacent frequency bands from 0 to 150 kHz and from 1.6 to 3 MHz, and includes details on all types of utility stations including FAX and RTTY stations. Besides CW, FAX, SSB and standard RTTY with its derivates in the Arabic, Cyrillic and third-shift Cyrillic alphabets, sophisticated modulation systems are represented by hundreds of frequencies of stations using VFT (Voice-Frequency Telegraphy), FEC (Forward Error Correction) and SITOR (Simplex Teleprinting Over Radio)/AMTOR.

The numerical frequency list covers 15083 frequencies of stations which have been monitored during 1985, thereof 29% RTTY and 3% FAX. Frequency, call sign, name of the station, ITU country/geographical symbol, type(s) of modulation and corresponding return frequency, or times of reception and details, are listed. All frequencies have been measured exact to the nearest 100 Hz. Radio Regulations on frequency allocations, including the complete Table of Frequency Allocations from 9 kHz to 150 MHz with all footnotes, are included. With reference to the previous (3rd and 11th) editions, 1705 new frequencies are listed, 1386 frequencies have been deleted, and 3227 entries have been modified.

The alphabetical call sign list covers 2976 call signs, with name of the station, ITU country/geographical symbol, and corresponding frequency (-ies). An additional section—arranged in country order—covers 365 stations operating without complete official call sign, and co-channel stations. The formation of call signs is explained in the Radio Regulations on the identification of stations. The table of allocations of international call sign series is also included.

80 RTTY press services are listed on 502 frequencies—not only in the numerical frequency list, by also

—chronologically in a comprehensive list for easy access around the clock;
—alphabetically in country order with frequency, call sign and schedule. Additional alphabetical indices cover
—Schedules of 63 meteorological FAX stations on 239 frequencies.
—80 meteorological RTTY stations on 261 frequencies.
—867 mnemonic abbreviations, including all utility station name abbreviations, all abbreviations for regional states in Australia, Canada, USA and USSR, all ITU symbols designating countries or geographical areas, and all traffic abbreviations and signals.
—182 service codes and abbreviations used in gentex and telex operation.
—Schedule of NAVTEX transmissions of navigational and meteorological warnings on 518.0 kHz.
—All Q-code groups including all special air/maritime groups from the QA-QO series.
—322 Z-code groups for civil and military use.
—Phonetic alphabet and figure code.
—SINPO and SINPFEMO signal reporting codes.
—Designation of emissions, with associated examples from A1AAN to R3EGN.
—Classes of stations from AL to TZ.
—Comprehensive list of terms and definitions.
—Reverse list—in area order—of the Aeronautical Mobile Service (AMS) frequency allocation plan, with the corresponding Radio Regulations.
—Maritime Mobile Service frequency allocation scheme.
—Regulations on technical characteristics of facsimile equipment.
—Addresses of 605 utility stations in 171 countries, in country and category order.

Three AMS network allotment area world maps (each 465 × 225 mm) are attached, covering MWARAs, RDARAs and VOLMET Allotment and Reception Areas.

SUPPLEMENT SERVICE to the Guide to Utility Stations £8.—or DM25.—
Straight from the source, the subscription of the Supplement Service keeps you fully informed about the latest monitoring results. It comprises two recapitulatory supplements to be isued in April and August before the publication of the 5th edition of the GUIDE TO UTILITY STATIONS in December 1986. Each supplement will include several hundred new frequencies and call signs of stations monitored until that date, in the same format and quality as the reference book itself.

Reference

Dennis Rodgers G4CKF, Great Britain—15 November 1985
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J. P. Hawker G3VA in RSGB RADCOM January 1985, Book Review
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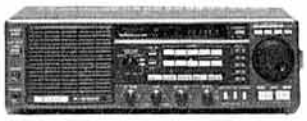

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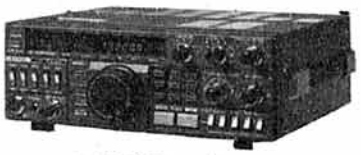

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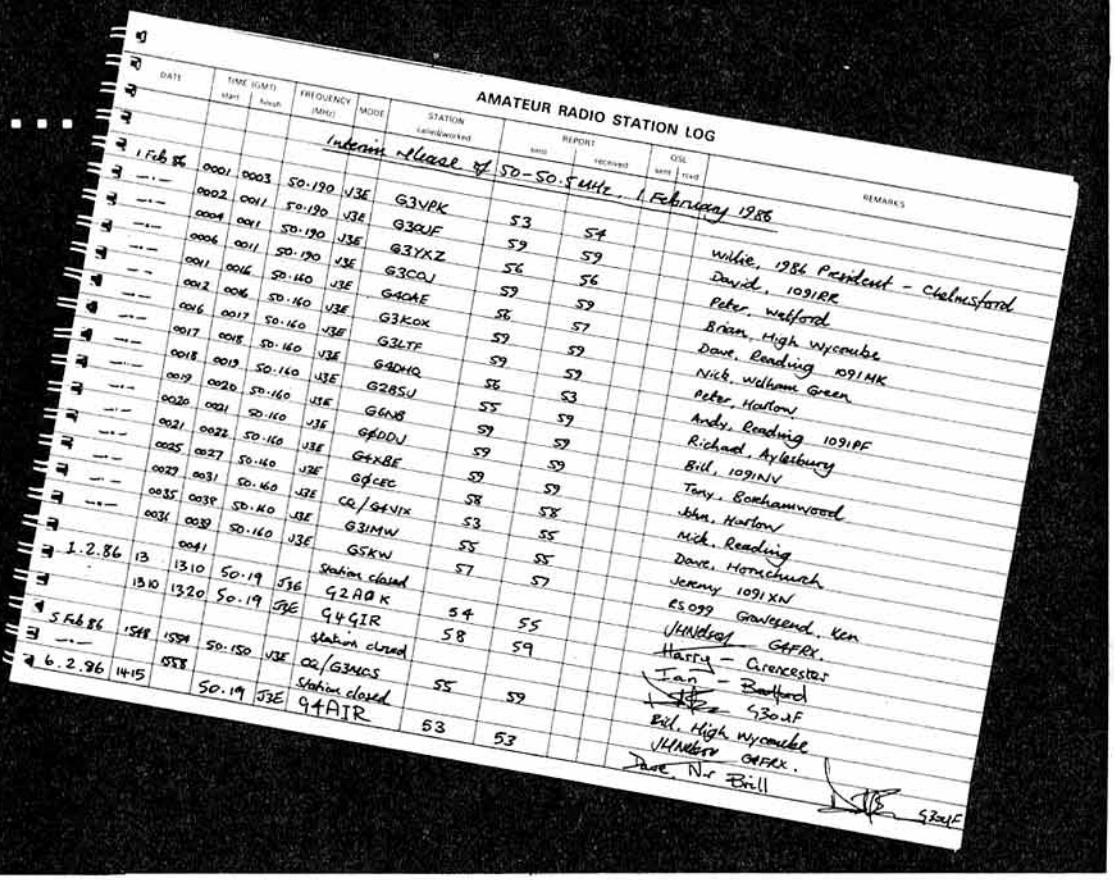
THE
RSGB News Bulletin
PAGES

50 MHz Day 1....



The latest stage in the 50 MHz experiment got off to a good start in the early hours of the morning of Saturday 1 February - lots of activity and plenty of stations to work and the pattern was continuing as we went to press. GB3RS was on the air from the proverbial word go, first contact was with this year's President, Willie McClintock, G3VPK. Headquarters worked about 20 stations in the first session - log page shown above gives a flavour of how it went (yes, GB3RS does QSL 100%). HQ site at bottom of hill is poor for VHF, so best DX from Potters Bar on first night was Reading, all of 20-odd miles - oh well, it can only get better....tnx G4OAE, FB DX OM.

Reports suggest quite reasonable range under average conditions despite modest ERP and antennas in use, but some fading apparent even on short paths with occasional "bursts" of stronger signals - lots of people using CW to make the most of the low power. Activity tends to cluster round the calling frequencies a fair bit - remember to move away from the calling frequency as soon as you've established contact so that you don't make life difficult for other users.

Lots of people also reporting the band to be noisy - thermostats, etc, S9 on 50 MHz when they're just audible on 144 MHz. We've also had several reports of high sun noise, especially early in the morning. Not too much in the way of meteor activity yet - things should look up here with the April Lyrids, by which time sporadic E on 50 MHz won't be far away. Jimmy, ZB2BL, was an excellent signal in the south of England last year, and we gather that there may be some activity from Cyprus before too long.

It's now been confirmed that 20 special 50 MHz permits are to be issued to Irish Class A licence holders, valid for one year from 1 February 1986 - as we went to press they'd been issued to EI2W, EI9D and EI6AS. Operating times are quoted as "outside peak television hours", whatever that means, and the other conditions are apparently similar to the UK ones except that EIs can use 50 - 51.75 MHz.

We also heard just as we went to press that Tiago, CT1WW, now has a 50 MHz permit. He's only running 3W - we don't know whether this is his licensed power or all he has available for the moment. No news on a general CT 50 MHz allocation yet.

A couple of cautions - first of all, WATCH THAT ERP. We know we've said it all before, but broadcasting and the land mobile service are still primary users of the band in Europe and UK amateurs MUST NOT cause interference to these services. If we do, there is no doubt at all that we'll

*** * * lose the band * * ***

so please be very careful. Do be prepared to reduce power if someone tells you you're very loud - GB3RS usually reduces power until the other station tells us we're about 5 and 8 - and please do the proper calculation to make sure you're not exceeding the ERP limits. Don't forget the "ERPogram" in last month's edition - if you need another one for the shack (maybe you've worn it out working out your ERP....) we'll gladly send you another on receipt of a stamped addressed envelope to our Membership Services Department. The other thing worth thinking about is the level of second harmonic coming out of your Tx. A member of Headquarters staff had a shock when looking at output of his homebrew transverter on an analyser - 2nd harmonic only -26 dB below 12 watts as built (seven-pole filter installed smartish) and well-known commercial rig only -30 dB. Problem is that the harmonic is in Band II - broadcasting and police territory - and we're already having enough trouble with the RIS without another set of problems.

Seems to us that lowpass filter a Very Good Idea for 50 MHz rigs - we'll publish an easy-to-build design next month, and in the meantime South Midlands Communications should have some for sale as you read this. So two things to check before you go on 50 MHz:

1. Have I worked out my ERP and am I happy it's within limits?

2. Is my level of second harmonic well down?

One minus point on 50 MHz is that DTI is not prepared to allow special-event stations access to the band. Reason is that special-event variations to the licence are regarded as extensions to clause 1(1)(ii), i.e. "temporary premises", for 28 days, and until the 50 MHz review commencing in 11 months' time, restriction on "temporary premises" operation remains in force.

We didn't tell you last time, but RSGB made special arrangement with Powers That Be for the biggest auroral event for years to take place the weekend after the opening of 50 MHz - just long enough for you to get your antenna up and the Rx working. Big solar flare early in week gave A index of 75, result was aurora during afternoon/evening 7 February and then very big one next day. Seems to have begun around lunchtime and ended about 0200 next morning - full info in G8VR's column next month, but 50 MHz going great guns, much less Doppler than on 144 MHz and loud signals despite low ERP. Seemed to be at least two separate reflecting areas, one to north-west - did anyone work W/VE on 50 MHz? Lots of 144 MHz DX as well - dozens of Eastern Europeans very loud in London, especially RQ2GAG who was 59A on CW at times. Other countries audible were EI,PA,F,ON, DL,Y22,OK,SP,UQ2,UR2,HG,YU,YO and SM. BBC Radio News

50 MHz beacon list Mk II

FREQUENCY	CALLSIGN	LOCATION	LAT/LONG	ERPW	ANTENNA	MASL	BEAM DIRECTION	MODE
50.005	H44HIR	SOLOMON ISLANDS		-		-		
50.005	ZS1SIX	CAPE PROVINCE		10	TURNSTILE	174	OMNI	CW
50.010	ZS1STB	STILL BAY	34°23'S, 21°24'E	50	2 X DELTA LOOP	15	NORTH	F1
50.010	ZS6STB	VEREENIGING		-		-		
50.015	SZ2DH	ATHENS		-		-		
50.020	GB3SIX	IO73TJ		100	3 ELE YAGI	58	WEST	F1A
50.025	ZS6SIX	KEMPTON PARK		-		-		
50.030	ZS6PW			-		-	N OR NNW	A1A
50.035	ZB2VHF	IM76HE		100	5 EL YAGI	-	WNW OR S	A1
50.039	FY7THF	FR. GUIANA		-		-		
50.041	WA8KGG	NE OHIO		-		-		
50.050	GB3NHQ	IO91VQ	51°43'N, 00°12'W	15	TURNSTILE	35	OMNI	F1A
50.055	LA	OSLO		-		-		
50.055	LA***			-		-		
50.060	GB3RMK	INVERNESS		30	DIPOLE	201	NORTH/SOUTH	F1A
50.060	ZS6DN/B	PRETORIA	25°44'S, 28°12'E	100	4 ELE YAGI	1280	NORTH	
50.062	PY2AA	SAN PAULO		25	GROUND PLANE	-	OMNI	A1
50.062	W3VD	LAUREL, MD		-		-		
50.070	4U1ITU	GENEVA		-		-		
50.075	VS6SIX	HONGKONG		30	GROUND PLANE	-	OMNI	
50.099	KH6EQI	PEARL HARBOR		-		-		
50.500	5B4CY	ZYGI KM64PR	34°45'N, 33°19'E	15	GROUND PLANE	30	OMNI	F1A
50.925	ZS1VHF	25KM W DURBAN		200	6 ELE	-	NW	A1
50.945	ZS1SIX	CAPE PROVINCE		8	3DB VERTICAL COLIN	-	OMNI	FSK
52.200	VK8VF	DARWIN, AUS		15	GROUND PLANE	-	OMNI	
52.300	VK6RTV	PERTH, AUS		-		-		
52.320	VK6RTT	CARNARVON		-		-		
52.330	VK3RGG	GEELONG, AUS		4	CROSSED DIPOLES	400	OMNI	F1
52.350	VK6RTU	KALGOORLIE, AUS		-		-		
52.500	JA2IGY			-		-		
52.500	ZL2VHM	PALMERSTON NTH		-		-		
52.510	ZL2MHF	MT CLIMIE		5		890		F1

on Sunday morning reported extensive visual displays as far south as Essex. Special tnx to BBC TV weatherman John Ketley - on Saturday evening he said "...oh, and my friend Jim Bacon says there's a big aurora tonight" (nudge nudge - Jim is G3YLA).

Final thought on 50 MHz this month came in a message from the American Radio Relay League, as follows;

"It is a great pleasure to welcome the amateurs of the United Kingdom to occupancy of the 50 MHz band. British amateurs have played an important part in the development of the band, from the first successful crossband contacts in 1947 to the present day, and we can now expect to see even greater contributions. Whilst it is unlikely that propagation will permit G/UK contacts immediately, we look forward to summer Es activity and to future F2 activity during sunspot peaks with great anticipation. Congratulations to RSGB on a significant accomplishment in overcoming the enormous regulatory hurdles". —K1ZZ

A new 144 MHz beacon became operational from Iceland on 19 January 1986. Callsign is TF8VHF and it's on 144.939 MHz; it runs 40W to a 6 ele Yagi 16 metres agl and beaming about 100 degrees. President of Icelandic Radio Amateurs Kris Benediktsson, TF3KB, says beacon's already been copied in Norway and seeks reports - should be audible in UK under right conditions.

ITU's Richard Butler speaks at Region 3 Conference

The IARU Region III Amateur Radio Conference held in Auckland, New Zealand in November 1985 had a tremendous honour - its opening speech was made by no less than the Secretary-General of the International Telecommunications Union, Mr Richard Butler. We feel that elements of his speech were significant - here's some of what he said;

"I am very honoured to participate in the General Assembly of the IARU Region III and to bring you greetings from the 160 member states of the International Telecommunications Union. I am pleased to see radio enthusiasts from so many countries present here in this beautiful city of Auckland. The choice of venue for this year's Conference is, I believe, especially appropriate, being situated in a country which has a remarkable record of contributions to the development of international telecommunications and which is encouraging radio amateurs to enjoy their hobby and to render service to the community.

"Amateur radio is the only hobby provided for by international treaty, i.e. the Radio Regulations annexed to the International Telecommunication Convention. These define amateur radio as a 'service of self-training, intercommunication and technical investigations carried out by amateurs, i.e. by duly authorised people interested in radio technique solely with a personal aim and without pecuniary interest'. Radio amateurs belong to a group of devoted enthusiasts scattered all over the world. They have developed a network of radio communications that extends over the globe, probably the only system which can be correctly described as global.....

"In 1907 voluntary investigators conducted circuit tests on short waves to demonstrate that stable communications were feasible on wavelengths below 200m. These pioneers soon had many disciples but the amateur field was quickly appropriated by people fond of tinkering with equipment and interested in picking up transmissions from large broadcasting stations....

"The point I want to make in bringing this early history to your attention is that systematic division of the radio frequency spectrum as we know it today stems largely from the use of the ionosphere for radio communications. In this regard, major contributions were made by radio amateurs in conducting research in radio technique and in the properties of the ionosphere with comparatively simple apparatus. Radio amateurs were thus involved in the exploration of space long before the age of rockets and satellites, and well before the International Radio Conference held in Washington DC in 1927 which drew up the first allocation table extending into the high frequency part of the spectrum.....

"Only a few weeks ago the first session of the World Administrative Radio Conference on the use of the geostationary satellite orbit and the planning of space services utilising it concluded its work in Geneva. I am glad to know that, as was the case on the occasion of previous World and Regional Administrative Radio Conferences, the IARU again sent a delegation of radio amateurs to follow the proceedings of this historical and extremely complex conference in its search for acceptable means of guaranteed access to the geostationary orbit. I am sure too that they made new friends for amateur radio among the representatives of ITU's member countries.

"Radio amateurs built the series of OSCARs and tried them out as soon as satellite communication was found feasible. Radio amateurs have served as a nucleus to bring about many advances in radio techniques and in the improvement of human relationships. This nucleus will continue to grow in size and advance in level. Because they are amateurs, the only driving force urging them - and there are more than 600,000 in the world - is interest; interest in human contact and interest in improving their techniques. It is a hobby which I would

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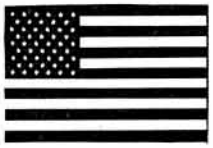
like to see introduced on a large scale in as many ITU member countries as possible. At the beginning of the electronic age many people were afraid of science and engineering, assuming that these subjects are beyond their grasp, but radio amateurs can show them otherwise by their own experience. Amateur radio clubs, particularly those in developing countries, can interest laymen and young people in radio - and through radio, science in general.

"...Share your amateur radio know-how with your friends and with youngsters of your respective countries and to transfer it to the young generation of the many developing areas and countries of Region III. ITU seeks your co-operation. Indeed, with the IARU we are arranging in 1986 a training course in the administration of the amateur radio service in Nairobi, Kenya, on the eve of AFRICA TELECOM 86; we are exploring similar possibilities in Region III.

"I am privileged to be patron of the International Radio Club, and most of you have had the opportunity to contact its international amateur radio station 4U1ITU at ITU Headquarters. You are welcome to operate this station whenever you come to Geneva.

"In October 1987 the ITU is organising TELECOM 87, the 5th quadrennial World Telecommunication Exhibition and Forum in Geneva. It is the world's largest and most prestigious telecommunications event. Floor space is available for an IARU pavilion; why not make TELECOM 87 your rendezvous for an eyeball QSO with your friends from other parts of the world? Operate 4U1ITU from Geneva. If you cannot be with us in Geneva, meet us on the air. Plan special amateur radio events to highlight TELECOM 87 now.

"May I offer you my best wishes for the success of your noble efforts".



RadCom - fly the mag....

Members in the USA who have in the past received RadCom by surface mail may be surprised to receive this issue rather earlier than normal - reason is that the Society has switched to airfreight. We hope this will make our magazine more topical and of greater interest to you (and the HQ station callsign is GB3RS and we'll be delighted to try 50 MHz skeds.....)

Books - SPECIAL PRICES

There are special offers on Callbooks while stocks last. The RSGB 1985 Callbook now costs £2.95. The 1985 "DX and US Listings" Callbooks are priced at £8.49 each. In addition the 1985 World Radio and TV Handbook is available at the special price of £8.93. Stocks of all these items are limited, so place your order in good time - we suggest you telephone before ordering to make sure we still have some of what you're interested in.

We also have a special offer which should interest RTTY aficionados - the Teleprinter Handbook is on special offer at £5.83.

All prices are by post to members - even cheaper over-the-counter, assuming the cold snap's over and you can actually get down Cranborne Road without becoming horizontally polarised.....

RAE Lasham satellite station now has a "Weatherwatch" telephone line available between 5.15 pm and 8am; it gives details of current satellites, including ECT, LEC, nodal period etc. Number is 0256 83 577

AMATEUR RADIO MORSE TESTS

As from 1 April 1986 the Department of Trade and Industry has appointed the Radio Society of Great Britain to provide Morse test facilities for the purpose of amateur radio licensing.

The RSGB Morse test will replace the test previously given by British Telecom International. The format of the Morse test will not change.

The RSGB was notified in November 1985 that it had been appointed to conduct tests after 1 April 1986. At present the Society is establishing Test Centres in each county in England, Wales and Northern Ireland, in each Region in Scotland and on each main off-shore island. Not all Centres will be operational by 1 April 1986.

If you wish to take the Morse test after 1 April 1986, please write to the Society at the address below. On receipt of your name and full address (please include your postcode) we will send you a list of Centres available in your area together with dates and times of tests and an application form.

Please do NOT write to us prior to 7 March 1986.

The address to which to write is;

Morse Tests (BR)
Radio Society of Great Britain
Lambda House
Cranborne Road
Potters Bar
Herts EN6 3JW

THE Members' Ads PAGES

FOR SALE •••••••

HOUSE MOVING SALE ALL ITEMS MUST GO! RTTY terminal board, vgc, with data, £30. RS232 Netronics computer terminal, advanced features, with data, £125. S100 boards, all working, most with data, 32k DRAM (internal refresh), £45. 16k DRAM (internal refresh), £20. Bytesaver eight EPROM programmer, £30. Imsai front panel/diagnostic unit £30. Pack of 3x8080 CPU, 16k SRAM with spare unpopulated board, £25. Pair new Shugart SA800 disc drives with data & CP/M, £150. Set of 7 Acornsoft business software on disc, £40, (cost £175). Spectrum: switchable interface, £10. 80 off recent cassette games, £50. Interface-1 with RS232 lead, £15. BBC: Wizard joyROM, £5. Graphics ROM, £15. 8off Acornsoft cassettes, £15. BC348 with manual, £35. Pair new 813 valves, £20. 19" rack mounted blower with flow switches ideal for 813 pa? £25. Hitachi 1" Vidicons, unused, £15 ea. Pye Westminster, boot mount, with all accessories on approx 156MHz, 25kHz spacing, FM, 10ch offers? Set of four SEI 1.6MHz xtal filters (DSB/USB/LSB/CW). 7 years mint condx RadCom to present, offers? G3TDZ 160/80m TCVR, QRP, with data, was in RadCom, £35. Telequipment D66A manual, offers? Thorn 8000 LOPT, new, £10. All items carriage extra. G8POO, QTHR, tel: Stocksfield (0661) 843449.

RSGB NEWSLETTERS

Microwave Newsletter
VHF/UHF Newsletter
- every 6 weeks approx.

DX News Sheet
- every Wednesday

DON'T MISS OUT

Newsletter subscription info from Circulation Dept, RSGB HQ

SONY ICF6700, £150 ono. WANTED: Straight key with coax lead for TS120S for white stick operator. Bruce, RS53584, tel: Salisbury 780396.

TOKYO MASTHEAD PRE-AMP, cost £94.99, accept £60, boxed & full mounting kit, instructions. 16-ele ZL Special Yagi, full mounting kit, £25. Shinwa bandpass filter for 2m, £7.50, plus postage. Mike, G6MNX, QTHR, tel: York (0904) 422773.

YAESU FT290R with nicads, chgr, YH1 headset & mic, also flexiwhip, vgc, £265. FC757AT auto atu in vgc £200. GOCCU, NOT QTHR, tel: Bristol (0272) 721744.

FRG7 RX vgc, no mods, manual, £125. G1CIA, NOT QTHR, tel: 061-626 5597, after 5pm.

WPO MICRON CW TCVR, 6-bands 80-10m, constructed to high standard & in gwo £130 ono. Paul, G4VAM, NOT QTHR, tel: 0733-62848, evenings.

726R SATELLITE BOARD, surplus to requirements, £60 G4HKY, QTHR, tel: Huddersfield (0484) 862773.

YAESU FT790, £200. Trio 9R-59DS gen/cov RX, AM/SSB £35. G6TFB, QTHR, tel: Chelmsford (0245) 265152.

EDDYSTONE EC10, £45. Marconi vtvm, £2. Sig/gen, 85kHz-32MHz, £15. Solartron 4" scope, £20. DVM, £10. Philips N1700 VCR, £40. Ferrograph, £5. Grundig TK120, £5. Collaro Studio, £2. Car radio, £3. 13.8V 3A psu, £3. Michalak, tel: 0602-266492.

ICOM IC701 classic HF TCVR, gc, c/w matching Icom mains psu, £425 ono. Drae 12v 24A psu, hardly used original packing, £100 ono. Yaesu FTV107R 2m tvtr, easily adapted to suit most rigs, £70 ono. G4SJP, tel: 040924-667, evenings.

NEW UNUSED 23cm GEAR, XYL ill: Fortop TVR1300 RX, £95. Fortop TVD100 demodulator, £15. 2off CR23 antennas, £20ea. 2off AR1002 rotators, £25ea. 2off oscilloscope transformers, £5ea. Collect or carriage extra. Burton, G2JR, QTHR, tel: Coventry (0203) 455021.

TR2300, boxed c/w nicads, case slightly scratched hence £90. Wood & Douglas ATV-1 3WTVTX, used once, £65. Bearcat 220 VHF/UHF scanning RX, some accessories lost, inspect before buying, £100. G6DGX, NOT QTHR, tel: 01-385 7203, evenings.

DRAKE TR4CW c/w MS-4 psu/spkr plus Shure 444 mic with speech processor, A1 condx, some spare valves £460. G4FPU, QTHR, tel: 0707-320741.

TRIO TL120 HF linear amp, 10-80m, 13.8V solid state, ex condx, to match TS130V TCVR, original packing, £95. G3YMU, QTHR, tel: 0329-833014.

TRIO 3500 70cm handheld c/w base stand/quick chgr, mobile mount/chgr, spkr/mic, spare nicad, s/case, books, full outfit immaculate, only £299. Also AMT2 software package for Commodore 64, £29. G6STE, QTHR, tel: Bedford (0234) 768854.

TRIO TS530SP TCVR, 14 months old, prefer buyer inspects & collects. G4SAZ, tel: 0539-24461.

TRIO 2500, mint with leather case, £200. K Williams, 3 Llugwy Road, Kinmel Bay, Rhyl, Clwyd LL18 5LD.

MOSLEY TA31 rotary trap dipole, 10/15/20m, £40. Colormaster lightweight rotator, suits small or medium VHF beams, needs new 'U' bolts hence, £15. Buyer collects. Paul, G4MJM, tel: Grays Thurrock (0375) 371475, evenings or weekends.

PYE CAMBRIDGE 12V mobile, air-band, xtalled for 129.7, £30. Mallory 3-section VHF spiral inductuner, £10. WANTED: Air-band RX type R512. GU3HKV, QTHR, tel: 0481-47278, 6-7pm only please!

HAVE YAESU FT902DM, all mode HF TCVR, mint condx, will exch for Yaesu FT726 with modules, must be in mint condx. Also AOR-2002 scanning RX, 25-1300MHz, new, in box, £350. Adams, tel: Irvine 217611.

"ADMIRALTY HANDBOOK OF WIRELESS TELEGRAPHY", 1938 vol 2, ex condx, offers? G6NYV, QTHR, tel: 01-561 0293, anytime.

TRIO SP930 spkr unit. SM2200 stn monitor. HF mini beam. Copy "World at Their Fingertips". Geoff Barnes, G3AOS, 3 Church View, Sutton Lane End, Macclesfield, Cheshire, SK11 0DT.

DATONG D70 Morse tutor, vgc, passed test so only £28. Star Gemini 10X dot matrix printer with 95% of Epson control codes, £120. Mitsuki 80-200mm F4 zoom lens, Canon FD mount, £40. Khee, G0DXS, QTHR as G1MUR, tel: 061-225 5202, evenings.

VIDEO GENIE 48k microcomputer c/w monitor, twin 5.25" floppy-disc drives plus much software incl Visicalc, RTTY, CW, games, word processing, assembler, LDOS etc, £150. 2m linears: Sota 100W, £50; REW design 3W to 20W, £17.50. Datong active antenna, indoor, £15. G3MSW, QTHR, tel: 05827-5549

SX200N SCANNER with psu & operating instuctions booklet, still in original box, £165 incl p&p, will consider p/exch for FT707 atu or FC700 atu cash adjustment required. Canavan, RS48056, tel: 0282-59320, after 5pm.

RADCOMS FROM 1971, most complete, offers? Blowers, £5. RF strength meters, £2. SWR bridge, £5. Dummy load, £15. 30W combo amp, £60 ono. Casio keyboard, £80 ono. Linsley Hood cassette deck & 30+30W amp, £100 ono. G3XFW, QTHR.

YAESU FT203R, absolutely mint 2m handheld, toneburst, rptr shift, vox, little used, boxed with manual plus PA3 car adapter/chgr, fitted FMB-3, £180 ono. Still looking for Sphinx TX & Pyramid linear. G4GVM, NOT QTHR, tel: Langport (0458) 252848.

AZDEN 144-146MHz FM, 5/25W o/p, £125 ono or will swap for FRG7, KW2000 or Microwave Modules MML144/100LS linear. Would deliver within 50 miles radius. Also large collection of CBM64 computer games from £2.50ea. Peter, G6WWV, QTHR, tel: Blackpool (0253) 591605.

TRIO 2300 2m TCVR, original packing, manual, case, nicads, helical, rev-rptr mod, chgr, battery lead, also 10W linear included, £150. Home-brew psu, 13.8V 5A, twin meters, over volts & current protected, £35 or swap Datong D70. Philips N1700 VCR, working, gc, tunes bands I/III/IV/V, good for DXTV use, plus tape, £50. Finally the best item!!! Mk1 Cortina 1965, fitted 3 litre Ford V6, all mods eg suspension, brakes etc, all new, full spec available, owned since 1967 stored since 1980, has MOT June '86, £2,500 ono. Keith, GW8WNB, QTHR, tel: 03417-7714, 6-7pm or Barmouth 281049, work, 9-5pm.

FREE FOR COLLECTION...! Teleprinters, Creed 85B (printing perforator) c/w psu, 7ERP (mains), Class D wavemeter. FOR SALE: TU Spacemark SRD1, gwo, £10 Unused valves: PCL85, EF91, £1 ea; PCL82, PY801, EZ81, 50p ea. G3ZOG, QTHR, tel: 0783-280080, 6-8pm

KW204 TX, KW202 RX, vox unit fitted, new valves recently, in gc, £225 collected, no split. G3EJA, QTHR, tel: Reading 588503.

ICOM IC730 HF TCVR, ex condx, all bands 80-10m, all solid state, dual vfo, memories, vox, pre-amp, processor, etc, c/w mic & instruction book, £465. David, G0AFP, QTHR, tel: 0900-826461.

TWO SECTIONED STEEL TRIANGULAR MAST, total height 42', buyer inspects/collects (Harlow), £115 ono. G3WRO, QTHR, tel: Harlow 30609.

ICOM IC271E, 25W 2m base multimode, fitted Mutek front end, £525. Brother M-1009 Centronics parallel dot-matrix printer, true descenders, nearly brand new, £130. Trippler interface, link CBM computer to Centronics printer, no software required, £30. G6IAT, QTHR, tel: 0582-23750.

TET 2-ele HF MINI BEAM, 20/15/10m, one year old, £100. G4SSX, QTHR, tel: Ruislip 30627.

FT101E TCVR with hand mic, original packing and manual, vgc, £330. Altron/Allweld swing post for 20' mast, bargain, £15. G3HKH, QTHR, tel: Weybridge 47112.

FC700 ATU, immaculate condx, £90 ono. G0CDD, NOT QTHR, tel: 01-958 8516.

RSGB Members' Ads - seen by over 37,000 amateurs & SWLs each month

JAYBEAM 4 & 6m ANTENNAS: 4Y4M, £32 & 4Y6M, £36, in new condx, buyer collects, G8BIH, QTHR Alton (Hants), tel: 0420-82739.

FT290R with Mutek front end plus MML144/30 linear, £290. Heath SB102 with HP23 psu, £100. TenTec Triton 2, £90. 20A 12V psu, £50. KR40 twin-paddle keyer, £35. G3RTE, tel: 0707-57309, evenings.

KENWOOD R-820 RX, the "ultimate" RX, IF shift, VBT NB, Notch, among many features, £295. Global 1000 atu, £15. GOCGL, NOT QTHR, tel: Bournemouth, (0202) 473399, office hours.

HF5V ANTENNA, 5-band HF vertical, vgc, 2 months use, original box, £45 incl p&p. G4TRU, NOT QTHR, tel: 0273-693107.

YAESU DC 200 pu, 12V to 700V, 350V & 110V @ 18A nominal, never used, cash or WHY? Edd, G4KLQ, NOT QTHR, tel: Bewdley 402558.

KW1000 HF LINEAR AMP, rarely used, £275.
WANTED: Accessories for Collins HF gear, also accessories for Rolleicord cameras. GI4GNZ, QTHR, tel: 0266-880740, evenings.

2M RIG, 12 months old, 25W mobile NDI c/w antenna mount etc, £150 ono. Telescopic mast, 4" box section, 20' down 35' up, c/w winches, rotator mount head bearing, £250 ono. G6XFB, NOT QTHR, tel: 0702-28 4232.

MML28/100S, 100W linear amp with pre-amp for 10m, £80. Also Icom BC-35 fast base chgr for IC2E/4E, etc, £30. Also Trio 2200GX 2m FM TCVR, nicads, psu, fully xtalled, £69 ono. GM4UKG, QTHR, tel: Inverkeithing (0383) 416688, evenings and weekends.

FT290R, Mutek, nicads, case, rubber duck, £250. MM144/100LS linear, unused, boxed, £120. ST5MC terminal unit, new, £70. Alinco 30W linear with pre-amp, £40. Datong Morse tutor, £40. Matt, tel: Watford 28116, evenings or Rickmansworth 770634, daytime.

YAESU FT207R 2m handheld, 144-146MHz, 2.5W/200mW, c/w leather case & spkr/mic, features:- keypad entry, 4 memories, scan facility, in gc, c/w HB chgr/receive psu, £100 ono. Ian, GOAYN,
tel: 0670-816078, evenings.

R1000 gen/cov RX, AM/SSB/CW c/w handbook & service manual, vgc, £195. Pace Nightingale modem, c/w Comstar ROM for BBC micro, £100. Yaesu FT480R multimode TCVR c/w handbook, service manual, whip antenna, magnetic mount, £280. G3RDG, NOT QTHR, tel: 01-455 8831.

TRIO TS120V with YK88C CW filter, AT120, £40. DFC230 frequency controller with MC42S mic, £60. MC50 mic, £20. LF30A LPF, £15. Yaesu FL110 HF linear 200W i/p 10W drive, £90. G4TCQ, QTHR, tel: Worcester (0905) 641328.

JAYBEAM 6-ele Quad c/w 45m 1mm 3-core & 50 ohm low loss coax 10.22mm, 5m alloy tubing 7G, 1m alloy tubing 7G, dipole centre fixing 120' total, 2m glass fibre tube, 36m cable for dipole c/w pulleys, brackets, all new, no split, £100 carriage extra. Also Yaesu FT209, RH5W, NC15 chgr, 2off nicad FNB-4 battery pack, MN/FBA-5 battery case, MH/12A2B spkr/mic, NC/18C nicad chgr, MMB21 car bracket, PA/3 mobile trickle chgr, YH/2 headset vox boom, 7/8 mobile gutter antenna, all new, £345, no split. Randall, G1PXU, tel: Dawlish 864032.

REALISTIC DX-302 RX, 10kHz-30MHz, as new, boxed, £160. FT101E, ext vfo, spkr, £300. R1000 RX, £120. G4GTO, QTHR, tel: 01-660 2532.

YAESU FT707, FC707 atu & FP707 psu in mint condx, £550 ono. Also BN0S psu 25A constant, £90, no offers. Dave, tel: 0757-618943.

ICOM 271E, 10 months old, as new. BN0S 6A psu. Daiwa swr/pwr meter. 9-ele Tonna. Hirschmann 250 rotator. Complete 2m stn for £525. G1LAS, QTHR, tel: Gravesend (0474) 62578.

YAESU FT707, FC707, both mint condx, boxed, manuals, "only had 10 hours use", modified for top-band, may split, £500. G4YJP, QTHR, tel: 0604-37736, daytime or 583872, evenings.

YAESU FRDX400, FLDX400 with matching spkr, in boxes, £250. Trio 7730 2m mobile, sell £160 or swap handheld plus pa. Standard C58 multimode portable, nicads, chgr, case, swap C5800 or TR9000. Dave, G1BGF, NOT QTHR, tel: Northampton 714669.

YAESU FT757 HF TCVR & gen/cov RX, vgc, seen working, £550. FP757 h/duty psu, 20A 100% duty, with spkr, £130. YM24A spkr/mic, £15. G4WSN, QTHR, tel: 0743-62393, after 6pm.

DATONG MORSE TUTOR, £35. Wood & Douglas 2m synthesised TCVR, built & working, £100 or swap for good solid stste RX, FRG7 etc. Chris, G0DVV (G8OMA), tel: 051-648 3241, after 6.30pm.

450 BRAND NEW OC71': manufacturer's original packaging. Property of late G4GRB. Offers to G3VGN, QTHR, tel: 0947-602332.

HEATHKIT SB401 TX, SB301 RX, gc, manual, Shure mic key, £120. B40 RX, £25. 28MHz linear Zetagi BV131 mains, £30. Hirschmann rotator c/w bottom bearing, £35. Canon Datematic camera, £25. Tony, G0CKB, NOT QTHR, tel: 0206-575035.

KENWOOD TS520SE HF TCVR, 6-bands, 10-160m with Kenwood desk mic MC50 plus instruction manuals, buyer collects, £340 ono. G4IRM, QTHR,
tel: 061-865 0456.

SOLARTRON DIGITAL VOLTMETER LM1440, solid state, c/w full spec, £35. Communications RX, Marconi type AD94, 150kHz-18.5MHz, c/w handbook, £35. HRO type 5T communications RX, 500kHz-30MHz, c/w 6 coils, psu, full spec, £45. G1PWN, tel: Bicester 246389.

JAYBEAM ANTENNAS: 5Y2M, 75 ohm, £3.50; 8Y2M, 50 ohm, £7.50. 500V, 180mA psu, £7.50. 275V 100mA psu £5. Partly built psu 10+10V 10A, transformer, capacitors & bridge rectifier, £15. Antenna switch SMC S2, £2.50. Offers considered. Burnard, tel: Newport Pagnell (0908) 613523.

DRAE 6A PSU, immaculate condx, £27. Zetagi 4-way antenna switch, brand new, £5. WANTED: Info on radio programs for Sharp PC1246 pocket computer. G4TQL, QTHR, tel: Bolton 55092.

FT730R, mobile, vgc, £160 ono. G6MAQ, tel: 0302 859451.

TRIO JR599 RX, 160-10m +2m, £100. 2m-70cm tvtr, Elector design, boxed, 10W o/p, ccts, £35. Texas teletext decoder, keypad, psu, application data, £20. WANTED: 2C39BA's, pref Eimac, for 23cm cavity David, G8NEY, NOT QTHR, tel: Corsham, Wiltshire (0225) 810138.

RACAL RA117E, £250. Racal RA98 matching SSB adaptor, £60, ex condx, bought together £300. 4m TX by TW, CW/AM working, psu to work same, £30. ITT switching psu, 5V 20A, £40. G3OIS, QTHR, tel: Kelshall 378.

YAESU FT221R 2m all mode TCVR, £290 ono. ATV TCVR + psu, boxed, £100 ono. Robot SSTV board + memory, £50. Nascom 2 psu, Naspen, Zeap etc, offers? G4BZE, QTHR, tel: 0392-81425.

ST5 RTTY TERMINAL UNIT with control board, £75. Toni-Tuna with 3 shifts, £80. 2off Creed 444, 45 & 50 baud, perfect working order, £25ea. Buyer collects. Yaesu FT790R, 70cm, £210. G4NTY, QTHR, tel: 061-790 7673, after 6pm.

ICOM R71E gen/cov RX, mint, original packing, £675 G4NBT, QTHR, tel: 06285-22303.

COLLECTOR'S STATION: Collins KWT6-5, rack mounted, comprising 786E-1, 367A-3, 180U-2, 786F-1, 159-B1, psu, phone patch. Sensible offers please. G4GYC, QTHR, tel: 08956-72543, evenings & weekends.

ICOM IC-740 TCVR, nine bands, mint, £450. Dentron CLA-1000 linear, 400W o/p, 80-10m, new valves, improved protection cct, £220. KW107 supermatch, £75. 60' 2-section winch-up tower, slight damage, £80. G4GYC, tel: 08956-72543, evenings & weekends.

HEATHKIT GR-110, 8ch 2m scanner c/w 14 xtals plus new power lead, item in gc, £40 ono. Also Maxcom 20E TCVR, portable because of nicad power, c/w chgr, £30. Ricky BRS87801, tel: 0392-31941.

ICOM 251E, £350. Trio PS10 psu/spkr, £25. Yaesu FP80A psu, £25. Yaesu base mic YM38, £18. MMA144 pre-amp, £18. Belcom LS102L 10m, £175. G1AMX, QTHR tel: 0670-731653.

HALLICRAFTERS 538 communications RX, 0.5-33MHz in 4 bands, c/w handbook & headphones, ex condx, collectors item, £50. Arthur, G1NVW, QTHR, tel: Bishops Cleeve (024 267) 5632, evenings and weekends.

SEM TRANZMATCH ATU, 160-10m, £35. Daiwa CN620A swr/pwr meter 20W-1kW, £25. Drake DL300 dummy load 0-30MHz, £10. G4LLG, tel: Padgate 825573, evenings

KENWOOD TRIO TCVR 8300, 70cm xtalled even rptrs, 4 simplex, rx i/p RB0, original packing, handbook & service manual, £90 ono, carriage extra or collect, gwo, p/exch + adjustment considered for 144MHz 100W linear, FT290. John, G6UGU, tel: 0302-841530.

BBC MODEL B COMPUTER c/w View word processor & RTTY/CW ROMS, light pen & numerous amateur radio programmes included, ie. Locator c/w reader, satellite tracker & many more, £350. Goodwin, tel: Macduff (0261) 33298.

NORFOLK HERITAGE COASTLINE, attractive flint faced 3yr old det/house, conservation village 2 mls Blakeney, backing pastureland, far reaching views. Hall, cloaks, lounge/dinner, kitchen/breakfast, 3 beds, bath/wc, Parkray FCH, grge, lawned gardens excellent space antennas, no BCI/TVI. G3CDC, QTHR.

ALTRON AQ6-20 2-ele minibeam, 6 months old, £85. Tonna 9-ele 2m portable, £12. MET 144-7T 2m beam, £10. MMA144 2m pre-amp, £20. 2m 5/8 gutter mount mobile antenna, £8. G4ZOY, QTHR, tel: 0670-811950.

SILENT KEY SALE: FT101Z, fan, YD148 mic, FC901 atu vgc, all boxed, £450 ono, no split, buyer collects Rosser, for G3YMQ QTHR, Brackley (Northants), tel: 0280-703056.

HEATHKIT HW8 with mains unit, £80. Mohican with mains unit, £20. HRO with coils, mains unit, £30. RX R1224A TRF, £15. KW E-ZEE Match, £25. BC221AE freq meter, £15. Marconi key, £5. 2off headphones, £5. Aerial tuner, £5. Minimitter Top 2-7, £20. Heathkit R-C bridge C-3U, £15. Radio books. Band checker 80-10m, £5. KW Vanguard TX, £25. Layfayette 99-2501 vfo 80-10m, £12. Codar PR30 RF preselector, £7. Assorted xtals, £2.50. Buyer must collect please. Sweeney, G3TFS, tel: 03727-72689.

IS YOUR FT-1 AS GOOD AS IT CAN BE? Unused service extender board kit, £45 incl postage. G3FNJ, QTHR, tel: 01-866 4680.

FT101Z FM, mic, fan, Mk3, £400, buyer inspects and collects. Scarab terminal unit MPTU-1 plus RTTY/CW tapes, £37. Realistic DX302 RX, digital readout, £65. G3JXR, QTHR, tel: 0908-642398.

JIL SX400 PROFESSIONAL SCANNER, 26-550MHz continuous, boxed, mint, £375. Trio DM81 dipmeter, new, boxed, £40. TR2400, SC3 case, ST1 base, PB24 spare nicad, BC5 quick chgr, MC30S mic, SMC24 spkr/mic, boxed, mint, £220. G3VKC, QTHR,
tel: 0202-476593.

WELZ SP300 swr/pwr meter, 1.8-500MHz, 2kW rating, three switched in/outputs, £75 (£125). Welz SP10X swr/pwr meter, 1.8-30MHz, 200W rating, £17.50 (£38). Jaybeam 70cm 18-ele Parabeam £17.50 (£32). 70cm colinear c/w 60' H100 coax N-type fittings, £20 (£36). 6'x2" dia glass fibre tube, £7.50. Tandy pwr pedestal mic, £10. FRB707 relay linear box to match FT707, £10. New prices in brackets. All items mint condx, carriage extra. G4GQH, tel: 0202-534933, after 6pm.

FT290, nicads, MB10, chgr. FT708, NC7, 70cm handheld. Palm IV, chgr etc. Eddystone EC10 RX. R209 Army RX. R1155 aircraft RX. A14, RF amp, atu, Army manpack. A510 WW2 manpack, complete stn. Brownie No2 crystal set. Thandar 5MHz pulse/gen. G4OFO, tel: 01-949 2317.

KENWOOD TL922, 2kW linear, 160-10m, £700. Icom IC290D, 2m multimode, 25W, brand new, £375. HL82V, 80W 2m linear, £70. MML432/50, 70cm linear, £70. MMT432/28S, 70cm tvtr, £100. G4KPT, tel: 0984 23333.

MM144/40 with RX pre-amp, 10W i/p 40W o/p, ex condx, £75 ono or swap with cash adjustment for similar 70cm linear. G3ADZ, QTHR, tel: Rugby 815222.

YAESU FT102 HF TCVR with FM/AM unit, narrow CW filter & YM38 desk mic, immac condx, hardly used, £550. Also SEM atu, 160-10m, £30. GW4RKX, QTHR, tel: 0244-660066.

ANTENNA WIRE, new multi strand 7/22 swg Cadmium Copper antenna wire suitable for long wires, dipoles etc, 150', £4, postage £1.82. Longer lengths at pro-rata price. SASE for sample. G3WMM, QTHR, tel: Colchester (0206) 842453.

DATONG UC1 UPCONVERTER, £70. Commercial RTTY modem £60 ono. New Leader HF/VHF sig/gen, £75. New Daiwa PS80M, 3-15V 8A psu, £55. Pair Toshiba stereo speakers, £50. New MM high performance 2m cvtr, £35. MM 432MHz tripler, £25. Sony ICF2001 RX, with psu, £75. Electronic AVO, £40. JVL 2m 5/8 colinear, £20. Unused ASP magmount, £8.50. S/S whips 2m 1/4 wave, £2; 2m 5/8, £2.50, 70cm 5/8, £7.50. Gutter mount, £2.50, Kenpro 1kW HF balun, £10. Telescopic mast, 5-20', £10. 6'x2" alluminium poles, £5ea, 6'x1", £4ea. N connectors, new, £1ea, used, 50p ea. Unused muffin fan, £5. 8-digit 50MHz counter, £35. MM 500MHz prescaler, £20. Buyer collects or pays carriage. G8AWB, NOT QTHR, tel: 0935-813097, weekends only.

SIGNAL GENERATOR, Marconi TF1101, 20Hz-200kHz, four ranges, o/p 2mV-20V, 600 ohm variable and metered, £35. Airmec 304A oscillator, 50kHz-100MHz nine ranges, o/p 12V max, attenuator 80dB automatic level control metered, £50. G4ULR, QTHR, tel: Norwich (0603) 51656.

ICOM IC4E handheld TCVR c/w all original accessories, all items ex condx, selling due to lack of activity in "GU", hi, £180. Also UHF mobile whip 5/8 over 5/8 boot mounted, £18. Roy, GU8TGP, tel: Guernsey (0481) 47918.

MOSLEY MUSTANG, top of the range, 3-ele tri-bander beam, 2kW pep, £95. WANTED: Yaesu FT290R in fine condx. G3SRJ, QTHR, tel: 0494-442869.

FT757GX gen/cov TCVR. Daiwa 419 atu. BNOS 25W psu. FL2 multimode filter. 4:1 balun. CBM64 interface for slow-scan, CW, RTTY. Brian, tel: 0369-6778, evenings or weekends.

FREE....!!! What do I do with 700 micro-switches bought in error at auction? Any suggestions? Send 3 x 17p stamps for free sample pack. G4NMP, NOT QTHR, 12 Eilam Road, Rotherham, S61 3PQ.

FDK MULTI 700EX, 2m TCVR, 25W FM, £150 ono. WANTED: WM26 EMI oscilloscope manual. G4ZZS, QTHR, tel: Stafford (0785) 664667.

DOUBLE BEAM SCOPE, Fairchild, gc, c/w handbook & some spares, 50MHz type 766H, £70 ono, buyer collects or by arrangement. G3DAV, NOT QTHR, tel: 0947-810753.

MURPHY AP1000335 communications RX, no psu, £30 ono. G8VBQ, QTHR, tel: Rainham (Essex) 22994.

MARCONI TF801B, VHF sig/gen, 12-470MHz, gc, £85. G8LCD, tel: 01-427 1379.

2m STATION, boxed FT290R with nicads, charger, c/case, 30W MM linear, Mutek SLNA144S preamp, SMC swr meter & 10A psu omitted in last ad (8-15V and 4-12A variable) PS1310S, genuine bargain the lot £375. G1ECY, QTHR, tel: 01-890 9733.

KENWOOD TR7950 2m FM TCVR, 5/45W o/p, c/w MC4 scanning mic & mounting bracket, never used mobile £200 or part exch & cash adjustment, MML144/100S linear with preamp, or similar. GOARF, QTHR, Herefordshire, tel: Pembridge (05447) 350.

10m SSB Realistic, 40ch, 28.271-28.740MHz +/- 4kHz per ch, vgc, £50. WPO Morse memory, unwanted gift, 120s, £45. 48/70cm ant, £15. Heathkit RX, HB10B, 3.5-30MHz, vgc, £50. H/man rotator, £25. G4YBP, QTHR.

FT101ZD, 9-band HF TCVR with SP901 matching spkr, £525. Also FC902 atu for above, £75. FT290R, 2m TCVR, £200. All equipment in ex condx. Sorry no offers. Carriage extra or will deliver within 50 miles. G4BWB, QTHR, tel: 0272-426486.

RACAL EQUIPMENT: RA117E & RA218 sideband cvtr in single case, £215. Frequency synthesiser MA350E, rack mounting, £160. LF cvtr RA137, £50. All with manuals. Scanner SX200, £150. Delivery 50 miles Sussex arranged. Harrison, tel: 09066-2921.

DRAKE TR7 with 6kHz & 500Hz filters, £625. Drake PS7, heavy duty supply, £120. Drake NB7, noise blanker, £60. All three above, £775. WANTED: FT225RD workshop manual. John, tel: Chelmsford (0245) 355331, early evenings.

JAYBEAM 10XY, gc, £22. 6-way H/B polarization switch for above, gold plated contacts, £12. Creed 444 vgc unused this owner, £35. All ono. Require SSB conversion info for AR2001/2, expenses paid. G4RLM, QTHR, tel: Wimbourne (0202) 887947.

ICOM IC271E, unwanted legacy, 2m multimode base stn, 25W o/p, voice frequency readout, 144-148MHz, vgc, original packing & manuals, could deliver London or SE, £495 ono. Phil, tel: Gravesend (0474) 64224, anytime.

MARCONI TF1064 VHF/UHF sig/gen, £40. Pye Olympic AM, £35. Westminster FM, £40. Scope S51B, £35. Airmech mod meter, £35. Quantity mixed ICs, EPROMS Z80 etc, £20. WANTED: PC1, PC2 radio controller. TS830S or FT101ZD. G3XDA, QTHR Lincs, tel: 0775-66533.

FT290R, nicads, case, charger, antennas, £225. 35W 2m linear, £35. 10m multimode, SSB/CW/AM/FM full coverage, shift on transmit & receive plus usual multimode facilities, also separate psu & 80W mains linear, £125. G4WFA, NOT QTHR, tel: Preston (0772) 634149.

FT707, 100W, £330. H/B 707 vfo, £10. Datong FL3, £90. LF30A LPF, £10. BPF2A for 2m, £15. Heath vtvm £20. Heath HM102HF pwr/swr meter, £15. Stolle VHF rotator, £15. Support bearing, £5, carriage extra. FV101Z, £70. G4IOT, QTHR, tel: Folkstone 76063.

FREE TO GOOD HOME: high power home-brew tuning units, Z-match type, 3 off. Also telescopic alum'n tubing, perfect for home-brew antennas, many sizes to 12', 1" or 1.25", low price. Details G3UKS, NOT QTHR, tel: Wantage 65358, evenings.

BGY36 FM power modules, 144MHz, 150mW i/p 20W o/p, £25. MMC144/28 cvtr, £15. W&D unbuilt VIDIF kit, £30. Kenwood VFO120, £25. G3WPO talkbox, unboxed, R3 modules TX, £15, RX £18. WANTED: MML432/30, MML432/20, IC202E, IC202S. Dave, G4FRE, QTHR, tel: 0394-271622.

DATONG AD370 active dipole antenna with mpu, new, £50 post paid. Cambridge antenna tuner c/w leads and PL259 plug, £10. R J Newey, 1 Barlow Close, Oldbury, Warley, West Mi[illegible]ds, tel: 021-544 4185, after 6pm.

INSULATORS, ceramic stand-off, brown, 3" tall, 2" base, £2 ea. Valves: 6GM6, 150B2, £2; 6EW6, £1. Gardners choke, 20H 100mA 318 ohm, £3. Yaesu FSP-1, 8 ohm mobile extn spkr, £6. Pye marine, grey battery box, takes 8xU2, 12v, £5. FT101Z series AM unit, instructions, as new, £7. Headphones, light, black, 300 ohm, £7. Five AR88 pointer knobs, £3. Valve cvtr to receive 160m on 80m tuning, £4. Various vibrators. G3MBL, NOT QTHR tel: Bury St Edmunds (0284) 60984.

POWER SUPPLIES incl 20-0-20V mains transformer, 1.2A/winding, large cap, 24V h/duty relay, diodes etc, in aluminium case, £6.50 ea. Pye Westminsters W15AM mid-band (RX 140MHz), some control boxes, £25 ea. No offers. G6HBX, QTHR, tel: 01-574 2957.

ICOM IC202, extra range xtal, Jaybeam 4-ele quad, UR67 feeder, offers? Also Jaybeam LW24 70cm antenna, never used, unopened carton, £22. MM tvtr's, 28-144MHz and 28-430MHz, in box with regulated psu, metering, switching etc, £250. Buyer to inspect and collect. John, G4FRX, QTHR, tel: 01-794 9200.

KENPRO KP-200 memory key, £130. Three volumes of Admiralty list of Radio Signals 1984, £27.50. Jaybeam 6-ele quad, £25. Stephen & James Mk1 swl atu, £17.50. Cliff, G4NHG, 6 Charsley Place, Blurton, Stoke-on-Trent, tel: 0782-310427.

TRIO TS520E TCVR, as new condx, only 1 month use, £300 ono. Kenwood AT200 for above, £50 ono. Icom 260E 2m multimode, ex condx, c/w mobile mount & spkr/mic, £210 ono. G8VWI, QTHR, tel: 0272-425601, daytime.

SCOPES TEKTRONIX: 581, £70; 555, £90. Avo's from £19. Sig/gens AF-UHF, £19 to £55. Pye Olympic VHF/L8 AM, £49. Modulation, deviation, watt meters £12 to £50. Teletype ASR33, £19. Transistor testers £10 to £35. Tektronix plug-ins from £10. G4YVJ, QTHR, tel: Brighton 416963.

IC271E c/w Mutek, £550. BNOS 12A psu, £70. KR500 elev rotator + 40m cable, £70. 40m LDF250 c/w skts £20. 4off 19-ele 2m MET's, £30 ea. 4-way splitter, £15. Carriage extra. G4JBH, QTHR, tel: 0935-23873.

FT757GX c/w MH1 scan/mic, 6 mths old & never used, £650. G3WJI, tel: Bristol 798298, evenings only.

TRIO AT230, mint, £123. DX160 gen/cov RX .15-30MHz £31. Altai gdo KDM-6, mint, £47. PW ZX81 programs 1 & 4, £2 ea. Altai headphones, 2000 ohms, £3. Supertester 680G multimeter 20k ohm/V, bargain £19. All ono, carriage extra. G4GIG, QTHR, tel: 021-777 6086.

YAESU FRG7 comms RX, mint condx, no mods, boxed, manual, £120. Also Datong Morse tutor, £35. Pye Cambridge, 6ch, S20-S23 & R3/5/7 fitted, toneburst £50. All above ono. G6MLE, NOT QTHR, tel: Nelson (0282) 603967, 24h ansaphone.

FT207, 144-148MHz, nicad, spkr, mic, charger, case handbook, maintenance service manual, original packing, £115. GW4UWD, QTHR, tel: 0654-710548, daytime.

APPLE II COMPUTER, "Starcard" cpm 6MHz clock, brilliant with Wordstar etc, c/w 64k RAM, can be used as 3rd electronic drive, c/w manuals, software, brand new should be £115, yours for £55. Other items available. G6RRR, QTHR, tel: 061-790 5001.

VHF AM TCVR, mobile GEC RC/650/TR, two complete sets, easily modified for ham bands, £15 ea, worth it for spares alone, complete handbook available. G4XOS, tel: 0384-371108.

48k SPECTRUM c/w Interface One & microdrive, books mags, software etc, £110. Atari 800XL computer c/w double density disk drive, lots of disks, books, mags, £125. Tokyo HL35V 35W 2m linear, suit FT290R £45. G1MAT, tel: 01-300 7323.

SINCLAIR SPECTRUM+ with Scarab Systems SSTV software, tape deck etc, some games, £100 ono. Datong D70, £30. Icom ICB1050 on 10m FM, £25. MM 2m-70cm tvtr with controler, £80 ono. Ian, G0AFH, QTHR, tel: Meopham (0474) 814809, evenings and weekends only.

YAESU FL2100Z LINEAR, new bands, mint, £450. 30'+ Versatower, rotator, 'bowtie' mini-beam, vgc, moving to flat, reasonable offers please. Sam, G3JNY, tel: Leeds 824350, 6.30pm.

HROMX with psu & full range of coils, adapted for AM/FM, extra low voltage for FM, £35 ono, buyer collects. G5YK, QTHR, tel: Southwold 722733.

AS NEW TS530S, virtualy unused, c/w mic etc, £500. G3XQZ, NOT QTHR, tel: 0543-253452.

FT101B with CW filter fitted, all as new, £315. G3VHA, QTHR, tel: 0562-730484.

STANDARD C78 70cm TCVR, 1W o/p, c/w leather case & original packing, £150 ono. G4LJZ, QTHR, tel: Wells (0749) 77250.

TET 5-band HF vertical. 48-ele 70cm Yagi assembled varnished, unused. 28MHz SSB microwave tvtr, little used. Clegg 143/149 FM mobile set, 0/25W variable o/p. Buyer collects antennas. G4YUG, QTHR tel: 0473-830147, anytime.

AZDEN PCS4000 2m mobile FM TCVR, £150. New 4CX250B valves with VHF base & chimneys, £30. Top-band TX with psu, £30. Would exch for MM2001 HF RX, AR2001 scanner or WHY?. G8MHL, QTHR, tel: Coningsby, Lincs (0526) 42710.

KW2000B ac psu, mic, recent revalve, £210 ono. MTV435 atv TX, 20W psp, as new, £135 ono. MMC435/600 atv cvtr, £20 ono. G4BFJ, QTHR, tel: 07373-60415.

ICOM IC260A 2m mobile TCVR, 10W FM/SSB, 143.8-148.2MHz, has memories, scanning etc, £200. Roger, G6HQK, NOT QTHR, tel: Wolverhampton 69285.

SWAP..!!!: FT290R c/w nicads, charger, c/case, gc, for HF linear eg. KW1000, Swan 1200, SB250, FL2100B in fb condx. Also want KW107S/M atu. John, G4ZOJ, tel: 0636-812429, after 7pm.

FRDX500, all modes with full 180-10m coverage plus WWV and one other, £120 ono. Zenith camera with 54mm, 135mm, 400mm & sliding bellows, all gwo, £80 ono. Rob, G4FAX, tel: Luton 594869.

YAESU FT101ZD c/w fan, mic, 600Hz CW filter, maintenance/service manual, hardley used, £300. G4BWU, QTHR, tel: 0438-354261.

APRICOT COMPUTER 256k plus twin 3.5" disc drives & mono monitor, software incl utilities, supercalc super writer, super planner. offers over £500. GOAOE, QTHR, tel: Sunderland 283822.

TRIO R600 gen/cov RX, mint condx, boxed, £200. G4SYB, QTHR, tel: Farnborough (0252) 549852.

CREED 444 teleprinter, vgc with extra gear for 45 baud, also paper rolls, £25. IC740 HF TCVR, all bands with PS115 psu, £600. G3JTQ, QTHR, tel: 04242-77767, after 5pm please.

SOMMERKAMP TS280FM 2m TCVR, 10/1W, 80ch, incl mobile mount & manual, vgc, £100. G4MTC, QTHR, tel: 043471-2642.

1920-1930 WIRELESS SETS and numerous spares, new and used. G4YSU, QTHR, tel: 0772-600239.

FT208R with NC8 charger, psu, nicads, case, YM24A spkr/mic. FDK750E with Adonis AM503 & Welz SP45M. Best offers secure. G6JKR, QTHR, tel: 0602-503939.

TRIO TR7800 2m mobile or base TCVR, 25/5W, 14 memories, priority, tone-burst, keypad or mic scan superb radio at a bargain price, £135. G3XJP, tel: 01-958 9558.

YAESU FRG9600 VHF/UHF all modes scanning RX, 60-905MHz, as new, £375. Codar AT5 TX, ideal QRP CW, 160 & 80m c/w mains psu, £35. G3IWE, Cheshire, tel: 0925-601485.

TRIO TW4000A as new, unmarked, £385. Geoff, G3LVB, QTHR, tel: 0533-418279, evenings or 0533-769781, daytime.

TRIO TR9500 70cm TCVR c/w mobile mount, still boxed, vgc, hardly used, never used mobile, reason for sale surplus to requirements, £390 incl carriage. G4YME, QTHR Oxon, tel: 0491-38473.

FT200 TCVR with spare valves, Amcomm atu, Daiwa S110 swr/pwr meter. FX1 wavemeter, dummy load, lo/pass filter, HF/VHF cvtr, 1/2 G5RV plus more, £265 or exch for vg Racal gen/cov. G4PJG, tel: 01-807 4372.

YAESU FRG7 communications RX, SSB filter, gc, £85 ono. Sekosha GP100 Centronics dot-matrix printer, gc, with paper & lead for BBC, £90 ono. Mike, G1ERT, QTHR, tel: Milton Keynes 605380.

YAESU FT101ZD Mk3 with FM, fan, ext vfo FV101Z, atu FC902, spkr SP901, all matching and in mint condx, spare pa valves plus lo/pass filter & manuals, £560 for lot. GM0ATA, QTHR as GM6WUJ, tel: 0360-310209.

COMPLETE 2m stn comprising Icom IC260E, 10W multimode TCVR with Bremi 10A psu, full auto rotator, 9-ele Tonna, wavemeter & dummy load, 1/4 wave mobile whip with coax & gutter mount, £325. GODDN, tel: Daventry 76034.

1296MHz MM tvtr, vgc, £175. Trio TR2200G hand portable 2m rig, £60. 70MHz MM tvtr 2m if, £50. 70MHz MM linear, 100W o/p, £50. G3WHK, QTHR, tel: 01-330 5795, after 6pm.

MM435/28S tvtr, never been used, £110. Tonna 435MHz 19-ele crossed Yagi, still in box, disassembled, £24. Equipment of late G3PY. G3AUB, QTHR, tel: 0625-25910.

MICROWAVE MODULES MMT432/144R 70cm/2m tvtr, £105. MM4000 RTTY/Data TCVR c/w RCA keyboard, £150. Commodore Pet 2001 computer/IEEE controller, £100. Full keyboard, £15. G-whip coils, £3ea. Bantex magmount, £4. 2m & 70cm helical stubby aerials, various conns, £3ea. G8AYN, tel: 04555-57790.

TRIO TS530S, ex condx, manual, original packing, £450. G4DMG, QTHR, tel: 096-273 4408 (Hants).

YAESU FRG7000 communications RX, digital frequency display, digital dual time clock & timer. 240V & 12V. LSB/CW/USB/AM, very sensitive, original box, manual, vgc, incl broadcast stns book, £150 ono. Nick, G6LZJ, NOT QTHR, tel: 01-669 0713 (Croydon)

30' LIGHTWEIGHT TILT-OVER TOWER in 3x10' sections for small HF or VHF beams, easily carried on roof rack, £60. SX200N scanner, vgc, £200. G4VQH, QTHR, tel: Whixall 460.

WANTED ••••••••

BELCOM LA106, also Shure 444 high impedance mic and Drake low pass filter. GD8ODB, QTHR, tel: 062-488 433, most evenings & weekends.

DUAL BANDER (VHF/UHF) mobile, any make. Also 2m mobile, small size prefered, (Trio 7500 etc) though others considered. 2m linear, 10W i/p, 30W+ o/p. Married so reasonable prices please!! Steve, G4WXC, tel: Grantham (0476) 77708, before 11pm.

URGENTLY: DC-DC converter for Yaesu FT101ZD, also Mk123 plus info availability Clansmen portables. FOR SALE: AR40 medium rotator with 100' cable, £50 also reference books "Aircraft of the Fighting Powers" WW2 vols 3&4. G4KKZ, QTHR, tel: 0566-3012.

EDDYSTONE 990R required in gc with manual. G4ZSW, QTHR, tel: 01-393 8503.

HEATHKIT HW7 or HW8 or similar QRP CW TX/RX, must have 20m and be in gwo. Also want mobile mount for FT290R. G0CUO, tel: 091-410 7884.

CODAR AT5 TX's & 250/S AC/pu's. Also Marconi 1017 RX. Please send details of price & condx to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks, SL2 1DA.

VIBROPLEX bug key. GM3WIJ, QTHR, tel: 0224 317019.

YAESU SP-901 ext/spkr, must be in ex condx. G4KZZ, QTHR, tel: 0203-444160.

DC-DC CONVERTER for TS520, also atu for same, must be in ex condx. G4XNY, QTHR, tel: 021-353 2061.

SEM TRANZMATCH atu, must be in gc. Also Shure 444 desk mic & HQ1 minibeam incl full setting-up instructions. GW4VEB, QTHR, tel: 0222-887193.

T&R BULLETINS, 1925 & 1926. Andy, tel: 01-989 0867

BBC MICRO USER wishes to swap software info etc, disc or tape. Also any mods to FT102 to cover international shortwave broadcast bands or mods in general. Goodier, 35 Rose Lane, Marple, Stockport, Cheshire, SK6 6DS.

RACAL LINEAR AMP TA349 or T99 with psu. Also MA350 interested in TTA371. Require manuals for RA6217, RA6366, RA6337, RA298C, RS6504, MA350.
40/60 lattice mast. Dip meter. G3BYT, QTHR, tel: 0480-53748.

DOES ANYONE PLEASE HAVE AN ICOM IC451 FOR SALE???? My IC251 needs a partner to keep her company. Bob, G1EGL, QTHR, tel: Wymondham 604019.

2m MULTIMODE, prefer FT480 or TR9130 but consider anything, GW1MGI, tel: 0633-62351, evenings.

KR5400 ROTATOR, Datong FL3 filter, low-pass filter 1kW, OSCAR 10 antennas 70cm up 2m down preferably circular and vertically plus horizontally working with all bits and pieces, must be in gwo. Willf Beeck, G4VON, 30 Kettlethorpe Close, Ketton, PE9 3RS, tel: 0780-720543, evenings.

WELZ SP15M swr/pwr meter. Also mobile HF aerial for 10/15/20m in gc. May, GW3OMN, QTHR, tel: 0792-472348, daytime or 582059, evening.

FT790 & MATCHING YAESU LINEAR. VHF/UHF scanner. PSU, at least 20A neat & regulated if homebrew. 70cm beams, MET 19-ele, 2m beam. Mobile mount for FT290. Fair prices please, cash waiting. Phil, G4WMO, tel: Lincoln (0522) 752563.

FTDX401 YAESU SSB filter XF-31A. COM-IN64 interface for CDM64 c/w manual. 2 pa transistors 2SC2290. Yaesu FL110 linear or similar 100W linear for FT7. G3YJF, QTHR.

B2 SPARES OR WHOLE. Particularly coil socket, meter (MT4), pu plugs (cable plug 2A). Have several round and edge type meters 200uA upwards also 270V 250mA 6V 10A+ psu's. R K Mildren, G3FVD, QTHR, tel: 0208-2487.

CONTROL UNIT for four-wire AR40 rotator. Price to, GM3DOD, 165 Eldon Street, Greenock, tel: 0475-23742.

YAESU FT901DM HF TCVR with AM & FM, in gc at sane price, prefer Home Counties west because of transport of same, must have handbook. G3EJA, QTHR tel: Reading 588503.

YAESU FC901 or FC902 atu to match existing equipment. G3NDC, tel: 01-954 1309.

GENERAL COVERAGE RX, FRG7700, FRG8800, ICR70/71, R2000 or similar, must be mint condx, will collect London area. Arthur, G6UWG, QTHR, tel: 01-254 3944 evenings.

DESPERATE OF WEST WICKHAM, requires cabinet for Racal RA117. Prefer RX+unit size or 2 RX size, condx immaterial. Racal MA144 atu. G6XNC, QTHR, tel: 01-462 4461.

MIDGET MAINS TRANSFORMER (RS Components-obsolete) 245V pri, 125-0-125V @ 50mA and 6.3V @ 1.2A sec. G3WZR, QTHR, tel: 0483-575870.

TO BORROW, PURCHASE OR HIRE, for photocopying with deposit provided for security, manuals as follows: ZC1 Mkll command sets, WSC11, WSC13, WSC42, WSC45, RAF Air Publications, WS18, WS No12 sender, B2 etc Jim, G4XWD, tel: Kidderminster 3674.

BASIC 70cm HANDHELD, eg Pye 3ch pocketphone etc, prefer converted but all considered. If not available, would consider 2m handheld. G4YSS, QTHR, tel: Scarborough 863137, evenings & weekends

EXCHANGE TONO 350 Baudot/ASCII/Morse decoder with Centronics printer cable/plug, for small gen/cov RX, preferably digital. Will consider any make except Tandy. P Karagianis, 20 Lea Road, Sonning Common, Reading RG4 9LJ, tel: Reading 722085.

FT790 70cm multimode. FOR SALE: Kenpro KR400 rotator with round display, £95. Will arrange collection/delivery. Lees, tel: 0788-817932.

MECHANICAL BUG KEY, to be used! Not for museum shelf! Vibroplex, McElroy or Eddystone. Also Heathkit RG1 manual to borrow or photocopy, all expenses paid. G3KXF, QTHR, tel: Lancing (Sussex) 764599, evenings.

Conditions of Acceptance

These subsidised flat-rate advertisements are accepted as a service to members of the RSGB only. They must be submitted on the Members' Ad form printed on the back of a recent address label carrier used to mail RadCom to the advertiser: this will automatically provide proof of membership and should not be more than 2 months old. No acknowledgement of receipt will be sent and advertisements not clearly worded, or which do not comply with the conditions of acceptance, will be rejected. No correspondence concerning this service will be entered into.

Trade or business advertisements, even from members, will not be accepted for "Members' Ads", these should be submitted as "Classified " or "Display" advertisements in the usual way. Traders who are members must enclose a signed declaration that the items for sale or wanted are part of, or intended for, their own personal amateur station.

The RSGB reserves the right to refuse advertisements and accepts no responsibility for errors or omissions, or for the quality of goods offered for sale. Advertisements for citizens' band equipment will not be accepted. Refunds will be sent for any advertisement which are rejected for any reason.

WARNING: Members are advised that they should, as far as possible, 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.

RATES: The current rate for Members' Ads is £2.30 (incl VAT) for 40 words or less. An additional cost of £2.30 is incurred for every additional 40 words or less. Each advertisement must be accompanied by the correct remittance, either as a cheque or postal order made payable to 'Radio Society of Great Britain'. When writing out advertisements, please ensure that you do not enter more than one word in each 'box' on the form. It is advisable to read some of the advertisements contained on these pages and familiarise yourself with the house style. Equipment type numbers, telephone numbers and certain abbreviations will count as one word. It may be necessary to edit certain advertisements in order for them to comply with the conditions of acceptance.

The following abbreviations are in common use for Members' Ads:-

TX - Transmitter RX - Receiver
TCVR - Tranceiver
TVTR - Transverter CVTR - Converter
gen/cov - general coverage
sig/gen - signal generator
vgc - very good condition
gc - good condition
ex - excellent condx - condition
c/w - complete with

Post to: MEMBERS' ADS, RSGB, LAMBDA HOUSE, CRANBORNE ROAD, POTTERS BAR, HERTFORDSHIRE, EN6 3JW.
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- All programming from key pad on microphone
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- Frequency selection from front panel or microphone
- Mobile mount included

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Micro processor controlled versatility and programming from the microphone in a compact package.

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- Programable band scan
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- 'S' meter
- Toneburst
- NiCad, charger supplied as standard

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Spare NiCad	£33.75
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DC/DC converter	£13.50
Case	£14.50
Cigar plug cable	£4.50
Mobile charger mount	£26.50
Speaker/microphone	£18.50

(prices do not include post & packing)

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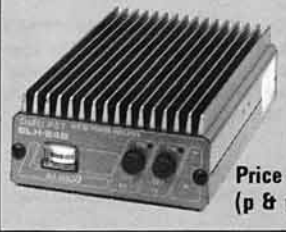

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2M & 70cm FULL DUPLEX FT2700RH

The FT2700R, virtually two transceivers in one case, is designed to be the ultimate in convenience, for FM mobile or base station operation, on the 144 *and* 430MHz bands. Using Yaesu's new one piece die-cast aluminium chassis concept, the FT2700R provides 25 Watts continuous output on either band, for full duplex (or simplex!) operation whilst obtaining optimum circuit shielding and efficient heat dissipation.

SCANNING
Two 4-bit CPU's provide convenient control together with simple operation of the dual VFO's, 10 channel memory with back up and two calling frequencies.

Dual, receiver front ends, local synthesisers, IF's and transmitter RF stages make this the first mobile transceiver capable of *true* full duplex cross-band operation.

PRIORITY
Comprehensive scanning features include "PMS" (programmable memory scan) which permits continuous or skip-scanning between two memory channels in the same band. A MHz 'stepping' switch is fitted for quick transition from one band to another. Priority channel monitoring is available whilst on the same or another band!

CROSS BAND
Independently programmable transmit and receive frequencies, standard repeater shifts (with reverse facility), offers total freedom of operation.

READOUT
The large green back-lit dimmable LCD offers an aesthetically pleasing and easy to read display of the complete operating status of the transceiver, including memory and reverse repeater indications at a glance. The PO/S meter incorporated in the main display is a distinctive graphical two colour type. (Optional Voice Synthesiser available, see FT270R/RH text.)

GENERAL SPECIFICATIONS

Mode	: FM (F3, G3E)	Antenna	: 50ohms, unbalanced
Supply	: 13.8V ± 15%	Modulation	: Variable reactance
Circuit	: Double Conversion	Deviation	: ±5KHz
	: 21.6MHz, 455KHz	Tone Burst	: 1,750Hz
Sensitivity	: 0.2μV @ 12dB Sinad	Spurious	: −60dB (or better)
	: 1.0μV @ 30dB Sinad	Maximum BW	: 16KHz
Selectivity	: 14KHz −6dB	Microphone	: 600ohms, nominal
	: 28KHz −60dB	Temperature	: −10°C + 60°C
Image	: −60dB (or better)		
Audio	: 4 to 16ohms	**OPTIONS**	
	: 2W in 8ohms (10% THD)	FVS-1, MF-1B3B, SP55, YH1, SB10	

The FT270R/RH is constructed on a unique massive diecast aluminium ducted heatsink which enables significantly larger output powers to be obtained from a transceiver substantially smaller than any similar radio to date. The FT270RH, with fan assisted cooling provides 45W RF output whilst the conventional R version offers 25W. Both FT270R and RH are fitted with a "low" power switch which provides around 10% of full output.

DISPLAY
The FT270R/RH uses a high visibility back-lit LCD, with large 5mm digits, providing a readout of frequency and all important transceiver functions. Pleasant green illumination and newly developed wide angle LCD ensure easy visibility day or night from most angles.

MICROPROCESSORS
The dual 4-bit microprocessors of the FT270R/RH provide maximum ease of use combined with an extremely wide range of operating functions. Dual VFO's, ten memories and programmable band scan limits are all easily selectable from the front panel.

MEMORIES
The FT270R/RH can memorise a number of scanning parameters for maximising performance. Upper and lower limits may be set (for quick scanning of the band). The ten memories may be scanned for a busy channel or for monitoring a priority channel. The scanning can be either manually or carrier controlled.

VOICE SYNTHESISER
For easier and safer 'eyes on the road' mobile operation an optional voice synthesiser (FVS-1) is available to give an audible indication of frequency, memory channels and VFO selections at the touch of a convenient microphone mounted button. The FVS-1 is of course ideal for those with impaired vision.

45 WATTS OUTPUT FT270RH

FT2700RH

Frequency	: 144-146MHz : 430-440MHz
Power out	: 2m 25/3W : 70cm 25/3W
Supply	: 7A (25W Tx) : 3A (3W Tx) : 0.6A (Sq Rx)
Stability	: 2M ± 10ppm, −5 +50°C : 70cm ± 5ppm, −5 +50°C

DIMENSIONS (Ex/Inc Projections)
150W, 50H, 130/185D mm, 1.6Kg

FT270R/RH

Frequency	: 144-146MHz
Power out	: RH; 45W/5W : R; 25W/3W
Supply	: RH; 9A/3.5A Tx : R; 6A/2.5A Tx : 0.6A (Sq Rx) R/RH
Stability	: ± 10ppm (−5 +50°C)

DIMENSIONS: (Ex/Inc Projections)
140W, 40H, 143/175D mm, 1.25Kg

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