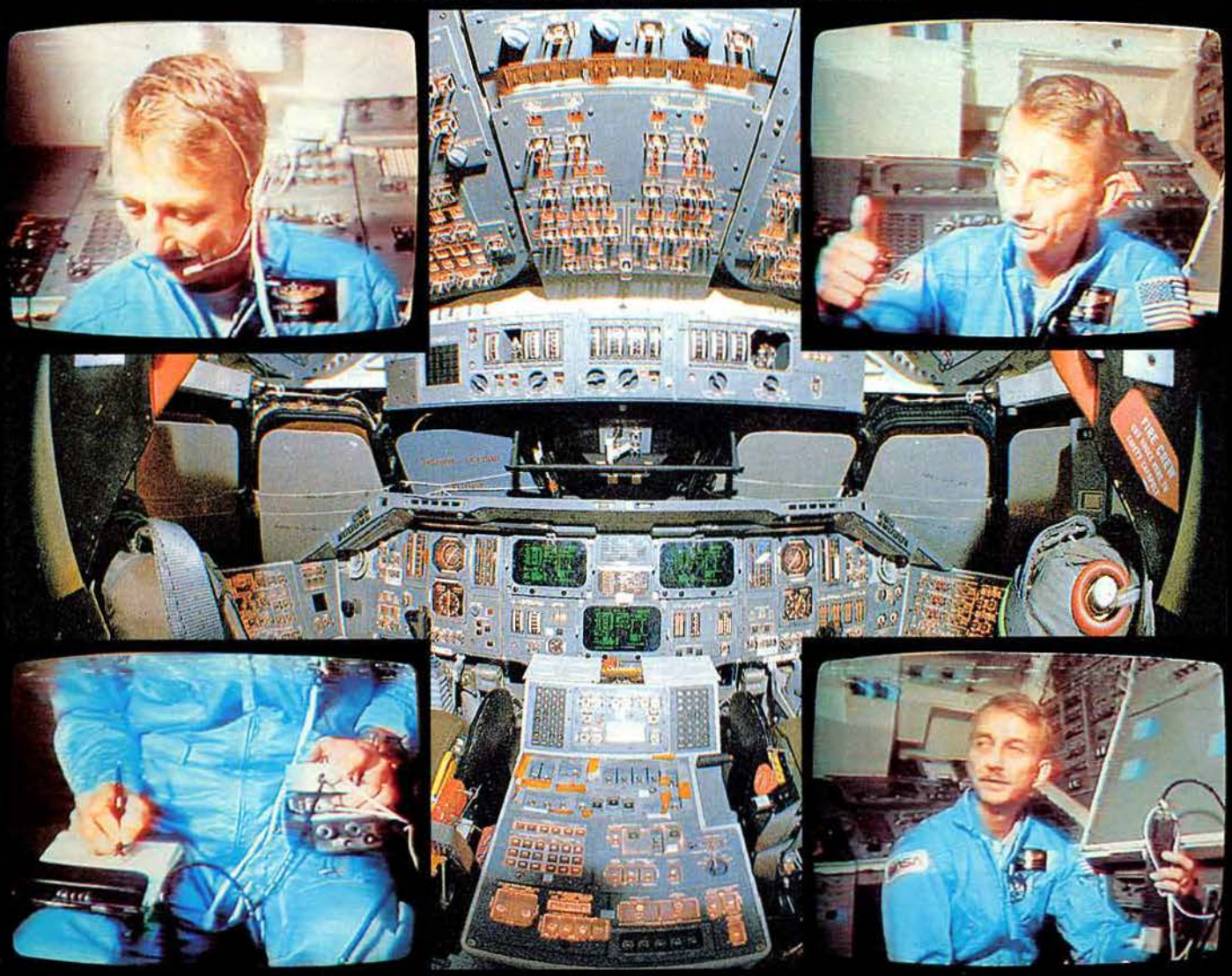
RADio COMmunication

January 1984

THUMBS UP FOR OWEN GARRIOTT, W5LFL

THE FIRST RADIO AMATEUR IN SPACE



BACKGROUND: **THE FLIGHT DECK OF *COLUMBIA***

NASA photographs

Journal of the Radio Society of Great Britain

British Technology & Innovation

B.N.O.S.
ELECTRONICS

British Designed & Manufactured

Take a look at the world's most advanced range of 2 metre Linear Amplifiers

Over 40 years of design experience has gone into what is fast becoming acclaimed as the biggest break-through in linear technology. Performance and reliability have been designed in, which gives us the confidence to offer a free 5-year warranty. Why not take a closer look at our products and see where value for money really counts.

The LPM144 Range

This sophisticated, but simple to use, range of amplifiers have performance characteristics and extra features previously not available in the UK. The pre-amplifier uses the highly regarded BF981 MOSFET, and an LED bargraph power meter is provided, to highlight only two of the amazing number of features.

The L144 Range

To complement the LPM range, we have introduced the L series linear-only versions for the amateur who may already be equipped with a good pre-amplifier and power meter. The excellent linear performance is maintained and both RF Vox and hard-wired changeover are standard.

- *Linear all mode operation*
- *Continuous rated RF output power (RMS)*
- *RF & HARD switched changeover with selectable delay*
- *Trouble-free RF switching at low drive levels*
- *Straight-through mode when switched off*
- *Unique over-drive protection circuit*
- *Mobile mount on all 100 Watt models*

LPM144-1-100	**£172.50**
LPM144-3-100	**£172.50**
LPM144-10-100	**£149.50**
LPM144-25-160	**£189.50**
LPM144-3-180	**£215.50**
LPM144-10-180	**£212.50**

LINEAR PART NUMBERING SYSTEM

LINEAR / PREAMP / RF METER — LPM144-3-100 — OUTPUT POWER / INPUT POWER / FREQUENCY (BAND)

L144-1-100	**£138.00**
L144-3-100	**£138.00**
L144-10-100	**£115.00**
L144-25-160	**£155.00**
L144-3-180	**£181.00**
L144-10-180	**£178.00**

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- 10A output terminals
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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.

A contribution will only be considered for publication on the understanding that the person submitting it is the original author and owner of the whole copyright, and that on acceptance for publication such copyright will become the property of the RSGB in consideration of the above-mentioned payment by the RSGB to the contributor.

The editor will be pleased to send intending authors a manuscript preparation guide and to give any other advice and assistance requested.

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We here at TRIO-KENWOOD have over the years developed a range of equipment designed by our professional engineers for you the active radio amateur. Our products range from the top notch TS930S HF amateur band transceiver to the smallest accessory. Each piece of equipment is specifically designed with the requirements of you, the radio amateur in mind. It has always been our policy at TRIO-KENWOOD to improve the specification and reliability of equipment by listening to the valuable comments of radio amateurs all over the world. The important relationship between yourself, the radio amateur and TRIO-KENWOOD is through our authorised distributor for the UK, LOWE ELECTRONICS LTD.

We give below a list of approved dealers in the UK. Any dealer not on this list has no connection with the UK distributor network and has no direct factory backing. Great care should be taken when purchasing your amateur radio equipment, to ensure that the dealer is factory approved. In any case, first contact our sole distributor for the UK: Lowe Electronics Ltd., who will be pleased to advise you of your nearest dealer.

Sole Distributor Lowe Electronics Ltd.
Chesterfield Road, Matlock, Derbyshire DE4 5LE.
Tel: 0629-2817, 2430, 4057, 4995

London Lowe Electronics Ltd.
278 Pentonville Road, London N1 9NR
(Shop located lower sales floor, Hepworths)
Tel: 01-837 6702

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Soho House, 362-364 Soho Road, Birmingham B21 9QL
Tel: 021-554 0708

Buckinghamshire Photo Acoustics Ltd.
58 High Street, Newport Pagnell, Bucks.
Tel: 0908 610625

East Scotland Jaycee Electronics
20 Woodside Way, Glenrothes, Fife KY7 5DE
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Tel: 0444 400786

Yorkshire Leeds Amateur Radio
27 Cookridge Street, Leeds LS2 3AG
Tel: 0532 452657

Northern Ireland George Moore Electronics
7 Cyprus Avenue, Belfast BT5
Tel: Belfast 658295

Although transceivers intended for mobile operation have kept pace with electronic technology and have incorporated the latest in operating facilities, there has always been the problem of where to install them in today's compact cars. With this difficulty in mind TRIO have concentrated on the size of the mobile transceiver and its relationship to performance. Certain brand new concepts in mobile transceiver design have been the result. These fresh ideas have been applied by TRIO to not one new transceiver but two; the TM201A for two metres and the TM401A for the seventy centimetre enthusiast – two new rigs for the mobile operator.

* By removing the internal speaker, TRIO have gained in two important ways, the overall size of the new rig is reduced to the minimum, 5½W x 1½H x 7½D (inches approx.) and the quality of receiver audio produced by the now separate speaker (77mm diameter) is extremely high. (The separate speaker is not an optional accessory but is included in the purchase price of the rig).
* The TM201A two metre transceiver produces 25 watts, the TM401A seventy centimetre version 12 watts, in the low power position the rigs give 5 and 1 watt respectively.
* Dual digital VFO's covering the full two metre band for the TM201A and the entire 10 MHz of the seventy centimetre band for the TM401A are provided, selection of the required VFO being by a front panel switch. On the TM201A VFO A tunes in 25KHz steps, VFO B in 5KHz steps and on the TM401A both A and B VFO's tune in 25KHz steps. Control of the VFO's is either by the front panel knob of the up/down microphone switch.
* Five memories are available, memory 1 holds the priority frequency, memories 2 and 3 are standard memories and memories 4 and 5 hold receive and transmit frequencies independently. An internal lithium battery backs up memory data (estimated 5 year life).
* With the priority alert switch on, once every 6 seconds, whether receiving or scanning the rig checks the frequency in memory channel 1. A dual 'beep' will sound if a signal is present.
* The MS switch initiates memory scan. Memories which hold no frequency data are skipped. Depressing the up/down microphone switch begins band scan, programmable scan is available, the upper and lower frequency limits being those as set in memory 5. In both memory and band scan, scanning stops on a busy channel and automatically resumes after approximately 6 seconds.
* A four digit yellow LED display giving improved visibility under mobile conditions indicates the operating frequency. The MHz decimal blinks whilst scanning and the KHz decimal lights to show that VFO B is being used. A S/RF LED bar meter with separate occupied channel, memory recall, priority alert and 'on air' indicators are also provided.
* The use of a GaAs FET RF amplifier plus an improved antenna switching circuit provides high sensitivity and wide dynamic range.

TM201A..... two metre transceiver .....£269.00 inc. VAT
TM401A..... seventy centimetre transceiver.....£299.00 inc. VAT

TRIO

TRIO-KENWOOD CORPORATION
Shionogi Shibuya Building, 17-5, 2-chome Shibuya, Shibuya-ku, Tokyo 150, Japan

TRIO-KENWOOD COMMUNICATIONS, GmbH
D-6374 Steinbach-TS. Industriestrasse,8A West Germany

TR9130 TWO METRE ALL MODE TRANSCEIVER

This rig is proof, if one needed it, that TRIO do not bring out new models just for the sake of it. The TR9000 is remembered as a classic rig and today people are still asking for second hand ones. They're even a rarity on our S/H shelf. The TR9130 incorporates the improvements that all amateurs asked for, green display, reverse repeater, tune whilst transmitting, higher power, more memories and of course memory scan. TRIO's answer, the TR9130.

TR9130 . . . **£433.32** inc VAT.

TS780 DUAL BAND BASE STATION TRANSCEIVER

The TS780 is the perfect base station VHF/UHF transceiver for the enthusiastic operator. The rig has all the necessary control functions essential for operating on both today's busy two metre band and the wide open spaces of seventy centimetres. Full repeater facilities plus reverse repeater are included and the transceiver has the usual memory channels (10), two VFOs, up/down frequency shift microphone, IF shift, two priority channels, memory and band scan etc. A superb rig, I have one myself, write for a full enthusel

TS780 . . . **795.00** inc VAT.

TR7930 TWO METRE FM MOBILE TRANSCEIVER

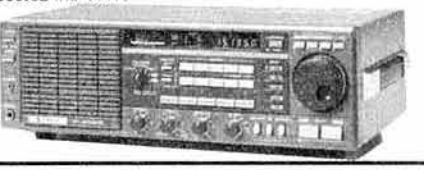
Those who have used or owned a Trio TR7800 will know what I mean when I say that Trio, with the introduction of the TR7930 have improved on the unimprovable. The Trio TR7930 improves on the TR7800 by giving a green floodlit liquid crystal display, extra memory channels, both timed and carrier scan hold, selectable priority frequency and correct mode selection (simplex or repeater). The most significant change is the liquid crystal display, but closely following this must be the ability to omit specific memory channels when scanning and the programmable scan between user designated frequencies.

TR7930 . . . **£305.21** inc VAT.

R2000 GENERAL COVERAGE RECEIVER

The amateur bands are only a very small part of the radio spectrum, many other transmissions are available for the short wave listener. Broadcast stations provide an alternative source of current information both political and regarding the life style of the country. Fitted with the internal VHF converter the R2000 covers continuously frequencies from 118 to 174 MHz giving access to amateur two metre transmissions (am, fm, ssb and cw) plus a lot more. Having 10 memories, memory scan and programmable scan the R2000 provides in one rig the perfect receiver.

R2000 . . . **£398.82** inc VAT.



TS930S HF TRANSCEIVER WITH GENERAL COVERAGE RECEIVE FACILITIES

Much has been said about the TS930S transceiver and it now has a place high in the affection of those amateurs fortunate enough to own one, indeed it has become the "flagship" of the TRIO range. Providing full amateur bands plus a general coverage receiver (150kHz to 30MHz), the TS930S has every conceivable operating feature for today's crowded frequencies.

TS930S . . . **£1150.00** inc VAT.

TR2500/TR3500
HANDHELD TRANSCEIVERS

Two first class hand held transceivers, one for two metres and the other for seventy centimetres. Ten memory channels, band and memory scan, repeater shift, reverse repeater and a low power position make the rigs extremely useful for the radio amateur who wishes to keep in touch with his local scene. A comprehensive range of accessories, base station charger, speaker microphone, mobile mount etc. can be added to enhance operation, accessories used with one rig being compatible with the other.

TR2500 . . . **£232.53** inc VAT.
TR3500 . . . **£250.70** inc VAT.

TS530S HF AMATEUR BAND TRANSCEIVER

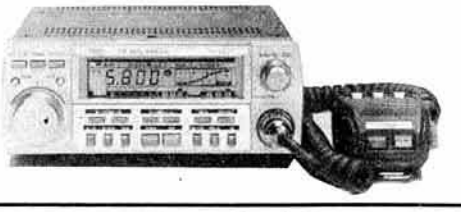
A logical progression from the reliable TS520 series the TS530S was the most popular HF rig in the range. I use the term "was" because TRIO decided to cease production and supplies were no more, however the demand from radio amateurs worldwide for the transceiver have continued and TRIO have reintroduced the rig. A standard HF valve transceiver without the frills but providing today's amateur with all necessary facilities for reliable world wide communication, the TRIO TS530S.

TS530S . . . **£595.00** inc VAT.

TW4000A DUAL BAND FM TRANSCEIVER

I have been waiting for this rig for the last three years, now it is here and I am using one, words fail me. Send for details.

TW4000A . . . **£469.00** inc VAT.



just a part of the range

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for all round reliability, a **DAIWA** rotator.

The Daiwa range of rotators has established itself as the most popular series on the market. There are some simple reasons why this is so, not least of which is the almost legendary reliability of Daiwa equipment. After all, when you have installed a rotator high up on a mast, you want it to stay up there, so it's foolish to buy anything less than Daiwa quality.

Here are a few of the more detailed advantages of the Daiwa rotator system:

UNIQUE CONTROLLERS
Since the controller scales can be set anywhere within their range of rotation, you can arrange the rotator end stop position to be in the most convenient direction to suit yourself. For example, in many rotators, the end of rotation is either South or North. This can be very inconvenient if you want to work DX from Africa and you find that in order to turn your beam from Kenya at about 170 degrees, to Capetown at about 185 degrees, you have to rotate all the way round the scale. With the Daiwa system, you can set the overlap point to the least favoured direction, for example 45 degrees and eliminate the problem. A really elegant idea to solve an annoying drawback of other rotator systems.

PRESET CONTROLLER ROUND CONTROLLER

SAFE OPERATION
Since the motor supply is only 24V ac split phase, there are no dangerous voltages being fed up the mast, unlike some other rotators on the market.

DEPENDABILITY
The rotator head units are housed in a weather sealed and factory lubricated die cast housing finished in a melamine/resin paint for corrosion protection. All external screws are of stainless steel, and a moulded plastic cover with a rubber gasket protects the connection terminals.

QUIET OPERATION
The reduction gear train has moulded hard nylon pinions and die cast spur gears which ensure smooth and quiet operation. The lower ratio gears are surface hardened for exceptionally long life.

EASY MAST ALIGNMENT
Calibration scales are cast into the upper and lower rotator housings, and both sides of the mast clamp are adjustable. This means that the rotator can be aligned exactly on the mast centre line with none of the mast skewing and binding which takes place in other types of rotator. Mast sizes from 38 to 63 mm can be used.

SUMMARY
The Daiwa rotators are the best we have ever found, and we searched for a long time. Their combination of top quality construction coupled to the unique controller system and their ability to withstand harsh treatment have made them the standard by which others are judged. The Daiwa DR7500 and 7600 rotators employ a servo indicating system which ensures really accurate indication of beam heading and fully automatic alignment of the controller and rotator.

The Daiwa rotators are designed to support and rotate the normal range of multi element HF beams used in amateur service. Detailed specifications are available on request, but as a general guide, the DR7500 will rotate up to and including a 3 element tribander such as a TA33 or TH3, whilst the DR7600 will take anything up to and including a two element 40 metre beam . . . and that's some aerial.

DR7500X	Preset Controller	**£113.72** inc VAT.
DR7500R	Round Controller	**£125.00** inc VAT.
DR7600X	Preset Controller	**£163.49** inc VAT.
DR7600R	Round Controller	**£176.29** inc VAT.

the **LS20XE** from **Belcom**

***The rig you will forget you are carrying . . . . . .**
With overall dimensions of 140mm high, 69mm wide, 26mm deep and weighing only 260 grams (including aerial and batteries), the LS-20XE fits easily into your pocket giving perfect portable communication.

***Long range communication . . . . . .**
A newly developed dual gate MOS FET is used in the RF stage of the transceiver which considerably improves receiver performance. The internal 50mm diameter speaker ensures clear audio under difficult portable conditions.

***Full coverage of 2 metre amateur band . . . . . .**
The transceiver covers 144 to 146 MHz in 5 kHz steps and has repeater shift and automatic tone burst.

***Switchable output power for extended operation . . . . .**
In order to extend portable operation, transmission power level is switchable, 1w, 500mW and 100mW, so depending on the terrain and conditions, the most economical level can be selected.

***Simple to operate . . . . .**
Simplicity of operation is a special feature of this rig and many optional accessories are available. Of major interest is the matching headset SH-2 having built-in vox, this convenient accessory provides simple and safe operation whilst cycling, walking etc.

LS20XE **£128** inc VAT

What is so special about it? It's the first truly general coverage VHF/UHF monitor receiver. 25-550MHz with *no gaps*.

Is it more sensitive than the Bearcat/SX200N/Gemscan or whatever? You're damn right it is. Measured sensitivity of 0.2μV for 12dB SINAD on FM(N) at *any frequency* in the band is quite incredible, and far far better than anything else available.

Does it have any spurious responses? None that we can find. With a first IF of 750MHz, there are literally no images to be found, and the design is so excellent that we have literally not found any signals that were not genuine.

Is it AM or airband only? No, you can select any mode in addition to frequency, so it's entirely flexible.

How many memory channels? 20, and they store the mode in addition to frequency, so you can leap from Radio 1 VHF FM to 2 metre amateurs, to TV sound and back to AM airband, just as you wish.

Is a power supply provided? No, you can use any convenient 12V dc supply at about 300mA. A suitable mains/12V regulated supply can normally be supplied at less than £10.00.

Is a telescopic whip provided? We are glad to say no to this one. With a high performance receiver like the AR2001, using a telescopic whip is like owning a Ferrari and fitting it with second hand remould tyres. *Use an external aerial,* has always been our advice. Even a simple one will be far better than a short internal whip.

What are the scanning steps? They are 5kHz, 12.5kHz and 25kHz, so all normal commercial amateur and military channel spacings are catered for.

Is there a search facility? Yes, you can enter any two frequencies and automatically search between them in any mode and any of the three channel spacings. You can also choose whether to scan low to high, or high to low. Two search speeds are available.

Is there a priority channel? Yes, any frequency and mode entered in memory 01 can be automatically monitored at 2 second intervals. If a signal appears, the receiver will hold on channel 01 until the transmission ceases.

Is a delay function provided? Yes, a 2.5 second delay can be added to the end of each transmission so that two way conversations can be monitored.

AR2001

YOUR QUESTIONS ANSWERED

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CLOSED FOR LUNCH 12.30 TO 1.30

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EMPORIUM NEWS

Good morning

Well another Emporium News being written on the train. I hope Irene can read my writing. Off to Glasgow to see Sim. Got to get away from the office once in a while.

Now somewhere between Crewe and Preston – very murky out of the window but a good journey so far.

The JST100 from JRC – a superb rig and one that for a **limited period** we are reducing in price. With such reliable equipment we can afford to do this. So you are not to worry, the **Lowe Electronics' service** will still be there, plus the advice and continued assistance that we are well known for . . . A new special deal for the true enthusiast of real top notch amateur radio equipment. The JST100 is the rig which, **to quote John Wilson,** "has the feel of high quality American gear of several years ago." To try and explain this feel is impossible. My only way is to hope that you see something of **my enthusiasm** for the rig in the text. Regarding the JST100, one could be forgiven for thinking the equipment **plain** and **uninteresting** compared with other pieces of equipment of a lesser price. A JST100 may not have that **"front panel sparkle"** but the plain outside contains perfection in HF rig construction. The four demonstration units located in Glasgow, Darlington, Matlock and London all have their covers removed; **so pleased are we with the quality of construction.** I am not giving you a price for the special JST100 HF transceiver – you would be too upset if you still could not afford one. The answer is to **ring Alan personally** and find out what perfection is all about. **He may even tell you the new price!!**

Of course I am still the proud owner of the NRD/NSD515 line up from the Japan Radio Company. I know of no other separates that could give such pleasure – indeed I know of no other separates. **Normal price** for a JRC NRD515 is £985 but, at the moment, **a few are available for £965. £20 off** – Oh dear me, I must remember not to say **"business is business my life"!!!**

Train now entering Carlisle – still misty, no sun, no pleasant autumnal vistas but I have had a cup of British Rail coffee and a piece of fruit cake and I only had to walk through four coaches to the buffet car – still, the exercise will, no doubt, do me good. 11.13 Carlisle, I must remember to compliment **Marlyn,** our tea lady, on the quality of her coffee.

That reminds me for the lady readers of my column (**correction, to my lady reader**) get your handkerchief ready, a bit of office romance. Marlyn, our tea lady/account assistant will, during the early part of 1984, be getting married to Keith from our Computer Department. A truly happy event and since I know each well I can say they are made for each other. OK, you can now blow your noses, etc. **Unfortunately,** the marriage will cause myself and my colleagues in this office some considerable annoyance – **Keith will always get his tea first!!**

I have told you about **Telereader** equipment before. For those of you who have heard RTTY from the direction of Matlock I will tell you it is me. **A very enjoyable mode,** a different style of contact and way of operating, but a very satisfying one. **Tim, G6XBE** with whom I have had several contacts and who has always been most helpful came along with a QSL card and hard copy of our last contact. A very kind thought and much appreciated. **The three Telereader models** are the **CWR685E** receive and transmit unit with built-in 5" green screen monitor and separate keyboard £730.94 inc. VAT, carriage £6 – **the CWR679E** receive only unit without monitor for £335.00 inc. VAT, carriage £6 and the compact **CWR610** receive plus CW code practice generator built-in for £176.00, the postage on this last item being £2.50. All units give superb performance and reliability. **If you have a general coverage receiver** then many other RTTY transmissions are available for decoding.

Just speeding through Lockerbie now very fast, no hold-ups so far and considering the speed, a very smooth ride. Beatock summit ahead.

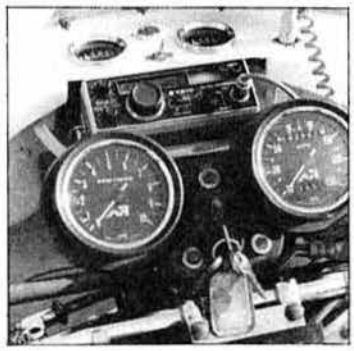
We never seem able to get **enough TRIO TR9130's** – they always seem to be out of stock. A well designed rig having SSB, FM and CW modes plus 25 watts of RF. Equally at home in the car and shack, **the TRIO TR9130** @ £433 inc. VAT, carriage £6.00 – real value for money. As a measure of its popularity **try to buy a second hand one;** difficult if not impossible.

Glasgow. Sunshine, a nice fine day and now for the shop. Many people in as usual but Sim still giving individual attention to each customer. The item being sold when I arrived was the **new Daiwa power supply.** 12 amps intermittent, 10 amps continuous and variable voltages between 3 and 15 volts. We have waited some time for a decent power supply for 25 watt rigs.

Back on the train now, 5.10 in the afternoon and heading home.

You may be forgiven for wondering what a picture of a **TRIO TR7500** is doing in this 1984 column of the Emporium News. The story is fascinating.

We, David and myself, gave the **last Club talk of 1983** to the **Derby and District Amateur Radio Club** and afterwards **G80ZP** came up to us with the following story. I almost said amazing story but, after consideration, perhaps not, I will let you judge. The **TRIO TR7500** was bought in February, 1978 and fitted to the **Triumph 750cc Trident** which you see in the picture. It resided there for two years being rained and snowed on. In 1980 whilst used on holiday on a boat the transceiver was



connected for a week to a 24 volt supply, the owner thought at the time the dial lights were bright. In 1981 **the rig was stolen** from the owner's car and subsequently returned and in August, 1983 the TRIO TR7500 was **again stolen** from a boat again whilst on holiday. It was later recovered from the bottom of the canal. The top and bottom covers were removed and the rig allowed to dry out in the sun. **When switched on it worked perfectly** – the owner, Bob G80ZP's only complaint is that several screws in the back of the rig are rusty. This is what you get when you purchase TRIO equipment. **Reliability!** Of course I am not suggesting that you test your particular rig by immersing in in hot water!!

No new products this month that I can think of so I will take this opportunity to tell you of a few old favourites that if you are new to the hobby you can consider for part of your station.

Starting at the top we have the Jaybeam aerials, not the entire range but those most asked for and, in our opinion, the best. **The GPV5 2 metre colinear** at £33.90 inc. VAT, carriage £6.00, **the 7 cm version GPV7 5/8 over 5/8 over 5/8** £29.00 inc. VAT, carriage £6.00, **the 5 band HF colinear HF5** for ground mounting £55.75, inc. VAT, carriage £6.00 and **the radials** for mast or chimney mounting an additional £35.00 inc. VAT. Ring for further aerial details. Coax for HF frequencies UR43 @ 30p per metre VHF and UHF frequencies UR67 @ 85p per metre, twin 300 Ohm feeder 09p per metre.

Between the aerial and the shack **the well known Daiwa range of cross needle meters,** meters that simultaneously tell you power out, reflected power and where the needles cross indicate the SWR of the system. Available in a **range of models** to suit all frequency combinations and power levels, the Daiwa range of meters like the rotators described on the opposite page set **the standard against which all others must be judged.**

Hope you enjoyed last month's Christmas competition. As I write this between Preston and Crewe 8.45 p.m. you have not yet seen December RadCom. But I hope the response is good and that I have not set an impossible task. Anyway, that's about it for now as I have to get off this train at Crewe.

Gud DXes 73es FBYLS, XYLS, esFBOM, etc.

David

PASS FASTER

MODEL D70 MORSE TUTOR

Once you've decided to tackle the dreaded Morse Test you won't want to mess about. You'll want a learning method that is effective, painless, and that gets you on the HF bands FAST without any expensive retakes.

Thats exactly what the Datong Morse Tutor can do for you, as thousands of satisfied users will confirm.

The Morse Tutor generates a random stream of Morse characters to give receiving practice, but two very important features set the D70 apart from other systems.

First: each character comes at you at its normal speed but with an extra delay between each one. As you improve you reduce the delay until full speed is reached. This way you always learn the correct rythmic sound for each character and avoid the worst of the notorious "plateau" effect.

Second: you can take it anywhere and use it whenever you like without the bother of a mains lead. Battery drain is so low that you should be able to pass the exam on the battery which we install before shipping!

Supplied complete with internal speaker plus personal earpiece, and with a key jack for sending practice, Model D70 is your passport to a more rewarding hobby.

Price: **£49.00 + VAT** (£56.35 total)

FL2/FL3 MULTI-MODE AUDIO FILTERS

These high performance audio filters will improve the performance of any existing communications receiver . . . in most cases, dramatically.

By selecting "SSB" mode you can: remove high pitched monkey-chatter from off-tune SSB stations; remove low pitched noises from other stations on the low side of your signal; remove tune-up whistles with a manually controlled notch filter; at the same time remove tune-up whistles with a second notch filter which tunes itself automatically (this function applies to FL3 only).

What marks out the Datong filters from the rest is the high performance of each of the above functions plus the fact that *all four functions are available simultaneously*.

By selecting "CW" mode all available filters (except the automatic notch) are automatically harnessed together to give an almost unbelievable ability to pull out a single CW signal from a crowded band.

Whether you are an amateur or a professional and no matter which rig you use, the overcrowding on today's HF bands can spoil your reception. Simply adding a Datong audio filter in series with the speaker may be the biggest single improvement you will ever make.

Note that by retrofitting the FL2/A auto-notch conversion kit you can convert an FL2 to an FL3 at any time. The only difference is the auto-notch filter.

Prices: FL2, **£78.00 + VAT** (£89.70 total); FL3, **£112.49 + VAT** (£129.37 total); FL2/A conversion kit, **£34.49 + VAT** (£39.67 total)

DATONG ELECTRONICS LIMITED

ORDER FORM

Your Name ..... Call Sign .....

Address ..... Tel .....

Town .....

City ..... Post Code .....

Please send me the following

Model	Qty.	Unit Price	Unit Total

Total £ _____

Prices include Post, Packing and VAT (U.K.)

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..... for £ .....

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WE DON'T BELIEVE IN MINCING WORDS. WE LEAVE ALL THAT TO OUR COMPETITORS.

ICOM FROM THANET IS QUITE SIMPLY, THE BEST.

The new IC-02E Push-button Perfection

ICOM introduces the new top-of-the-line IC-02E to complement its existing line of popular handheld transceivers and accessories. The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these features include: scanning, 10 memories, duplex offset storage in memory & odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are of course included.

Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. The IC-02E has an easy to read custom LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions.

A battery lock, frequency lock and lamp on/off switch are also featured, as is an aluminium case-back, providing superior heat sinking.

A variety of batteries will be available for the IC-02E, including new long-life 8.4 volt and 13.2 volt packs. Charging may be done from a top panel connector for 13.8 volts which will also power transceiver operation. The IC-2E continues to be available, and its complete range of accessories work with the new IC-02E.

The IC-02E comes with the BP3 Nicad battery pack, BC25E wall charger, flexible antenna, wrist strap and belt clip as standard equipment. A truly excellent product destined to a great future.

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

Something new to celebrate! IC-745 HF Transceiver £759.

What's the celebration about?
The IC-745...a new all band HF transceiver with SSB, AM receive only, CW, RTTY, FM option, and 100KHz – 30MHz general coverage receiver.

And...the IC-745 has a combination of features found on no other transceiver at such an incredibly low price. See the IC-745 at our shop and showroom at Herne Bay or contact your local authorised ICOM dealer for more information.

IC-751, £969. HF Transceiver

Think about the IC-740.
One of the most popular amateur bands transceivers, make a few improvements such as adding 36 memory channels, doing away with mechanical bandswitching and then add full HF receive capabillity (0.1-30 MHz) which is even an improvement on the famous R70 and you get a pretty good idea of what the IC-751 is like. It is fully compatible with Icom Auto units such as the AT-500 and IC-2KL and a further option for computer control can be added. There is also a digital speech synthesizer option which will be ideal for blind operators For power supplies you have the option of the IC-PS740 (which fits inside) or the PS-15/PS20 range for external use.

As you would expect there is a built in speech processor, a switchable choice of a J-FET pre-amp, straight through or a 20dB pin diode attenuator and two VFOs allowing split frequency operation.

Other standard features include:- 36 memory channels with scan facility and start/stop timers, a marker, 4 variable tuning rates, Pass Band Tuning, notch, variable noise blanker, monitor switch, DFM (direct feed mixer) in the front end, full break-in on CW and AMTOR compatibility. The first IF is 70.045 MHz. Any XIT and RIT adjustment is shown on the display.

NEW! IC-120, 1296 MHz FM £419.

Thinking of 1296? Then Icom IC-120 could be the answer.

Now you can have the sophistication of today's technology on this up and coming band-all built into a unit the same size as the IC-25E, very compact..

Features include:	Output Power = 1 W or more
Frequency coverage 1260 - 1300	Mode:- FM
Adjustable Repeater Shift	2 VFO's
6 Memories - with scanning facility	Deviation + 5 KHz
Spurious Emissions - 40dB or better	RIT

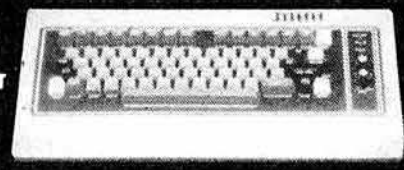
8 W and 16W (Puma) Linear Amps available shortly.

RTTY, Morse & ASCII

Shortwave listeners and amateurs are able to take more interest in other modes of transmission than speech with the latest range of decoders and senders available. As well as amateur transmissions, there is an abundance of news and other interesting broadcasts which can be read using these space-age devices.

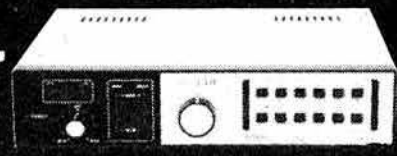
Some models in our range are the Tono 550, 9000E and the Telereader CWR-670, CWR-685E and CWR-610E. There is now available a professional version of the Tono 9000E, the PRO-1, which has a built-in scrambler. The Telereader CWR-670 is also available with a built-in VDU which can include a 40 column printer.

TONO 9000E Sender/Decoder £669.



CWR-610E, Decoder £189.

TONO 550, Decoder £299.



As U.K. importers of the renowned TONO and TELEREADER products, we can offer you a wide range, from a simple morse and RTTY reader which can be plugged into your TV., to a complete send and receive system with memories and built-in displays, or outputs for high-definition VDU.

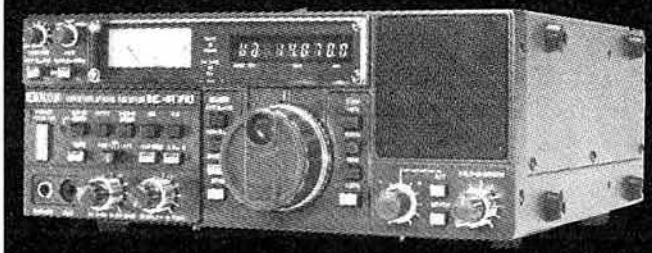
Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Th

NEW! IC-271, £569. VHF Multimode Base station

Icom have made improvements to the IC-251 and brought it up to date.

Power can be adjusted up to 25W on all modes SSB, CW and FM. Squelch works on all modes and a listen-input facility has been added for Repeater work. RIT shift is shown on the display.
10 Hz tuning facility.
Options include a switchable front end pre-amp. SM5 desk mic
Speech synthesizer announcing displayed frequency.
22 Channel memory extension - with scan facilities.
Internal chopper PSU, Why not call us for further details?

IC-R70, HF Receiver, £499.



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

IC-290D, VHF. £433. Multimode Mobile

The recently introduced IC-290H has proved so popular that we have decided to concentrate on this (25W) model 2m multimode. With its bright green display, 5 memories, scan facilities on either memories or the whole band, tone-call button on the microphone and instant listen input for repeaters, this little box really is a beauty. The 70cm version, the IC-490E has similar features (although the output is only 10W in this case).

IC-2E, VHF/FM, £179. IC-4E UHF, £199.

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

IC-25H, £329. VHF, FM Mobile

The 25H now available has a green display and 45 Watts output. There are five easily programmable memories, and facilities for changing the repeater shift from the default value of 600kHz.

Do you know what time it is! £59.

When the globe of this digital clock is revolved, a red lamp indicating a major city in the world will blink, and the current time of that city will be displayed in place of the date. At a glance know the current times of 24 different time zones throughout the world.

This mini-globe clock stands 195mm. high and also has an alarm fitted. This useful device should stop you getting your Amateur friends, on the other side of the world, out of bed in the middle of the night.

As well as stocking the complete ICOM range of equipment suitable for European use, we also sell Yaesu, Jaybeam, Datong, Welz, G-Whip, Western, TAL, Bearcat, Versatower and RSGB publications from our shop and showroom at the address below.

Agent Please telephone first, anytime between 0900 – 2200 hrs.
Gordon G3LEQ Tel: Knutsford (0565) 4040

All prices shown include VAT.
Interest-free credit available
Securicor or post despatch free, same day if possible.

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Thanet Electronics
143 Reculver Road, Herne Bay, Kent
Tel: (02273) 63859/63850

BARCLAYCARD VISA

NEW NORTHERN BRANCH !

We are pleased to announce that Harry Leeming, G3LLL of Messrs. Holdings, Blackburn has now joined us and will be operating as Holdings-(Amateur Electronics UK) from premises at 45 Johnston Street, Blackburn. A full range of our products including all YAESU models will be in stock.
Phone Harry on 0254-59595

FT-726R
VHF/UHF
multi-mode

YAESU's latest VHF/UHF base station now comes to you at £**675** VAT incl. (70cm unit optionary extra).

FT-480R 2 metre multi-mode

Now back in town by popular demand! £**399** VAT incl.

FT-230R 2 metre 25 watt FM mobile
A marvellous buy at only £**239** VAT incl.

FT-730R
70cm FM mobile
This is real value- for-money.
At the new price of £**259** VAT incl.

FT-790R 70cm multi-mode portable
Your best buy at £**299** VAT incl.

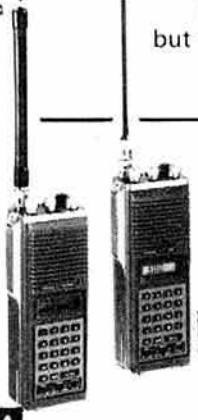
FT-290R
2 metre multi-mode portable
This famous set now comes at £**249** VAT incl.

FT-780R 70cm multi-mode

Limited stocks only
but first come first served
at £**299** VAT incl.

FRG-7700 General coverage receiver
With memory £**389** VAT incl.
Less memory £**335** VAT incl.

Attention FRG-7700 owners!
See us for your special requirements in converters and active antennas - complete range ex stock - Post free.



FT-208R 2 metre FM hand-held
The finest hand-held bar none at under £200 £**199** VAT incl.

FT-708R 70cm FM hand-held
New low price of £**209** VAT incl.

All prices include VAT	All prices subject to alteration without notice.

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East Anglia - Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT Norwich 0603 667189
North East - North East Amateur Radio, Darlington 0325 55969
Shropshire - Syd Poole G3IMP, Newport, Salop 0952 814275

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

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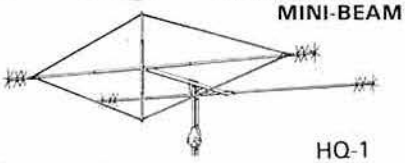
Bredhurst electronics

AUTHORISED YAESU

SUPERB HF TRANSCEIVER FROM TRIO

TS430S **£736 inc VAT**

6M-10M-15M-20M MINI-BEAM



HQ-1

6ft turning radius
1kW power handling

£139 (c&p £4)

LATEST VHF MULTIMODE FROM YAESU

FT-726R **£675 (2M fitted)**

TRIO

		£	c&p
TS930S	9 Band TX General Cov Rx	1216.00	(—)
AT930	Auto ATU 80M-10M	141.00	(—)
TS830S	160-10m Transceiver 9 Bands	697.00	(—)
VFO230	Digital V.F.O. with Memories	243.00	(2.00)
AT230	All Band ATU/Power Meter	135.00	(2.00)
SP230	External Speaker Unit	41.00	(1.50)
TS430S	160-10m Transceiver	736.00	(—)
PS430	Matching Power Supply	112.00	(3.00)
SP430	Matching Speaker	29.44	(1.50)
MB430	Mobile Mounting Bracket	11.27	(1.50)
FM430	FM Board for TS430	34.50	(1.00)
TS530S	H F Transceiver 9 Band	595.00	(—)
TS130S	8 Band 200W Pep Transceiver	559.00	(—)
TS130V	8 Band 20W Pep Transceiver	456.00	(—)
TL120	200W Pep Linear for TS120V	167.00	(1.50)
MB100	Mobile Mount for TS130/120	18.60	(1.50)
SP120	Base Station External Speaker	26.40	(1.50)
AT130	100W Antenna Tuner	93.00	(1.50)
PS20	AC Power Supply—TS130V	57.96	(2.50)
MC50	Dual Impedance Desk Mic	30.80	(1.50)
MC35S	Fist Microphone 50K ohm IMP	14.70	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.70	(0.75)
LF30A	HF Low Pass Filter 1kW	21.00	(1.00)

If you can't see it listed—please ask

TW4000A	2M/70cm FM mobile 25W	469.00	(—)
TM201A	2M FM compact mobile 25W	269.00	(—)
TM401A	70cm FM compact mobile 12W	299.00	(—)
TS780	2M/70cm all mode transceiver	795.00	(—)
TR9130	2M Multimode	433.00	(—)
TS9500	70cm Multimode	395.00	(—)
BO9A	Bass Plinth for TR9130	39.30	(0.50)
TR2300	FM Portable	152.00	(—)
VB2300	10W Amplifier for TR2300	36.50	(1.50)
MB2	Mobile Mount for TR2300	21.00	(1.50)
TR3500	70cm Handheld	250.00	(—)
TR2500	2M Synthesised Handheld	232.00	(—)
ST2	Base Stand	51.90	(1.50)
SC4	Soft Case	13.80	(0.50)
SMC25	Speaker Mic	16.10	(1.00)
PB25	Spare Battery Pack	25.00	(1.00)
R600	Gen. cov. receiver ·15-30MHz	257.00	(—)
R2000	Gen. Cov. Recvr	398.00	(—)
VC10	VHF converter for R2000 (118-174MHz)	113.00	(—)

TW4000A and TM201A now in stock

ICOM

IC745	H.F. 9 Band Transceiver	769.00	(—)
IC751	HF Tx + Gen. Cov. Rx	969.00	(—)
IC-PS20	P.S.U. for above with spkr	155.00	(—)
IC-PS15	P.S.U.	119.00	(—)
IC2KL	H.F. Linear 500 Watts O/P	915.00	(—)
IC2KLPS	P.S.U. for above	256.00	(—)
ICAT500	1·8-30MHz Auto A.T.U.	349.00	(—)
ICAT100	3.5-30MHz Auto A.T.U.	256.00	(—)
IC271E	2M Multimode Base Station	P.O.A.	(—)
IC290E	2M Multimode Mobile	379.00	(—)
IC25E	2M FM Mobile 25W	269.00	(—)
IC2E	2M Handheld	179.00	(—)
IC4E	70cm Handheld	199.00	(—)
ICBC30	Base Charger	49.00	(1.50)
ICHM9	Speaker—Microphone	15.00	(1.00)
ICML1	10 Watt 2M Booster IC2E	64.00	(1.00)
ICSM5	Desk Mic (8 pin for Icom only)	29.00	(1.00)
ICR70	General Cov. Receiver	499.00	(—)
ICOM	Dig. World Clock	59.00	(1.00)

MICROWAVE MODULES

Full range stocked, please 'phone for prices.

DATONG PRODUCTS

		£	c&p
PC1	Gen. Cov. Converter HF on 2M	137.42	(—)
VLF	Very Low Frequency Converter	29.90	(—)
FL1	Frequency Agile Converter	79.35	(—)
FL2	Multi-mode Audio Filter	89.70	(—)
FL3	Audio Filter & Notch	129.37	(—)
FL2/A	Auto Notch for FL2	39.67	(—)
ANF	Auto Audio Notch Filter	67.85	(—)
ASP	Auto RF Speech Clipper (Trio or Yaesu 4pin Plug)	82.80	(—)
D75	Manual RF Speech Clipper	56.35	(—)
RFC/M	RF Speech Clipper Module	29.90	(—)
D70	Morse Tutor	56.35	(—)
AD270	Indoor Active Antenna	47.15	(—)
AD370	Outdoor Active Antenna	64.40	(—)
MK	Keyboard Morse Sender	137.42	(—)
Codecall	Selective Call Device (Link prog)	32.20	(—)
Codecall	Selective Call Device (Switch prog)	33.92	(—)
RFA	Wideband Preamplifier	33.92	(—)
DC 144/282	Metre to 28MHz converter	39.67	(—)
MPU	Mains Power Unit	6.90	(—)
SRB2	Auto Woodpecker blanker	86.25	(—)

WELZ

SP15M	SWR PWR HF/200W	35.00	(1.00)
SP45M	SWR PWR 2M/70cm 100W	51.00	(1.00)
SP200	SWR PWR HF/2M 1KW	69.95	(1.50)
SP300	SWR PWR HF/2M/70cm	97.00	(1.50)
SP400	SWR PWR 2M/70cm 150W	69.95	(1.50)
SP600	SWR PWR HF/2M/20KW	97.00	(2.00)
SP10X	SWR PWR HF/2M	24.45	(0.75)
SP350	SWR PWR HF/2M/70 200W	59.95	(1.50)
AC38	A.T.U. 3.5 to 30MHz 400W PEP	65.00	(1.00)
CT15A	15/50W Dummy Load (PL259)	7.95	(0.75)
CT15N	15/50W Dummy Load (N type plug)	13.95	(0.75)
CT300	300/1kW Dummy Load 250MHz (SO239)	49.50	(2.00)

COAXIAL SWITCHES

—	2 Way Toggle Switch (H.F./2M)	6.00	(0.50)
SA450	2 Way Diecast - SO239 (500MHz)	10.00	(0.75)
SA450N	2 Way Diecast - N plugs (500MHz)	12.95	(0.75)
CH20A	2 Way WELZ - SO239 (900MHz)	17.95	(1.00)
CH20N	2 Way WELZ - N plugs (900MHz)	31.95	(1.00)
—	5 Way Western Rotary (H.F.)	15.95	(1.00)
DRAE	3 Way Rotary	15.40	(0.50)
LAR	3 Way Rotary (H.F.)	19.95	(1.25)

ROTATORS

Hirschman	RO250 VHF Rotor	45.00	(2.00)
9502B	Colorotor (Med. VHF)	56.95	(2.00)
EMR400	Alinco	89.95	(2.50)
KR400RC	Kenpro—inc lower clamps	125.00	(2.50)
KR600RC	Kenpro—inc lower clamps	175.00	(3.00)

TEST EQUIPMENT

Drae	VHF Wavemeter 130-450MHz	27.50	(—)
DM81	Trio Dip Meter	71.00	(0.75)
MMD50/500	Dig. Frequency meter	75.00	(—)

TELEREADERS (CW & RTTY)

TONO 550	299.00	(—)
TONO 9000	669.00	(—)

YAESU

		£	c&p
FT980	H.F. Transceiver	1150.00	(—)
FT102	AM Band Transceiver	685.00	(—)
SP102	Matching Speaker	49.00	(2.00)
FC102	Matching A.T.U.	200.00	(2.50)
FC902	All Band A.T.U.	135.00	(1.50)
SP901	External Speaker	31.00	(1.50)
FT77	Economy H.F. transceiver	459.00	(—)
FT757 GX	H.F. Trans. (Gen. cov. rec.)	625.00	(—)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	335.00	(—)
FRG7700M	As above but with Memories	389.00	(—)
FRT7700	Antenna Tuning Unit	42.55	(1.00)
FT208R	2M FM Synth Handheld	199.00	(—)
FT708R	70cm FM Synth Handheld	209.00	(—)
NC7	Base Trickle Charger	30.65	(1.30)
NC8	Base Fast/Trickle Charger	50.60	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FNB2	Spare Battery Pack	19.95	(0.75)
PA3	12V DC Adaptor	14.20	(0.75)
FT726R(2-M)	V.H.F. Multimode Base	675.00	(—)
FT480R	2M Synthesised Multimode	399.00	(—)
FT780R	70cm Synthesised Multimode (1·6MHz Shift)	315.00	(—)
FT230R	2M 25W FM Transceiver	239.00	(—)
FT790R	70cm Portable multimode	299.00	(—)
FT290R	2M Portable Multimode	249.00	(—)
MMB11	Mobile Mounting Bracket	24.90	(1.00)
CSC1	Soft Carrying Case	3.85	(0.75)
NC11C	240V AC Trickle Charger	9.20	(0.75)
FL2010	10W Linear for FT290R	59.00	(1.20)
Nicads	2·2 amp HR Nicads Each	2.50	(—)
FF501DX	HF Low Pass Filter 1kW	25.70	(1.00)
FSP1	Mobile Ext Speaker 8 ohm	11.15	(0.75)
YH55	Headphones 8 ohm	9.95	(0.75)
YH77	Lightweight phones 8 ohm	9.95	(0.75)
QTR24D	World Clock (Quartz)	31.45	(0.75)
YM24A	Speaker/Mic 207/208/708	18.40	(0.75)
YD148A	Stand Mic	22.60	(1.50)
YM38	Stand Mic dual imp 8 pin	27.20	(1.50)

Many more accessories in stock—please phone to enquire.

SCANNING RECEIVER

SX200N VHF-UHF

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BNOS LINEARS & PRE-AMPS

LPM	144-1-100	172.50	(—)
LPM	144-3-100	172.50	(—)
LPM	144-10-100	149.50	(—)
LPM	144-25-160	189.40	(—)

TV INTERFERENCE AIDS

Ferrite Rings 1⅛" dia. per pair		0.80	(0.20)
HPF-1	High Pass Filter/Braid Breaker	6.32	(—)
BB-1	Braid Breaker	6.32	(—)
LP-30	Low Pass Filter (low power)	3.95	(0.50)
Trio Low Pass Filter LF30A 1kW		21.00	(1.00)
Yaesu Low Pass Filter FF501DX 1kW		25.70	(1.00)

POWER SUPPLIES

DRAE	4 amp	30.75	(—)	12 amp	74.00	(—)
	6 amp	49.00	(—)	24 amp	105.00	(—)
BNOS	6 amp	48.00	(—)	25 amp	125.00	(—)
	12 amp	86.00	(—)	40 amp	225.00	(—)

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E & OE

MICROWAVE MODULES LTD

In this issue of *Radio Communication* we are briefly describing our entire range of top quality British-made products, so that our regular customers and the many newcomers to amateur radio can see for themselves the extensive range we have to offer.

Microwave Modules, formed in 1969, is a wholly independent British company manufacturing quality products to professional standards solely for the amateur market, and it is this dedication together with strong customer loyalty that has enabled us to go from strength to strength in expanding and diversifying our product range.

Please note the addition of various new products (marked ●) which are now in full production.

A full data sheet on each product is available on request.

MTV435 ATV TRANSMITTER

THE ENTIRE RANGE

MML144/100-S PA & PREAMP

LINEAR AMPLIFIERS

		Price £ inc. VAT	Post rate
MML28/100-S:	10m 100 watt linear/preamp, switchable	129.95	C
MML70/50-S:	4m 50 watt linear/preamp, switchable	92.00	B
MML70/100-S:	4m 100 watt linear/preamp, switchable	149.95	C
MML144/30-LS:	2m 30 watt linear/preamp, 1/3w i/p, switchable	69.95	B
MML144/50-S:	2m 50 watt linear/preamp, switchable	92.00	B
MML144/100-S:	2m 100 watt linear/preamp, 10w i/p, switchable	149.95	C
●MML144/100-HS:	2m 100 watt linear/preamp, 25 w i/p, switchable	149.95 ●	C
MML144/100-LS:	2m 100 watt linear/preamp, 1/3w i/p, switchable	169.95	C
MML432/30-L:	70cm 30 watt linear/preamp, 1/3w i/p	129.95	C
MML432/50:	70cm 50 watt linear/preamp, 10w i/p	129.95	C
MML432/100:	70cm 100 watt linear, 10w i/p	245.00	D

RECEIVE CONVERTERS

		Price £ inc. VAT	Post rate
MMC27/mw:	27MHz to medium wave converter	19.95	A
MMC28/144:	10m to 2m up converter	29.90	A
MMC50/28:	6m to 10m down converter	29.90	A
MMC70/28:	4m to 10m down converter	29.90	A
MMC70/28-LO:	4m to 10m down converter with 42MHz LO output	32.90	A
MMC144/28:	2m to 10m down converter	29.90	A
MMC144/28-LO:	2m to 10m down converter with 116MHz LO output	32.90	A
MMC432/28-S:	70cm to 10m down converter	37.90	A
MMC432/144-S:	70cm to 2m down converter	37.90	A
MMC1296/28:	23cm to 10m down converter	34.90	A
MMK1296/144:	23cm to 2m down converter, GASFET preamp	79.95	B
MMK1691/137-5:	1691MHz Meteosat converter	145.00	B

AMATEUR TELEVISION PRODUCTS

MMC435/51:	70cm ATV converter, VHF output	37.90	A
MMC435/600:	70cm ATV converter, UHF output	29.90	A
MTV435:	70cm ATV 20 watt transmitter	159.95	B

RECEIVE PREAMPLIFIERS

MMA28:	10m low noise preamp	19.95	A
MMA144V:	2m RF switched low noise preamp, 100w capacity	34.90	A
MMA1296:	23cm bipolar low noise preamp	37.90	A
●MMG1296:	23cm GASFET low noise preamp	59.95 ●	B
●MMG1691:	1691MHz Meteosat GASFET preamp	92.00 ●	B

MICROPROCESSOR PRODUCTS

●MM1001KB:	Morse keyboard	135.00 ●	C
MM2001:	RTTY to TV converter	189.00	B
MM4001KB:	RTTY transceiver with keyboard	299.00	D
MMS1:	THE MORSETALKER—Speaking Morse Tutor	115.00	B
MMS2:	Advanced Morse Trainer	169.00	B

VARIOUS

MMD050/500:	500MHz digital frequency meter	75.00	A
MMD600P:	600MHz + 10 prescaler	29.90	A
●MMD1500P:	1500MHz + 10 prescaler	97.75 ●	A
MMDP1:	Frequency counter amplifier/probe	14.90	A
MMF144:	2m bandpass filter	11.90	A
MMF432:	70cm bandpass filter	11.90	A
MMS384:	384MHz frequency source	29.90	A
MMR15/10	15dB 10 watt in-line attenuator	14.50	A
●MMR7/3:	7dB 3 watt in-line attenuator	14.50 ●	A

TRANSVERTERS

MMT28/144:	10m linear transverter, 2m input, 10w output	129.95	B
MMT70/28:	4m linear transverter, 10m input, 10w output	129.95	B
MMT70/144	4m linear transverter, 2m input, 10w output	129.95	B
MMT144/28:	2m linear transverter, 10m input, 10w output	109.95	B
MMT432/28-S:	70cm linear transverter, 10m input, 10w output	159.95	B
MMT432/144-R:	70cm linear transverter, 2m input, 10w output	184.00	B
●MMT1296/144:	23cm linear transverter, 2m input, 2w output	199.00 ●	D
●MMX1268/144:	1268 MHz Satellite Up Converter, 2w output	135.00 ●	D

POSTAGE

The above prices include VAT but not postage. Please add postage to the above at the following rates:

UNITS 'A' = £1.25 UNITS 'C' = £3.50
UNITS 'B' = £3.00 UNITS 'D' = £4.50

MMS1 MORSE TALKER

STOP PRESS . . .
24 PAGE CATALOGUE DESCRIBING THE ABOVE PRODUCTS IS NOW AVAILABLE . . .
Send 40p in stamps for your copy

DATA SHEETS

A full data sheet on each of the above products detailing specification and a general description is available free of charge upon request

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FT902DM ALL MODE DELUXE BASE STATION TRANSCEIVER

~~£885~~
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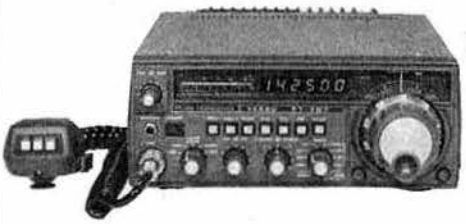
£765 inc

Now's your chance to buy one of the last few of these deluxe transceivers, the 'Grand Tourisme' version of the FT101Z utilizing plug in edge connector boards for ease of servicing and all the little extras not fitted to the 101Z series and all for a price of around £200 less than its forerunner the FT901DM retailed for in 1978.

How much did your gin and tonic or favourite box of cigars cost in 1978

FT707 HF MOBILE OR BASE STATION TRANSCEIVER



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YAESU FV901DM DIGITAL VFO

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FV101DM

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FV901DM

YAESU'S LINE UP FOR '84
THE FT757 SYSTEM

FT757GX	ALL MODES AND FILTERS FITTED	**£625 inc**
FP757GX	SWITCHED MODE PSU	**£135 inc**
FC757AT	AUTOMATIC ANTENNA TUNER	**£210 inc**

* Frequency range 160-10M Tx, general coverage Rx. 10Hz VFO steps and 500kHz band steps. * Modes, USB, LSB, CW, AM, FM all as standard. * Power output 100W SSB, CW, FM 25W carrier AM, 3rd order products −40dB at 100W on 14MHz. * Dynamic range better than 100dB CW(N) at 14MHz. * Frequency stability better than ±10ppm after warm up. * Dual VFO's and 8 memories with VFO/memory transfer feature allowing more flexible split frequency operation. * Programmable memory scanning with scanstop threshold adjustable with the RF Gain control. * All accessories installed including AM, FM, marker, speech processor, shift filters, 600Hz CW filter and keyer. * New heatsink design and ducted cooling system allows 100W o/p at 100% transmitter duty cycle. * Selectable semi break-in or full break-in and built-in iambic keyer with dot-dash memory. * Three micro processors control most of the switching and adjusting functions normally done by hand and on optional CAT interface unit allows further operating flexibility with an external computer.

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FT ONE	Transceiver Gen Coverage	£1395.00
KEYT901	Curtis Keyer	£26.85
DCT1	DC Power Cable	£9.60
RAMT1	Non volatile memory board	£13.05
FMUT1	FM unit	£39.85
XF8.9KCN	300Hz CW filter	£17.25
XF8.9KC	600Hz CW filter	£17.25
XF8.9KA	6Hz AM filter	£17.25
XF10.7KC	800Hz CW filter	£11.90
FT980	Transceiver General Coverage Rx Amateur Tx	£1150.00
SP980	External speaker	£54.00
SP980P	External speaker, phone patch	£69.75
FT102	Transceiver 9 band multimode	£685.00
SP102	Speaker with audio filter	£49.05
SP102P	Speaker and phone patch	£69.00
FV102DM	Synthesized scanning VFO	£223.00
FC102	Antenna coupler, 1·2kW PEP	£200.00
AMFMUT102	AM/FM unit option	£46.00
FAS14R	4 way antenna selector	£39.10
XF82GA	6kHz AM filter	£18.80
XF82HSN	1·8kHz Narrow SSB filter	£18.80
XF82HC	600Hz CW filter	£18.80
XF82HCN	300Hz CW filter narrow	£18.80
XF455C	500Hz CW filter	£44.85
XF455CN	270Hz CW filter narrow	£44.85
FT77	Transceiver 9 band mobile multimode	£459.00
FT77S	Transceiver 9 band mobile, 10W	£399.00
MRKT77	Calibration marker unit option	£9.60
FMUT77	FM board option	£25.30
FP700	External power supply/spkr	£110.00
FC700	Antenna tuner	£85.00
XF8.9KC	600Hz CW filter	£17.25
FT902DM	Transceiver 9 band, multimode	£765.00
FT902DE	902 DM less inverter, memory and FM	£749.00
FT902D	902DM less inverter, memory and keyer	£749.00
FMU901	FM Module	£28.00
KEYT901	Curtis Keyer	£26.85
MEMT901	Memory Unit	£87.90
DCT901	Inverter (from 12VDC)	£46.75
XF89GF	12kHz crystal filter FM	£26.05
50TV	6m transverter module	£79.75
70TV	4m transverter module	£84.80
144TV	2m transverter module	£109.65
430TV	70cms transverter module	£214.65
XF8.9HC	CW filter 600Hz	£26.05
XF8.9HCN	CW filter 300Hz	£26.05
XF8.9GA	AM filter 6kHz	£26.05
FL2100Z	Linear amplifier 1200W+(PIP)	£475.00
FT707	Transceiver 100W 10-8M (8 bands)	£499.00
FP707	Mains power supply/speaker	£110.00
FV707DM	Digital VFO	£170.00
FC707	Antenna tuner	£85.00
FTV707R	Transverter (frame)	£79.00
FRB707	Relay switching box	£15.35
FT26R(2)	Multimode multiband c/w 2M	£675.00
FT726R	Main frame only	£550.00
50/726	6m module	£170.00

21/24/28	HF module for 15m, 12m and 10m	£180.00
144/726	2m module	£135.00
430/726	70cm module	£230.00
SAT726	Full duplex module	£90.00
XF455MC	600Hz CW filter	£39.85
FT230R	Transceiver 2m FM 25W	£239.00
FT730R	Transceiver 70cm FM 10W	£259.00
FT690R	Transceiver 6m 2·5W multimode	£239.00
FT290R	Transceiver 2m 2·5W multimode	£249.00
FT790R	Transceiver 70cm 1W multimode	£299.00
SMC2.2C	Nicad cell, 2·2A/hr 'C' size	£2.70
SMC8C	Slow charger (220mA)	£8.80
MMB11	Mobile mount	£24.90
CSC1A	Soft carrying case	£3.85
YHA15	Flexible helical antenna	£5.00
FL2010	Linear amplifier 2m 10W	£59.00
FL7010	Linear amplifier 70cm	£91.00
FT680R	Multimode transceiver 6m	£349.00
FT480R	Multimode transceiver 2m	£399.00
FP80A	Power supply unit	£55.00
SC1	Station console	£138.00
FL2050	Linear amplifier 50W	£115.00
FT720RV	Transceivers 2m 10W	£199.00
FT720RVH	Transceivers 2m 25W FM	£209.00
FT720RU	Transceiver 70cms 10W FM	£229.00
FT720R	Control head	£100.00
720RV	Deck only 2m 10W	£100.00
720RVH	Deck only 2m 25W	£110.00
720RU	Deck only 70cms 10W	£130.00
S72	Switching box	£39.00
E72S	Cable, 2m long	£10.00
E72L	Cable, 4m long	£15.00
FT208R	Transceiver handheld 2·5 2M	£199.00
FT708R	Transceiver handheld 1W 70cm	£209.00
FNB2	Nicad Battery Pack	£19.95
FBA2	Battery pack sleeve (fits FNB2)	£3.05

Prices include VAT and carriage
*DENOTES SPECIAL OFFER PRICE

FBA3	Charging sleeve (for FT207 acc)	£5.35
NC9C	Slow charger	£8.00
NC7C	Base Master	£30.65
NC8C	Quick charge and PSU	£50.60
MMB10	Mobile bracket	£6.90
FRG7700	Receiver 0·15-30MHz AM/CW/SSb/FM	£335.00
FRG7700M	Receiver c/w 12 channel memory	£389.00
DCRG7700	DC modification kit	£1.15
MEMG7700	Memory option	£98.90
FRT7700	Antenna tuner/switch	£42.55
FRA7700	Active antenna	£38.70
FF5	Low pass filter 500kHz	£9.95
FRV7700A	Converter 118-130, 130-140, 140-150MHz	£78.95
FRV7700B	Converter 118-130, 140-150, 50-59MHz	£84.70
FRV7700C	Converter 140-150, 150-160, 160¼ 170MHz	£74.75
FRV7700D	Converter 118-130, 140-150, 70-80MHz	£80.90
FRV7700E	Converter 140-150, 150-160, 118-130MHz	£83.95
FRV7700F	Converter 150-160, 160-170, 118-130MHz	£83.95
YM21	Hand 600, 4 pin noise cancel	£15.70
YM24A	Hand 2k, 6 pin min, speaker/mic	£18.40
YM35	Hand 600, 8 pin scan	£15.35
YM36	Hand 600, 8 pin, noise cancel	£14.95
YM37	Hand 600, 8 pin	£7.30
YM38	Stand 600/50K, 8 pin scan	£27.20
YM47	Hand 600, 7 pin, scan control	£10.75
YM49	Hand 600, 7 pin, speaker/mic	£16.85
YE7A	Hand 600, 4 pin	£7.65
YD148A	Stand 600/50K, 4 pin	£22.60
YD844A	Stand 600/50K, 4 pin	£26.85
MH-1B8	Hand 600, 8 pin scan	£13.80
MD-1B8	Desk 600, 8 pin scan	£49.85
FSP1	Mobile speaker 8ohms	£11.15
FSP2	Mobile speaker 4 ohms	£11.15
YH55	Headphones padded low Z	£9.95
YH77	Headphones lightweight low Z	£9.95
YH1	Lightweight mobile headset/ bottom mic	£13.80
SB1	PTT switch box for FT208/ FT708	£14.95
SB2	PTT switch box for FT290/ FT790	£12.65
SB3	PTT switch box for FT202	£13.80
FP4	12V power supply 4 amps	£44.45
QTR24D	World time clock quartz	£31.45
FF501DX	Low pass filter	£25.70
YP150Z	Terminated Wattmeter 5-30-150W FSD	£92.00

REMEMBER

Only authorised Yaesu dealers have contact with the factory in Japan, and only if you buy your radio from an authorised dealer can you be assured of spares and service back up. So **BEWARE** of grey importers who offer sets a few pounds cheaper, they may not be around if your set goes wrong!

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9.30-5.30 Mon-Sat

STOCK
SMC (Stoke)
76 High Street,
Talke Pits, Stoke.
Kidsgrove (07816) 72644
9-5.30 Tue-Sat

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Leeds (0532) 782326
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New Whittington, Chesterfield
Chesterfield (0246) 453340
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Buckley (0244) 549563
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1 Belmont Gardens
St Helier, Jersey
Jersey (0534) 77067
10.00-7.00 Mon-Sat

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23 Morton Street
EH15 2HN
031-657 2430
10-5.00 Tue-Fri (9-4 Sat)

SCANNING RECEIVER

MS-8400

New from S.M.C. the MS-8400 VHF/UHF microprocessor controlled scanning receiver with 40 programmable memory channels, keyboard entry of frequency or command; automatic band search, AM and FM selectable, 4 selectable scanning steps, priority channel, connections for external antenna, DC supply and loudspeaker. Supplied c/w telescopic antenna mounting bracket, etc.

SPECIFICATIONS

Frequency Range:	Low VHF 68,000 MHz ~ 88,000 MHz Mid VHF 108,000 MHz ~ 136,000 MHz High VHF 136,005 MHz ~ 174,000 MHz UHF 360,000 MHz ~ 512,000 MHz
Scanning steps:	5, 10, 12.5 and 25 KHz VHF (10, 12.5 and 25 KHz UHF)
Channels:	40 programmable memories
Modes:	AM or FM selectable
Scan rate:	Approximately 18 channels per second
Scan delay:	2 seconds **Priority sampling:** 4 seconds
Audio output:	1.2 Watts
Selectivity:	Better than −60 dB @ ± 25KHz
Power supply:	DC 12V ~ 16V 0.6A max
Memory backup:	9 volt, battery (PP3)
Antenna:	Telescopic antenna or External
Loudspeaker:	2.5" x 4" oval speaker
Size:	190(W) x 250(D) x 85(H) mm
Weight:	1.7kg

£249.00 inc.

Price includes free carriage

ROTATORS

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

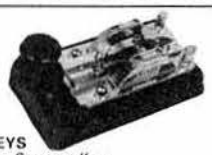
RLD3	Bell	5 Core	Light Duty	£40.25
505	Bell	5 Core	Light Duty	£40.25
AR30	Offset	5 Core	Light Duty	£56.35
KP250	Bell	6 Core	Lighter Duty	£54.91
9502B	Offset	3 Core	Lighter Duty	£56.92
AR22	Bell	4 Core	Medium Duty	£67.85
9508	Offset	3 Core	Medium Duty	£80.21
AR40	Bell	5 Core	Medium Duty	£90.85
BT1	Bell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

Control Cable

RC4W	4 Way	28p/mtr	Carriage £1.80
RC5W	5 Way	33p/mtr	Carriage £1.80
RC6W	6 Way	51p/mtr	Carriage £1.80
RC8W	8 Way	55p/mtr	Carriage £1.80
9523	Support Bearing 9502	£15.81	Carriage £2.50
KCO38	Lower Mast Clamp KR400 600	£12.07	Carriage £2.50

Prices including VAT and carriage, but carriage on accessories is extra unless sent with rotators

MORSE EQUIPMENT



MORSE KEYS

BKU1	Squeeze Key	£30.30	£1.20
HK703	Straight Key	£25.70	£1.20
HK704	Straight Key	£17.65	£1.20
HK706	Straight Key	£14.60	£1.00
HK707	Straight Key	£13.75	£1.00
HK710	Straight Key	£36.40	£1.75
HK808	Straight Key	£45.60	£1.75
HK711	Key Mounting	£29.50	£1.50
BK100	Mechanical Bug	£22.25	£1.75
MK701	Single Lever Paddle	£25.25	£1.60
MK702	Single Lever Paddle	£26.45	£1.60
MK703	Squeeze Key	£25.95	£1.75
MK705	Squeeze Key	£22.60	£1.75
MK706	Squeeze Key	£19.50	£1.75
IKP60	Iambic	£9.95	FOC
SR1	Straight Key	£12.65	FOC

MORSE EQUIPMENT

KP100	Squeeze CMOS 230/13·8V	£69.00	£2.00
KP200	Memory 4096 Multi Ch Mem Back Up 230/13·8V	£155.25	£2.50
D70	Morse Tutor (Datong)	£56.35	FOC
MMS1	Morse Tutor (M/M)	£115.00	FOC
MMS2	Morse Tutor Advanced	£155.00	FOC

MICROWAVE MODULES – RTTY EQUIPMENT

MM2001	RTTY to Demod./Convertor	£189.00	FOC
MM4001	RTTY Transceiver		FOC
MM4001KB	RTTY Transceiver c/w keybd	£299.00	FOC
MM1000	ASCII to Morse Converter	£69.95	FOC
MM1000KB	ASCII CW conv c/w keybd	£89.00	FOC

PRICES INCLUDE VAT at 15%

Carriage as shown

10M FM CORNER

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

OSCAR 2 10M FM **£49.00 inc**

ACCESSORIES		**INC**	**P/P**
SMCGP27	¼ Wave vertical with radials	£24.15	£2.50
SMC VA27	¼ Wave vertical no radials	£20.70	£2.50
SMC11V11S	Glass fibre shortened ground plane	£29.90	£2.50
SMC10SE	10M Mobile whip	£13.80	£2.00
SMCGCCA	Gutter mount and cable for 10SE	£9.95	£1.80
SMCSOCA	4M cable assembly for 10SE	£5.00	£1.20
FLEXI 10	G. Whip mobile 10-80M	£49.00	£2.00
MULTI-MOBILE	G. Whip mobile 10, 15, 20M	£30.48	£1.85
FLEXIWHIP	G. Whip 10M mobile	£18.11	£1.85
GW BASE	Base for all G. Whip antennas	£5.75	
SMCT3170L	Twin meter SWR bridge	£14.95	F.O.C.
SMC100LP30	Low pass filter	£5.30	F.O.C.
SMCRU12-04-06	4 Amp DC power unit	£15.00	£2.00
FSP1	Extension L/S	£11.15	F.O.C.

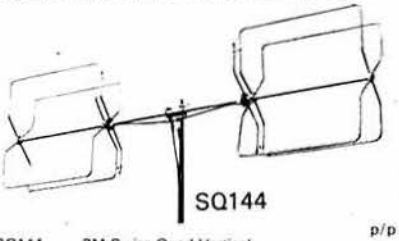
NB. PRICES INCLUDE VAT AT 15%

and carriage by post or Securicor

SMC-HS

HF, VHF, UHF, BASE STATION ANTENNAS

SMC-HS range of base station antennas covers from 80M through to 70cm. All have S0239M connectors and are supplied complete with all required mounting hardware.



			p/p
SQ144	2M Swiss Quad Vertical Mounting 2M ⅝ c/w ground plane	£57.60	£2.50
GP2M	3·4dB ↓	£18.00	£2.50
GP144W	2M 2 × ¼ colinear 6·5dB ↓	£27.60	£2.50
GP23	2M 3 × ¼ colinear 7·8dB ↓	£39.85	£2.50
GP432	70cm 3 × ¼ colinear 6·8dB ↓	£29.90	£2.50
70N2V	2M/70cm colinear 2·8dB ↓/5·7dB ↓	£29.90	£2.50
HS770	2M/70cm Duplexer 50W 30dB isolation	£15.35	£1.50
VHFL	65-520MHz Discone Rx only	£15.70	£2.50
GDX1	80-480MHz Discone 3dB ↓	£40.25	£2.50
GDX2	50-480MHz Discone 3dB ↓	£49.45	£2.50
GDXA	100-480MHz Discone 3dB ↓	£33.75	£2.50
LT606	50-500MHz Log Periodic 7·8dB	£115.00	£2.50
HF5V	Trapped Vertical 10-80M 5 bands	£54.80	£2.50
HF5R	Loaded Radial Kit	£34.90	£2.50
3Y1015D20	3 ele 10, 15M Dipole 20M	£144.90	£5.00

NB: PRICES INCLUDE VAT AT 15%

Carriage extra, mainland rate shown

JAYBEAM

4 METRES				
4Y/4M	Yagi 4 element	7dBd	£29.90	£2.20
PMH2/4M	Phasing harness 2 way		£16.10	£1.50
2 METRES				
H0/2M	Halo head only	0dBd	£5.98	£1.20
HM/2M	Halo with 24" mast	0dBd	£6.55	£1.50
C5/2M	Colinear omni vert	4·8dBd	£54.62	£2.50
LW5/2M	Yagi 5 element	7·8dBd	£14.37	£2.50
LW8/2M	Yagi 8 element	9·5dBd	£17.82	£2.50
LW10/2M	Yagi 10 element	10·5dBd	£24.15	£2.50
LW16/2M	Yagi 16 element	13·4dBd	£35.07	£3.20
14Y/2M	Yagi 14 element	12·8dBd	£36.23	£3.20
PBM10/2M	10 ele Parabeam	11·7dBd	£44.85	£3.20
PBM14/2M	14 ele Parabeam	13·7dBd	£55.77	£3.20
Q4/2M	Quad 4 element	9·4dBd	£29.32	£2.50
Q6/2M	Quad 6 element	10·9dBd	£39.10	£2.50
Q8/2M	Quad 8 element	11·9dBd	£44.85	£2.50
D5/2M	Yagi 5 over 5 slot	10dBd	£25.30	£2.50
D8/2M	Yagi 8 over 8 slot	11·1dBd	£34.50	£2.50
5XY/2M	Yagi 5 ele crossed	7·8dBd	£28.17	£2.50
8XY/2M	Yagi 8 ele crossed	9·5dBd	£35.65	£2.50
10XY/2M	Yagi 10 ele crossed	10·8dBd	£46.00	£2.50
PMH2/C	Harness cir polarisation		£9.77	£1.50
PMH2/2M	Harness 2 way 144MHz		£12.65	£1.50
PMH4/2M	Harness 4 way 144MHz		£28.75	£1.50
SEVENTY CM				
C8/70	Colinear Omni Vertical	6·1dBd	£62.10	£2.50
D8/70	Yagi 8 over 8 slot	12·3dBd	£25.87	£2.50
PBM18/70	18 ele Parabeam	13·5dBd	£32.20	£2.50
PBM24/70	24 ele Parabeam	15·1dBd	£42.55	£2.50
LW24/70	Yagi 24 element	14·8dBd	£27.02	£2.50
MBM28/70	28 ele Multibeam	11·5dBd	£21.27	£2.50
MBM48/70	48 ele Multibeam	14·0dBd	£35.65	£2.50
MBM88/70	88 ele Multibeam	16·3dBd	£48.87	£2.50
8XY/70	Yagi 8 ele crossed	10dBd	£42.55	£2.50
12XY/70	Yagi 12 ele crossed	12dBd	£52.90	£2.50
PMH2/70	Harness 2 way		£10.35	£1.50
PMH4/70	Harness 4 way		£22.42	£1.80
1296 MHz				
CR2/23CM	Corner reflector	13·5dBd	£40.25	£2.50
PMH2/23CM	Harness 2 way		£31.05	£1.50

NB: PRICES INCLUDE VAT AT 15%

Carriage extra, mainland rate shown

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Stourbridge Andrew G4BJY (0384) 390916

Bangor John GI3KDR (0247) 55162
Tandragee Mervyn GI3WWY (0762) 840656

Neath John GW4FOI (0639) 52374 Day, (0639) 2942 Eve

POWER METERS

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

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

FS-500H

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

T3-170L

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

SMC-HS

HF, VHF, UHF ANTENNAS MOBILE VERTICALS

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

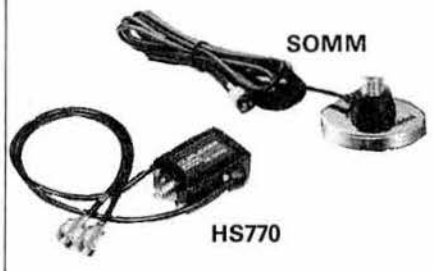
SMC 78F

GCD

SMC258

GCD

	SMC-HS MOBILE ANTENNAS	£	P&P
SMC6P2T/PL	Telescopic 2M PL259 fitting 0dB¼	3.45	0.60
SMCT144h	Telescopic 2M ¼ wave BNC	8.45	0.80
SMC6P2T/BNC	Telescopic 2M BNC fitting 0dB¼	5.00	0.60
SMC2H/PL	Helical 2M PL259 fitting	3.45	0.60
SMC2H/BNC	Helical 2M BNC fitting	5.00	0.60
SMCHS430	70cm ¼ wave BNC fitting 2.5dB¼	6.90	0.60
SMC2QW	2M ¼ wave 0dB¼ 1.6'	2.30	1.50
SMC2NE	2M ¼ wave fold 3.0dB¼ 4.3'	6.90	1.80
SMC2VF	2M ¼ wave fold 3.0dB¼ 3.5'	11.50	1.80
SMC78F	2M ¼ wave fold 4.5dB¼ 5.7'	13.80	2.00
SMC78B	2M ¼ wave ball 4.5dB¼ 5.6'	13.80	2.00
SMC78SF	2M ¼ wave short 4.7'	13.80	2.00
SMC88F	2M 8/8 wave 5.2dB¼ 6.5'	18.80	2.00
SMC118M	Colinear 2M 11/8 wave fold 7dB¼ 9.7'	29.90	2.50
SMC25B	70cm 2 × ¾ fold 5.5dB¼ 3.1'	12.65	1.80
SMC35B	70cm 3 × ¾ 6.3dB¼ 4.7'	16.85	1.80
SMC70N2M	Dual band 2M 2.7dB¼ 70cm 5.1dB¼	16.85	1.80
SMCHS770	144/432 Duplexer 50W	15.35	1.50
SMC20SE	20M 1.72M 'fold over' 100W PEP	17.65	2.00
SMC15SE	15M 1.72M 'fold over' 130W PEP	14.55	2.00
SMC10SE	10M 1.72M 'fold over' 200W PEP	13.80	2.00
SMC17SE	17M 1.915M 'fold over' 200W PEP	15.70	2.00
SMC12SE	12M 1.915M 'fold over' 200W PEP	14.20	2.00
SMCGCCA	Gutter clip 4 mtrs cable	9.95	1.80
SMCSOCA	Cable assembly 4M	5.00	1.20
SMCSOCAL	Cable assembly 6M	5.35	1.20
SMCTMCAS	Trunk mount c/w 6M cable	8.45	1.80
SMCSOMM	Magnetic base c/w 4M cable	9.95	1.80
SMCSOWM	Adjustable wing mount base	4.20	0.90
SMCGCD	Gutter clip deluxe	4.60	1.20
SMCBSD	Bumper strap deluxe	8.80	1.20
HS88BK	Bumper mounted extension for 144 MHz ant.	18.80	1.80



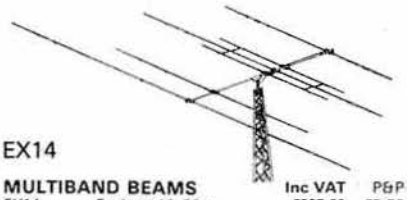
SOMM

HS770

NB: PRICES INCLUDE VAT AT 15%

HF ANTENNAS

SMC have the greatest range of HF antennas eg. Multi Beams/Quads, over 20 models. Shown below is the sensational new Explorer 14—contact us for full details.

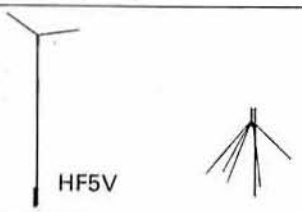


EX14

	MULTIBAND BEAMS	Inc VAT	P&P
EX14	Explorer 10-20m	£325.00	£5.50
TH3JN	3 Ele 10-20m	£202.40	£3.50
TH2MK3	2 Ele 10-20m	£169.05	£3.50
TH3MK3	3 Ele 10-20m	£274.85	£5.30
TH5DXX	5 Ele 10-20m	£419.75	£6.70
TH7DXX	7 Ele 10-20m	£511.75	£8.75
TB3	3 Ele 10-20 Jaybeam	£181.70	£5.40
HQ1	Mini Quad 10-20	£139.00	£4.00
G4MH	Mini Beam 1-20	£82.50	£4.00
TA33JNR	3 Ele 10-20 Moseley	£161.00	£3.40
Mustang 2	2 Ele 10-20 Moseley	£177.10	£3.50
Mustang 3	3 Ele 10-20 Moseley	£220.80	£3.70
GQ2E	2 Ele 10-20 Quad	£189.75	£5.40
GQ3E	3 Ele 10-20 Quad	£313.95	£9.20
GQ4E	4 Ele 10-20 Quad	£446.20	£10.00
Hyquad	2 Ele 10-20	£354.20	£6.00
LP1007	Log Periodic 13-20 MHz	£1474.30	DIST
3Y1015D20	3 Ele 10-20m	£134.95	£5.00
DB10/15A	3 Ele 10-15m	£198.95	£4.80

TB3

	MONO BAND BEAMS		
103BA	3 Ele Yagi 10m	£67.85	£3.50
105BA	5 Ele Yagi 10m	£155.25	£3.75
153BA	3 Ele Yagi 15m	£90.85	£3.50
155BA	5 Ele Yagi 15m	£236.90	£5.90
203BA	3 Ele Yagi 20m	£178.25	£4.90
204BA	4 Ele Yagi 20m	£286.35	£7.30
205BA	5 Ele Yagi 20m	£396.75	£9.40
402BA	2 Ele Yagi 40m	£247.25	£6.50
18TD	Dipole Tape 10-80m		



HF5V **HF5R**

	VERTICALS		
12AVQ	Vertical 10-20m	£50.60	£2.75
14AVQ	Vertical 10-40m	£64.40	£2.75
18AVT/WB	Vertical 10-80m	£113.85	£2.75
18V	Vertical 10-80m taped	£36.22	£2.75
C4	Vertical 10-20m	£59.00	£2.50
SMCHF5	Vertical 10-80m	£54.80	£2.50
SMCHF5P	Radial Kit for above	£34.90	£2.50
	TRAP DIPOLE		
SMCTD/HP	High Power 10-80m	£43.41	£2.50
SMCTP/P	Portable inc coax	£59.80	£2.50
	MOBILE		
Tribander	10-20m Slide sw.	£25.88	£1.50
Multiband	10-20m	£30.48	£1.50
Flexiwhip	10m only	£18.11	£1.85
Extra coils	For above to 160m	£5.70	£1.00
Flexiten	2, 10, 12, 17, 15, 20, 30, 40, 80M	£49.00	£2.00
Bases	For above	£5.75	£1.00

NB: PRICES INCLUDE VAT AT 15%
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THE NATIONAL SOCIETY REPRESENTING ALL UK RADIO AMATEURS

Founded 1913 Incorporated 1926 Limited by guarantee A member society of the International Amateur Radio Union

PATRON: HRH PRINCE PHILIP, DUKE OF EDINBURGH, KG

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

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Affiliated societies: £14.50 (including *Radio Communication*); **£8.70** (excluding *Radio Communication*)
(Subscriptions include VAT where applicable)

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QSL cards for distribution should be sent to: **Mr E. G. Allen, G3DRN, QSL Bureau manager, 30 Bodnant Gardens, London SW20 0UD**

A list of QSL Bureau sub-managers is published in this issue of *Radio Communication*, and amendments will be published under "Amateur Radio News".

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Telephone 0707 (77 from London) 59312 for a recording of the latest amateur radio news.

GB2RS Broadcasts
Sunday news broadcasts from stations throughout the UK using the callsign GB2RS on frequencies in the 3·5, 7 and 144MHz bands.

Details of frequencies, locations and times were last published in the June 1983 issue.

Amendments are published under "Amateur Radio News". A full schedule can be obtained free on request by sending a large sae to the Membership Services Dept, RSGB HQ.

EDITORIAL

BAND PLANNING

The centre section of this month's issue contains up-to-date information on hf and vhf band plans as they are agreed at present. They represent nothing more, of course, than an attempt to make the best use of the limited spectrum that we have been allocated. Usually the problem is how to fit all the interests into one small frequency segment—Amtor, beacons, contests, cw, data, dx, eme, fm, meteor scatter, nets, news broadcasts, Raynet, repeaters, rtty, satellites, simplex, ssb, sstv and tv to name but some—in alphabetical order I hasten to add. Oddly enough the problem with our higher frequency allocations is the reverse: the allocation may be so wide that building equipment to cover the entire band may be impractical, and it becomes necessary to specify preferred parts for operating, at least for the present.

How do band plans come about? Well, one supposes by a mixture of historical precedent, some general principles, and *much* give and take to achieve a reasonable compromise. With the heavy demands placed on most bands, the latter is the best we might expect. In this part of the world, decisions about band planning are taken by IARU member countries at triennial conferences such as the one to be held in April this year in Sicily. This is not necessarily the case elsewhere: in the USA, for example, the national administrative body, the Federal Communications Commission, plans amateur allocations in detail after consultation with the national amateur body, ARRL. Thus modes of operation for particular frequencies are specified in USA amateur regulations depending on the class of licence held.

Clearly, because of the nature of amateur radio, decisions have to be made on an international basis, and this is always a slow, ponderous and costly business. With their resources, of course, it is not surprising that national administrations are able to meet, under the auspices of the ITU, rather more frequently than us to manage the spectrum and determine policy.

One of the problems that has to be recognized is that different countries, even in Europe, often have different priorities. Odd things crop up. It seems that those who live in Central Europe surrounded by amateurs in all directions place a much higher value on beacons than those of us who live on the edge of things. On the other hand, our emergency organization, Raynet, is more highly developed than in most other countries. In those circumstances, it is easy to see how conflicts can arise—and do. But somehow we have to struggle through as best we can, with arrangements that serve the best practical requirements of users.

One of the more important decisions made recently at IARU was simply to recognize that, especially at vhf, there was no way of band planning so that all interests in all countries could be accommodated in a single plan. The more sensible approach adopted was simply to have a broad international plan with each country adding its own details to reflect its own special interests.

The happy thing about band plans is that they *actually work* remarkably well. This is simply because the vast majority of amateurs are thinking, disciplined and generous. Long may this situation continue. If it did not exist, there would be chaos overnight.

David Evans, G3OUF

A MESSAGE FROM THE RSGB'S 50TH PRESIDENT

I am aware of both the honour and responsibility of the office of the 50th President of RSGB, and note with much pride that I am the first Class B licensee to hold this office—but surely not the last. Despite its Orwellian overtones, I look forward to 1984 being faced in a most positive manner.

On the domestic front, a considerable effort over recent years has transformed the Society's administration, and this is now allowing more manpower to be devoted to amateur radio matters; for example, that of generating much closer links between the 500 or so affiliated clubs and societies that make up a major part of the Society at large. As a zonal member of Council, and especially as the chairman of the Society's Membership & Representation Committee for the last two years, I have welcomed this, and as your President it is something that I greatly wish to encourage during my term of office.

This year sees another IARU Region 1 Triennial Conference. Increasingly, decisions affecting amateur radio are being taken on an international level by organizations such as CEPT, which represents the national administrations of 26 European countries. It will be one of the tasks of the IARU conference to ensure that both the national and international amateur radio organizations become increasingly geared up to operate at the same level. I have no doubt that the RSGB will continue to play a leading role in these efforts.

I look forward to joining with all members in accepting the challenge of these and other major issues affecting the future of our very special hobby. In this I extend my good wishes for a happy and successful year.

Robert G. Barrett, GW8HEZ

Amateur Radio News

Amateurs and the Grenadian situation

A news release from the American Federal Communication Commission dated 28 October 1983 has recently been received at RSGB headquarters. In it the FCC has high praise for radio amateurs and the role which they played in the situation in Grenada, during which the FCC waived some of its rules in order to facilitate communication. Mark Barettala, KA2ORK, and others provided the main links to the outside world.

In the FCC's words: ". . . at all times the paramount interest of this agency was the safety and welfare of the medical students on the Grenada campus. Mr Barettala and the amateur operators assisting him provided valuable services in relaying information as to the safety of the medical students and their families and as to the general situation existing at the Grenada station".

Still in the USA, the FCC issued a news release on 7 October 1983 granting the extension of amateur station and operator licence terms from 5 to 10 years: the new terms will be phased in as licences come up for renewal. Amateurs in the USA are fortunate in that they do not have to pay any fee for their licence; presumably the administration costs for the amateur service are met by general taxation, which is not the situation in the UK.

Burners, petrol pumps and the *Daily Express*

On 28 October 1983 the *Daily Express* ran a front-page story highlighting the use of illegal 27MHz power amplifiers to affect the metering system in forecourt petrol pumps and thus to obtain fuel cheaply. This so-called "scoop", couched in highly-coloured journalese, displayed considerable confusion and a marked lack of technical knowledge. The Society was concerned about the possible implications for radio amateurs, and sent a letter to the editor of the newspaper via telex which corrected some of the wilder assertions in the story. This letter was not published, although amateur radio was not implicated in the follow-up stories in subsequent editions.

However, the *Daily Express* reported on the following day that the Minister of State for the Department of Trade intended to implement new legislation which would ban high-power amplifiers for 27MHz: it did so in such a way as to imply that this was by way of response to their coverage of the matter. However, the fact is that the legislation already formed part of the Telecommunications Bill and, according to DTI staff, there are no plans to change the timescale of the bill's passage through Parliament as a result of the report in the *Daily Express*.

The possible implications for amateur radio are not thought to be serious, but the Society is very aware of what happened in the USA in 1978: the commercial manufacture of external amplifiers capable of operation in the frequency range 24–35MHz was banned by the FCC as a direct result of abuse by the cb fraternity, and this ban is still in effect at the time of writing. The ARRL continues to press the argument that this places an unfair burden on the radio amateur, but it has already lost a court case aimed at revocation of the FCC ruling.

To the radio amateur in the UK, the fact that a piece of commercial equipment employing modern microprocessor-controlled electronics is vulnerable to rf breakthrough-induced malfunction will hardly be news. There is also the point that the radio amateur is much more aware of the implications of radio transmissions in the technical sense that the cb user.

Subsequent to the report in the *Daily Express*, the DTI issued a press release drawing attention to the danger of rf-induced sparking causing explosions of filling stations. Interestingly enough, the society has a representative on the British Standards Institution Committee responsible for this topic, and it is understood that there is no known case of rf-induced ignition of this nature. This committee includes within its ambit transmitters which are of much higher power than those licensed for the amateur service, such as broadcast transmitters and radar units. Guidance Note GS21, from the Government's own Health & Safety Executive, also appears to be germane to this issue. It is called "Assessment of Radio Frequency Ignition Hazards to Process Plants where Flammable Atmospheres may Occur" and it contains the relevant graphs and formulas for the determination of the likelihood of potential explosion dangers.

Any further developments in this area will be reported as soon as they occur.

Novice licensing

With the Post Office at Chesterfield now looking towards computerization of all amateur licensing records in autumn 1984, the Society is beginning to consider once again its stance on the matter of novice licensing in the United Kingdom. The Home Office, as the department of state then in charge of amateur licensing, said in 1980 that it could not consider a further tier of licensing in the UK because of administrative difficulties brought about by lack of available staff and a manual record-keeping system. This meant that the RSGB did not pursue the matter further at that time.

The Society has favoured the concept of novice licensing in the past, provided that it would represent a genuine step towards a full licence and not be merely a device whereby access to amateur frequencies could be gained by those who were not interested in the precepts of amateur radio in the wider sense. The recent "novice licence" proposal in Belgium was of this latter type, and—as was said in these pages at the time—was engendered by cb operators seeking more spectrum space.

RSGB COUNCIL ELECTION RESULT

The result of the ballot to fill three vacancies on Council from 1 January 1984 was as follows:

ORDINARY MEMBERS

Candidate	Votes
J. T. Blackwood, G3TG	1,127
K. E. S. Ellis, G5KW	1,538
D. S. Evans, G3RPE	2,516
S. Gabriel, G3HCQ	1,675
A. E. Green, G8NRB	1,096
G. A. Griffiths, G3STG	866
B. O'Brien, G2AMV	2,316
F. S. G. Rose, G2DRT	1,480
L. W. Ross, G8MWR	670
C. V. Smith, GM4FZH	1,224
G. R. Smith, G4AJJ	1,912

Messrs D. S. Evans, G3RPE; B. O'Brien, G2AMV; and G. R. Smith, G4AJJ, were accordingly elected to serve on Council for the three years 1984-6.

As was made quite clear by the violent response of both national societies and individual amateurs in Europe, this type of proposal was emphatically not acceptable to the genuine radio amateur: indeed, the RSGB considers it the antithesis of what a genuine novice licence should be about. There could well be a place for some form of beginner's licence, or additional incentives to improve skill and ability, as a part of the "self-training" aspect of the hobby, but it is rather too early to be able to assess the benefits or drawbacks of the various possibilities and certainly the Society's Licensing Advisory Committee would be pleased to hear the views of RSGB members on this topic. Comments from listener members who are aiming to become licensed would be especially welcomed. Please address letters to "The Secretary (LAC)" at RSGB headquarters.

Raynet zonal representation

As a consequence of the resignations of the Raynet representatives for Zones 5 and 10, vacancies now exist. Raynet Zone 5 covers the Greater London area, and Zone 10 comprises the counties of Cheshire, Merseyside, Greater Manchester, Lancashire and Cumbria.

Members of Raynet who are resident in either zone may forward nominations for the vacancies to "The Secretary (Raynet)" at RSGB headquarters. Nominations should be supported by five registered members who are resident within the zone, and they must be received no later than 31 January 1984. They should be accompanied by a declaration that the nominee is a member of the Society and is willing to serve. The period of appointment is normally three years.

Where more than one valid nomination is received by the due date, an election will be held during the month of March 1984 and members will be notified of the arrangements as soon as possible. In the interim period, the Raynet Committee is making arrangements for temporary appointments in order to ensure continuity of representation.

Region 14 election

Nominations for the position of Region 14 representative have been received in respect of Messrs R. M. Cowan, GM4SRL; G. L. Leishman, GM4MCB; and T. G. Wylie, GM4FDM.

Not later than 29 February 1984, members residing in Region 14 may vote for one candidate in the form prescribed below. Completed ballot forms, which must reach RSGB headquarters by the above date, should be enclosed in a sealed envelope marked "Region 14 election", and addressed to "The Secretary". The composition of Region 14 is given on page 18 of this issue.

FORM OF BALLOT PAPER

I, ...
being a fully-paid-up corporate member of the RSGB residing in Region 14 wish to record my vote in favour of
Mr .....
as representative for Region 14
Signed .....
Callsign or BRS No .....
Address .....
.....

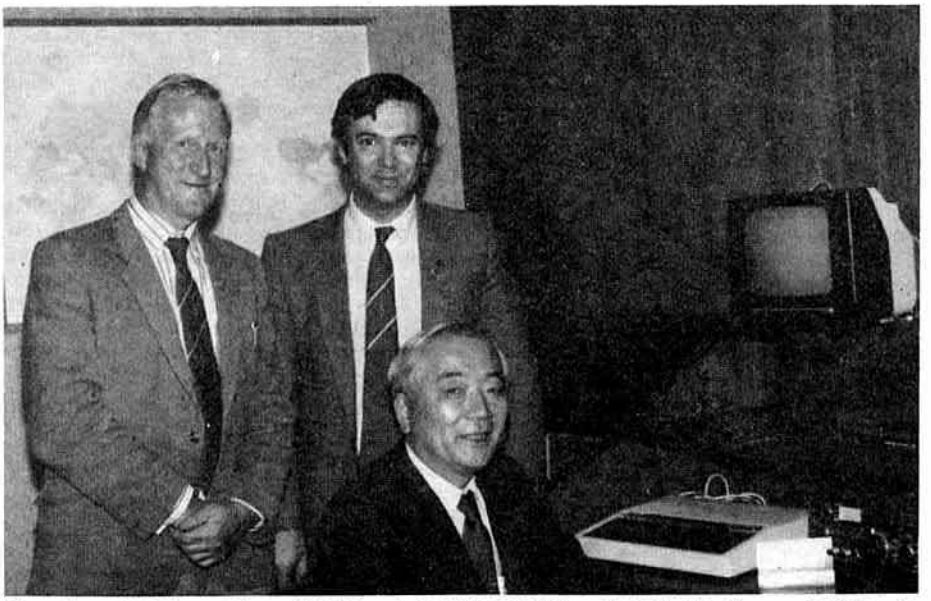
JARL president visits RSGB HQ

Shozo Hara, JA1AN, the president of the Japanese Amateur Radio League, visited RSGB headquarters on 3 November 1983, and was entertained to lunch by the society. JARL has about 140 staff and its own associated publishing company, which has acquired the translation rights to the RSGB's *VHF-UHF Manual*. Of the 560,000 amateurs in Japan only some 52,000 have a full licence, but those who do not hold this licence have access to all bands except 1·8 and 14MHz by means of a "radio telephone" licence which permits phone operation on 3·5, 7, 21 and 28MHz as well as vhf. No morse test is required, Japan being one of the very few countries permitting access to the hf bands without a morse test. Breakthrough problems are prevalent in densely populated towns, even though they are ameliorated by the fact that property owners can erect any antenna they wish, or so it would seem.

Even though repeaters were only introduced into Japan early in 1983, there are already 200 in the 432MHz band and this number will shortly increase to over 1,000. some 50 repeaters are already operational on 1·3GHz as well, and there will be about 100 soon. Japan is also to launch its own amateur satellite in March 1986: it will be sponsored by JARL and launched by Mitsubishi. We understand that a 145MHz uplink and 435MHz downlink are planned.

WARIC

A World Amateur Radio International Conference took place in Tokyo during September 1983. It was organized by the Japan Amateur Radio League jointly with the Japanese Ministry of Posts & Telecommunications, and was dedicated to support the concepts of World Communications Year 1983. Invitations were extended to representatives of countries in all three ITU regions, and indeed all three were represented at the meetings. There was, however, some disappointment that attendance from some of the invited "developing" countries was not as great as had been hoped. Nevertheless the conference included a good cross-section of delegates from both large and small societies: these included BARS, KARL, RJARS, MARTS, ROARS, NZART, NARS, PARS, RAST, TTARS, and JARL. Also attending were IARU president Dick Baldwin, W1RU; David Rankin, 9V1RH, chairman of the IARU Region 3 Association, and H. Walcott-Benjamin, EL2BA, a member of the Executive Committee of IARU Region 1. The RSGB was represented by past-President and council member John Allaway, G3FKM; the ARRL was represented by its president, the late Vic Clark, W4KFC; and the DARC by its president, Philip Lessig, DL3RK. A number of delegates from TIARA, an association of foreign amateurs working in Tokyo, were also present.



Shozo Hara, JA1AN, president of JARL (seated), with G3FKM (l) and G3OUF (r) in the new GB3RS radio room at RSGB headquarters

RSGB NATIONAL VHF CONVENTION

Sandown Park Racecourse, Esher, Surrey

Saturday 24 March 1984

Lecture programme — Trade exhibition

Details next month — Trade space enquiries to L. Hawkyard, G5HD, tel 040 928 342

The conference was also attended by three representatives from the China Radio Sports Association—the first occasion at which China had been present at an international amateur radio meeting. They took an active part in the proceedings, with their lady interpreter speaking excellent English, and they went home bearing (and in some cases wearing) RSGB ties! It is clear that activity from club stations in China will increase in the near future, and the group were excited by the prospect of a new station in Shanghai which is to open soon. This is expected to have telephony capability, which will be a "first" for China. Also, a JARL film of amateur df activity taking place in China was shown, and the RSGB has now obtained a copy of this. The df activities were run on IARU lines, following information and training given to the Chinese society by the Yugoslavian society SRJ.

Undoubtedly the greatest honour received by the conference was the presence throughout of Mr Richard Butler, the secretary-general of the International Telecommunications Union. He was present at both working sessions and social events, and he gave great support to amateur radio by his attendance and interest. At the final dinner he was presented by JARL with a radio receiver, and it is hoped that he will now be able to listen to some of the amateur radio activity which he is so clearly supporting. Mr Butler also attended the IARU Region 1 Conference in Hungary in 1978, and his continued support as evinced at the Tokyo conference was most welcome.

The conference itself was divided into two major groups, one of which was itself subdivided into a number of small discussion groups. The final plenary meeting of the conference agreed the document "Declaration of the World Amateur Radio International Conference", which consists of eight pages. Its final conclusions were: that amateur radio is an asset of national importance, and that IARU member societies should make every effort to secure recognition for it by stressing its many benefits; that IARU member societies should work closely with administrations to increase the number of qualified amateur radio operators; and that the IARU member societies should increase their membership through means and ideas appropriate to the countries concerned.

The conference was most professionally organized and conducted, and was of considerable significance in the history of amateur radio as the first of its scope and type.

Repeater meeting

A London region repeater meeting will take place (provisionally) on 21 January 1984 at Brunel University between 2pm and 6pm. Further details are available from Mike Senior, G4EFO.

Meteors and amateurs

The British Meteor Society has been conducting research in the field of radio scatter observations for more than 10 years, and it is aware of the use of ms techniques by radio amateurs. The BMS has requested a full exchange of information between themselves and the RSGB, and any member interested in assisting is requested to contact Robert A. Mackenzie, FRAS, AFBIS, 26 Adrian Street, Dover, Kent CT17 9AT.

Beacons to move

The GB3SX and GB3WHA beacons located at Crowborough, and operation in the 28, 70 and 43MHz bands, will shortly have to close down for a time while a new site is found for them; the owner of the present site now wishes to use it for other purposes. A new site had not been approved at the time of writing, and it may take some time before the site change procedure can be carried out.

Callbook out soon

The 1984 *RSGB Amateur Radio Callbook* is expected to be published during April 1984. The delay beyond the originally intended February date will permit more newly-licensed stations to be included.

MARS

Headquarters is occasionally asked what MARS stands for and what it is. MARS stands for Military Affiliate Radio System, and is essentially an American network of amateur, professional and military operators whose primary function is to provide emergency communications and which also specialises in providing links between American military personnel overseas and their familes via phone-patch. A good deal of MARS traffic takes place outside amateur bands, since the system is sponsored by the armed forces with the intention of providing training in military communications for US amateurs, and it fulfils a valuable social communications need as well. Several MARS "speciality nets" exist, including a slow-scan television network and a comprehensive phone-patch system.

Cable television news

Cable television is common in the USA, and radio amateurs have experienced many problems caused by the loose entry and exit specifications of cable systems. The ARRL recently renewed its request for the cessation of the use of frequencies in amateur bands for cable tv distribution systems, but this has brought about a strong response from the industry. Two companies referred to the ARRL request as ". . .absolutist and a classic case of overkill" and a third stated that ARRL ". . . .destroys its own case with outdated information". The National Cable Television Association has filed its opposition to the ARRL's proposal and has cited its ". . . .comprehensive efforts to co-operate with ARRL and its members to identify and resolve cable/amateur interference problems".

News from Australia

The trend towards the relaxation of logging requirements for amateur radio stations appears to be growing. As a result of negotiations between the Wireless Institute of Australia and the Australian Department of Communications, log-keeping is now optional provided that distress and emergency traffic is still logged. Club stations are, however, still required to keep logs.

According to a recent report in *Amateur Radio*, phone-patching in Australia is permissible provided that approved equipment wired in place by the Australian Telecom is used.

Save your *Bulletins*

The second issue of the *RSGB News Bulletin* should be found within this copy of *Radio Communication*. From time to time it is intended to use one side to carry information such as bandplans, repeater and beacon lists and other matters, and a binder should be available later so that copies of the *Bulletin* can be kept for reference. Details will appear in a future issue of *Radio Communication*.

Morse classes

A 10-week beginners morse course will commence at Brooklands Technical College, Weybridge, Surrey, on 9 February 1984. The classes will take place on Thursdays from 6.30 to 8pm. Enrolment: 6.30–7pm 2 February. Details from Chris Roberts, Dept of Technology, tel Weybridge 53300, ext 246.

For students who can already read 8wpm approximately. Commences Tuesday 10 January, 7.30pm, Beckenham Adult Education Centre, 28 Beckenham Road, Beckenham, Kent; tel 01-650 1383.

Stolen equipment

On 16 October from an address in North London: FT290R and YM38, serial number IHO40129. Information to 01-794 2399, or Golders Green police station, tel 01-200 2555.

A DATE FOR YOUR DIARY

RSGB NATIONAL CONVENTION 1984

National Exhibition Centre, Birmingham

28-29 APRIL 1984

HOURS

Saturday 10am-6pm **Sunday 10am-5pm**

TRADE EXHIBITION EXTENSIVE LECTURE PROGRAMME

Admission: £2

Full details in later issues

On 29/30 October from a car in Sheffield: Standard 7800 fm transceiver, serial number EO50058, non-standard switches on front, heatsink engraved G4HHM on top; and mobile mounting bracket for FT290R and duplexer. Information to G4HHM, tel 0742 872619, or Maltby Police, tel 0709 812282.

"HF predictions on the home computer"

The authors of this article (*Rad Com* March 1983, pp246-8) have advised the following correction: Line 1170 in the program should read:

G3 = G3 *(1 + SGN(L(N))/2

This leaves G3 unaltered when L(N) is positive, whereas the original statement incorrectly doubles it. See program comments on diurnal muf factor. The result is that daylight mufs for paths with a control point magnetic latitude less than 45°C will be higher with maximum effect around 23°.

American Mould?

It is understood from the American magazine *Aviation Week & Space Technology* that the Hughes Aircraft Systems Group has been awarded a contract for the development and production of its "Position Location and Reporting System", PLRS, for the use by the US Army and the Marine Corps, in part of the 420-450MHz band in the USA. The system is essentially digital and, according to informed sources, it will interface with the Joint Tactical Information Distribution System, JTIDS, now under development. This suggests that PLRS will carry wideband scrambled speech and data links.

Hughes is apparently to produce 23 "master" units and "in excess of 2,000" "user" units, at a net cost of some $265m.

Lincoln Hamfest moves

Owing to circumstances beyond its control —a double booking of the Lincolnshire Showground and Exhibition Centre—the Lincoln Short Wave Club will be unable to hold its annual Hamfest on 6 May 1984. The event will now take place on Sunday 23 September 1984, and in future years it is intended to hold the event on the second Sunday in September.

Sidebands

The Radio Society of Bermuda is concerned about the growing number of QSL cards addressed to VP9AM. This callsign has never been issued, and the operator (giving

CORNUCOPIA!

This remarkable collection of rare and ancient equipment belongs to Les Hare, G8VJE. Les, who comes from Scarborough, has been interested in amateur radio since schoolboy days in 1920, when he spent his dinner money on parts to build his own rig! He has been collecting and restoring radios since the 'twenties, has at least 2,000 spare valves, and can even make his own condenser coils

the name Amy) is thought not to be operating from Bermuda. "VP9AM" operates mostly on 21MHz cw and occasionally to 28MHz.

Chess & Amateur Radio International is an informal organization of radio amateurs who are interested in playing chess over the air: new members are welcome. Their address is PO Box 682, Cologne, NJ 08213, USA.

The "DX-TV" column of the November 1983 issue of *Television* contained what amounted to a definite statement that radio amateurs in the UK would be allocated 50-52MHz. This is, to say the least, somewhat premature: the Society remains optimistic that an allocation in that part of the spectrum will eventually be made, but no decisions have been taken yet.

Special Event Stations

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

12—14 January, GB4SWN
Swansea ARS will operate this station at the Third Swansea Bay Micro Show, The Leisure Centre, Swansea. RTTY will mainly be used on hf and vhf, but phone contacts will also be made. Details from Roger Williams, GW4HSH.

16—26 January, GB4HRC
The station will celebrate 20 years of hospital radio in Chelmsford. Operation will be on the hf bands, and a special QSL card will be issued. Details from G4LDS, tel 0245 269034.

Other Events

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

14 January—RSGB Presidential Installation, Cardiff Castle, Cardiff.
24 March—RSGB National VHF Convention, Sandown Park Racecourse, Esher, Surrey
28-29 April—RSGB National Amateur Radio Exhibition, National Exhibition Centre, Birmingham.

Mobile Rallies Calendar

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

5 February—Bury RS Ham Feast. Mosses Community Centre, Cecil Street, Bury. Talk-in on S22. Open 11am. Refreshments available. Bring & buy. Details from H. F. Bridge, G3VC, 17 Raglan Avenue, Whitefield, Gt Manchester M25 5US, tel 061-773 8824.
18 March—Pontefract & DARS Components Fair, Carleton Community Centre. Open 11am-4.30pm (10.30am for disabled people). Talk-in on 144MHz fm, S22. Aimed at home constructors. Trade stands, RSGB bookstall, bring & buy and raffle. Details from A. Mason, G4TGU, tel 0532 871484, or N. Wittingham, G4ISU, tel 0977 792784.
1 April—White Rose ARS Rally, The University of Leeds. Details from A. N. Bramley, G4NDU, QTHR.
8 April—Buxton Mobile Rally, Transport Museum, Buxton, Derbyshire (next to railway station). Open 11am (10.30am for disabled). Admission 50p, under 14yrs free if accompanied by adult. Talk-in on 144 and 432MHz. Ample car parking. Snack bar and cafeteria. Numerous trade stands. Details from G6MIF, tel Buxton (0298) 6174.
8 April—Swansea ARS Rally. Patti Pavilion, Swansea (next to St Helens Cricket Ground on A4067). Open 10.30am to 5pm. Trade stands, RSGB books, local repeater groups, bring & buy, licensed bar, refreshments. Talk-in on S22. Good car parking. Details from GW4HSH, QTHR. Tel 0792 404422.
6 May—Anglo-Scottish Rally, Kelso, organized by the Kelso ARS, Junk, bring & buy and trade stalls. Full catering facilities and bar. Details from Bruce Cavers, GM4UIB, Kelso ARS, c/o Community Centre, Kelso, tel 0573 24654.
13 May—Swindon Radio & Electronics Rally. Oakfield School, Marlowe Avenue, Swindon, Wilts. Doors open 10am. Talk-in on S22 and SU8/GB3TD. Trade stands, cartoon film show, displays, refreshments, free car parking. Details from Ken Saunders, G8SFM, QTHR, tel 066-689 307.
13 May—Otley ARS Northern Mobile Rally. Flower Show Hall, Great Yorkshire Showground, Harrogate. Open 10.30am. Overnight accommodation and caravan site available. Details from H. Moore, G3CQQ, 269 Leeds Road, Ilkley, LS29 8LL.
20 May—Drayton Manor Mobile Rally. Drayton Manor Park, nr Tamworth, Staffs. Organizer N. Gutteridge, G8BHE, QTHR, tel 021-422 9787. Full details to follow.
27 May—East Suffolk Wireless Revival. Suffolk Showground, Ipswich. Organized jointly by Ipswich RC and Martlesham RS. Details later. Information from J. Tootill, G4IFF, QTHR.
3 June—Spalding & DARS Mobile Rally. Springfields, Spalding. Talk-in on S22 and SU8. Trade stands, 25 acres of garden, bars, restaurants. Details from I. Buffham, G3TMA, tel Spalding 3845.
10 June—Elvaston Castle Mobile Rally, Elvaston Castle Country Park, 5 miles south-east of Derby on the B5010. Organized by the Nunsfield House ARG. Opens 10am. Talk-in will be provided by GB2ECR on both 144 and 432MHz. All the usual facilities including bring & buy sale and flea market. Full on-site catering facilities. Further details from Ian Cage, G4CTZ, QTHR, tel Derby (0332) 799452. Trade enquiries to Mr R. Woolley, G4HIJ, tel Ashbourne 43241.
17 June—Denby Dale Mobile Rally. Shelley High School, nr Skelmanthorpe, Huddersfield. Open 11am. Talk-in on S22 and SU8. Trade stands plus something of interest for the ladies and children. Refreshments, bar. Admission and parking free. Details from G3FQH, QTHR, tel 0484 862390.
24 June—Longleat Amateur Radio Rally, Longleat Park, Warminster. The Bristol Unicorns Marching Band will be with us again this year, plus all the usual Longleat Park attractions for the family. Details from B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead, tel 0272 848140.
1 July—Worcester & DARC Annual Mobile Rally. Droitwich High School, Ombersley Road, Droitwich. Open 11am to 5pm. Attractions will include "Strawberry Fields" and children's fancy dress competition. Details from sec A. C. Lindsay, G4NRD, QTHR.
22 July—Anglian Mobile Rally, Stanway School, Colchester, Essex. Open 1000-1700. Talk-in on 144MHz. Further details from G3YAJ, tel 0206-39 3938.
22 July—McMichael ARS Mobile Rally. Bells Hill, Stoke Poges, nr Slough. Open 11am. Talk-in on S22. Attractions include trade stands, flea market, atv exhibitions and special event station GB2MRS. There will also be vintage wireless, family entertainment, refreshments and a CAMRA beer tent. Free parking. Details from G8IHF, c/o McMichael Ltd, Wexham Road, Slough, Berks.
29 July—Scarborough ARS Rally. The Spa, Scarborough. Open 11am. Talk-in on 144MHz (S22) and 432MHz (SU8). Further details from sec N. Lill, G6CXK, QTHR, tel 0723 60587.
29 July—Rolls Royce ARC (Barnoldswick) Mobile Rally, Sports & Social Club, Barnoldswick. Open 11am. Details from Leslie Logan, G4ILG, QTHR.
12 August—27th Annual Derby Mobile Radio Rally. Lower Bemrose School, St Albans Road, Derby. Talk-in by GB3ERD on 144 and 432MHz. Free admission and parking, but not before 10.30am. All usual attractions including trade stands, prize draw, flea market, refreshments and "Derby junk sale" at 1.30pm. Ample accommodation if wet. Organized by the Derby D&DARS. Details from G3SZJ, QTHR, tel 0332 556875.
26 August—Preston ARS 17th Annual Rally. Lancaster University. Details to follow.
23 September—Lincoln Hamfest, organized by the Lincoln Shortwave Club, on the Lincolnshire Showground (4 miles north of Lincoln City on the A15). Opens 11am-5.30pm. Talk-in on 144MHz (S22) and 432MHz (SU8). Ample car parking, caravan and camping facilities, refreshments, licensed bar. More trade stands than in previous years, many attractions for junior ops. Facilities for the disabled. Further details from G8VGF, c/o City Engineers Club, Central Depot, Waterside South, Lincoln.

COUNCIL PROCEEDINGS

A brief report on the Council meeting held on 29 September 1983

Present: Mr D. E. Baptiste, CBE (President, in the chair), Dr E. J. Allaway, Messrs J. Bazley, K. A. M. Fisher, G. A. Griffiths, F. D. Hall, L. 'N. G. Hawkyard, Mrs J. Heathershaw, Messrs G. R. Jessop, I. J. Kyle, T. I. Lundegard, W. J. McClintock, H. S. Pinchin, K. E. V. Willis (members of Council), Miss S. Gabriel (EMC Committee), Messrs R. J. Hughes (chairman, IARU Committee), B. O'Brien (chairman, Finance & Staff Committee), D. A. Evans (secretary/general manager), A. W. Hutchinson (editor), Ms H. M. Norman (minutes secretary).

The President opened the meeting by welcoming Mr Hughes and Miss Gabriel, who were in attendance to discuss the reports of the IARU and EMC Committees respectively.

Apologies for absence were received from Messrs Barrett, Cornish, Holmden and Pratt.

Committee reports
Council discussed, in turn, with R. J. Hughes, chairman of the IARU Committee, and Miss S. Gabriel, representing the chairman of the EMC Committee who was unable to attend, the reports of those committees and their recommendations and future plans.

Honorary treasurer's report
The President welcomed Mr O'Brien to the meeting and thanked him for agreeing to present the accounts at short notice, as the honorary treasurer was unable to attend the meeting.

Mr O'Brien went through the provisional accounts to 30 June 1983 in detail, highlighting points of interest and noting minor amendments to figures.

He and the secretary answered a number of questions arising from the end-of-year accounts.

Consideration was given to the inclusion of Raynet expenses with other committee expenses, and it was agreed to amend the allocation heading to "Raynet supplies". In future this would be included under "rallies, exhibitions and publicity", if possible.

Secretary's report
The secretary discussed membership levels in some detail, mentioning the new letter being sent to members with their renewal notice.

Liaison with the Radio Regulatory Department was discussed, and the secretary noted that some future meetings with RRD would be held at RSGB HQ. The first of these would take place on 5 October, and would be a full quarterly meeting. Subjects on the agenda included morse code for Class B licensees; emergency communication—user services; reciprocal licensing; unattended operation of df transmitters; novice licensing; morse testing; licence documentation following computerization; greetings messages; cordless telephones; crossband contacts; power limits in the UK; licence fees, and 50MHz.

The secretary mentioned that the position with regard to callsigns as a vehicle registration was being investigated with the Department of Transport.

Committee recommendations
EMC
A recommendation not to hold stocks of filters for sale to members was discussed. The subject had been considered by the Finance & Staff Committee, and in the light of this action it was agreed to refer the recommendation back to the EMC Committee.

HF
"That the 1983 award of the Rotab Trophy be made to Mr N. Cawthorne, G3TXF" was approved.

IARU
"That Mr G. P. Shirville, G3VZV, representing BATC, attend the 1984 IARU Region 1 Conference as an observer" was approved. It was noted that observers were responsible for their own expenses.

Licensing Advisory
"That Mr D. M. Pratt, G3KEP, be appointed honorary organizer of the Amateur Radio Observation Service for the period 1983-6" was approved.

VHF Contests
"That the Surrey Trophy be awarded to the Hadrabs and Addiscombe Contest Group as winners of the open section of the VHF NFD, and the Arthur Watts Trophy be awarded to the Cotswold and Big M Contest Group as winners of the restricted section of VHF NFD" was approved.

Membership and representation
Council noted:
(i) reduced subscriptions granted to a further eight members;
(ii) the waiving of subscriptions in respect of a further six members on health and disability grounds;
(iii) The granting of affiliation to:
Inverness ARC,
Oldham ARC,
Westmorland RS,
Yaesu Club, Nottingham.
Council approved the appointment of Mr M. Elliott, G6NEY, as representative for Region 8.

1983 awards
The following were agreed: Founders Trophy to Mr N. O. Miller, G3MVV; Calcutta Key to Mr R. Cherrill, W3HQQ; and Mullard Award to Mr P. Martinez, G3PLX.

Past-Presidents
Consideration was given to a paper produced by Mr Jessop, in which he proposed that some type of recognition should be made to past-Presidents, in the form of automatic honorary membership.

After discussion, it was concluded that the main purpose of the recommendation was to keep past-Presidents in touch with Society matters, and this was currently done by means of the *Council Letter*. It was agreed not to grant past-Presidents honorary membership automatically.

Offer of painting
It was agreed to accept with thanks G8LT's offer of a painting of HM The Queen to be hung at headquarters.

Raynet and Civil Defence
Council noted correspondence from Mr A. Underwood, G3ESO, together with a paper written in response by Mr Griffiths. The secretary would reply to Mr Underwood, stating that his personal opinions had been noted by Council.

Copyright
Considerable discussion took place on this subject, based on papers from Mr Lundegard; Mr O'Brien (chairman, Finance & Staff Committee), Dr Evans (chairman, Technical & Publications Committee), and copies of letters recently received from the Society's solicitors.

Mr Jessop expressed his concern at the lack of documentation. He was anxious that authors sign a paper assigning copyright to the Society.

The President replied that the lack of documentation reflected the absence of any problems in the past. He added that some authors had in fact been affronted when approached about copyright, as they did not expect any acknowledgement of their voluntary work.

The need for contracts was stressed by Mr Jessop, and the secretary explained that the subject was extremely complex; the Society had received advice on the subject from an expert on the subject as well as from the Society's solicitors.

The secretary agreed that there was a possibility of separating the issues of authors' contracts from copyright, but the Technical & Publications Committee had wished to deal with both subjects together. He undertook to pass on Council's comments to the chairman of the committee.

HF manager's report
Dr Allaway reported that the French had agreed to waive the requirement of a morse test for hf users over 65 years of age. Concern was expressed at this news, and the secretary was asked to raise the matter with RRD.

VHF manager's report
Referring to the vhf managers' meeting, Mr Fisher reported that items of significance had been dealt with and a full report would be circulated shortly.

Six-monthly reports were continuing to arrive from 50MHz licensees, and these would be passed to the VHF Committee for collation. Participants should be congratulated on their efforts.

Mr Fisher had been asked to raise the subject of the 430MHz band at the 1984 IARU Region 1 Conference. He proposed to seek information from other societies during the conference and then produce a paper for the VHF Committee and Council for comment.

World Amateur Radio Conference
Dr Allaway reported briefly on his recent attendance at the World Amateur International Conference, held in Tokyo. He said that the conference had proved most worthwhile. Council was pleased to note the presence of the secretary-general of the ITU and his interest in amateur radio.

OBITUARIES

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

Miss S. D. L. Barnes, G3ZYJ
Susan Barnes died in Zimbabwe on 8 August 1983, aged 28. She was one of the youngest people to attain a licence, having passed the RAE at 14.

Mr E. S. Bates, G4PTO
Eric Bates died on 4 October 1983. although he had only been a member of the RSGB for a short time it had always been his ambition to become a radio amateur. He achieved this only a year before his death.

Mr A. Blissett, G8LGR
Alf Blissett died on 28 October, aged 73. Although for the last 13 years he had been confined to a wheelchair, he was well known on GB3SN, GB3WH, GB3MH, GB3BC and GB3WR. He was an active member of the RAIBC and attended most of their rallies. He was also a member of the Kennet and Lodden Raynet Group.

Mr E. T. Browning, RS52961
Ted Browning, who died recently, was studying for the RAE at the time of his death. He had been an active member of the Derby (Nunsfield House) ARG.

Mr J. D. Gales, G3YRY
Jim Gales, who died recently, was a white-stick operator. He was active mainly on vhf until lately, and had been a member of the Derwent ARC.

Mr B. Harrison, BRS33083
Brian Harrison died on 19 July 1983, aged 33. He had been a member of the RSGB for many years as an swl, and had taken the RAE in May. He died before hearing that he had passed.

Mr E. Harvey, G4DHI
Ernest Harvey died on 17 October. He was active on ssb and sstv until shortly before his death, and had intended to transmit on fstv. He will be missed by the other members of the 3·5MHz lunchtime nets in which he was involved.

Mr S. F. Havers, G4JWM
Mr Havers died on 3 October. He had been an all-band operator, and had been keen on working with antennas.

Mr W. B. Johnson, GI3EIO
Bertie Johnson died on 2 November, aged 58. He was first licensed in 1951 and was a founder member of the Mid-Ulster ARC. He was active on all hf bands and constantly monitored 144MHz. As a radio and tv engineer he was always willing to help fellow amateurs with problems. He spent his spare time refurbishing short wave receivers and was a keen supporter of RSGB.

Mr J. V. Kitchingman, OBE, G4NZR
Jim Kitchingman died on 28 September 1983. Although a paraplegic, he had been a very keen RSGB member.

Mr K. G. Lines, G3FOH
Ken Lines died on 9 September 1983, aged 65. He originally joined the Coventry ARS in its very early days, and rejoined a few years ago. He had lately been operating on 144MHz and often went portable and mobile when on vacation, but his real love was cw dx working.

Col W. H. Lloyd, ex-G5TV
Bill Lloyd died on 18 November 1983. In his mid-eighties, he achieved mention in *World at their Fingertips* as being almost a founder member of the London Wireless Club, in 1913. When he arrived at the meeting venue he felt that as a teenager he would be out of place in such an august gathering, so he turned away—to join at a later meeting.

He had a distinguished military career in two world wars, being awarded an MC in the first and being made a CBE for his services as a chief signal officer in the second. He was active on the amateur bands until a few years before his death.

Mr D. Mann, G4HMY
Donald Mann died on 2 October 1983, aged 64. An excellent cw operator, he took pride in a high standard of operation on all bands, both hf and vhf. Until recently he had been chairman of Smiths Industries RS and member of RAFA, RAFARS, and the Rats of Tobruk. He will be remembered most for his quiet but enthusiastic encouragement of many people to take the RAE, and his delight when they were successful.

Mr F. Monk, G3AKP
Fred Monk died on 23 October. He was a long-time member of the RSGB.

Mr E. Parker, G6EGK
Eric Parker died on 22 July 1983. He came to amateur radio as a form of therapy after sustaining severe injuries both in the second world war and later. He was an enthusiastic constructor and on passing the RAE became a keen operator on 144MHz multimode. He was a member of the North Kent Repeater Group.

Mr A. Smith, G8WP
Arthur Smith died in June 1983. He was very active on 14MHz cw, and was a keen constructor.

Mr T. Wareing, G3EFA
Tom Wareing died on 21 October, aged 63. He had been looking forward to his retirement to allow him to become a more active radio amateur. He learnt morse as a telegraphist for the Post Office, and was active on all hf bands and 144MHz. Tom was always keen to help and offer advice to others.

Mr T. White, GM8YGR
Tom White died on 18 August 1983. an active member of Tayside Raynet and Kingsway Technical College ARC, Tom was fully committed to vhf working, and yet was never too busy to offer technical advice nor to encourage new licence holders.

Also:
Mr L. G. Cox, RS45331, on 14 August 1983;
Mr S. Cruden, G4JQH, on 2 September 1983;
Mr L. A. Dunn, RS27303, on 2 August 1983;
Mr J. Fitzgerald, G3EUS;
Mr R. S. Haslam, EI3BC;
Mr G. A. Hatton, G8GJK, on 22 September 1983;
Mr W. E. J. Higgins, RS49433, in August 1983;
Mr A. H. Johnson, G4EFJ;
Mr L. W. Jones, G5JO, on 21 September 1983;
Mr N. Nieall, RS49870, on 28 June 1983;
Miss J. Peters, G4MYO;
Mr M. D. Pugh, G4JD, on 28 April 1983;
Mr L. A. Rea, RS48023, on 2 August 1983;
Mr B. Scott, G4KRK;
Mr G. A. Steels, G4KPK, on 13 September 1983; and
Mr D. Sutherland, G4OJI, in March 1983.

Members' Mailbag

MORE 432MHz ACTIVITY, PLEASE

Sir—I am appalled by the low level of activity on 432MHz in my area. GB3SY RB6, Barnsley, and GB3WU RB15, Wakefield, are both very much under-used. Some areas in the country have a much higher activity level, almost like 144MHz; I noticed this in Staffordshire. One person I spoke to on 144MHz did not realize that there are three times as many repeaters on 432MHz as there are on 144MHz (150 432MHz, 50 144MHz approximately).

The ubiquitous "Catch 22" applies on 432MHz, stations do not venture on to the band because there is no activity, and there is no activity because . . .

Some stations think that the range of 432MHz is more limited than that of 144MHz. I have used 1W to 5λ/8 antenna on 432MHz, and 2·5W to a λ/4 antenna on 144MHz and found no difference. In order to promote activity on 432MHz, I operate at 1230pm on Sundays, and 8pm on Wednesdays, on GB3SY or GB3WU or SU8. Get on uhf now. Use it or lose it!

A. R. Geering, G4LMS

"Use or lose", although a cliche, is very true: although nothing further has been heard from Belgium, the recent happenings in that country must demonstrate that quite clearly. Certainly GB3RS, and the licensed staff at headquarters, experience the average range of 432MHz as being much the same as that of 144MHz. Having said that, the Society would welcome any suggestions as to how to increase activity on any band.

SHUTTLE DIPLOMACY

Sir—I read with interest the editorial entitled "Shuttle Diplomacy?" Very interesting I thought—press kit, ah! Bet we get a small column in one of the rags—I thought.

But NO—I got to work, picked up my copy of *Electronics Times* (No 239) and find not a small column but "two" yes "two" pages devoted—well almost, to amateur radio.

Well done RSGB. Looks like you've got your act together this time!

Keith Harris, G8LGP

In fact, the article in Electronics Times *was one of a great many which have found their way into the newspapers of late: even* The Times *ran a piece on how amateurs would be able to speak to a shuttle astronaut, and headquarters has been deluged with telephone calls from broadcasting stations and other national media.*

LICENCE FEES

Sir—To abolish amateur licence fees in the UK, as G4GEE suggested ("Members' Mailbag", October 1983), would undoubtedly give the cb movements something to really get their teeth into. One could just imagine the field day they would have via the press (**Headline:** "HAMS DON'T PAY, WE DO!"). Or is G4GEE suggesting a free ride for cb users also?

Anthony Mayers, GW6ZHY

WHY "INDIAN QUEENS"?

Sir—Having been asked many times during QSOs the origin of the name of my QTH, as a majority of place names in Cornwall begin with Tre, Pol or Pen, I thought your readers may be interested in an extract from the *History of Indian Queens*.

"When the Stanna Way became converted into a turnpike road, a high toll gate was erected at Carworgie Cross, as Indian Queens was then called. The road leading down from St Denis is still called High Gate to this day. The Old Mediaeval Pilgrims' Inn became converted into a post-house, an inn where coach travellers could stop for ale, cider, wine, food, and fodder for their horses. It formed an important staging post, standing as it did on a very busy crossroads. During the reign of King James I, John Rolfe of Virginia married Pocahontas, the daughter of the mighty Red Indian chief Powhatan. In 1616 he decided to bring her to England to be presented at court. The Atlantic crossing was stormy and the Red Indian princess was not very happy. Because of the rough seas, the boat put into Falmouth instead of Plymouth, and the princess and her English husband finished their journey by stagecoach. On the way they stopped at the inn at Carworgie Cross, which thereafter became known as the Indian Queen. Alas poor Pocahontas, the English climate did not suit her, and she died in 1617 and is buried in Gravesend, Kent. Gradually the name of the inn began to be applied to the village, and so 'Indian Queens', that is why it is so called."

The next road to my QTH is called Pocahontas Crescent.

W. J. Colclough, G3XC

THE RAE WAR OF WORDS

Sir—Judging by the numbers involved in the war of words over the RAE, it is obviously a topic close to many hearts. The RAE is often used as a "whipping boy" to explain the apparent lowering of standards among the newer licensees. The word "apparent" was used deliberately, since I believe the situation to be more subtle than previous letters seem to suggest, and that the new style RAE is far from the villain it is made out to be. (It is also far from perfect.)

When I obtained my licence (Sept 1970) the number of new licences issued each year was small compared with the number issued nowadays. Most people gravitated towards 1·8MHz then, rather than 144MHz, but the ratio of new licensees (ie less than one year) to established types was preciously small. I think that it's fair to say that inexperience causes you to "put yer foot in it" at regular intervals to begin with, but with such a small number of new guys per year, the chances of coming across someone making a "wally" of themselves were very slim.

Compare that with nowadays, where the number of licences issued per year is much greater, it surely follows that the chances of meeting a "wally" are similarly increased. Maybe it is just numbers that give rise to the view that "144MHz is full of wallies". It certainly seems a partial explanation, but I feel there is rather more to it than that. When I obtained my licence it was generally the case that a year or so (sometimes several) as an swl had preceded the joining of an RAE course. During that time a vast amount of experience would have been obtained about operating procedures, antennas, servicing rigs, and the like. But nowadays many operators join the RAE course "on impulse" after seeing a demonstration of amateur radio, and often do not even have a receiver until the ticket arrives on the mat. This attitude is inherent in a society where everything from credit to mashed potatoes is "instant", but it does mean that new licensees today are more likely to put their collective feet in it more often than their counterparts of yesteryear. Compound this by the increased numbers, and *voila* . . . 144MHz does seem to be full of wallies, and operating standards do **seem** to be declining.

RAE courses (by definition) train tyros to be *technically* competent, not *practically* competent. Perhaps instead of knocking the RAE, and insisting on higher technical standards, people ought to be running lectures on *background* knowledge. I'm certainly not advocating another exam, since this is the kind of topic that radio clubs could easily cater for, and new licensees must make up a significant number of many a club's membership. If today's attitudes are such that people are unwilling to learn the ropes beforehand, then at least offer them the chance afterwards.

David J. Reynolds, G3ZPF

One reason why the staff at headquarters is often badly overloaded is that in the last few years there has been a very large influx of newly-licensed amateurs who, to judge from the volume and type of telephone calls and letters received, have not been through the traditional "apprenticeship" of listening, and who have never been members of a club. We would highly recommend both steps to the aspiring radio amateur, since they seem to the Society to form an important—if not essential—part of the training process. Lectures on "background knowledge" would be an excellent idea.

Sir—In October "Mailbag", G4HES correctly asserts that if a completely ignorant candidate sat the RAE and ticked answers at random he would stand a 12 per cent chance of getting 25 per cent of the marks (on Paper 2). Her conclusion that only two per cent of such candidates would "manage 25 per cent marks on both papers" is, however, quite wrong. The 12 per cent figure is the probability density, per question, at the peak of the distribution, for such a candidate getting *exactly* 15 correct answers out of the 60. G4HES has forgotten the 11 per cent chance of his getting exactly 16 correct, 9·5 per cent chance of exactly 17, and so on. The distribution is shown in Fig 1, calculated on the basis of 100,000 such candidates sitting the exam (heaven help us!).

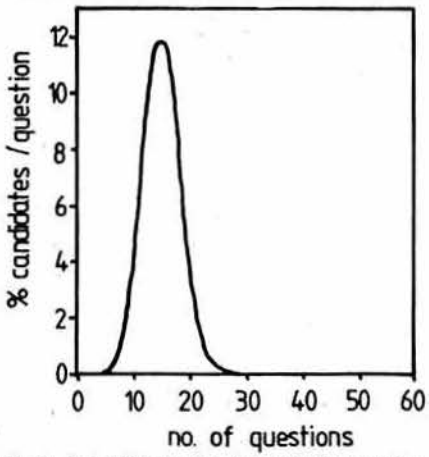


Fig 1. Probability density for randomly-answering candidates to answer correctly the given number of questions

The important result is the chance of getting 25 per cent *or more* of the marks, which is a 50 per cent probability for a paper with an infinite number of questions (now there's an idea!); and actually a little more, 55 per cent probability for getting 15 or more out of 60 questions correct. This is found by integrating the area under the curve of Fig 1, which results in Fig 2, expressed as the percentage of ignorant candidates obtaining at *least* the given number of correct answers. The chance of eight *or more* correct answers out of the 35 on Paper 1 is even higher: 68 per cent.

This leads to the result that 37 per cent of these randomly-answering candidates would manage 25 per cent marks or more on both papers, not two percent of them as G4HES reckons.

All this is just to put the record straight—I happen to believe that it has no bearing whatever on how "easy" or otherwise the RAE

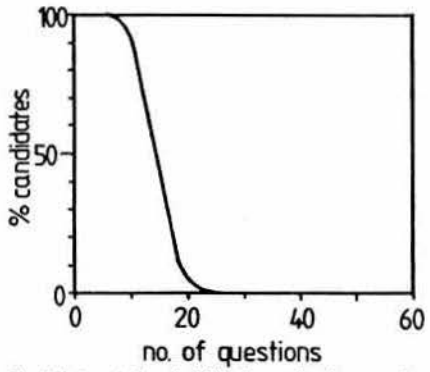


Fig 2. Integrated probability for randomly-answering candidates to answer correctly at least the given number of questions

has become. As it seems that the pass mark is altered from year to year, apparently arbitrarily, it is (presumably) a committee at City & Guilds which sets the standard at the desired level, and not the laws of chance.

One encouraging result, however, is that the chance of our hypothetical (?) zero-knowledged candidate actually obtaining a pass is virtually zero. In other words, a room-full of monkeys with exam papers and pencils would result in very very few passes, although anyone listening to the fm end of 144MHz at times would be forgiven for questioning this.

Dr N. P. Taylor, G4HLX

Any more statisticians care to comment?

Sir—Possibly the cause of the heated and protracted argument re the current RAE examination system is best summed up by a quotation of Niccolo Machiavelli in 1513 when he wrote:

"There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle than to initiate a new order of things. For the reformer has enemies in all who profit by the old order, and only lukewarm defenders in all those who would profit by the new order.

This lukewarmness arises partly from fear of their adversaries who have the law and tradition in their favour, and partly from the incredibility of mankind who do not truly believe in anything new until they have actual experience of it.

It is the leader's job to overcome this lukewarmness."

Food for thought wouldn't you agree?

Ron. C. Torr, G6LJS

CHANGING THE G5s

The September issue of *Radio Communication* contained a notice to the effect that "all existing G5 + 3-letter callsigns will be phased out by the end of this year".

The majority of radio amateurs probably won't have paid much attention to this—"Oh yes, of course, they're going to let foreign visitors use their own callsigns; a much better idea, really". Few people seem to realize that this does not just affect a small handful of foreign holidaymakers, but about 600 (six hundred) foreign nationals permanently resident in Britain, some of whom have lived here and held their callsigns for a decade or more, and all of whom have ordinary British amateur radio licences which they renew on an annual basis just like everyone else.

Like most people, we are very attached to our callsigns—and not only that; losing them will also mean: piles of QSL cards will go to waste, and a fortune spent on having new ones printed; we will have to start from scratch on many awards which have to be worked under one callsign; and, worst of all, **we will lose our identity,** both on the air and in amateur radio circles off-air.

I was told that the reason we have to give up our callsigns is that the Radio Regulatory Department has introduced a simplified way of issuing licences to foreign tourists—which in itself is certainly not a bad thing. However, why this new regulation should affect us, people who have lived here and held British amateur radio licences for many years, I simply do not understand. **To me, it just looks like an act of petty bureaucracy and discrimination against foreign-born UK radio amateurs.**

There does not appear to be any *plausible* reason why they should want to rob us of our callsigns. Do they want to re-issue them when the G1 and G0 series have run out? It's possible, but not very likely—after all, they *did* say, not long ago, that existing callsigns would not be re-issued (and just imagine the confusion it would cause if they did re-issue our callsigns, especially seeing that QSLs often arrive years after the actual contact).

However, if they *do* want to re-issue existing callsigns after all—**why ours?** Of course they couldn't really revoke all the G3, 4, 6 and 8 licences—there are just too many of them—but how about G2 + 3 letters . . .? They are just as much of an "anomaly" as our callsigns, but I am sure no one would dream of revoking them unless all other licences were revoked at the same time.

With the exception of the old tv licences (G6 + 3 letters), no one has ever lost their callsign in this country—and I understand that those who had tv licences had their tv callsigns as secondary callsigns, so they only lost one of two calls. (Yes, OK, so you get a new callsign when you pass your morse test—but that is an entirely voluntary thing—also, you don't lose your old one, as you can always take it out again.)

It will cost the RRD hundreds of pounds in administrative costs to revoke all 600-odd G5 licences and issue an extra 600-odd G4s, G0s or G1s. To me, this seems like an utter waste of money, especially in view of the recent 50 per cent increase in our licence fees.

If all radio amateurs in this country were to be given new callsigns, then, obviously, I wouldn't mind losing mine. But it seems extremely unfair that a small group of radio amateurs should be singled out and discriminated against in this way.

Angelika Voss (Miss), G5CCI

The DTI realizes that within 18 to 24 months it will run out of callsigns and will need to utilize the approximately 17,000 potential calls available from the G5-plus-three-letter series, probably for Class B licences. By upgrading the 400 or so holders of permanent UK reciprocal licences to full UK A or B status, following the dropping of the nationality requirement for UK amateur licences, the DTI will then release the entire series, which will at least provide them with some breathing space. RSGB has already made suggestions for a long term solution to the callsign shortage problem.

The issue of the loss of callsign identity is one which is faced, without any apparent difficulty, by several thousands of Class B licensees who voluntarily upgrade to a Class A licence each year. A few reserve call letters of their choice, but the vast majority do not. Presumably careful planning can help reduce the wastage of QSL cards to a minimum, and as far as awards are concerned the most popular ones, such as DXCC and RSGB awards, make proper provision for an individual who has had more than one callsign. The difference, of course, is that in the Class B to Class A case the change is a voluntary one and the licensee determines the timing of the new callsign.

The Society has requested that some arrangement be made whereby similar call letters can be allocated to the holders of permanent UK reciprocal calls who are being upgraded to full UK licence status. Also the Society advocates that the DTI allows more time for G5 licence holders to make the transition to their new callsign. The Society feels that these measures should go some way towards alleviating Miss Voss's concern.

CONTEST OPERATING

Sir—After reading through "Contest News", *Rad Com* October 1983, I felt I ought to ask the Wirral contesters to consider an alternative to QWB for "worked before" sign during contests. The suggestion was made all in good faith, but upon looking through the international "Q" code, I see QWB? means "What is the true bearing and distance in nautical miles?".

If this Q signal were to be used in NFD (or other) contests, confusion could arise. A signal to inform other competitors that they have been worked before is a good idea, and would save many contesters penalty points deduction, but in my opinion "QWB" is not the ideal answer.

C. Hartles, DJ0OS ex G3ENH

This is an interesting point—the full list of Q-codes is very much longer than that with which amateurs are familiar, and there are some extremely obscure ones in the full list which are probably used once in the proverbial blue moon (there is a Q-code for "Are you towing a glider?", for example!). We agree that it is better to use the correct Q-code wherever possible, although there does not appear to be one which signifies that stations have previously been in communication. In the circumstances it is perhaps better to modify an existing one with a similar meaning (as is done with QTHR, for example). How about "QSOB", meaning "We have worked before in this session/contest/opening"? A publication giving details of all Q-codes is available from HM Stationery Office.

Sir—Yet another weekend's hf operation is disrupted by a contest, with each and every hf band crammed full of "CQ contest . . . 5-9 . . . QRZ". Good luck to them.

That's fine unless you wish to keep a sked, call "CQ" yourself, or simply have a ragchew. I know it's a well-worn theme, but cannot someone, somewhere, please co-ordinate these hf contests, with fixed times, frequencies etc, to better effect. Contests are a minority interest yet they push the rest of us aside by the sheer volume of their traffic on hf (and, heaven knows, there's precious little room on 7 and 14MHz at best) particularly when weekends are the only times that many people have to settle down for an hour or two's operation to enjoy the hobby.

I am not against contests *per se*, and I know many enjoy them, but please let us keep them in perspective.

J. P. Boot, G4NJH

See also last month's "Mailbag".

A VARIETY OF VOCALS

Sir—G3KPO's letter "Those phonetics" (*Rad Com* November 1983) awakened some old memories for me. My father, an army signaller, taught me both morse and the phonetic alphabet (Ack, Beer, Charlie etc). The morse was useful when I joined the Navy as a telegraphist, but I had to relearn phonetics (Able, Baker, Charlie) etc; however, when contacting civilian coast stations, Amsterdam, Baltimore and Casablanca had to be substituted.

My demob intervened just two months before all Nato forces switched to Alpha, Bravo, Charlie etc; and when I went to the Post Office as a telegraphist the training school insisted on Andrew, Benjamin, Charlie etc. The public, however, not having the benefit of our training, preferred A for Apple, B for Brother, C for Charlie etc.

And so, last December, I took my RAE, for which I needed to know Alpha, Bravo, Charlie.

CW being my first love I have only recently ventured into the unknown territory of phone, and I find that as often as not my call is returned as "Germany Four Sugar Nancy Yellow".

John Marsden, G4SNY

LIGHTNING

The nature of the beast and how to survive its fiery fingers

Alan Martindale trained as an army wireless operator in 1946, and later became an instructor. In 1956 he joined the Pye group of companies in a technical capacity, and worked in a variety of spheres from test and alignment of transmitters to the design of modular tvs. He took up amateur radio in 1958 and became secretary of the Leiston ARC. In recent years he has lectured in eastern England on antennas and associated subjects, including lightning.

A short treatise on the nature of thunderstorms and the anatomy of lightning as far as it would be of especial interest to radio amateurs

by A. MARTINDALE, G3MYA*

Introduction

If, like my wife and I, you are one of the millions of people who show a certain amount of trepidation every time those black heaps of cumulo-nimbus loom large, read on. . . . . We live on one of the highest points in the small Suffolk town of Leiston, and we have had one or two close encounters of the charred kind since we moved here 26 years ago.

Our apprehension is fuelled by memories of an incident in 1959 when my top-band antenna became a lightning victim. We had been warned on the radio that there would be some electrical storms that day, so before I left for work I disconnected my equipment and grounded all the antennas. This seemed like a good idea at the time, and I was under the impression that this was the correct way to protect your installation from the ravages of lightning—how wrong can you be?

The predicted storms arrived after lunch, and did their thing with rain and heavenly pyrotechnics, and passed on their way. After the storm had gone by and the sun was shining, my wife looked out of the kitchen window to make sure the rain had stopped, and as she did so there was a most vivid flash accompanied by a tremendous crash and roar.

From what my wife told me when I got home, and from subsequent studies, I have no doubt that this was a positive lightning strike, which is the most violent type of all.

A quick inspection of the antenna system soon revealed a total absence of the top-band antenna and a close inspection of the ground revealed a few tiny copper balls—a direct strike! This unplanned metamorphosis of my antenna left me completely bemused and wondering how to protect my system from heavenly fireworks. I did not find an answer until comparatively recently, when the secretary of the Ipswich Radio Club suggested that I fill in some idle moments in a study of lightning and give a talk on protective measures to the members—that's how I got really interested.

The first problem I encountered was the difficulty of finding any suitable learned literature on the subject in the English language. My quest was eventually rewarded by my local library with a work by Dr R. H. Golde entitled *Lightning Protection* (Published in 1973 by Arnold at a (then) price of £6) to which I attribute most of the knowledge I have since acquired on the subject.

Thunderstorms—their formation and performance

In order to face an enemy, it is always a good idea to have a basic understanding of his physiology and habits—in military parlance this is called an "appreciation"—so I will start this appreciation with the lightning's home base—the thunderstorm itself.

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In the UK, thunderstorms fall into two basic categories which have quite different beginnings and are not readily confused with each other. Both are the result of very turbulent air which, by its very nature, collects electrical charges from frictional contacts within the air itself, with surrounding objects, and with water vapour in particular. These charges distribute themselves in a very orderly manner throughout the storm centre so that the top of the storm is positively charged with respect to its base.

The first of the two categories is the "frontal" storm that heralds the arrival of cooler air on a cold front. It is triggered by the sudden upheaval of warm, surface air by the approaching cold air. This has the effect of lifting the warm air very quickly and creating an assisted thermal situation as the warmer air is replaced by the advancing cold air. All this activity is quite violent and frequently creates a "squall-line" that is often accompanied by quite severe, but short-lived electrical activity.

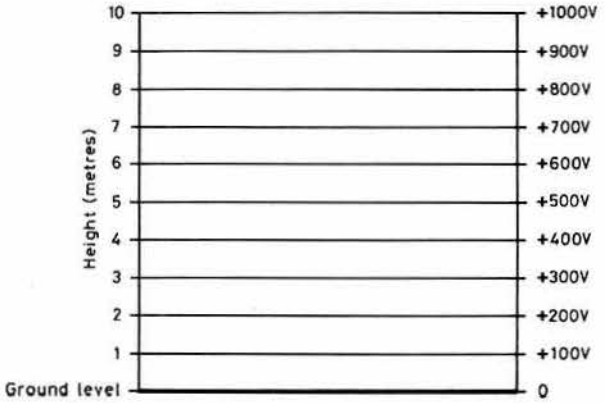

Fig 1. The normal voltage gradient on the bottom 10m of the atmosphere on a normal, warm summer's day

The more familiar type of storm is the one that appears late on a summer's afternoon and seems to hang around for hours grumbling and banging for what seems to be an age. These summer storms are again the result of rising warm air, but this time not assisted by the approach of cooler air. This time the rising air is the result of summer heat over warm, moist ground creating thermals beloved of gliding enthusiasts. These thermals, however, are really quite fierce. They rise to many thousands of feet and lift huge quantities of water with them in the form of vapour, which condenses as it cools and forms those massive thunderheads known as cumulo-nimbus. This massive conglomeration of thermals is due to the fact that there is not usually much wind at the time, thus allowing these thermal columns to become much more concentrated. This lack of wind also accounts for the fact that summer storms tend to hang around for some time.

Both types of storm produce lightning of all descriptions. Frontal storms seem less active, but this is mostly due to their rapid transit over the ground and the fact that the line of storms is at right angles to the passage of the front, thus allowing storm activity to pass relatively quickly. The summer storm, however, moves very slowly, is usually much larger—covering a greater ground area—and contains more than one storm centre to each storm.

Lightning—what it is, how it is produced, and types of stroke

While it is not easy to quantify all the components of a lightning stroke, a lot of research has been done, and by a combination of scientific measurement and educated observation it has been possible to come up with some interesting figures. For instance, the average peak current in a cloud-ground stroke is about 25kA. That is for a negative stroke, but the sort of current encountered in a positive stroke has been known to peak at over 270kA!

When it comes to measuring the actual amount of electricity discharged in a single stroke, the task is much more difficult, but certain scientific techniques have come up with some very reliable figures, based on measurement and calculation. For instance, by measuring the damage to aircraft or other metal surfaces, it is possible to re-create the same current in a controlled discharge and, by measuring the distance of travel and dissipation of heat en route, to come up with a reasonable estimate. From these and similar measurements, such as oscilloscope traces measuring current in certain selected lightning conductors, it is estimated that the

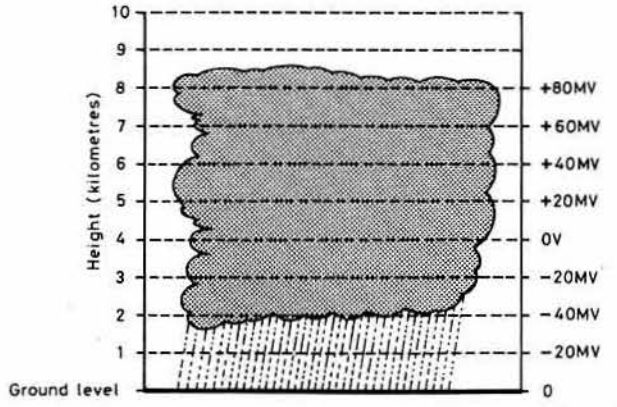

Fig 2. The average voltages encountered in the bottom 10km of the atmosphere in the area of an active thundercloud

average total discharged during the life of a single storm centre is around 1,000 coulombs. With an average of about 20 to 30 discharges per storm centre, this would put an average stroke's total discharge at around 40 coulombs. If we assume the average storm centre to resemble a capacitor of about 25μF, with a charge of 1,000C the charge potential will be of the order of (V = Q/C) 40MV. To put this into perspective as potential energy, it represents an energy of 40GJ or (in terms of the domestic electricity supply) enough latent power to supply the average household for two years. Remember that one storm can, and usually does, consist of several storm centres.

One aspect of thunderstorms which can be measured accurately is the voltage gradient between cloud and ground, and results of research in this field (no pun intended!) produce some hair-raising figures (that pun *was* intentional!). On any day of the year there is always a space charge between the ground and the atmosphere, with the ground normally being negatively charged with respect to the air above it. On a warm, summer day this charge is around 100V/m, somewhat less on a cooler day. These figures go completely haywire when there are thunderstorms about!

As mentioned earlier, a thunderstorm carries a heavy static charge with positive at the top and negative at the bottom. In fact, the base of the thundercloud becomes so negatively charged that it is much more negative than the ground, thus reversing the normal voltage gradient and doing it in a most convincing way. With the base of a thundercloud at about 2km above ground and the top some 6–7km high, it is the charge across the bottom 2km that most interests us at this stage.

As a charged-up cu-nim approaches, the standing voltage gradient declines, momentarily disappears and then reappears with reversed polarity and increases very quickly. When the storm centre is still some 5km distant, the voltage gradient has climbed to 5,000V/m, and directly beneath the storm centre it rises to a shocking 20,000V/m! It is when this gradient gets so steep that you feel its effects by your hair "standing on end", and at the same time sweat glands are stimulated.

Looking at the voltage gradients, Fig 1 shows the gradient on a normal summer day, and Fig 2 the gradient under and in a thundercloud over flat ground. In residential areas of course, flat ground is broken by obstructions such as trees and buildings (not to mention our antennas!) and Fig 3 shows the effect of obstructions in the electrostatic field between cloud and ground. Where an obstruction occurs, there is some local compression of the voltage gradient, especially at the corners of electrically-earthed structures and other protrusions. Flagpoles, masts and chimneys all tend to cause tight compression and the effects of this will be discussed later. Fig 4 shows the extreme compression of the voltage gradient at the tip of a very sharp pointed object, such as a lightning conductor, and it will be seen how easy it is to get a breakdown of the insulation factor of air. This results in local ionization, which appears as a pale blue glow and is sometimes called St Elmo's Fire. Another place where one can see ionized air in connection with a thunderstorm is along the leading edge of a very active squall line, but this pale blue line is not often visible.

Now to the actual anatomy of lightning itself, and there is literally more to this than meets the eye! For our example we will take the common ground stroke, known as the negative stroke because it originates in the negative region of the cloud, and which is the most documented of all the lightning phenomena. As explained above, there is already a steep voltage gradient between the base of the cloud and the ground, though this in itself is not sufficient for the insulation property of air to break down and the air to ionize—it needs some help. Beneath the cloud is an area of extreme turbulence, and this is constantly causing local high charges to be

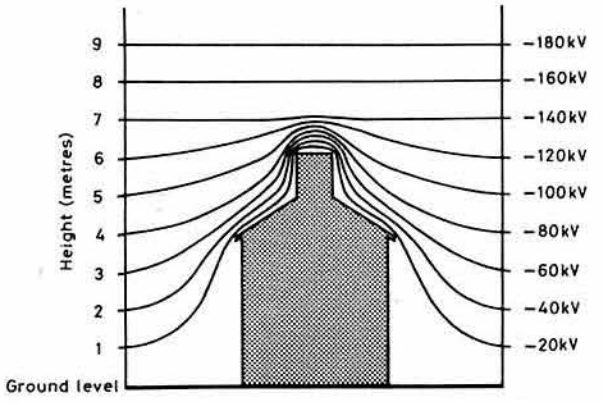

Fig 3. The effects of the high voltage gradient beneath a storm centre on ground obstructions. Note the tight bunching at chimney corners

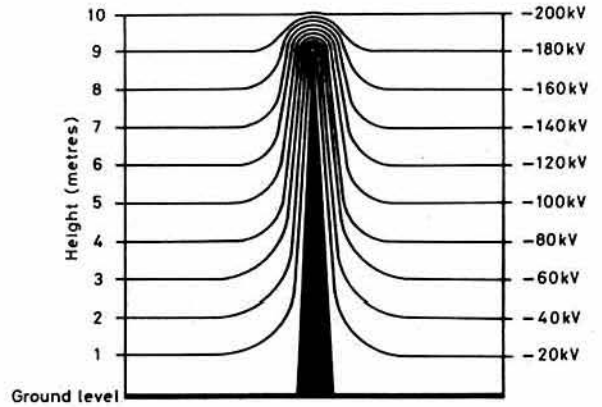

Fig 4. The effect of a tall, sharp object in the high voltage field beneath an active storm centre. The tight bunching often leads to a local breakdown of air insulation at the tip, causing ionization at that point

generated. This causes separation of air molecules, and the positively-charged ones (those that have temporarily lost an electron) are lighter and travel upwards towards the highly negatively charged cloud base. This, in turn creates local imbalances in the overall voltage gradient and suddenly there is a path of about 20m where the gradient is so steep that ionization occurs between a point at the cloud base and a positively-charged packet of air about 20m or so below it. This ionized path now brings the cloud base potential down by 20m at the leader tip (the ionized track is called the leader). This means that another packet of positively-charged air within about 20m will cause the leader to continue its course—possibly two more packets will be targets for the leader, which will split as many ways as it pleases. Not all leader tips continue to find sufficient targets on which to continue, so they just fizzle out, while the more prosperous ones continue on their erratic path towards the ground (see Fig 5).

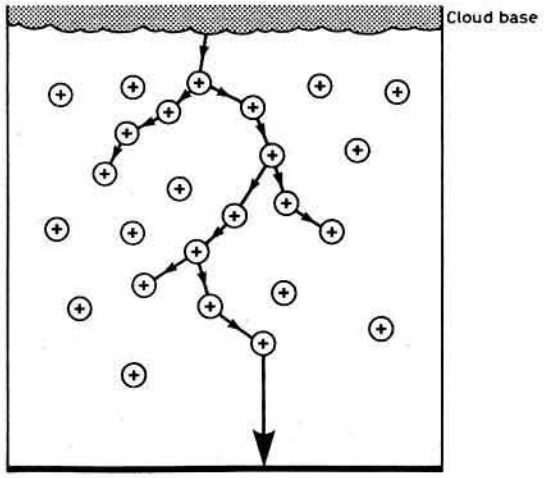

Fig 5. Track of a leader, showing its movement to the nearest positive air packet, and dying leader tips

In addition to the positively-charged packets of air caused in the under-cloud turbulence, there are also packets being formed by local ionization down at ground level—where small coronal discharges are taking place at the tips of lightning conductors and other projections. All these little packets rise and join the throng, making sure that there is a steady supply of "tag-points" for the leader tip. Eventually, this tip reaches a point about 40m above the ground. As the leader is a track of ionized air, it has a very low resistance, so it effectively brings the potential of the cloud base to a point just 40m from the ground.

So far, the leader has been travelling downwards from the cloud base at a velocity of around 10^5m/s, and is clearly visible as a pale blue, jagged, luminescent line. The reason we do not actually notice it is because it only takes about two thousandths of a second to complete its downward path before it is totally outshone by the main discharge. But, before that can happen, one final leap is required to complete the ionized path between the cloud and the ground. From its vantage point some 40m above the ground, the leader tip selects the shortest (electrical) path to ground potential and bridges it with the final bit of ionization to complete the circuit between cloud and ground.

We now have a low resistance connection between two points of many megavolts, and the only thing that can possibly happen is that a current will flow in an effort to neutralize that potential difference. The main discharge actually travels in the opposite direction to the leader, ie from the leader tip via the shortest electrical route back to the point of origin of the leader. The actual amount of current depends on the resistance of the path and the potential across it (Ohms Law). If it had its way, the discharge would be a perfect square wave, but the ionized path, being a single conductor of finite length, also has inductance. This inductance shapes the return stroke, thus allowing it to build up to maximum as it generates a colossal magnetic field around it, and dying away as the field collapses at the end of the discharge. Fig 6 shows the profile of a ground stroke (negative) as measured on a special lightning conductor connected to an oscilloscope. Even so, the leading edge of the return stroke (as the main discharge is called) reaches the cloud just 22 ten-thousandths of a second after the leader started its downward journey. To put it another way—it's all over in a flash!

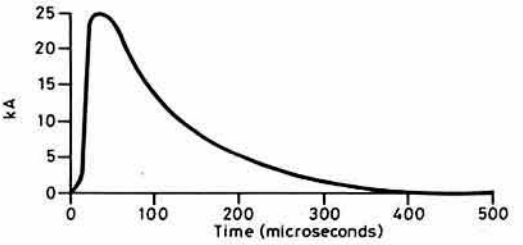

Fig 6. Profile of a negative ground stroke

In the introduction I mentioned a positive ground stroke which made itself known to me in 1959. When a storm cloud is almost spent, there is less electrical activity as most of the charge has been discharged, either to ground or between clouds. The internal turbulence dies down and the positively-charged air tends to mass at the top of the cloud. This now creates a new situation where the main potential difference appears, not at the base of the cloud, but at the top; this is all the residual charge, which amounts to something like almost half the original charge. As the top and base of the cloud tend to travel over the ground at varying speeds, there sometimes comes a point when the easiest way to discharge this huge charge at the top of the thunderhead is to do so to ground rather than in the cloud itself. This creates a positive stroke and works in exactly the reverse order to the more common negative stroke, with the leader starting its journey from the ground and the return stroke actually travelling the commonly-thought route from cloud to ground. This is the mighty "tail-ender" that often takes you by surprise when you think that a summer storm has safely passed. A profile of the positive stroke appears in Fig 7.

Another variant of the common negative ground stroke is the multiple stroke, and it also has an interesting anatomy. It starts out in exactly the same way as a normal negative ground stroke, but one return stroke is not enough to neutralize the potential across the leader track. With all the tubulence and the damage caused by the return stroke, the track needs re-ionizing in order to permit a further discharge. A fresh leader sets out and follows the remnants of the original path for most or all of the way, creating a freshly-ionized track for a further discharge. This new leader travels much faster than the first one, at the same speed as the main return stroke, in fact, and it is known as a "dart leader". However, during the course of a multiple stroke, the entire storm is travelling laterally and it quite often happens that—after a few multiple strokes—the next dart leader finds a

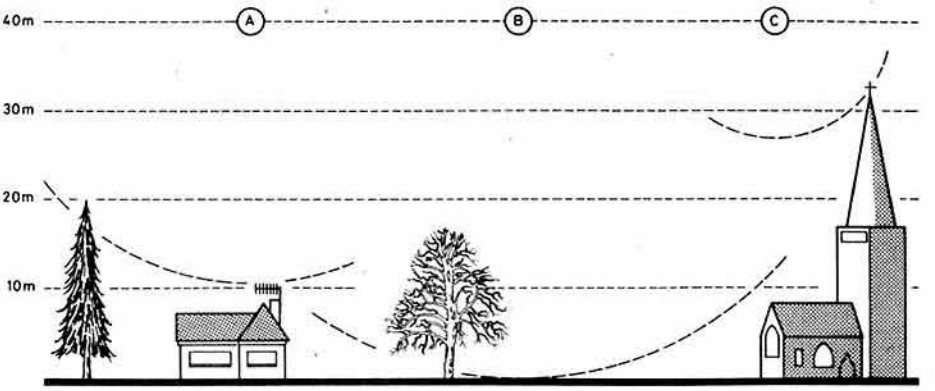

Fig 8. Three alternatives for the leader to find its final track to ground. At "A" the fir tree and the tv antenna are most at risk; at "B" the round tree or the ground itself seem most likely, while at "C" the top of the church spire is an obvious choice. The significant thing is that prior to arriving at these three points, ground conditions have little effect on the track

more acceptable ground target so that it ionizes a fresh path for the next and subsequent discharges. To the unaided eye this looks as if the lightning has split and struck two or more places at the same time. This is not so, but because the strokes are in such quick succession it looks like a split stroke. This is what is commonly known as "fork-lightning", for obvious reasons. Up to 26 succesive discharges have been recorded in a multiple stroke, taking almost half a second to complete.

Going back to our primary leader for a moment, it might help to put things in perspective if we take a further look at the last 40m when the final breakdown of the remaining gap occurs. As the last leap is over a distance of about 40m, and the actual insulation breakdown point of air is between 3 and 5kV/cm, a short calculation based on 4kV/cm gives a breakdown voltage between leader tip and ground of about 16MV! That is a fair old "tickle" in anyone's language, and it helps one to realize just how insignificant are man's efforts when compared with nature's gentler activities. Incidentally, cloud-to-cloud strokes are thought to resemble negative ground strokes, but it is difficult to verify this. The common name for cloud-cloud strokes is "sheet lightning".

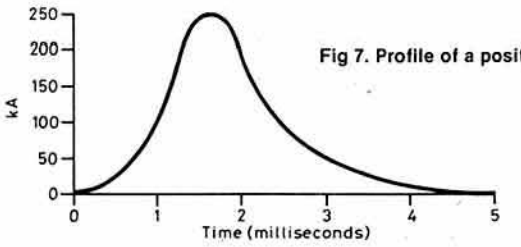

Fig 7. Profile of a positive ground stroke

Other factors which influence the strength of a lightning stroke are the nature of the ground potential at the point of strike. This means the physical nature of the object struck—its conductivity and the conductivity of the ground connected to it. For instance, a chimney that has not been used and is dry is not a very good conductor, but one that has been used and contains an internal coating of soot (carbon) is a good conductor and is more likely to attract a direct strike. Likewise a tree in winter when the sap is low is not so attractive as it is in the summer when it is full of sap and greenery.

Fig 8 shows how a leader selects its target for the final connection of the ionized track; it would be better if it could be shown in 3-D, but a cross-section of typical ground gives some idea of the situation. The important thing is that when the leader tip reaches the 40m point it will immediately go on to the most advantageous ground potential, and that means the point of least resistance (including the intervening air) and that normally means the highest point at earth potential within striking distance. Down to the 40m point from the cloud base it is not affected so much by what is on the ground, unless that ground structure is giving off a good supply of ionized air packets to guide the leader in.

Some facts and figures on thunderstorm activity in the UK

In assessing the need for protection from electrical storms, the following information may help to make up your mind—or, conversely, it may only serve to confuse you even further! By scientific observation it has been established that, on a nationwide basis, there are 10 days in the year when there are thunderstorms in the vicinity of any one place. They need not be directly overhead, only within clearly audible range. Of course this is an average which is subject to differences in location and counts from year to year, but these figures have been calculated over a long period and from a large variety of locations. My own recollection seems to differ quite substantially from this, but then mine is subjective while the quoted figures are objective.

Allowing for the fact that not all storms are overhead and that most storms consist of more than one storm centre, it is calculated that 10 storm centres pass directly overhead in any one year (on average!). However, seasonal variations, preferred storm paths and other stray phenomena could double this figure, so we will assess the risk on the basis of 20 storm centres passing overhead per year.

In the UK and similar temperate regions, each storm centre produces about 20 or 30 strokes during its average life of 30 to 60min. Of these strokes, less than half (about 40 per cent) are cloud to ground strokes, and of these ground strokes about 95 per cent are negative type.

Each storm centre covers a ground area of about 4km². If the storm centre were to remain perfectly stationary during its active life, it would produce 2·5 ground strokes/square kilometre, but on average a storm centre travels across the ground at a speed of 50km/h so its ground strokes are distributed over an area of 100km². This gives an average of 0·1 ground strokes/storm centre/square kilometre. Multiply this by 20 storm centres/year and this leaves us with two ground strokes/square kilometre/year.

Now let us take a look at an average domestic property of about 20 × 50m or an area of 1,000m². One thousand such properties would fit into 1km², which means that the chances of a direct strike on a single property works out at once every 500 years! We all know what happens to averages and statistics, but I think it is wise to try and get the whole thing into perspective.

Of course, radio amateurs do tend to tempt providence a bit by putting things up high in the sky with good electrical connections to a point not too dissimilar from earth potential—this must increase the risk of a strike on our property, to the relief of our neighbours! If, in our quest for better radio communications, we do put up such electrically attractive devices, it is in our own interest to do something to protect them.

This article is not intended to deal with protection, but one method is worthy of note, because it is simple and offers 93 per cent protection to all your antennas and house etc from a direct strike. This device consists of a single mast of sufficient cross-sectional area to stand (guyed if necessary) in the centre of your property and be 5m higher than any other part of the installation. Top off this mast with a short length of copper rod not less than 25mm², with a sharp point on the top and very securely fitted to the mast with an excellent electrical connection, and fully protected against corrosion. All joints on the mast must be the same. The mast ought to be of 2in diameter aluminium or similar.

The base of this mast should be connected to an earth rod of 0·5in galvanized pipe or, better still, hardened copper rod or "T" section earth rod. This should be not less than 8ft long for normal ground, but in poor conditions two or more spikes or one much longer spike should be used.

(Continued on page 36)

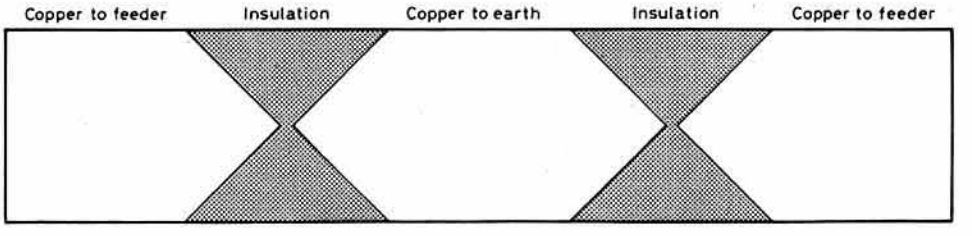

Fig 9. This is the exact size of the author's spark discharger, which is made from a piece of pcb with the copper either stripped or etched away from the shaded parts. The centre is earthed and the two sides are connected to the feeder

DATA RECORDING AND ITS PROBLEMS

by JOHN PARKINSON BSc, G3XJB*

John Parkinson first became interested in amateur radio at the age of 12, and three years later obtained his licence. His interest has always been centred on hf, with 3·5 and 21MHz being particular favourites.

After graduating from university, John worked for British Aerospace as an electronics engineer, and now runs the electronics department of a mechanical engineering firm, looking after both the hardware and software for microcontrol systems.

Now married and with a young (and time-consuming!) family, John finds too few moments to go on the air. However, he still enjoys reading *Radio Communication*, and has kept every copy of "Technical Topics" since 1967.

Introduction

The author read with interest the article for an error-resilient decoder for UOSAT [1], but was disturbed by the paragraph that read "Signals could be recorded on a domestic-quality tape recorder, and decoding was possible on play-back despite the speed fluctuations which exist in the transport; the decoder is self-timing". The author has had cause to use a variety of cassette recorders over the last seven years for the recording of digital data, and has encountered problems with the speed fluctuations of the tape transport ("jitter").

Rogue systems seem to be more common than one would expect, and the price of the cassette does not necessarily relate to its effectiveness as a digital recorder. Error rates as high as one in five thousand bits have been encountered when using a phase-locked decoder system, and consequently an "anti-jitter" circuit was developed for use with troublesome systems.

Data recording

Most digital data originates in the form of Non Return to Zero (NRZ) coding (see Fig 1(a)), which simply means that if a string of "1"s comes through, the signal will stay high until the end of the string. This code is fine for direct wire-linked communication, and is found in many 20mA current loops and RS232 systems. The NRZ code requires a system with a good response right down to dc because a continuous stream of "1"s appears as a very low frequency signal. Radio receivers and tape recorders cannot provide this response range, and if fed with NRZ produce large data errors due to signal droop (see Fig 1(b)). Another type of code is needed for an ac system, with the basic requirement that it must change level at least once every data bit. For low levels of data flow this can be achieved by two tones or frequency modulating a carrier signal.

For higher data rates the bandwidth of a recorder will not be sufficient to allow a carrier modulation type of code, and phase encoding is commonly used instead (see Fig 1(c)). This type of code allows a recorder to run at maximum data rate for a given bandwidth. With this code a transition occurs at the beginning of each bit cell. If a "0" is to be represented then there is a second transition half a bit period later, but if a "1" is required then no second transition occurs. In one low-cost digital recorder which the author used recently, the minimum pulse-width recommended by the manufacturer was 200μs giving a maximum data rate of 2,500 baud for a phase-encoded signal of the type shown in Fig 1(c). The decoder for this form of code must be "intelligent" enough to lock to the correct voltage transition, otherwise the outgoing data will look nothing like that which was recorded.

The UOSAT code (see Fig 1(d)) shown in [1] is a form of phase encoding that always ensures a rising edge at the beginning of a bit cell, and so the decoder can be less sophisticated. There is still a chance that with a string of "0"s the system will lock on to the second rising transition of the "0"

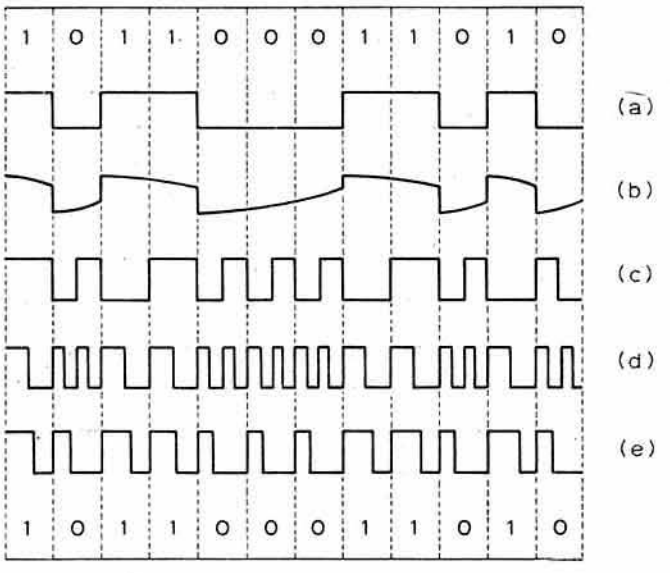

Fig 1. (a) NRZ. (b) NRZ with droop. (c) Phase encoding. (d) UOSAT encoding. (e) 30–60 encoding

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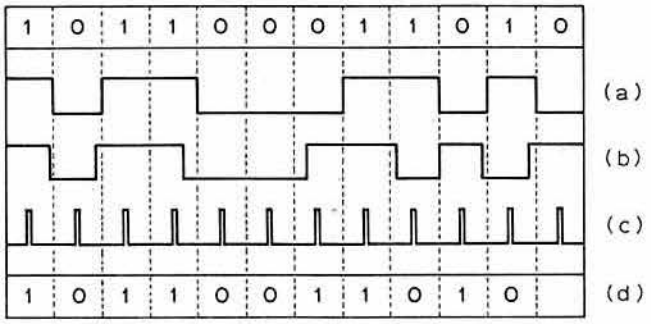

Fig 2. (a) Correct NRZ. (b) NRZ with 10 per cent jitter (after taping). (c) Read pulse locked to (a). (d) Resulting output from (b)

bit, causing an error when the next "1" appears. The UOSAT coding is half as efficient as the full phase encoding, and could only achieve a maximum of 1,250 baud if the recorder from the previous example were used.

The 30-60 code (†) has only one rising transition per bit cell, regardless of whether a "0" or "1" is being transmitted (see Fig 1(e)). This allows a simpler decoder than would be required for the previous examples. In this code 35 per cent of the bit cell is high if the bit is a "0", but 65 per cent of the cell is high if it is a "1". Using the recorder described above, the maximum data rate for this type of code would be 1,666 baud.

Both the full-phase encoded signal and the UOSAT version require synchronization bits for the decoders to lock onto the correct voltage transitions. The 30-60 code, by its very nature, does not necessarily need synchronization bits and decoders, for it can be designed to lock onto the data immediately.

Jitter

Any tape recorder has some jitter, however good it is, and in straightforward analogue recordings jitter can be heard as distortion in the output. With a digital recording there is more tolerance to jitter simply because the decoder only has to choose between two voltage states (ie it is binary). In practical terms this means that so long as the decoder's read pulse occurs between certain limits (see Fig 2) then the binary code will be read correctly. If the jitter is too severe then the read pulse will occur at the wrong time and cause errors. If a phase-locked loop type of decoder is used, the act of locking causes the read pulse to occur at an average of the baud and jitter rate, leading to the large error rates described at the beginning of the article. This is true even with an integrating decoder such as the one used in the UOSAT system, because the integrator must be switched within certain time limits to decode successfully. Reducing the damping coefficient of the phase-locked loop may well lead to an improved error rate, but the jitter then begins to appear on the decoded output, making it too unstable for reading by analysis systems such as microprocessors. One solution to the problem is to use an edge-triggered decoder (ie not phase-locked) to minimize error rates, followed by an anti-jitter circuit.

The 30-60 code is well suited to edge-triggered decoders, so this type of code was chosen for the system. Throughout the design, component counts have been minimized wherever possible.

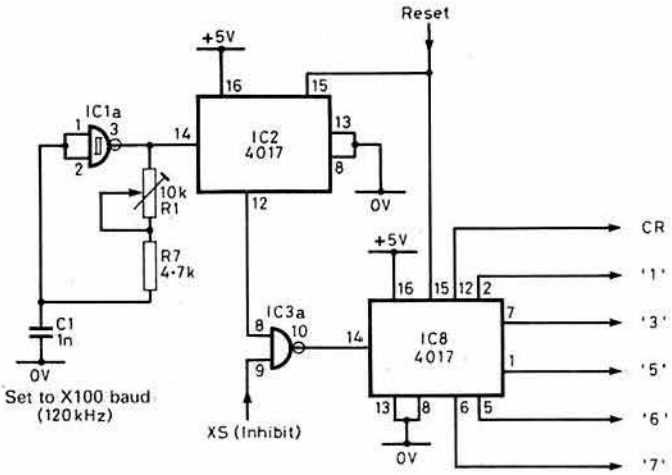

Fig 3. Clock circuits

The 30-60 encoder-decoder

System timing is generated by a Schmitt NAND gate oscillator followed by two ÷ 10 counters (ICs 1, 2 and 8 in Fig 3). Simple oscillators like the one shown are very voltage dependent and should ideally be supplied with their own stabilized +5V supply. In practice this is not always necessary if the main supply is well stabilized, and the author has had success with both methods of operation. Both counters receive reset pulses from the pulse generator (see Fig 4) which also uses the Schmitt NAND gate to form pulses from the incoming data. In the read mode the rising edge of the 30-60 code causes the reset pulse, and in the write mode it is any "1" to "0" transition of the NRZ code. This transition was chosen because each data word is usually preceded by a start bit which is a "0". If this bit is present it guarantees correction of encoder timing at least once every data word.

Components list for encoder-decoder

IC1	4093	**C1, 2**	1nF
IC2, 8, 9	4017	**C3**	10nF
IC3, 6, 7	4011	**R1**	10kΩ trimmer
IC4	4027	**R2, 3**	10kΩ
IC5, 13	4049	**R4**	8·2kΩ
IC10	4015	**R5**	20kΩ trimmer
IC11, 12	4014	**R6**	22kΩ
		R7	4·7kΩ
		Board	Single Eurocard

Additional components required for buffers. Choose from Figs 6 and 7 as necessary.

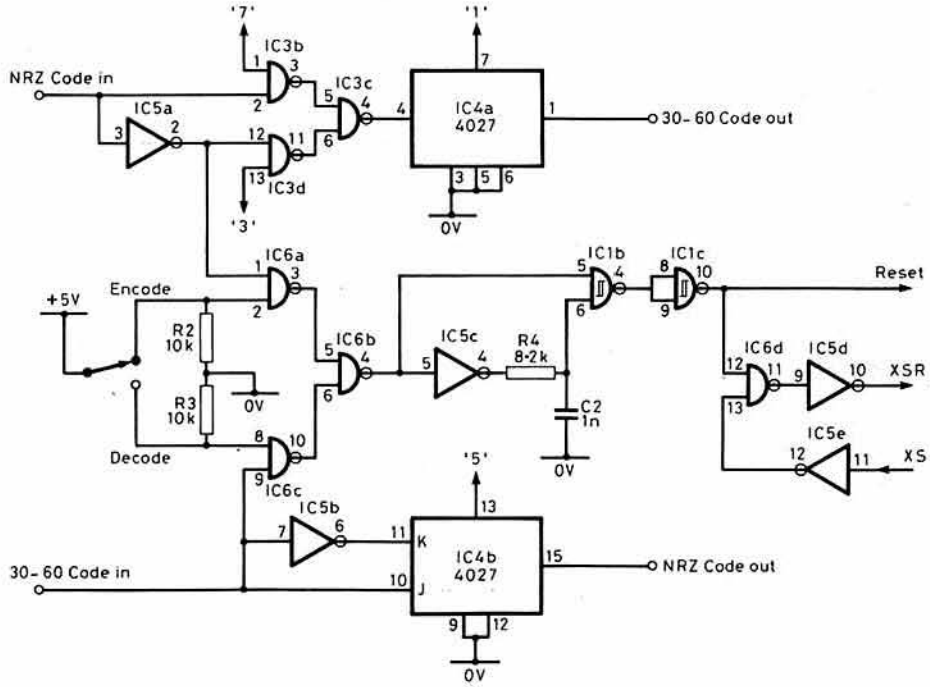

Fig 4. 30-60 encoder-decoder and pulse generator

†The term "30-60 code" is one which the author invented for a code that appeared to have no name. If any reader knows the correct title for this code the author would be glad to hear of it.

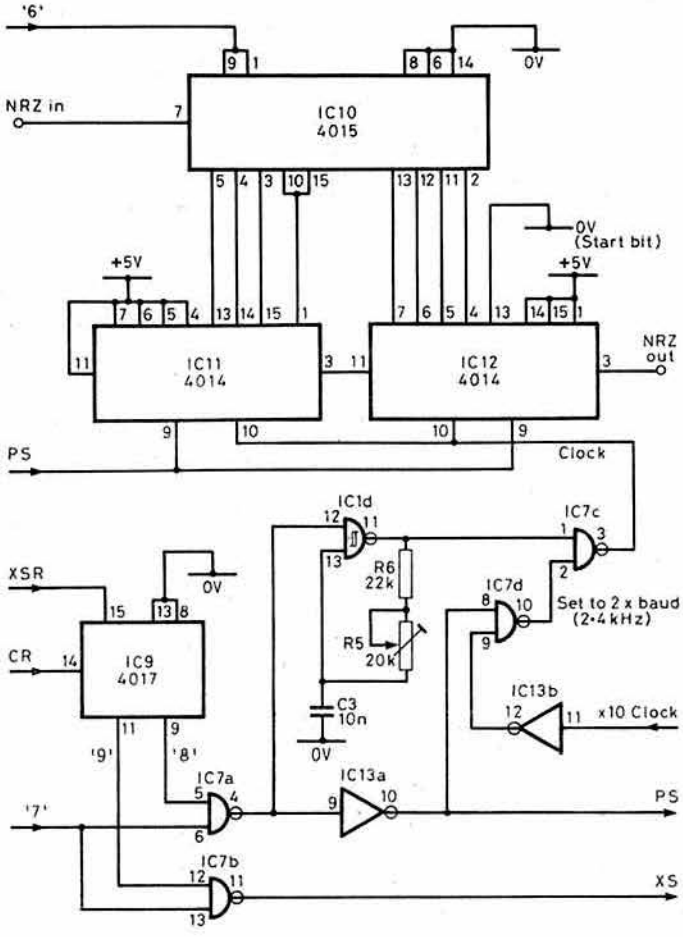

Fig 5. Anti-jitter circuit diagram

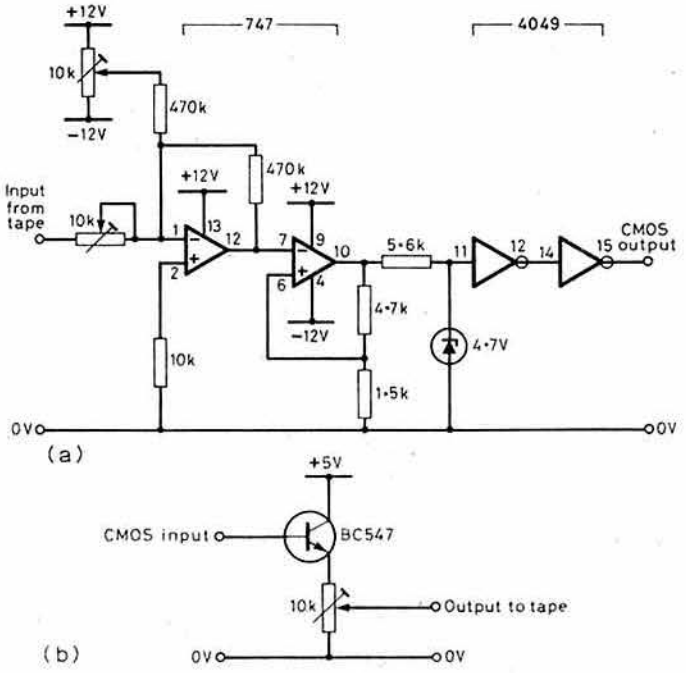

Fig 7. (a) Analogue tape input to cmos output. (b) CMOS to tape buffer

Encoding is achieved by setting and resetting the JK bistable (IC4a) at the 35 or 65 per cent bit cell positions as required. (The 4017 timing actually only approximates this.) Decoding uses the same timing circuits to clock a JK bistable (IC4b) at the 50 per cent bit cell position. If the voltage is still high at the input then the JK clocks a "1", if the voltage has already fallen it clocks a "0".

The anti-jitter circuit, Fig 5, consists of a serial-in-parallel out buffer store (IC10) to collect one word of data, and a parallel-in-serial out store (IC11/12) to pass the data out. The clocking of the data into this combination is controlled by the decoder's timing circuits and therefore contains timing jitter, but clocking out is under the control of a separate free-running output clock. Once the bit counter (IC9) has registered the completion of a data word the output clock takes control, allowing a stable, jitter-free transmission from IC12. The data is clocked out at twice baud rate to allow the buffer store to empty before the next word is loaded. In this particular design the words were of eight bits (seven + parity) preceded by a start bit of "0" and two stop bits of "1". The "waiting to transmit" state is also a "1". By hardwiring everything except the eight-bit word, the number of buffers is reduced to three. Two counters are needed to control the clocking of each data word (IC8/IC9) and 4017 divider decoders are used. IC8 (see Fig 3) is used in both encoding and decoding as described previously, and its carry output clocks IC9 which is used to count the bits into the buffer.

On decoding, the sequence of operation is as follows:

1. The rising edge of the start bit resets both counters to zero (state 00).
2. On the fifth clock pulse (state 05) the JK bistable is clocked and its output takes up the correct state.
3. On the sixth clock pulse (state 06) the bistable's output is shifted into the buffer IC10.
4. States 15, 16 clock and shift the first data bit.
5. Clocking and shifting continue through to states 85, 86 which represent the parity bit.
6. On state 87 the output clock is inhibited by PS which also prepares IC11 and IC12 for paralleled loading of data from IC10. Half a clock pulse later loading occurs.
7. As state 87 finishes the system reverts to serially transmitting the data out at twice baud rate from IC12.
8. On state 97 clocking of the counters is inhibited by control signal XS. The system then waits until the next start bit arrives to cancel XS and return both counters to state 00.

The anti-jitter circuit is left running during encoding to reduce circuit complexity. This results in the last stop bit being replaced by a gap in transmission to tape, which can assist the decoder in identifying the next start bit when it arrives.

The encoder-decoder requires input/output signals operating between 0V and 5V to suit the digital cmos circuits, but signals of this level are not likely from a recorder or other data analysers. Consequently a selection of simple interfaces for the most common requirements is shown in Figs 6 and 7.

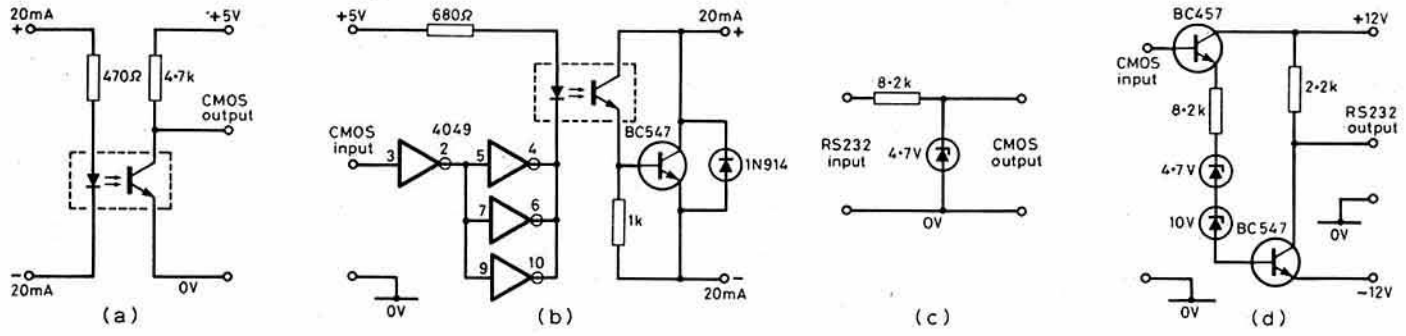

Fig 6. (a) 20mA to cmos buffer. (b) CMOS to 20mA buffer. (c) RS232 to cmos buffer. (d) CMOS to RS232 buffer

Table I. Integrated circuit power connections

IC	Type	+5V	0V	IC	Type	+5V	0V
IC1	4093	14	7	IC8	4017	16	8
IC2	4017	16	8	IC9	4017	16	8
IC3	4011	14	7	IC10	4015	16	8
IC4	4027	16	8	IC11	4014	16	8
IC5	4049	1	8	IC12	4014	16	8
IC6	4011	14	7	IC13	4049	1	8
IC7	4011	14	7				

Noise and UOSAT

So far, any noise that might be present in the signals has been ignored and clean waveforms have been assumed. In the author's experience this assumption is quite valid when dealing with cassette recorders that are coupled direct to other electronic systems. However, all radio transmissions will contain noise, and an edge triggered decoder such as the one described above will not be ideal. Recording this type of signal direct onto tape will add frequency instability (jitter) to the noisy signal, and on replay more instability is added, with the result that the data can be very difficult to decode successfully.

One answer to the problem is to use an integrating decoder (such as that described in [1]) directly at the receiver output, and follow it by a 30-60 encoder before recording. In this way noise is virtually eliminated from the signal before the frequency instability is added. If the jitter is not excessive it should be possible to use a phase-locked decoder with a low damping coefficient and follow it with an anti-jitter circuit such as the one shown in Fig 5. Only experimentation will find the optimum system for any given recorder.

Conclusion

Many recorders have adequate mechanical stability to work with phase-locked loop decoders, but unfortunately rogue systems do exist. These appear mainly among the small cassette recorders, where there is not much mechanical inertia to steady the tape movement. To use these recorders successfully for digital data storage it is preferable to use edge-triggered decoders rather than the more common phase-locked loop types. Recording and decoding radio transmissions can add a complication in the form of noise, and this may lead to a requirement for two types of decoder working on the signal together. If this added complication does not appeal, there is another alternative—buy another recorder with better mechanical stability!

Reference

[1] "An error-resilient 1,200 baud decoder for UOSAT spacecraft telemetry and experiment data", M. S. Hodgart and J. Z. Slowikowski. *Rad Com* January 1983, p28. □

An intelligent microphone splitter for Jamboree On The Air

by K. M. Hampson, G3WFW*

Introduction

The prototype of this piece of equipment was hurriedly developed for the 1982 JOTA after the Home Office permitted greetings messages to be sent from GB stations. The splitter interfaces between the microphone and the transceiver, and permits two microphones with press-to-talk (ptt) switches to be used while still giving overall control to one of the microphone inputs (the operator's).

Operation

On a normal contact, the operator will press his ptt switch and give the callsign etc. Then if there is anyone who would like to send greetings (we will call him the logger) he will then press the ptt switch of the other microphone while the operator still has his pressed; the logger's light emitting diode (l.e.d.) will glow red, and his microphone is now "primed". The operator can now release his ptt switch, thus switching the logger's speech path through to the transceiver—the logger's l.e.d. will change colour from red to green to show the logger that he is holding the transmitter on and that his speech path is through. Should the operator wish to stop the logger's speech path he can do so just by pressing the ptt switch on the operator's microphone.

The logger can only hold the tramsmitter on; he cannot bring it on from the receive state. Before the transmitter will go off, the ptt switch on both microphones must be released.

To help the logger to modulate the transmitter fully, an audio level indicator is provided in the form of an l.e.d. which will flash to the speech if it is loud enough. There is also an audio agc ic to assist in producing a fully-modulated signal.

The microphones to be used should be of similar type, the one normally used with the transceiver will do for one of them. The splitter will work with most inserts with the exception of carbon types.

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Circuit description

When the operator's ptt switch is pressed, IC2a inverts the "0" into a "1" to switch IC1a, which provides the audio path for the operator's microphone. The "0" lights LED1, and inhibits the logger's ptt switch path by the "0" on IC2d i/p. The "1" from IC2a o/p operates RLA by switching TR3 on, and prepares the path for the logger's ptt switch to hold the transmitter on by switching on IC1c.

If the logger operates his ptt switch while the operator still has his operated, LED2 glows red. The operator can then release his ptt switch, which causes the o/p of IC2d to change to a "0". It is then inverted by IC2c and the "1" goes through IC1c, lighting LED2 green half, switching the logger's microphone through IC1b and holding RLA on. In order to prevent the transmitter from dropping out between logger and operator handover, C3 delays the release of RLA by about 1s.

IC4 amplifies the input signal, the gain being set by RV2. D4, D5 and C20 detect the signal, and when the resultant dc is large enough the voltage across C20 switches on TR4, causing LED3 to light and thus providing a modulation indicator.

IC3 is an audio agc ic which gives a reasonably constant output level for varying input levels. R9 and C10 control the decay speed of the ic.

Construction

The prototype was built on a 3·75 by 2·5in piece of Veroboard, and the whole splitter mounted in a standard 5·5 by 3 by 1·5in aluminium box. Fig 2 shows the layout of the Veroboard. The splitter was connected to the transceiver by a seven-pin DIN plug and socket, which provided the power and the microphone connections. The power needed is 10-15V, but lower voltages down to 5V could be used with a relay coil of the necessary voltage.

Problems were experienced with rf getting onto the audio, so care should be taken to keep leads as short as possible and ensure that all the decoupling capacitors and ferrite beads are in place. The audio agc, IC3, is a luxury and

Components list

R1	100kΩ	**C14**	220μF
R2, 4, 5, 14	1kΩ	**C20**	3·3μF
R3,6	220kΩ	**C25**	4nF
R7	27kΩ	**C27**	47μF
R8, 13	150Ω		
R9	470kΩ	**TR1-4**	BC109
R10, 11	10kΩ	**D1-3**	1N4148
R12	2·2MΩ	**D4, 5**	OA90
RV1	4·7kΩ	**IC1**	4016
RV2	100kΩ	**IC2**	4011
		IC3	4417 (from Ambit)
C1 2, 7, 21	1nF	**IC4**	741
C3, 10, 11, 13, 16, 19	10μF	**RLA**	12V coil
C4, 12, 15	0·1μF	**FB**	Ferrite bead
C5, 17, 22, 23	100pF	**LED1, 3**	Any standard l.e.d.
C6, 8, 18, 24	2·2μF	**LED2**	Any tri-state l.e.d. with common cathode
C9, 26	0·01μF	**L1**	Choke
		FS1	0·25A

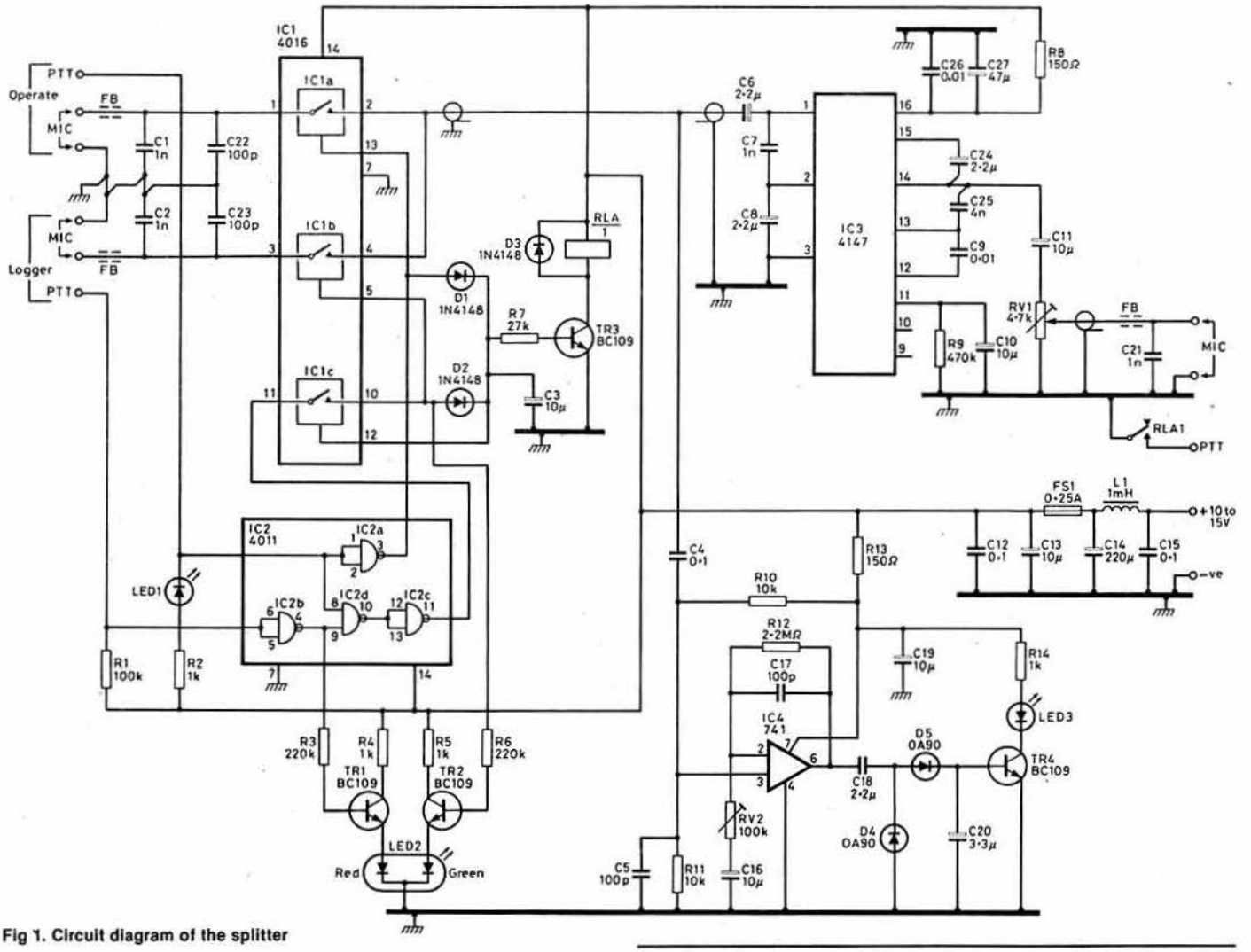

Fig 1. Circuit diagram of the splitter

therefore not essential; it was the main reason for the rf problems experienced. In fact, for the 1982 JOTA, IC3 was bypassed in order to overcome the trouble with the rf (most of the decoupling and ferrite-beads were added when IC3 was reconnected to the circuit).

Setting-up

There are only two adjustments. The first sets the level of the speech into the transceiver by means of RV1, which should be set so that the audio level of the transceiver is the same as it is with the splitter not connected. The second adjustment sets the point at which the modulation level indicator comes on, by means of RV2, which should be set so that LED3 just comes on when the microphone is modulated normally.

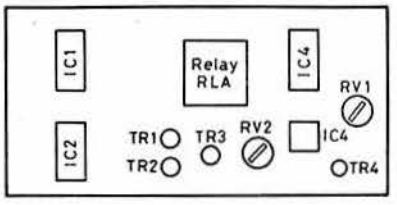

Fig 2. Veroboard layout

Both these adjustments can be done with an oscillator and oscilloscope, but if none is available they can successfully be done by whistling or giving an "AAAAR" into the microphone and watching the o/p on ssb, or by listening to the audio level on a receiver with fm. □

LIGHTNING

(Continued from page 31)

This mast will provide a cone of protection for all equipment within a radius of 20m or a circle 130ft across. This mast has one other advantage of most interest to the hf operator. It can be gamma matched and used for low-angle radiation on the hf bands, and if it happens to total 66ft high, then 3·5MHz dx will be a doddle! Without doubt, this is one of the best and most efficient lightning protection systems yet devised for the radio amateur, without spending a vast fortune for possibly one per cent more than the 93 per cent region of protection.

Conclusion

A final word on protective devices. Another thing the average amateur can do for himself is to make a simple spark-gap discharger to fit on to the downleads of his antenna systems. Fig 9 shows details of the one which I made for use on open-wire feeders. A different design, but of the same principle, will suit coaxial feeders, the objective being to avoid turning your antenna system into grounded lightning conductors. If your antennas are all well insulated from ground, a charge will build up on them in the presence of a storm; this will result in high voltages both at the top and bottom end of the feeders. The spark discharger will take away most of the high voltages present on the feeders without grounding them, and without interfering with their effectiveness as feeders.

All this protection and knowledge does not take away the potential of the emp (electro magnetic pulse) which is generated by all types of lightning stroke, and these "spikes" can seriously damage the health of solidstate devices in the front-ends of receiving equipment. A little care is needed to deal with this problem, but that is outside the province of this article. □

Equipment Review

The Datong Direction Finding System

by MALCOLM APPLEBY, G3ZNU*, and JOHN SAGER, G8ONH†

Background

The concept of a doppler scanning direction-finding system, the principle on which the Datong DF is based, is not new. An article entitled "A DoppleScAnt" describing just such a device was published in May 1978[1], and a number of claims were made for the invention. Its speed of response made it capable of catching the quickest of transmissions; it was not overloaded by high power transmitters; it was difficult to jam; and as it could be used in a car on the move, it was less prone to multipath reflections.

Fired by a sudden enthusiasm, two local amateurs set about building a unit to the published design. The result was an antenna unit with eight $\lambda/4$ antennas mounted on a large sheet of aluminium, which was connected to a display unit by means of a multi-way cable, and to a standard fm receiver by a piece of coaxial cable. Audio from the receiver was taken into the display unit. On a rather damp Bank Holiday weekend, we decided to test the whole arrangement, and while G8ONH disappeared into the countryside to hide, G3ZNU's car was filled with equipment, amateurs and copious maps. To say that, eventually, G8ONH was found is to state the truth. However, this was more as a result of driving down most of the country lanes in East Suffolk than as a result of good and accurate df work.

Indications from the display unit were often confusing and ambiguous, and even calibration presented a problem. Unfortunately we were never able to determine whether it was the theory of operation of the DoppleScAnt, or the actual implementation, which was at fault. The somewhat unwieldy nature of the antenna system made it inconvenient to fit to a car, and so the machine fell into disuse.

When Datong launched the DF onto the amateur market, the authors —ever-mindful of their previous experiences—viewed the claims made with some scepticism, and set out to prove, or disprove, them.

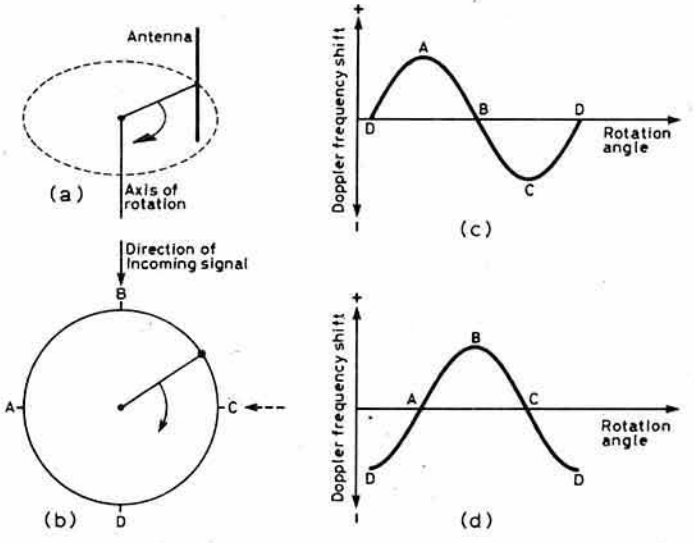

Fig 1. (a) Dipole rotating about a central pivot. (b) Top view showing direction of incoming signal from a transmitter. (c) Sinusoidal frequency modulation superimposed on the received signal by the rotation of the antenna. (d) The effect of an incoming signal from a different direction

Theory of operation

It is worth digressing for a moment to see how a direction-finding system such as this operates; the principle on which the direction finder is based is the doppler effect.

Fig 1(a) shows a dipole rotating about a central pivot. Fig 1(b) shows the top view, and also shows the direction of the incoming signal from a transmitter. When the antenna is at point A it is moving towards the transmitter, and so the frequency of the received signal will be higher than that transmitted. At point B the antenna is moving neither towards nor away from the transmitter, so the received frequency will be the same as transmitted. When the antenna gets to point C it will be moving away from the transmitter, so the frequency will be low. Finally, at point D it will again be the same as transmitted. The result of this is that the rotation superimposes a sinusoidal frequency modulation on the received signal, as illustrated by Fig 1(c). Now if the incoming signal comes from a different direction (dotted arrow) then the phase of the superimposed fm signal will change, as shown in Fig 1(d). So if the phase of the rotation-induced fm is compared with a reference derived from the antenna rotation, the bearing of the transmitter from the receiver can be found. The deviation of the frequency modulation generated will be proportional to the carrier frequency, the radius of the circle and the speed of rotation.

Unfortunately this simple system is not practical because, for a 1kHz peak deviation at 145MHz and a circle radius of 50cm, the speed of rotation has to be about 40,000rpm! Visions of such a lethal contraption gave rise to the local nickname for df systems of "Rotating Knives" [2].

To get round this problem it is possible to approximate the movement of an antenna around the circumference of a circle by switching the feed successively to several fixed antennas distributed equally around the circle, as in Fig 2. The switch can be a set of diodes which are normally biased off but switched on in turn to connect the appropriate antenna to the feeder. Being fully electronic, this is easily done at the required rotation speed of several hundred hertz. However, this arrangement generates phase modulation by a stepped approximation to a sinewave which cannot be demodulated properly as fm. A narrowband i.f. filter before the demodulator will remove some of the phase modulation harmonics, but the resulting demodulated fm will still be distorted, and it is difficult to obtain a reasonably smooth change of phase with bearing.

If, instead of switching from one antenna to the next, signal

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contributions from adjacent antennas are mixed together in relative amounts which vary in a particular way, it is possible to generate an output which varies continuously in phase from that of one antenna to that of the next. Datong have used such a system in their df unit.

Description of the unit

The Datong DF basically comes in two parts, an antenna combiner/switcher, and a control and display unit. The only connection between the two is a single piece of coaxial cable, which carries power and control signals to, and rf signals from, the antenna combiner. Four antennas, which can be supplied with the df unit, connect to the combiner. The combiner and display units are designed to be broadband, so the only frequency-determining elements are the antennas. Thus the unit may be used on any frequency band from 20 to 200MHz, provided the appropriate antennas are used.

The antenna combiner is built into a medium-sized plastic box (see photograph) fitted with a magnet for attaching to the roof of a car. Inside the box are two circuit boards, one carrying the logic, and the other the rf switches. As sold, the antennas are not connected to the combiner, so it is necessary to dismantle the unit (taking care not to break the multi-way cable) and attach the coaxial cables from the four antennas to the bottom circuit board. The cables then exit from the box through waterproof glands. This is a tricky operation, and while the use of waterproof connectors would have been more expensive, it would make the unit far more convenient to use. Once the antennas have been coupled to the combiner, they cannot easily be removed, so the whole assembly of combiner and antennas has to be carried around together, again an inconvenience.

The four antenna connectors inside the box are labelled "North", "South", "East" and "West", indicating the way in which the antennas should be placed on a vehicle roof. However, outside the box there is no indication which antenna is which, making it difficult to remember how to orientate the system. In the end, we stuck paper labels on the box to remind us.

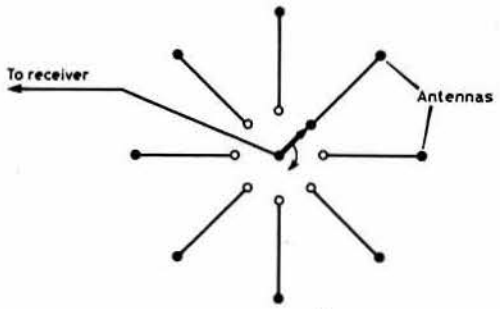


Fig 2. Switching the feed successively to several fixed antennas to approximate the movement of an antenna round the circumference of a circle

The display unit is built into a smart plastic box, which can be readily accommodated on most car dashboards. There is no provision for more permanent fixing into a car, an extra we would have liked to see. Inside the display unit are two circuit boards (see photograph), one for the front panel controls and indicators, the other carrying the remaining components. Construction is very neat, with an absence of flying leads so familiar in Japanese gear.

The display unit connects to an ordinary fm transceiver (or receiver) via the antenna and the external loudspeaker sockets. Power for the display unit has to be provided separately. The display unit contains its own audio amplifier, and a loudspeaker may be plugged into the back of the unit. When the unit is in operation a loud 875Hz tone is generated by the receiver, which would be annoying to listen to for extended periods. To combat this, a commutating notch filter locked to the antenna switching frequency is included before the audio amplifier to remove this tone. It is therefore essential to use the internal amplifier, with an external loudspeaker, to avoid headaches. It would have been more convenient if a loudspeaker had been built into the display unit, saving an extra external connection, although this would have meant extra cost. A normal antenna may also be connected to the display unit, which is automatically switched into circuit when the transceiver transmits. This facility serves to protect the combiner unit from damage due to rf power.

Connections to the transceiver are therefore very convenient, requiring no modification of the user's normal gear. The choice of sockets on the back of the display unit is, however, somewhat curious. RF connectors are, understandably, of the SO239 variety (although we would have preferred the use of BNC), while the audio in and out use phono (external loudspeakers invariably use 3·5mm jacks). Power to the unit is provided through either a 3·5mm jack socket (meaning the plug is "live") or a 3·5mm "power" socket used in many portable sets; it was not clear why both these options were provided, as the latter is preferable.

Operation of the display unit is relatively straightforward. Two l.e.d. indicators labelled HI and LO show when the volume from the transceiver has been set correctly. Sixteen l.e.ds indicate the direction of the signal, and a calibrate knob positioned at the centre of the array of l.e.ds allows the unit to be set up initially on a known signal. When in use only one of the 16 l.e.ds is illuminated at a time, so the indicated bearing "jumps" from one to the next. A NORMAL/INVERT switch caters for transceivers with an unknown number of inversion stages in their audio path—it is set so that the calibration control operates within its range. The RESPONSE control has the effect of changing the speed of response of the display, and is advanced until a relatively stable reading is obtained under mobile conditions—if not advanced far enough the display "dances" about almost randomly, while if advanced too far the display will not track changes in direction quickly enough. A volume control for the internal audio amplifier is also provided.

Bench testing

There are only a few tests which can be performed on a unit of this type that are at all meaningful, as it is only field testing which can show up the deficiencies of both the theory and implementation. However, it was possible to check the overall rf attenuation of the unit, its basic mode of operation, and the audio characteristics.

RF performance

A four-way resistive splitter was constructed, and its insertion loss measured. The splitter was then connected between a signal generator and the antenna combiner, and the rf output from the display unit connected to a spectrum analyser to measure the signal level. When the loss of the splitter was taken into account, measurements made indicated that the unit had negligible insertion loss. This method of measurement had to be used as it was difficult to perform quieting or SINAD measurements on a receiver with the switching unit running.

Subjective tests with the unit installed in a car and operating confirmed the degradation to incoming signals to be minimal.

Basic operation

The doppler scanning principle relies for its operation on phase differences between the signals received on the four antennas. These differences may be simulated on the bench by coaxial trombone lines, or more conveniently by extra lengths of coaxial cable.

Using the four-way splitter mentioned above, various configurations of inserted delay were set up, and in all cases the unit indicated the expected direction of arrival of the signal.

Audio measurements

The audio measurements were restricted to checking operation of the notch filter, and overall audio response.

The notch depth was measured with an audio signal generator and measuring set at 27dB. This is a reasonable figure for this type of filter, although some aliasing products from the commutating notch were apparent. This was almost certainly due to insufficient lowpass filtering after the filter, but this only affected the through audio quality, and not the overall performance of the unit. However, the resulting poor audio quality made it difficult to use the transceiver for normal communications with the df unit left in circuit and switched on.

It should be noted that while the notch depth was measured as 27dB, this was on sinewave modulation. In practice the 875Hz tone will have a considerable number of harmonics present which will not be removed by the notch, and so will still be audible.

Field tests

All the field tests were done in the 144MHz band using the system mobile on two cars, a Ford Escort and a Mk3 Cortina. The first test was to measure the system accuracy under field conditions.

A low-power transmitter of about 1W on 145·275MHz was fed to a 3dB colinear on top of a high tower about 60m agl. The system was installed in the Escort with the antennas in a square configuration on the roof, the antenna being connected to the "N" (North) terminal at front left and having a spacing of about λ/4. To calibrate the system the car was pointed at the tower about 300m away, and the bearing calibration control adjusted to the centre of the range over which the 0° light was illuminated. The calibration was checked at 180° about 1km from the tower. At this point the first tests were abandoned due to inconsistent readings from the system. After investigation we found that the coaxial braid had not been connected at one of the antennas during manufacture. This fault was found relatively

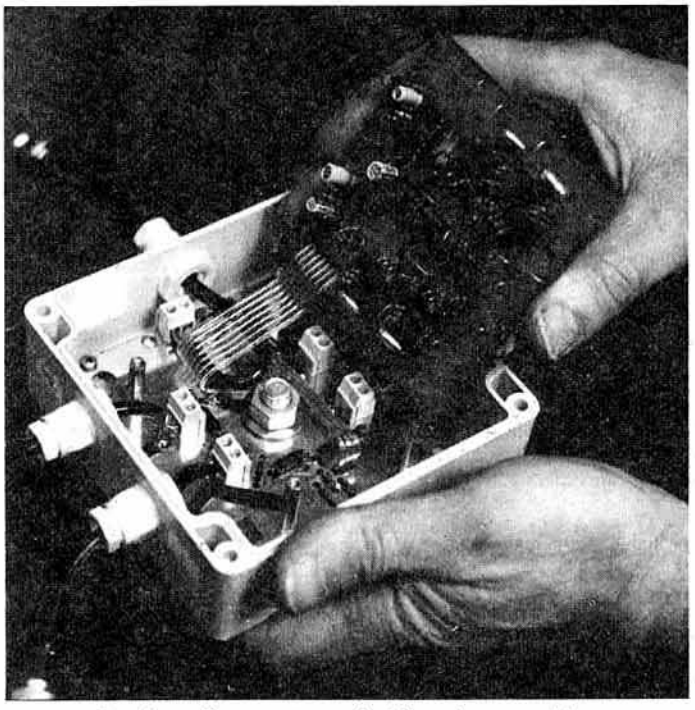
easily, as equipment for testing antenna performance was readily to hand, but had it not been, the poor system performance might have remained a mystery for some time. We also discovered that, although we had cut the antennas for 145MHz according to the graph supplied in the instructions, they in fact resonated at 160MHz. As they were well matched to each other we estimated that this would be unlikely to materially affect the results, and so we continued to use them like this.

The system accuracy test was conducted by driving in an area surrounding the transmitter at distances up to 14km. At points around the route the display unit reading was noted together with the position and heading of the car. Also, any unusual or erratic behaviour of the reading was noted together with the local surroundings. A total of 49 readings were taken, of which three were discarded for reasons discussed below. The difference between the reading and the actual bearing was computed for each point, and the mean and standard deviation of all the points calculated. The mean was $-2{\cdot}5°$, which is a measure of the error in calibrating the system initially. The standard deviation was 25°, which is a measure of errors induced by the terrain, shortcomings in the performance of the system, and errors in measuring the position and heading of the vehicle on the map. We estimate that this last error is somewhat less than 5°. The maximum errors in bearing were about ±45°. This compares unfavourably with the claimed accuracy of ±5°, but we regard it as reasonable for the operating conditions. A fixed installation at a well-chosen site would probably perform significantly better but, even if the phase generation and measurement circuits were perfect, the accuracy would still be limited to $\pm 5{\cdot}5°$ average, ±11° maximum error by the display format.

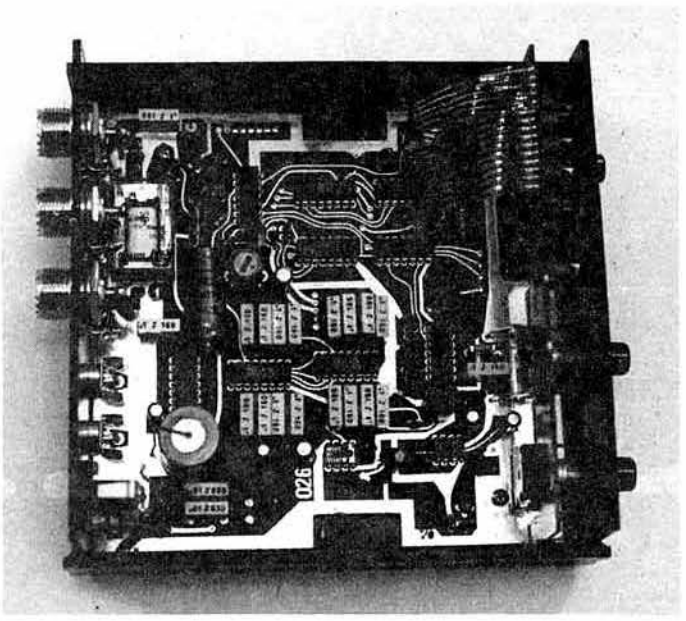
Three readings taken in the tests above were discarded due to the adverse effect of trees in the vicinity. At several points the test route passed close to or through pine forest, and in most cases the display became uncertain and the average bearing tended to change. In one case the error was 109°. The effects were similar whether the forest was behind the receiver or between the receiver and transmitter, but became insignificant more than a few hundred metres away from the trees.

Because the Escort had rather a small roof and also contained a non-metallic sunroof to further restrict the ground plane, the rest of the tests were done using a Mk3 Cortina. To check the previous results the same antenna configuration was used and part of the original route was traversed again. The readings showed no significant change.

Bench tests and tests of accuracy in the field are all very well, but the real purpose of the df unit is to find hidden stations. So the final field test simulated a df hunt to see how the system performed in a more realistic situation. A car went to "hide" several kilometres away and began to make regular transmissions. It was soon obvious that the df unit was excellent for homing in on the hidden station. The bearing errors noted in the earlier tests did not seem to matter very much, perhaps because we adopted a "chase" technique rather than bothering with triangulation. In two tests the "fox" was found in about 15min, where our previous average using conventional techniques (dipoles and/or beams) was about 1h. In the first test the "fox" was parked in relatively open countryside and, in the other, close to the middle of a housing estate. Neither situation caused any real problems, and we surmise that it would not have been much more difficult if transmissions had been limited to 2 or 3s on a random schedule.



Top view, with cover removed, of the antenna combiner



Interior view, showing pcb layout, of the display unit

Conclusions

Despite our initial scepticism about a doppler direction-finding system using only four antennas, we were agreeably surprised by the overall performance of the Datong DF. When in use on the road, its relatively accurate bearings, combined with its speed of response, made it an effective tool in finding hidden stations. However, its limitations should also be noted. While the df unit will get you close to the hidden station quickly, bitter experience has demonstrated to us that the last 200m are the most difficult, and the unit could hardly be described as portable equipment!

While the Datong DF may be installed at a fixed location, the display format and restricted accuracy make the unit less useful for accurate df work.

The criticisms of the unit add up to only minor irritations, rather than major deficiencies in the design or construction. Overall, the unit performs well, and is convenient to use. While less accurate than its professional counterparts, it is at least a factor of 10 less expensive, and is ideally suited to the amateur market.

Acknowledgements

Our thanks to Datong Electronics Ltd for the loan of the review equipment, and to G4SWX for providing the Cortina used in some of the tests.

References

[1] "A DoppleScAnt", Terrence Rogers, WA4BVY. *QST* May 1978.

[2] "The Architect Sketch", Monty Python's Flying Circus, BBC, September 1970.

The manufacturer comments:

The only point which I would like to make is to clarify the relative benefits of smooth antenna commutation rather than abrupt switching.

In the latter case a major problem is that a strong adjacent-channel signal can totally wipe out the wanted signal. What happens is that the stepped-phase modulation produces sidebands on either side of every incoming signal. High sidebands of a strong off-tune signal can easily be a lot stronger than the fundamental from the wanted station.

When I tested an early prototype with abrupt switching it was impossible to use it in certain areas where a local repeater gave a strong signal. Also one frequently heard cross-mod effects when driving past commercial mobile radio masts.

After we developed the smooth switching system such problems disappeared.

D. A. Tong

Technical Topics

by Pat Hawker, G3VA

HAPPY NEW YEAR! We enter the notorious year of 1984 with most, but not all, of George Orwell's gloomy forebodings happily still unfulfilled, and with the boom in UK amateur radio bringing us close to one-in-a-thousand of the total population now holding an amateur transmitting licence.

It would be pleasant to feel that all's well in our snug world, and that our unique scientific hobby is in better shape than ever before—yet those "Members' Mailbag" letters suggest otherwise. "Wingeing poms" indeed!

More seriously, what is surely important is not so much the level, existence and precise details of the RAE and the morse test, but the assurance that the new generations of radio amateurs do not come to regard technical and operating studies as "once and for all" hurdles, needed only to get the coveted ticket and then put aside for ever. As I have suggested before, an RAE pass comes nowhere near understanding the finer points of the theory and practice of radio communications—and never did! Morse unused can quickly grow rusty; for serious operating 12wpm is only a start and barely a practical mode.

It is up to all of us to show that, without any form of "incentive licensing", British amateurs *are* capable of taking the "learning-by-doing" side of our hobby seriously, and genuinely seek to add to the still far-from-complete knowledge and understanding of radio propagation and technology.

Many do attempt just this—though perhaps you might not always gain this impression from our bands and publications. Enjoy 1984 *responsibly!*

THIS MONTH

Quartz in pint pots

One of the most vital, yet perhaps least understood, components used in amateur radio equipment is the piezo-electric quartz crystal, forming as it does a resonant circuit of extraordinarily high *Q* and, when correctly used, providing truly remarkable precision and stability. Over the years many of us have tended to think of a crystal as little more than a simple plug-in item. It can be argued that had not the properties of quartz crystals been recognized in the 'twenties, the whole development of hf and vhf radio would have followed very different lines. Admittedly, quartz is not the only piezo-electric material, but it remains the one least susceptible to temperature.

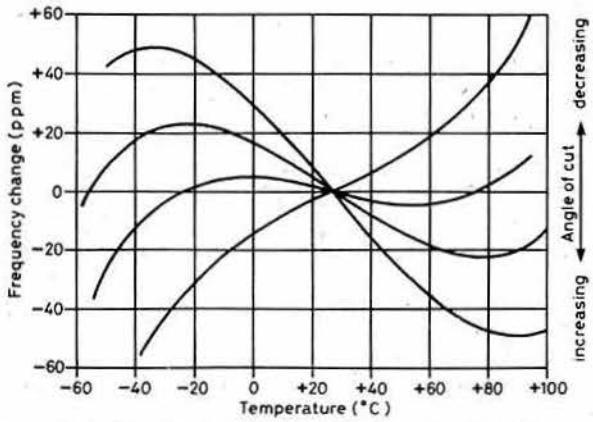


Fig 1. Typical family of a thin-plate AT-cut crystal with 27°C zero-coefficient crossing point showing frequency/temperature variations with different angles of cut

My first introduction to the magical quartz plate was in the days of open holders, though by then the original source in the form of pebble (optical) lenses had been superseded by the "zero-temperature-coefficient" AT-cut plates—the cut still used for the vast majority of hf crystals. Today most quartz is synthetic; in the 'thirties the large plates (about 1in diameter) were generally cut from natural South American quartz crystals.

The first enclosed holders were spring-loaded in order to accommodate the mechanical vibration of the plates, but these soon gave way to the air-gap holders, such as the FT243 holder, where the plates are held only at the corners. Over the years, plates have become smaller and smaller, rubber-gaskets and phenolic holders have given way to metal cases and glass-metal seals, with the crystals plated rather than held directly between metal plates.

As explained in *ART,* the "zero-temperature-coefficient" of AT-cut plates can mislead the unwary. These crystals *are* affected by temperature, but at some temperature (which can be determined by the maker) it changes from a positive to a negative coefficient, or vice versa, and is virtually "zero" over a small range: Fig 1. Many AT-cut crystals were intended for use in temperature-stable ovens (often 27°C) and have a positive temperature coefficient at room temperature, although with some angles of cut this can be quite small. At one time channelized vhf mobile equipment for commercial systems used crystal ovens that consumed about 6W of electrical energy. More recently ovens have tended to give way to "temperature-controlled crystal oscillators". In these the crystal is mounted in a block of aluminium heated by a power transistor under the control of a temperature-sensitive semiconductor (various forms of this technique have been described in *TT* and *ART)* or by "temperature compensated crystal oscillators", which can achieve a stability of the order of ±5ppm over the wide temperature range of −30°C to +60°C.

New crystals "age" over the first year of use, resulting in frequency changes of a few parts per million at a rate that depends partly on the drive level. The ageing effect reduces logarithmically with time. Some crystals are pre-aged by the manufacturers, who speed up the process by using high temperatures, of the order of 100°C.

Crystal oscillator basics

Fundamental AT-cut crystals tend to be used for the frequency range 1 to 20MHz, and as overtone oscillators up to about 150MHz (say, ninth overtone). Many fundamental oscillators use aperiodic circuits with no LC resonant circuits, although in some cases a tuned circuit can be valuable in eliminating any tendency to oscillate on spurious or overtone frequencies. An LC resonant circuit is almost always required for an overtone oscillator; above about the ninth overtone it becomes difficult to provide an LC tuned circuit capable of ensuring oscillation on the correct overtone. It is important to remember that an overtone frequency is *not* an exact multiple (ie harmonic) of the fundamental crystal frequency. Oscillators can be designed to use either the series or parallel resonance of the crystal, and these frequencies will differ. The dynamic load reactance affects the actual frequency of a crystal oscillator very significantly; the oscillator frequency can be "pulled" by external capacitors and/or inductors, either for "trimming" or as a restricted range vxo (variable crystal oscillator).

The most stable oscillators are those using AT-cut crystals; for frequency "standards" a lower-frequency AT-cut crystal overtone oscillator with 5 or 10MHz output is generally used; two-stage oscillators (eg Butler) tend to have better short-term stability (ie less phase noise) than oscillators using only a single active device. For minimum phase noise fairly high rf feedback should

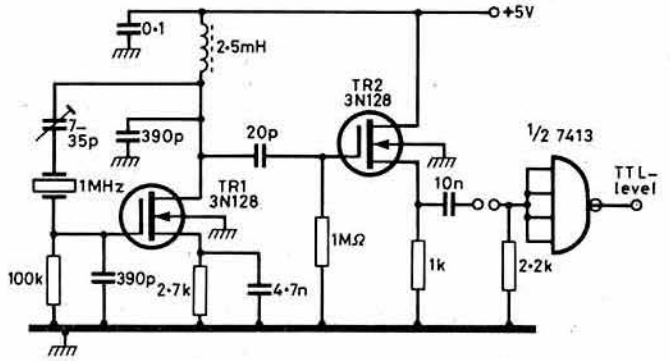


Fig 2. 1MHz Pierce oscillator using mosfets suitable as a clock for frequency-counters, calibration markers, etc. (Source *Digital PLL Frequency Synthesizers*, by U.L. Rohde, DJ2LR/W2)

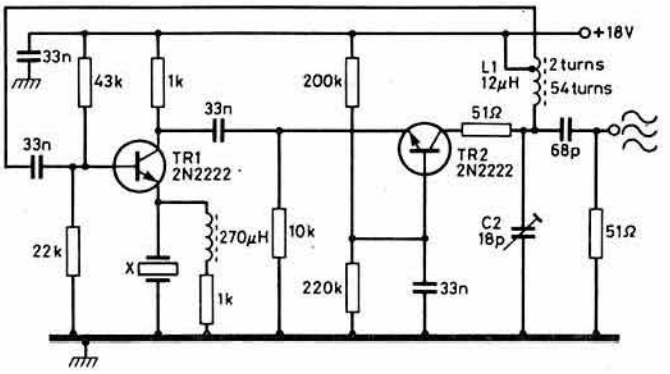


Fig 3. 5MHz (third overtone) two-stage, three-pole oscillator, due to M.M. Driscoll, providing exceptional low phase noise. Crystal dissipation about 85μW and rf output about 4dBm. (Source U.L. Rohde)

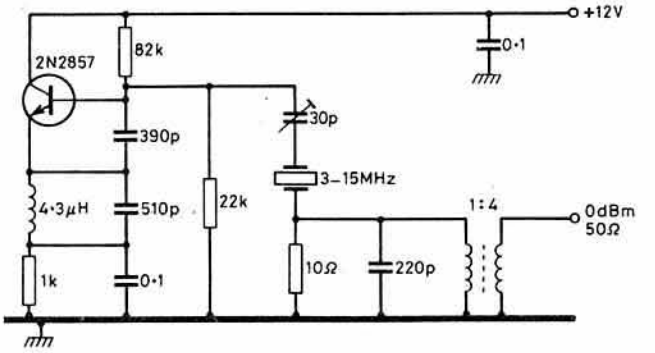


Fig 4. Low-noise crystal oscillator with high harmonic suppression in which the crystal acts also as a filter. (Source U.L. Rohde)

be used. The Q of an overtone crystal is much higher than that of the fundamental frequency. Useful circuits are given in Figs 2 to 4.

The original large crystals could cope with very high drive levels (we used 60mA pilot bulbs in series with the crystal as a check) but with HC6U (and similar types) a drive level of less than 5mW up to 10MHz, and less than 1mW for overtone or above 10MHz crystals is recommended. The FT243 crystals, with air-gap holders, can be driven more heavily. For long-term stability, drive levels should be kept very low, and this can give rise to the fortunately rare problem of "sleeping crystals" (see below).

Load capacitance of crystals

From an amateur radio viewpoint the most important variation of crystal oscillator frequency is not that produced by temperature or ageing but by variation of the dynamic load into which it works. It is this characteristic that allows crystals to be trimmed, for example, to put a vhf transceiver accurately on channel. A series trimmer capacitor will pull a crystal higher in frequency; a series inductance lower. Normally crystals are marked with their parallel resonant frequency for a specified value of load capacitance. At one time or another various "standard" values have been used, including 20, 30 and 50pF, 35 and 32pF. Today 30pF is generally used in the UK, 32pF in the USA.

Table 1 underlines the importance of the load capacitance. It shows how an HC6U plated crystal marked as 4,055·556kHz and intended for use with 30pF load capacitance can vary by almost 2·5kHz at fundamental, and a massive 88·5kHz if the output is multiplied up to 146MHz, when the circuit loading is varied from 10 to 100pF. It should be appreciated also that when you buy a crystal there are bound to be manufacturing tolerances that are sufficient to put a vhf transceiver out of channel unless carefully trimmed by adjustment of the load capacitance: see Tables 2 and 3.

While there is now a tendency for the use of large numbers of crystals to be replaced by various forms of frequency synthesis (despite the degradation of phase noise in low-cost designs), it must be recognized that all digital synthesizers, digital frequency readouts etc depend upon a crystal reference oscillator and will be only as accurate as the basic oscillator permits.

"Sleeping sickness" in crystals

Ray Hills, G3HRH, recently encountered a problem when a crystal failed to oscillate. As a result his attention was drawn to a note issued by Pye Telecommunications on "sleeping sickness" in crystals, a topic which I do not believe has previously been discussed in amateur journals.

The term "sleeping sickness" has come to be applied to a rare and still little understood characteristic of crystals used at low drive levels; the malady seldom occurs sooner than six weeks from manufacture of the crystal (and thus is not picked up in quality assurance or equipment acceptance tests); nor is it likely to occur while the equipment is in regular use. Unfortunately after a period of inactivity, such crystals may stubbornly refuse to oscillate. The next step is that usually the equipment owner returns the crystal to his supplier as faulty. When it is subjected to an activity check in a test unit, hey presto the crystal "wakes up" and passes all tests! The crystal may then be returned to the user who plugs it in; only to find it sleeping soundly with no sign of activity.

The reason why this happens, although not the basic cause of sleeping sickness in crystals, is now understood: manufacturers' test sets tend to drive the crystal harder than when in modern equipment. Crystals can be woken up temporarily, but not cured, by electrically shocking the crystal into activity. The cure will usually hold good as long as the equipment is in regular use, but given the chance a drowsy crystal unit will turn over and go back to sleep. It is thus not unknown for equipment owner and supplier to stay wide awake exchanging fractious correspondence on the lines of: "it's good"; "it's bad"; "it's good!" Pye Telecommunications state that it is a rare disease, but clearly one worth bearing in mind.

Rubber crystals

The fact that the effective frequency of a crystal depends on the load reactance forms the basis of both crystal ladder bandpass filters and the variable crystal oscillator (vxo). In *QST* ("Technical Correspondence") June 1983, p41, Frank Noble, W3MT, provides a graph that can be used

Table 1. Variations in frequency of typical HC6/U style plated crystal units with changes in circuit loading

Circuit loading	Measured frequency (kHz) A	B	C
10pF	4056·976	10,289·31	45,231·12
20pF	4056·094	10,287·10	45,229·73
30pF	4055·526	10,285·69	45,229·28
40pF	4055·199	10,284·90	45,229·02
50pF	4054·988	10,284·38	45,228·90
60pF	4054·838	10,284·02	45,228·74
100pF	4054·518	10,283·25	—
Series resonance	4053·960	10,281·91	45,228·22

Nominal frequencies: Crystal A, 4055·556kHz, crystal B, 10,285·71kHz; crystal C (third overtone intended for use at series resonance) 45,228·0kHz. Source David Rankin, VK3QV (*Rad Com*, April 1972)

Table 2. Deviations from nominal frequency of the 4055·556kHz crystal of Table 1, at fundamental, and when multiplied up to 146MHz, with changes in circuit loading

Circuit loading	Deviation from nominal frequency At fundamental	At 146MHz
10pF	+1,420Hz	+51·1kHz
20pF	+538Hz	+19·4kHz
30pF	−30Hz	− 1·1kHz
40pF	−357Hz	− 12·9kHz
50pF	−568Hz	− 20·5kHz
60pF	−718Hz	− 25·9kHz
100pF	−1,038Hz	− 37·4kHz
Series resonance	−1,596Hz	− 57·5kHz

Table 3. Frequencies and tolerances

Percentage	Parts per million (ppm)	Hz/MHz	Actual at 146MHz
±0·01	±100	±100	±14·6kHz
±0·005	±50	±50	± 7·3kHz
±0·0015	±15	±15	±2·19kHz
±0·001	±10	±10	±1·46kHz
±0·0001	±1	±1	±0·15kHz

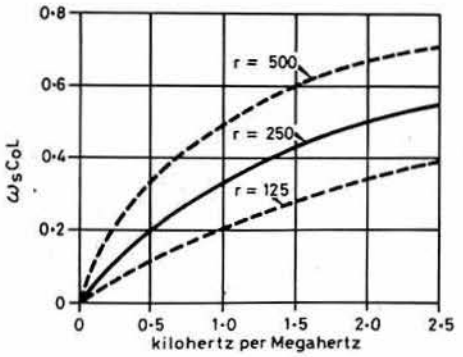


Fig 5. Graph used by W3MT to aid VXO design

to facilitate the design of inductance-loaded vxo units based on HC6U crystals.

This is shown in Fig 5, where ωs is the series resonance frequency of the crystal, Co is the equivalent parallel capacitance of the crystal, r is the ratio of Co to Ci (equivalent series-branch capacitance of the crystal), and L is the equivalent load inductance. The HC6U fundamental crystal has a Co of between about 5 and 9pF, an r of about 250. For crystals having an r of 250, W3MT suggests that a good compromise of maximum pulling range versus stability is about 1·5kHz/MHz or some 15kHz at 10MHz.

Using low-cost crystals and ceramic resonators

Many consumer electronics now depend on crystal clocks, representing a so-far largely untapped source of cheap crystals available for frequencies other than the 4·434MHz of PAL colour tv crystals. Dave Gordon-Smith, G3UUR, recently returned from the USA, writes:

"While I was in the States, a friend showed me an article in a trade magazine about Taiwanese quartz crystals made on a number of standard frequencies for video games, home computers and other electronics gadgets. These are sold in large quantities to American manufacturers at prices ranging from 10 to 15 cents (US) each. I feel that micro-chip suppliers must be handling such units in this country. If approached by a club or group prepared to buy in quantities of a hundred or so they should not cost more than about 50p each. Just 10 members building filters could absorb 100 crystals and make eight-pole ladder filters for around £5 each.

"The lists I have been shown include frequencies such as 5·0, 6·0, 8·0 and 8·866MHz while for QRP enthusiasts building simple crystal-controlled transmitters, frequencies in the 1·8, 3·5 and 7·0MHz bands appear to be available, including 1,843, 3,579 and 7,020kHz.

"Browsing around a new Tandy store here in Bath I find they sell miniature (HC18/U) 3,579kHz crystals for £1.59, including VAT. QRP enthusiasts might consider making this frequency a secondary QRP working channel in view of the price and wide availability.

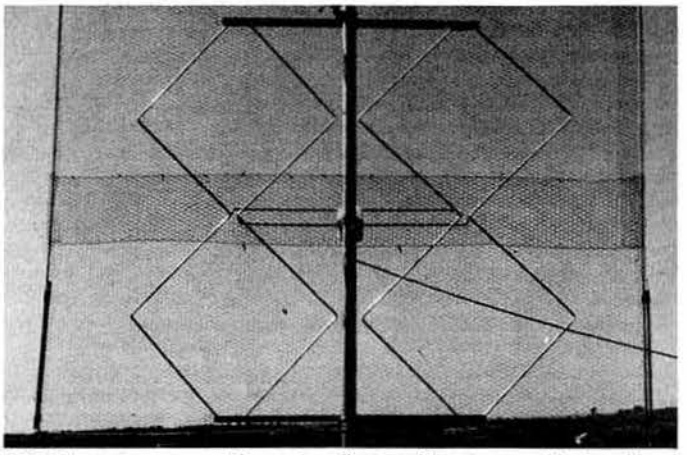
"I also feel amateurs should note that firms such as Tandy are selling 455kHz ceramic resonators at around 89p a pair. I have found these very suitable for ssb ladder filters at *445kHz*. This is not a mistake: the resonators are designed to operate at 455kHz with a 100pF load and have a series resonance at about 443kHz. Their Q factors are in excess of 2,000 which makes them adequate for bandwidths of around 2·5kHz at 445kHz. I have built a filter using them which has a −6dB bandwidth of 2·5kHz, an insertion loss of less than 6dB, and a 6/60dB shape factor of 2·5. The ultimate attenuation is greater than 100dB. Total cost, including carrier resonators, was only £3.56."

Broadband double loops

Mike Stringfellow, ZS6BUF, has been experimenting over several years with a number of loop and half-loop antennas for both hf and vhf, including single and twin loops that give exceptional broadband performance on vhf, and the DJ4VM loop on hf. He has also investigated a 28MHz six-element log-Yagi and the half-square form of inverted groundplane. I hope to refer on another occasion to all this work, but this month will confine myself to his broadband loops.

Incidentally, ZS6BUF acknowledges that he has received much moral and physical support for his antenna work from a number of other amateurs in the Johannesburg area, and mentions particularly Ted Cook, ZS6BT, no stranger to *TT*, who despite having just passed his 80th birthday is still active on the air and busy constructing antennas. Subsèquent to the development of his broadband twin-square antenna, ZS6BUF's attention was drawn to earlier work by Japanese engineers (Matsumoto *et al*) who used a similar twin-square element but with director elements for broadband uhf tv antennas.

Dr Stringfellow presented a paper "A broadband high-gain antenna for vhf/uhf" at a symposium on antennas and propagation organized by the South African Institute of Electrical Engineers during May 1983, from which some of these notes are drawn. These vhf/uhf arrays were based on a broadside array of driven loops (single and dual) in front of a screen mesh reflector (examples of single loops are shown in Fig 6). ZS6BUF noted that "vhf/uhf antennas of high gain are generally achieved by using end-fire arrays of parastically-excited dipoles or loops (Yagi array). Such antennas can provide very high gain, but this is at the expense of critical element dimensions and narrow operating bandwidth (typically a few percent)." Yagi antennas, such as those used for four-channel tv reception, can be adjusted to give useful gain over a larger bandwidth (up to ± 15 per cent but exceptionally more) but the broadband gain is usually much lower than is possible on narrowband designs.



ZS6BUF's twin-square with mesh reflector vhf antenna with broadband characteristics. Design frequency 150MHz but covers 100-200MHz

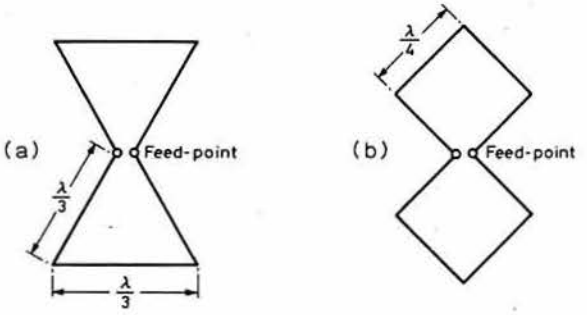


Fig 6. Experimental twin-loop antenna elements (a) twin delta (b) twin-square

Over the restricted spectrum of single vhf/uhf amateur bands extended antenna bandwidth is perhaps less important than the advantages that broadbanding gives in overcoming the need for critical dimensions and adjustments. There are very few published designs for conventional vhf/uhf or even vhf antennas that can be relied upon to provide anywhere near optimum results without adjustments. A broadband approach, even at the cost of a little forward gain, is inherently more suited to home brewing!

The ZS6BUF 145MHz array combines reasonable gain with operation over a full 2:1 frequency span, ie in this case roughly 100 to 200MHz. The original experimental array using two square loops each of circumference of 1·05λ to 1·2λ depending on the element thickness was adopted after a series of trials of other loop configurations. The first trials used a single driven twin-square loop mounted in front of a mesh reflector screen. The screen can be replaced by a pair of parastic stacked dipole reflectors without loss of gain but again with a narrower bandwidth. Yagi directors can be used to increase gain but again introducing resonant effects. In this single twin-square loop estimated gain (based on use of test antennas) was 6 to 7dB at loop resonance, but making good use of the additional aperture at the higher frequencies.

His subsequent array used two broadside twin-square elements, also in front of a plane screen reflector with the centres of the two elements 0·5λ apart at centre frequency. A parallel tubular feedline connecting the elements was arranged so that its spacing could be adjusted (impedance variable between about 50 to 500Ω) to facilitate matching. The elements were fed in phase with 50Ω feedline via a 4:1 broadband balun to the centre point of the tubular feedline. See photograph and Fig 7. The matching arrangements proved capable of providing a perfect match over a small

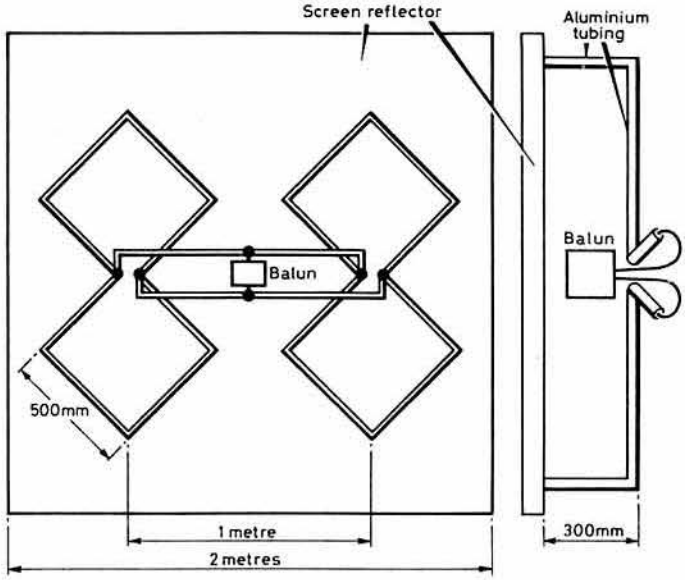


Fig 7. Constructional details of ZS6BUF's twin-square broadband antenna

frequency range but a compromise spacing could give an acceptable match (vswr less than 2:1) over the full 2:1 frequency span without adjustment. With some feeder adjustment this vswr could be achieved over the range 80 to 250MHz.

Gain at centre frequency showed a dip but generally was about 2–3dB above the single dual-loop. Front-to-back ratio was about 25dB with no major sidelobes identified. It can thus be assumed that doubling the size of the array will result in about 2dB or so of extra gain. Fig 8 shows the gain-figures for the two ZS6BUF arrays and also an eight-element Matsumoto array.

Although not described in the conference paper, ZS6BUF has also constructed a number of the single 2λ loops for hf bands. A twin-delta loop designed for 21MHz was found to be effective on 28MHz as well, but would not quite stretch down to 14MHz. A 14MHz twin-square loop worked well on both 14 and 21MHz but no better than a dipole on 28MHz. Both these arrays were fed by 600Ω open line to a link-coupled tuner.

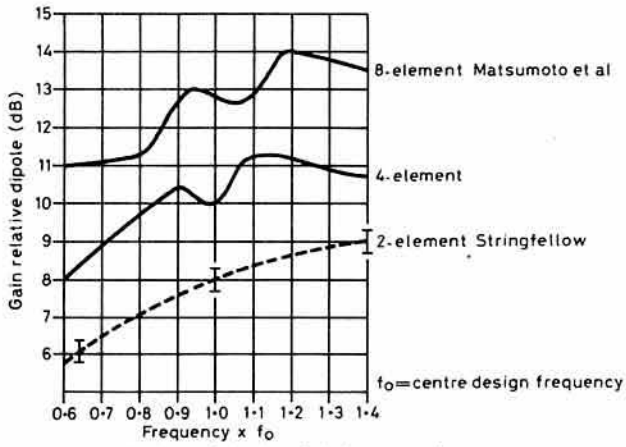


Fig 8. Measured gains of 2, 4 and 8-element twin-square antennas as a function (to centre design frequency is 150MHz)

ZS6BUF believes that the broadband characteristics of these hf loops are limited to about 1·5:1 frequency span rather than 2:1 primarily by the relatively thin elements. However, the 14MHz twin-square array was successfully turned into a most effective tri-band antenna by adding 0·25λ open stubs at its top and bottom points. The stubs acted as frequency switches to close the loops on 14MHz and open them on 28MHz, turning the antenna into twin bi-squares on the higher frequency. The antenna was constructed from 16-gauge copper wire and suspended from an 18m-high lightweight dural mast. Nylon line was used to form the loops in place of spreaders making the whole assembly, including mast, only about 50lb. However, this particular antenna was later destroyed during a violent storm and in his subsequent hf experiments ZS6BUF used the DJ4VM form of loop which will have to wait for another issue.

Doubling the voltage

TT November 1983, p996, noted that it would provide advantages if more solidstate rf amplifiers operated from 24V rather than 12V power supply units. This imposes a problem when one wishes to operate such equipment from a 12V vehicle battery. A solution is to use a voltage-doubler switched-mode psu. Another requirement for a higher-than-12V supply is where it is desired to charge a 12V nicad battery from a 12V vehicle battery. It was this latter requirement that caused Paul Stephenson ("Circuit Ideas" *Wireless World* October 1983, p59) to devise the low-cost voltage-doubler arrangement for dc supplies shown in Fig 9. He claims this can deliver about 2A depending on the type and value selected for the pump capacitors.

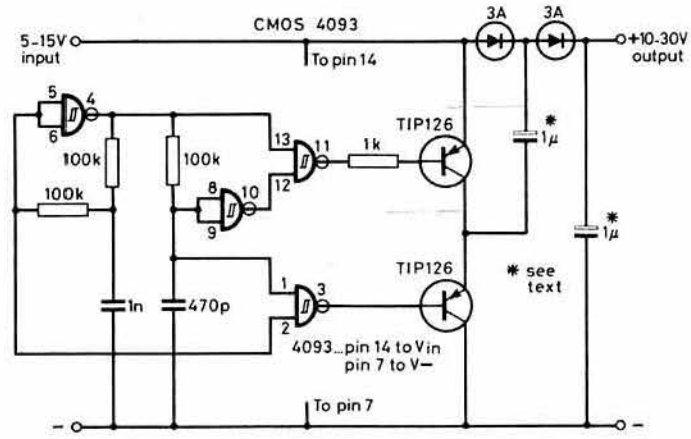


Fig 9. Voltage doubler (dc/dc) as described in Wireless World

To minimize transient current in the two TIP 126 Darlington-type output transistors, the oscillator is designed to provide a four-phase clock by providing a slave RC network with 90° phase lead over the oscillator; the outputs of the RC network and the oscillator are combined to provide non-overlapping output pulses for driving the output transistors; the Darlington-type devices provide sufficient gain without buffer amplifiers. The two pump capacitors require a value of only a few microfarads but have to be capable of passing relatively high currents; Paul Stephenson suggests that the cheapest solution is to use large-value electrolytics.

Fail-safe "kiss" 5A psu with relay

W. M. Frost, G3OAE, seeking a fail-safe 13·8V power system to use with an FT230R, which draws 5A on "transmit", decided that ic regulators, banks of pass transistors and crowbar protection were at variance with his deep-rooted belief in the use of "kiss" techniques and junk-box components, even if this involved a return to the steam-age era. With his tongue only partly in his cheek, he sent along his circuit arrangement (Fig 10) that gives entirely satisfactory results when used in conjunction with virtually any old 12V car battery. It depends principally upon the action of an electromagnetic relay with 5A (minimum) contacts, rewound with two layers of 16swg enamelled wire and adjusted to pull-in with a 2–4V series load. The mains transformer is an ex-WD surplus heater transformer with three 5V, 3A ct windings.

With the rig on "receive" the load is less than 1A. The 10V ac winding float-charges the battery to a minimum of 14V dc. The relay remains "open".

With the rig on "transmit" the relay "closes" and switches in an extra 2·5V ac to maintain the output at 13·8 to 14V for a 5A load.

G3OAE adds: "Even if the battery becomes disconnected, it makes no difference, except that the relay falls out momentarily as the rig is switched

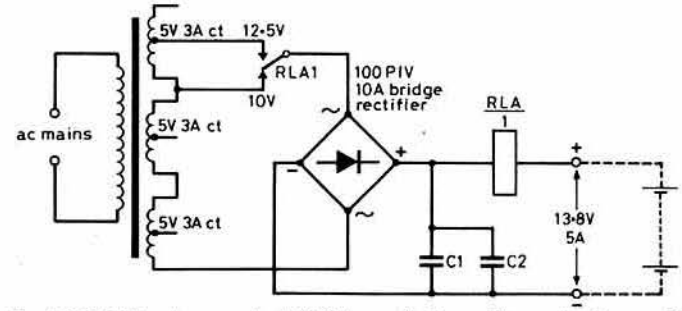


Fig 10. G3OAE relay-operated 13·8V psu that equalizes output on a 5A "transmit" load

to transmit. In fact the psu is completely fail-safe and the output can never rise above 14V. Nor can the battery be overcharged: it will go months without topping up."

One notes, incidentally, on the subject of MoD "surplus", that some of the overseas journals in Australia, South Africa etc are publishing an increasing number of articles on such post-war military equipments as the B47, C11, C42, C45, and R210 with a view to their use on hf or 50MHz, or conversion to other bands. Although mostly intended for short-range operation, some of these equipments and their antenna tuning units are worthy of interest.

Consumer hybrids

In *TT* December 1981, pp1127-8, I drew attention to the increasing importance of "hybrid technology" with components based on thick-film and thin-film technology, often in "chip" form and sometimes packaged into compact modules with "chip carrier" forms of discrete semiconductors.

For several years hybrid technology has been used by Japanese and American manufacturers of consumer electronics, and this is now spreading to Europe with Philips/Mullard introducing what they call "surface mounted assembly" (sma). In this form of hybrid technology, miniature chip components and standard ic devices are automatically assembled, located and glued into place on printed circuit boards and then wave-soldered. Because of the very small size of chip components, complex circuits can be assembled on small pcbs at very high speed: an sma-type pcb may often be only about one-third the linear dimensions (one-ninth the area) of a conventional pcb assembly fulfilling the same functions.

Component-lead spacings are based on an 0·05in grid instead of the usual 0·1in spacing. It seems likely that chip components and more hybrid technology will be adopted for factory-made amateur radio equipment, at least for those parts of the design that justify the setting up of high-volume automated production lines.

While there are obvious advantages to the manufacturers, the users benefit from the improved reliability and consistency of performance that is possible with sma and similar techniques. but at the same time it does represent a further step along the path towards "throw-away electronics"; that is the disposal of the complete circuit board (or even the complete equipment) should a fault occur. Tracing and replacing individual faulty components in such assemblies is virtually impossible. The chip components of millimetric dimensions are often far too small to carry identification marks or values, while the high packing density renders traditional forms of fault-tracing extremely difficult.

Advantages of 24V supplies

On several occasions recently attention has been drawn in *TT* to the advantages that might accrue if more use were made of 24V dc rails, rather than the almost universal 12V of current amateur radio equipment. Further evidence of this contention can be found in a recent *QST* review by Paul K. Pagel, N1FB, of the Yaesu FT102. he writes:

"One might be baffled by the excellent receiver dynamic range after examining the receiver front-end circuit. There is nothing unusual about the mixer, for it contains only a pair of source-driven fets in a singly-balanced arrangement. The rf amplifier is similarly mundane upon cursory examination: it employs two more jfets, this time in series. The reason for the strong front-end performance becomes clear when you trace the dc supply line to the pc-board terminal strip: Yaesu uses +24V for the rf amplifier and mixer rather than the usual 12V dc! The higher operating voltage greatly enhances dynamic range."

The review indicates that the receiver meets the maker's claim of a dynamic range exceeding 95dB.

Logic test probe

A logic probe is widely recognized as one of the most useful and virtually indispensable servicing aids for use when checking out digital circuits or, indeed, almost any circuits based on ic devices. In *Radio-REF* October 1983, pp1041-2, Bernard Basset, F6DWX/HB9COT, describes a simple unit that uses a new Siemens combination l.e.d. device (LD100), which puts one red and one green diode in the same compact package (5mm diameter). It also provides useful versatility and is claimed to be virtually indestructible in use: Fig 11. The inclusion of a miniature bridge rectifier and voltage regulator means that dc power can be drawn from the unit under test without regard to polarity over the wide range of 4 to 25V. The LD100 requires 3V, 40mA when both diodes are lit simultaneously.

The probe unit should not normally disturb the operation of the circuits under test and indicates four possible states: (1) absence of power (neither l.e.d. lights); (2) logic level 1 (high) with red indicator alight and green off;

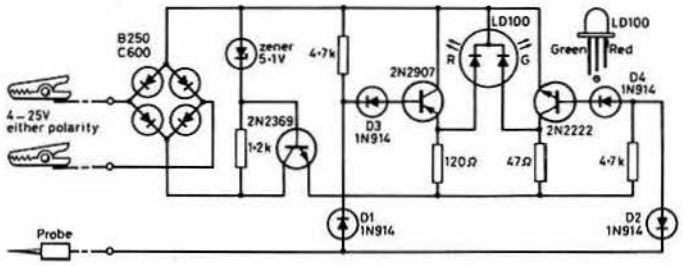


Fig 11. Useful logic test probe by F6DWX using recently introduced LD100 dual-colour l.e.d.

(3) logic level 0 (low) with green indicator on and red off; and (4) periodic change of logic levels by the indicators flashing alternatively at the switching rate or (if pulse rate is high) both appear to light together.

The entire unit can be built into a "fat" pen holder or similar plastic tube. Such a logic probe will not, of course, entirely replace a good oscilloscope for checking out digital circuits, but F6DWX is convinced of the usefulness of this simple unit, particularly to those who have never previously made use of a compact logic probe.

Operability matters

Quite a few letters have come in from readers on the question of providing guidance in "equipment reviews" to those contemplating the purchase of major items of factory-built rigs. Most agree fully with the comments, stemming from Laurie Margolis, G3UML, and myself in the November *TT*, that pleasant operation, reliability and consistency of performance, are often every bit as important as the finer details of the technical specification; always provided, of course, that reviewers confirm that the model tested met the standard of performance claimed by the makers.

One reason for this is simply that the *basic* performance of hf receivers and transmitters has not changed to any great extent over a considerable number of years. Even today a 40-year-old AR88D receiver is capable of a far from negligible performance. All-solidstate designs have had to struggle hard to overcome their initial poor strong-signal performance in order to achieve the sort of dynamic range that we took almost for granted with good valve receivers. The most significant improvement has been the shape factor of good hf bandpass crystal filters, better i.f. "image" rejection, and also the better frequency stability that became necessary with ssb and rtty.

For transmitters there is the problem that a really "clean" transmission, with minimum spurii of all types, tends to be appreciated more by the other operators on the band than by the owner of the equipment. Amateur equipment specifications are considerably less stringent, in this respect, than those of some military equipment, but I doubt if many amateurs would wish to pay the high prices asked for mil-spec and professional equipment. Then again, even a good ssb transmitter can readily be made to produce splatter simply by turning up the af gain control too far or by ignoring the gradual deterioration of heavily-run pa valves. How many amateurs accurately monitor outgoing signals, or are, these days, in any position to check thoroughly the performance of their transmitters?

An interference-limited service

Amateur radio, in the professional jargon, has become a competitive, interference-limited service rather than signal-strength-limited as in the early days. As I wrote in 1981:

"In these circumstances, extreme sensitivity of the receiver, its long-term frequency stability, accurate calibration (except at band edges) or even an unusually wide dynamic range may not in practice prove supremely important . . . except on 7 and 21MHz where amateur transmissions are located in the same, or immediately adjacent, bands to "megawatt" broadcasting stations. The old adage 'if you can't hear them, you can't work them' is losing its point; signals can be heard on most reasonable receivers with a suitable antenna; the problem is to hold them until the contact has been successfully completed, in the presence of widely-varying degrees of co-channel and adjacent-channel interference, splatter and local electrical noise."

A cause of contacts being lost or unsatisfactory may be the very rapid fluctuation of path loss (particularly at the edge of the first skip zone) due to short-term fluctuations of the muf. Even more common is the sudden appearance on the channel of a one-hop short-skip signal many tens of decibels stronger than the wanted signal. Only to a limited extent can such problems be overcome by improved receiver performance; far more important is the antenna and the use of its directional characteristics (if any).

It needs to be more widely appreciated that there is no one single factor or technical characteristic by which overall performance of receivers can be judged. For example, there remains a need to distinguish between blocking, reciprocal mixing and intermodulation as three important but separate strong-signal-handling characteristics.

In these circumstances it is only to be expected that equipment manufacturers will endeavour to make their equipment more attractive to customers by adding extra features, whether or not these really contribute in practice to operational performance. Unfortunately some features may even have disadvantages that can outweigh their benefits. A good example of this was the early rush into all-solidstate receiver designs. Then again, the incorporation of digital circuitry into receivers can provide attractive frequency readout, frequency synthesis etc, but if this is not done carefully the high-speed pulses in the digital circuits can degrade performance on weak signals. Operational controls must be capable of being adjusted quickly and easily or they will prove of limited use.

Reliability and after-sales service

The past decade has seen a tremendous improvement in the reliability of consumer electronics. In 1970 it was estimated that the average colour tv set required servicing about four times per year; today the corresponding figure is about one fault in three years. A good deal of the credit for this remarkable improvement belongs to Japanese set makers and component manufacturers, although recent *Which?* reports show that similar reliability figures are now being achieved by European factories. Nevertheless it remains true that the more separate components in a piece of equipment, the more chance of failures.

In practice it has also been shown that poor reliability is more a question of a "rogue" model or batch of models than poor design. For this reason it is extremely good news to learn from several correspondents of the fair and considerate treatment they have received from manufacturers and/or some distributors when it has become clear that they have in fact acquired a rogue model. As John Roscoe, G4QK, (who after a series of faults asked for and got his money back) points out this is not always the experience of those who have been unlucky enough to buy one of those "gleaming new A-registration cars" that I mentioned in the November *TT*.

Arising out of the incident when Jack Maling, G5JL, (*TT* October 1983, p889) had his transceiver ignite, I have received a long letter from an old friend of this column, Kjell Strom, SM6CPI. After six years in Japan, SM6CPI is now in Italy as European representative of the Yaesu Musen company. He notes that G5JL has confirmed to him that "the repairs were carried out promptly and free of charge by SMC, who also arranged collection and delivery; their service was excellent and very rapid."

SM6CPI is convinced that after-sales service such as this is ample justification of the policy of some Japanese firms to appoint "authorized agents" even though this sometimes leads British amateurs to complain of non-competitive pricing. The Japanese firms encourage their agents to carry the necessary spare parts and to take care of customers long after the final cheque has been cashed. He believes that the emphasis on quality assurance and initial "burn-in" procedures at the factories means that the probability of failure of each individual component is microscopic, though agreeing that to some extent this advantage is offset by the much larger number of components in recent equipments. Because it would not make economic sense for manufacturers to seek out the few remaining potential failures, they expect these to be taken care of in the after-sales service, performed and paid for by the authorized agents. Buying from an authorized agent, SM6CPI believes, is a form of insurance. "You do not buy an insurance policy because you expect a fire in your home, but you will be glad you did if it happens. Before you make that 'bargain deal' on a new transceiver, check carefully what you get for your money and what you do not get."

Some may feel that SM6CPI has an axe to grind, but many readers have commented in the past on the different standards of service they have received—and most have warmly praised Japanese firms in this respect, even when not altogether in favour of the "rice box" concept. Back-up service has become a hallmark of the Japanese amateur radio industry, and they deserve credit for pursuing this policy.

A lost opportunity—lf dx

In Europe the radio spectrum between 160 and 190kHz forms part of the "long-wave" broadcasting band, containing *inter alia* the extremely high power transmitters of Paris (Allouis), Moscow, Europe 1 and Deutschlandsender (GDR). In North America the long-wave band has never been used for broadcasting, and when you listen over there it seems almost empty. In fact, no licence whatsoever is necessary in the USA to use a 1W transmitter with an antenna not longer than 50ft between 160 and 190kHz. The powers-that-be must have at some time decided that with such limitations nobody would be able to radiate far beyond their own garden fence, just as in 1912 they opened the entire spectrum above 1·5MHz ("200 metres and down") to American radio amateurs.

S. J. DeFrancesco, K1RGO, is one of the American amateurs who have accepted the challenge of lf dx with QRP (see *Ham Radio* October 1983, pp71-3 "VMOS on 1,750 metres").

With a VN67AF vmos device as power amplifier fed from a 12V power supply and 50ft antenna, he claims to have made contacts over distances up to 250 miles, and reports that other enthusiasts have even spanned a remarkable 700 miles. This must be considered good going when you realize that the radiation resistance of a 50ft antenna at such a low frequency is of the order of only 0·02Ω, so that maximum effective radiation will be not more than a few milliwatts.

Old-time marine operators, and those who listened to them, will recall the highly-effective 2,000m shipping band (actually 100 to 160kHz with 143kHz calling frequency). In the 'thirties one could hear the Atlantic passenger liners ripping off telegrams at great pace on straight keys. But you have to go right back to the early 'twenties to recall an era when British amateurs had a 1,000m band. It vanished when it was claimed the signals interfered with Croydon Airport radio.

Simple tunable af oscillator

A simple af oscillator, tunable over a range of about 740Hz to 2·7kHz with a fixed duty cycle of approximately 50 per cent, has been described by John Widder of Hewlett-Packard *(Electronics,* November 3, 1983). As shown in Fig 12 it uses only a single readily-available comparator ic and a few discrete components. It is claimed to be reliable, with smooth control, suitable for use in microprocessor-controlled applications. Operation is described as follows:

"When power is initially applied, the voltage across C1 is zero, and output high. C1 charges through R5 and R6 until it reaches upper threshold V+. At that point the output switches to low and C1 starts to discharge through R6 until the voltage across it reaches the lower threshold voltage, V−. Then the output switches to high and the cycle repeats.

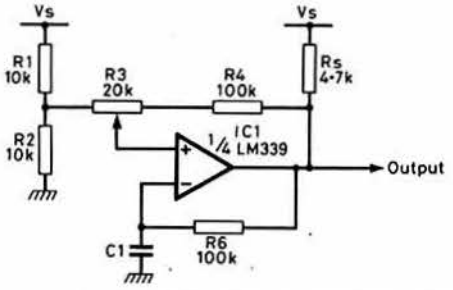


Fig 12. Single comparator ic and a few discrete components provide tunable af oscillator. By varying amount of hysteresis of the comparator output frequency can be varied from about 740Hz to 2·7kHz with fixed duty cycle of about 50 per cent

Varying circuit hysteresis via R3 adjusts the frequency. No value is given for C1 but it is stated that "the amount of hysteresis together with time constant R6 × C1 determines how much time it takes for C2 to charge or discharge to the new threshold after the output voltage switches."

Tips, topics and topples

F. Lees, G3PD, has spotted some errors in the useful item from G6JP on home-made by-pass capacitors: the factor 0·8842 in the formula should have been 0·08842. He also notes that the metric washer dimensions similarly need a decimal point since 1·5in etc is 38·1 and not 381mm, etc. Oops! Ted Hatch, G3ISD, suggests that the washers for such capacitors could be conveniently made from aluminium sheet using the type of chassis punch long used in the days of thermionics for valve holders. These were made in various useful sizes: 1in, 1·33in 1·5in etc. He adds that a ready source of mica is old smoothing-iron elements.

Dave Gordon-Smith, G3UUR, back from the USA, is concerned over some errors and omissions that slipped into items from him in the September, October and November issues. For example, his crystal calibrator (September) delivers a 1MHz unmodulated output or 1MHz modulated by either 10kHz or 100kHz and not the variations shown. G3UUR incidentally is *not* impressed by the patented toroid helix antenna (October), at least as a transmitting antenna, due in part to the vastly increased ohmic losses of the extra length and gauge of wire suggested. He much prefers the standard single-loop using very large diameter copper, even though its actual radiation resistance would be lower. □

4-2-70

*by Ken Willis, G8VR**

ANOTHER YEAR OPENS, and if you are like me, it will take a while to sink in before you stop writing out QSL cards with the old dateline.

Those who have read George Orwell's fascinating book *1984* will be relieved to note that his most sinister prophecies have not come to pass. The only "Big Brother" watching over the amateur fraternity is a benevolent licensing authority.

Instead of all-seeing video monitors keeping us under constant surveillance, it is our own *vdus* connected to microcomputers which dominate the domestic scene today. So, a happy New Year, and let us hope that all vhf/uhf records are broken in the 12 months ahead. Meanwhile, quite a lot has been happening . . .

Meteor scatter

Due to the Christmas holidays, it is possible that this issue will not reach some readers before the Quadrantids meteor shower peaks on 3/4 January. Nevertheless, as this shower is of such general interest I will give the comments of our ms correspondent John Matthews, G3WZT, as it adds to the general fund of knowledge on this most useful and fascinating mode of propagation.

John says that the Quadrantids is probably the most difficult of the regular showers to predict, as it is of very short duration and gives high reflection rates for only a few hours. Because the shower has a declination angle of 50°, and culmination time is 0830 (local), it means that in our latitudes the shower will be almost overhead at the time. It may well give very interesting results if you are prepared to try backscatter tests with antennas pointing towards the zenith—that is, straight up!

The peak should occur during 3 January, continuing into the early hours of 4 January. Past experience indicates that when the shower peaks, all theory seems to "go out of the window" and signals are audible from all over Europe regardless of beam heading. (This is a feature of many shower-peaks, incidentally.)

The Quadrantids should favour a direction (from the UK) from east to northeast, although signals from all round the compass may well be heard, but at less strength. John's best estimate for operating times is 1200 to 1700gmt on 3 January, and 2300 3 January to 0300 4 January, and he recommends such prefix areas as OH, SM, UR2 etc.

G3WZT has also drawn attention to an article in *Aviation Week and Space Technology* for 15 August 1983 entitled "Meteor trails may aid communications". The US Air Force Aerospace Defense Command has been testing the mode because of its low-cost and comparative invulnerability to nuclear attack. With the ionosphere very disturbed following a nuclear holocaust, it is believed that the ms mode would recover faster than conventional high-frequency radio in such conditions. While we hope that the theory will never be put to the test, it is good to see this professional interest in techniques which amateurs have largely pioneered, and though not everyone is ready to accept the point, ms is probably the *only* mode by which you could make contact on vhf over a range of up to 2,000km irrespective of the time of day, weather and general conditions, provided you were prepared to devote adequate time to completing the contact.

Tropo

The big tropo event of 22/23 October occurred just as we were going to press last month, so it was reported only briefly. However, there is no doubt that it was a major event. The 432MHz contact between G3LQR and UA3LBO providing evidence, if any were needed, that tropo conditions existed over a vast area of Europe and into the USSR. Several stations commented on the duration of the event—G3XBM (Cambs) saying that with him conditions were exceptional for all of three days.

Those who like to study the weather conditions which produce such openings may find Fig 1 very interesting. Since tropo "ducting" is largely a result of abnormalities existing in the refractive index of the atmosphere in the tropospheric belt close to the earth's surface, figures for the refractive index taken at various observatories during the event provide a measure of the conditions that prevailed. We are fortunate in having on the Propagation Studies Committee a professional in the field of meteorology in the person of Ray Flavell, G3LTP. He has provided the cross-sectional representation of refractive index measurements recorded between Long Kesh, N Ireland, and Stuttgart at the height of the event. For a more detailed explanation of these figures, see the RSGB *VHF-UHF Manual*, 4th edn 1983, propagation chapter, especially page 2.6. The potential refractive index measured at Crawley was much lower than the normal mean values up to about 3km in height, and Ray says that an interesting feature is that the abnormality extended to parts of the atmosphere closest to the ground. Under such conditions, if fog or mist should form, this will tend to push up the refractive index at the bottom of the profile and increase the intensity of the gradient. When this happens, the cooler and wetter the fog, the more spectacular the opening—provided your antenna does not project through the fog into the dry air above, as it might if you live on a hill! These technical explanations of the old "folk-lore" of vhf—a settled high-pressure weather pattern, just declining, with fog forming in the evening, are of great interest, and help immensely in interpreting conditions and in forecasting possible openings. They also go some way to explaining why some "mountain-topper" portables find that the dx does not reach them in their lofty locations.

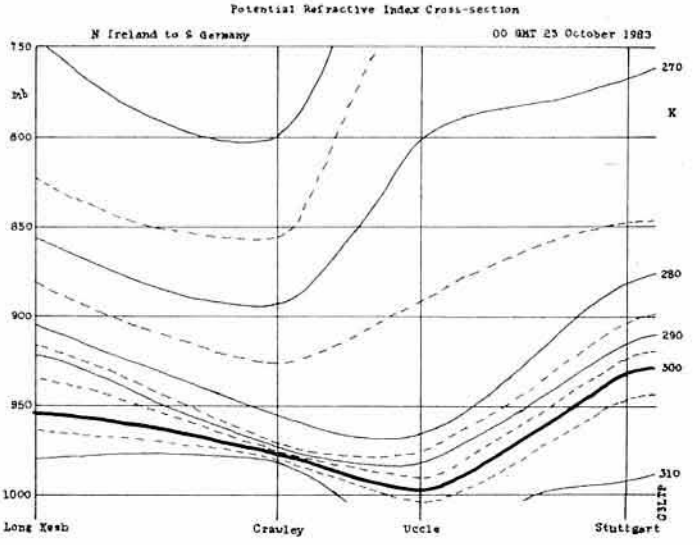


Fig 1. Cross-section of refractive index measurements recorded between Long Kesh, N Ireland, and Stuttgart

As for what was worked, thousands of dx contacts were made during the event. On 144MHz, G4KTP (Co Durham) worked several SPs and OKs plus Y22, D, OZ, SM and D, indicating the spread of the event. On 432MHz G4BVY (Worcs) had six contacts over paths exceeding 1,400km, including five OKs and three SPs, most of the contacts being on cw. The lift enabled him to reach the magic 100 squares level for the band.

Back on 2m, G4TNB worked his first SP, and his father, G3GAF, had a "CQ" call answered by UP2BEA (LQ) for another "first" for the station. Peter, G4TNB, commented on not being able to work as much on ssb as on cw, using only 25W to a 11-element Tonna. There is no doubt that having cw capability adds greatly to one's chances of working the rare ones when the band is open and QRM at its height.

Stephen Reading, G4LZD (Dartmouth) used a "barefoot" FT290R with a five-element Yagi in his roof-space. Since June 1983 this has enabled him to work 44 squares in 13 countries, all on tropo ssb/cw. He comments "QRP can make it!". Up in Lincolnshire, G4DHF worked seven SPs, five of them coming back to "CQ" calls. He was not QRV during the Sunday when most of the UP 2/UQ2 stations were coming through. On 23 September in a previous opening, David worked three Italian stations in EF square.

*11 Old Downs, Hartley, Kent DA3 7AA.

Aurora

With the probability of big auroras decreasing "as the sun goes down", we are dependent upon our more northerly amateurs to keep us informed of auroral activity, as they hear the weak ones which do not penetrate into the Midlands and south. A first report to *4-2-70* from Chris and Laurence Howell, GM4SDG and GM4DMA respectively, is therefore very welcome as well as informative. They moved from Surrey to the Fraserburgh area some six months ago to a site 300ft asl and one mile from their nearest neighbour, with a clear take-off in all directions except for a 50ft hill towards the south. The QTH locator is YR40g, and it sounds as if they have found their own personal Shangri-La. They have experienced very strong winds up there, and should ever they abate, they plan large arrays for all the "common" vhf/uhf bands, including 1,296MHz. Their report on auroral activity will help fill in some slots on the 27-day charts, quite apart from being a very interesting account of southerners apparently experiencing these events for the first time from so northerly a vantage point.

144MHz

17 October. Aurora lasted 1·5h. Beam heading did not vary at 020°. Worked LA6PV, OY9JD, SM7GEP.
18 October. A strong event lasting almost all evening on a beam heading of 010°. Worked OY9JD (on ssb), GM4HIG, DL0PR and GB3LER beacons strong.
30 October. Weak event, beam heading 020°. Little activity.

70MHz

16 October. A weak but long-lasting event with nothing being heard on 2m. 1300-1500gmt, beacon EI4RFF, Dublin, on 70·130, WN38c, was 54A on 020°.
17 October. Beacons heard with auroral tone, 1830-1900 EI4RFF (54A), 1845-1915gmt GB3BUX (55A), 1845-1900gmt GB3CTC (54A), and GB3ANG (54A). Beam headings were 010-020°.
18 October. "A strange event, never seen anything like it before, even when operating in Antarctic as VP8SB".
1900-2000gmt EI4RFF 53A, and 1900-1915gmt GB3BUX at 53A, both on 000°, then all quiet until 2059 when the beam was turned to 180°, and GB3BUX was heard with auroral tone. There was no activity at all from the north, not even from the most common beacon EI4RFF. GB3BUX was 53A for about 10min (See below for further details).
30 October. 1700gmt EI4RFF at 52A on 020° in an event lasting 40min, no other beacons being audible.

Laurence discussed the strange event of 18 October with his friends on the British Antarctic Survey team who are studying sporadic-E. Their suggestion was that perhaps a portion of Es had broken off from the main event and worked its way south, and although the main event had collapsed, this portion remained active at a high level over a region estimated to cover 100km², located either overhead or south of Buxton. Another explanation is that the event itself moved south, but if so, it is surprising that there was no apparent activity to the north of YR square in view of the intensity of this aurora. Question—if a "patch" of Es moved south, breaking off from a major auroral "curtain", would it maintain its turbulent nature to produce Au tones, or would signals not sound more like the pure tones of "auroral E"?

There was a large (green) visible aurora on 12 October at 0300 lasting 2h and covering 50 per cent of the total sky at Fraserburgh, but our correspondents were asleep and missed it. Well, you can't win them all! We look forward to further reports from this enthusiastic team.

Throughout all the events recorded, meteor pings were noticed on the Au signals such that a 53A signal would momentarily become 59A. The "A" report in both cases indicates that the ms reflection came via the auroral curtain rather than direct.

Further auroral reports were sent in by Andy Steven, GM4IPK (Edinburgh). He has 4× 16-element Tonnas which no doubt help him to find the weaker ones. His reports can be summarized as follows:

14 October. Aurora bearing 030°. Worked GM3JIJ (WS) and although his signal was S9, when both stations changed beam headings to about 320° and added a little elevation to the antennas, the signals went up 20-30dB. Charlie Newton has long advocated some antenna elevation when working auroras. GM4BYF heard the test and called in to confirm the NW reflecting area, and Andy asks if this could be a possible way of working between Scotland and VE/VO via 144MHz aurora. During this same event OY9JD was heard as the "ever-present auroral beacon", right into the small hours around 0430gmt on 15 October.
17/18 October. A good aurora with signals from OH, UR2 and UQ2. GM4IPK worked OH2TI (MU), OH1AJ (LU), UR2NW (LT) and UQ2GMD (LR) in an event starting around 1545gmt on 17 October and continuing into the night, a second phase coming at about 0030gmt on 18 October.
3 November. Weak aurora heading 025-030° with signals from GI and LA.
7 November. Aurora starting at 1600gmt, mainly GM/LA/SM but OH2MQ (MU) worked on heading 022° (OH2MQ beaming 285°). Second phase at 0020 8 October with very little activity except OY9JD.
9 November. Weak event.
10/11 November. Aurora commencing 1715gmt. LA8ON, GM3JIJ worked and beacons GB3LER and SK4MPI audible, second phase starting at 0045gmt.

These reports indicate how frequent auroral activity can be in the northern latitudes, and the lack of activity from stations further south is apparent. It is worth keeping watch even in these times of "auroral drought" since the odd signal may well break through. More on auroras next month.

Sporadic-E

News of sporadic-E propagation is not normally to be expected at this time of the year, but 1983 behaved differently in some respects and there was some later-than-usual Es activity.

First, GM4IHJ (Fife) has maintained his overall watch on propagation generally, and found October to be a very interesting month. He says that the month is normally a "dead" one for Es, but in 1983 he recorded 12 days when Es propagation existed above 50MHz, two of them going as high as 75-85MHz. He was not able to monitor after tv hours, so he wonders whether any of the 6m operators obtained any benefit from these events. November started off much the same way, with Es above 50MHz on 1, 3 and 8 November. As he wrote on 11 November, he was watching Polish tv on 49 and 57MHz. To round off an interesting period, auroral Es was noticed on 18 October for 2h, and on 3 November. John is looking for causes of these unusual events, and wonders whether the long comet dust-trail (Tempel 11), detected by the Infra Red Astronomical Satellite (IRAS) could be having some influence on propagation. Incidentally, this satellite also detected a small planetoid in an orbit which took it very close to the sun and then back to cross the earth's orbit. It was due to enter the earth's orbit on 14 December when it was expected to fragment and produce "shooting stars" (tv newscast) but as this is the time of the Geminids it may be difficult to identify any particular contribution made by this body.

To return to Es however, it was reported secondhand that a YU was worked on 144MHz by this mode from the UK around the beginning of November, and a more definite report has come in from Dave Dimambro, G4KTP (Co Durham). On 28 October, one of the days when GM4IHJ reported Es up to 50MHz, Dave heard I8TUS (IZ) calling CQ on 144MHz, but could not raise him. This was around lunchtime, and for about an hour dx stations kept "popping up". These were mainly Italian stations talking to one another, apparently unaware that their signals were reaching the UK. There was little or no activity from other British stations at the time. Later Dave went to the 14,340kHz vhf net and worked YU1AWW who told him that during the morning YU7NTU had been QRV from 1300gmt and worked several stations via 2m Es. YU1AWW had a contact on cw with G3DAO (XK) and with F6HLD (CG), the latter QSO being by FAI ("transalpine mode"). He also reported good tropo conditions in the Mediterranean area at the time.

This just goes to show that if you have the time to monitor the bands you can often be rewarded by an unusual event. Conversely it could be said that with the high level of vhf activity in Europe very little is missed these days. It all makes for good statistical information, so next year add these October dates to the Es list of "possibles" and do not assume that come September it is all over until the following year.

Beacons

At the end of October, Alan Taylor, G3DME, who is beacon-keeper for the Crowborough (Sussex) complex, reported that the military authorities who owned the building which housed the beacons required it for their own use, so the beacon service was discontinued pending the establishment of a new site. The beacons affected were GB3SX (28,215kHz) GB3WHA (70·040MHz) and GB3WHA (432·810MHz). Alan has since set up the 10m beacon at his own home in Crowborough, as the licence terms permit him do so, but with the vhf/uhf beacons it may be some time before they are back in regular service. Changing the location of a beacon site results in similar administrative problems to those encountered with repeaters, so the situation may take some time to resolve.

On the general topic of beacons, the VHF Committee of the RSGB feels that it should play a role in co-ordinating beacon interests whenever possible. Last month *4-2-70* reported some proposals for beacon systems incorporating propagation warning information. The VHF Committee makes the point that there may be one group of individuals who have ideas on the need for, and form of, a particular beacon, another which has the capability of designing and building it, and yet another which would be prepared to find a site, install and maintain it. In short, potential beacon projects should be a co-ordinated effort, and as the participants may be in areas remote from one another, the VHF Committee would like to hear from all those who have ideas for new beacons so that any viable plans can be progressed through a central point. Readers with such interests can write either to *4-2-70* or to Malcolm Appleby, G3ZNU, chairman of the VHF Committee, QTHR, or via RSGB HQ.

One of the dificulties of designing a good beacon system is that it would often benefit the designers more if it were to be located in another country rather than on one's own doorstep. For this reason any attempt to co-ordinate activities is surely to be encouraged as, through IARU, similar procedures might eventually be adopted throughout our region if the UK led the way. IARU is of course involved in beacon frequencies as part of band planning, but apart from this there is often a lack of information on

the status of beacons around the world. If a particular beacon is not heard over a lengthy period, there is no knowing whether it has closed down or is simply not being heard due to conditions. The RSGB is therefore embarking on a programme of interrogating all countries with beacons to obtain current information on their status. A new list can then be compiled, and the system will be such that a regular input of information will be sought to ensure that the list is kept up-to-date.

The 432MHz beacon GB3SUT will have to close down for a time soon, as a new mast has been erected at the BBC site at Sutton Coldfield. As at Wrotham, a new mast is being built alongside the existing one, and when complete, the old mast which currently supports the beacon antenna will be taken down. At this point some decisions may be taken on the role of GB3SUT. Is it needed, in view of GB3MLY which is not too distant? Would it be better sited elsewhere, such as in GI or GW or in the Merseyside area? Readers' views on this and their use of GB3SUT in its present location and with current beam-headings would be welcomed by the VHF Committee.

Expedition news

A pleasant flashback to summer weather came from a report of the Derbyshire Hills Contest Group's expedition to XM square between 8 and 20 August when they operated both 144 and 432MHz. About 950 stations were worked on 2m using the call GW6APZ/P, 26 of them by the ms mode, including some nice ones in EA6FB (AY), HG8CE (KG), SM1BSA (JR) and, the best dx, YU1EV (KE). Best tropo dx was SM7AED, while another good one was F1KBF/P (ZC).

On 432MHz the group had a nasty accident when the mast came down while being erected, but fortunately a chair broke its fall. On this band about 150 stations were worked using callsign GW8ROU/P, the best day being 18 August when several Dutch stations were worked. Operators were G8PNM, G8ROU, G6ABU and G6DNT. David, G8ROU, still needs to work XM square from his home location, so future expeditions please reserve a sked for him!

Repeater news

Brett Laniosh, G4NZK, has sent details of the Longbridge repeater, GB3AM on R6, situated in southwest Birmingham. (G8VR drives an Austin Seven car built at Longbridge in 1929, so the location evokes nostalgic memories for him!) Since being switched on in March 1983, GB3AM had suffered from a somewhat poor antenna system which resulted in some areas being badly served. However, after 31 October things improved greatly following the installation of a new colinear antenna. The repeater is located in the Austin-Rover factory and is intended to cover only the area around southwest Birmingham. Consequently power is kept low, about 5W into the single antenna. Brett says that the repeater is interesting in that it offers a wide range of modes, one of the most interesting being the ability to decrease receiver sensitivity when jammed on the input, eg under "lift" conditions. He hopes the new antenna with its improved coverage will encourage more operators to use this "friendly little repeater". Reports to G4NZK, QTHR, would be appreciated, as would donations to the Longbridge Repeater Group for which G4NZK is treasurer and publicity officer.

During the major tropo event on 23 October, Roger Lapthorn, G3XBM, operated from YK square in south Devon using a TR2300 with its built-in λ/4 whip antenna. He accessed several French and Belgian repeaters, and for three days during that event repeaters could be accessed in ON, F and D using a handheld 1W rig, the signals often being of "incredible" strength. Roger also copied perfect colour teletext from a Belgian tv station using a set-top loop antenna indoors.

A recent meeting of the Repeater Management Group resulted in the publication of an interesting summary of the repeater situation as at 20 August 1983. On 145MHz, 56 repeaters were operational, four temporarily off the air, three licensed but not operational, five awaiting authorization by DTI, and nine proposals pending.

The Derbyshire Hills Contest Group expedition to XM square. L to r: G6ABU, G8PNM, G8ROU and G6DNT

The position on 433MHz was reported as 92 repeaters operational, six temporarily off the air, two with franchises being re-allocated, eight licensed but not operational, 19 with proposals before DTI, and four proposals pending. In addition the experimental pilot ssb repeater was listed as licensed but not yet operational. The group was anxious to obtain coverage maps from several repeater groups, some outstanding ones at the date of the meeting being for GB3s AB, AV, CB, CI, ER, FE, LH, ML, PF, ST and TS.

Mike Dennison, G3XDV, chairman of the Repeater Management Group, makes an appeal for 70cm repeater groups to keep their equipment within specification to avoid interference with the MoD Mould system which is a primary user of the band.

Roy Philpott, G3VCH/MM, has sent some information on repeater dx from south of the equator. On 30 September after leaving Durban by sea for China, he made contact with several amateurs in Durban via the Durban 1 repeater (145·650MHz – 600kHz) and was able to maintain contact for three days, the final contact taking place over a range of 903 miles. In fact he was able to bring up the repeater from a distance of 975 miles, but at that time nobody was around to make a QSO. For these contacts he was standing on the bridge wing of the ship holding a TR2500 with its λ/4 whip antenna. He wonders if this represents some sort of dx record. The weather map at the time displayed a large high-pressure cell covering the entire area. Sea paths are frequently very good for dx, of course, and we are fortunate in *4-2-70* to have quite a few sea-going operators who can give us an insight into vhf conditions in other, and often remote, parts of the world.

From overseas

A few months ago, Peter Taylor, HH4PT, wrote from the Solomon Islands giving details of his fine vhf/uhf station, including 50MHz facilities. Few of us thought that from so far away he would be heard on the vhf bands here. However, he puts in a terrific signal at the top end of the 2m band via Oscar 10 when the orbit is suitable. Some of the exotic calls to be heard via this satellite are very exciting, such as two-way contacts between Japan and Australia at times when tropo conditions make it impossible to hear the UK beacons!

Roy Philpott, G3VCH, who travels a lot and sometimes operates /MM, says that excellent vhf conditions are often experienced around the Cape area of South Africa, the Persian Gulf and West Africa, and cites examples of contacts with ships on 160MHz fm over 1,000 mile paths using only 25W to a whip antenna. (See also under "Repeater news".)

Irving Spackman, ZL1MO, who is IARU Region 3 scientific and educational co-ordinator, writes to say that the NZ VHF Convention organized by the Auckland VHF Radio Group will be held on 20–23 April 1984 at the Auckland Teachers College Campus. It is a Silver Jubilee convention; they held their first 25 years ago, and will feature topics such as AMSAT, eme, tropo and meteor scatter in both lecture and seminar style. Any amateurs who will be in the area at the time and who might wish to contribute to the programme or simply attend the convention should write to the Programme Convenor, PO Box 10138, Balmoral, Auckland, NZ, as soon as possible.

Column name

A few months ago suggestions were sought for a new name for this feature, one which might take account of the fact that it currently tries to cover 50MHz operation. Hopefully there will be a much greater need to write about 50MHz sometime in the future if the band is ever opened to general amateur use in this country. However, in the meantime several suggestions have been received, some serious and some in fun, and the main ones are listed here:

VHF & Propagation News; 50MHz and Up; From 50MHz to 70cm; Six metres and Down; VHF Forum; The Upper Spectrum; 6-to-70; 50-to-500 (This one with a Yagi logo with the numbers between elements); *6-4-2-70* (Several suggested this); *VHF/UHF News; 1,000 and Down; Small Wavelengths.*

The main problem, one which is not encountered by contributors to most of the other radio magazines, is that *Radio Communication* uses specialist contributors for satellites and for microwaves, with microwaves being deemed to start at 1,296MHz as far as amateur allocations are concerned. Thus any title which includes "uhf" is liable to cause a certain amount of confusion if it does not embrace 1,296MHz. Any further comments or suggestions would still be appreciated, after which I will pass the matter over to the editorial board. The offer of a small prize still stands (see "Here & There" *4-2-70* May 1983).

VHF Convention 1984

The date of the 1984 VHF Convention has been set for 24 March, the venue being Sandown Park. The event will be much the same as in previous years, with one exception. The social evening will be discontinued due to a falling demand, despite a large increase in the day-only attendance. It is planned to keep the entrance fee much the same as it was in 1983. There will be three lecture streams meeting during the afternoon, with topics including GaAs fet amplifiers, eme, Oscar 10, Solar Cycle 21 review, 50MHz review, and microwave subjects. The VHF Contests Committee will stage a "forum" to respond to questions from the audience. The usual trade show will be organized by Norman Miller, G3MVV, and will appeal especially to those who like to "brew" their own equipment. Make a note in your diary—it promises to be a very good day out with much opportunity to meet fellow vhf-addicts.

VHF newsletter

The VHF Committee is considering the launch of a periodic vhf newsletter which would be mailed to subscribers by the RSGB. Such a newsletter would contain items of news of special interest to vhf operators, such as expedition dates, up-to-date dx news, and in fact news of any unusual or outstanding vhf event. Being in newsletter form, it could be produced rather more quickly than a full-scale magazine, and so would supplement rather than replace *4-2-70* and similar features in the radio press. Being a subscriber-only service, it would presumably have a smaller circulation than, for example, *Radio Communication*. Readers who are interested in such a service, including offers from those who might take an active role in editing or writing the text of the newsletter, should write to Malcolm Appleby, G3ZNU, QTHR, or to the VHF Committee, c/o RSGB headquarters.

RSGB QSL BUREAU

Sending cards through the bureau

Choose QSL cards which do not exceed normal postcard size, viz 5½ by 3½in. As packets going abroad are sent open-ended at Printed Paper Rate, large cards invariably have to be folded, while small ones and those of a thin nature are difficult to handle.

Print the addressee's callsign on both sides of the cards, together with details of his QSL manager if applicable.

Sort USA cards into call areas and *all others alphabetically by prefix*. Do not space the cards with paper markers etc.

Pack all cards the same way up, and ensure they are adequately packed with the correct postage prepaid. Post them to: Mr E. G. Allen, G3DRN, QSL Bureau Manager, 30 Bodnant Gardens, London SW20 0UD.

Collecting incoming cards from the bureau

Supply your sub-manager with stamped addressed envelopes of suitable size and strong material.

Print your callsign, RS or A number in the top left-hand corner of each envelope. Envelopes should be numbered, and "Last envelope" marked on one so that it is known when a fresh batch is needed.

Envelopes are not normally returned until full weight has been reached for the postage paid; those wishing to collect cards at more frequent intervals should mark their envelopes "Wait 6" etc.

Amendments to the list of sub-managers are published under "Amateur Radio News" in *Radio Communication* and broadcast on GB2RS.

Callsign series	Series sub-manager
G0 calls	K. Plumridge, G4BYY, 26 Woodlea Gardens, West End, Southampton SO3 3GA.
G1 calls	R. J. Nash, G4GEE, 135 Farren Road, Wyken, Coventry CV2 5EH.
G2 calls	C. H. Adams, RS10906, 4 Park Gate Gardens, East Sheen, London SW14 8BQ.
G3AA-ZZ G4AA-ZZ G5 calls	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G6AA-ZZ G8AA-ZZ	F. J. T. Harris, G4IEY, 4 Merestones Drive, The Park, Cheltenham, Glos GL50 2SS.
G3AA-DZZ	C. A. Bradbury, BRS1066, 13 Salisbury Avenue, Cheltenham, Glos GL51 5BT.
G3EAA-HZZ	S. L. Newport, G4DEV, 18 Chacewater Crescent, Barbourne, Worcester WR3 7AN.
G3IAA-KZZ	P. Lumb, G3IRM, 14 Linton Gardens, Bury St Edmunds, Suffolk IP33 2DZ.
G3LAA-NZZ	J. G. Holland, G3GHS, 26 Grand Avenue, Berrylands, Surbiton, Surrey KT5 9HU.
G3OAA-PZZ	J. H. Brazzill, G3WP, 43 Forest Drive, Chelmsford, Essex CM1 2TT.
G3RAA-TZZ	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G3UAA-VZZ	M. J. Newton, G3UKW, 11 Chestnut Grove, Rushmere St Andrew, Ipswich IP5 7ED.
G3WAA-XZZ	F. G. Rylands, G2VF, 39 Parkside Avenue, Millbrook, Southampton, Hants SO1 9AF.
G3YAA-ZZZ	I. Batley, G8TKU, 3 Folidon Avenue, Fulwell, Sunderland, Tyne & Wear SR6 9HP.
G4AAA-AZZ	C. Johnson, BRS31379, 118 Harvest Road, Smethwick, Warley, West Midlands B67 6NG.
G4BAA-BZZ	Miss L. Harper, G4FNC, 50 Ravenglass Road, Westlea, Swindon, Wilts SN5 7BW.
G4CAA-CZZ	P. Jobson, G3HLF, 52 Old Road West, Gravesend, Kent DA11 1LN.
G4DAA-DZZ	D. Buckley, G3VLX, 16 Wood Ride, Petts Wood, Orpington, Kent BR5 1PX.
G4EAA-EZZ	P. C. Barry, G8OPA, 32 Rutland Avenue, Sidcup, Kent DA15 9DZ.
G4FAA-FZZ	Mrs A. R. Burchmore, G8LXK, 49 School Lane, Horton Kirby, Dartford, Kent DA4 9DQ.
G4GAA-GZZ	J. C. Terry, G4GEU, 126 Dawberry Fields Road, Kings Heath, Birmingham B14 6NZ.
G4HAA-HZZ	Mrs J. Brakespear, G8RZO, The Chequers Stores, Eastchurch Road, Minster, Sheppey, Kent.
G4IAA-IZZ	C. J. Webb, G4JFF, 153 Apsley Road, Oldbury, Warley, West Midlands B68 0QT.
G4JAA-JZZ	K. Baker, G3WTV, 7 Long Buftlers, Harpenden, Herts.
G4KAA-KZZ	K. Draycott, G3UQT, 175 Oliver Road, Kirk Hallam, Ilkeston, Derbyshire DE7 4JW.
G4LAA-LZZ	C. Lennox, G4LXU, Kyme Cottage, Main Street, Newton Kyme, Tadcaster, N Yorks LS24 9LS.
G4MAA-MZZ	Mrs Gwen Thomas, G4JYL, 36 Chelwood Crescent, Leeds LS8 2AQ, West Yorks.
G4NAA-NZZ	John Brakespear, G8RZP, The Chequers Stores, Eastchurch Road, Minster, Sheppey, Kent.
G4OAA-OZZ	Mrs J. F. Rhodes, G8LRT, Wesley Mount, Spring Bank, New Mills, Stockport SK12 4BH.
G4PAA-PZZ	S. Smith, G4PPQ, 24 Blunham Road, Moggerhanger, Bedford MK44 3RA.
G4RAA-RZZ	Mr & Mrs J. Brakespear, G8RZO/G8RZP, The Chequers Stores, Eastchurch Road, Minster, Sheppey, Kent.
G4SAA-SZZ	A. Bell, G4MHQ, 22 Ryde Place, Lee-on-the-Solent, Hampshire.
G4TAA-TZZ	J. P. Porter, G3YZR, 94 Oaken Grove, Haxby, York.
G4UAA-UZZ	P. Godfrey, G8ULU, 38 The Halt, Whitstable, Kent CT5 3EQ.
G4VAA-VZZ	R. C. Powell, G4VAA, 11 North Park, Fakenham, Norfolk NR21 9RG.
G4WAA-WZZ	L. Gaunt, G4MLV, 31 Moat Hill, Birstall, Batley, W Yorks WF17 0DX.
G4XAA-XZZ	S. R. Tyler, G8YGP, 2 John Court, Hoddesdon, Herts EN11 9LZ.
G4YAA-YZZ	Mrs I. Rabbitts, RS42676, 1 Simmons Way, London N20 0TH.
G4ZAA-ZZZ	J. Densem, G4KJV, Cotswold, Startley, Chippenham, Wilts SN15 5HG.
G6AAA-ZZZ	Mr and Mrs D. R. Brooks, G4IAQ/G4IAR, 28 Avon Vale Road, Loughborough, Leics LE11 2AA.
G8AAA-CZZ	F. J. T. Harris, G4IEY, 4 Merestones Drive, The Park, Cheltenham GL50 2SS.
G8DAA-OZZ	T. Batley, G8TKU, 3 Folldon Avenue, Fulwell, Sunderland, Tyne & Wear SR6 9HP.
G8PAA-RZZ	Mrs C. Pope, G4CMM, 136 Ridgeway Drive, Bromley, Kent BR1 5DD.
G8SAA-SZZ	K. Baker, G3WTV, 33 Ashdown Drive, Borehamwood, Herts WD6 4NA.
G8TAA-TZZ	K. Draycott, G3UQT, 175 Oliver Road, Kirk Hallam, Ilkeston, Derbyshire DE7 4JW.
G8UAA-ZZZ	C. Lennox, G4LXU, Kyme Cottage, Main Street, Newton Kyme, Tadcaster, N Yorks LS24 9LS.
GB calls	Mr G. Newman, RS39157, "Little Gables", Flordon Road, Newton Flotman, Norwich, Norfolk NR15 1QX.
GD calls	W. P. Waid, GD3GQX, 1 Mount William, Summer Hill, Douglas, Isle of Man.
GI calls	R. P. Parsons, GI3HXV, 45 Erinvale Avenue, Belfast BT10 0FP.
GJ calls	H. J. Chater, GJ2LU, 106 Rouge Baulion, St Helier, Jersey, CI.
GM 2-letter calls GM4AAA-ZZZ GM5AAA-ZZZ GM6AAA-ZZZ GM8AAA-ZZZ	D. R. Macadie, GM6MD, 11 Marchmont Road, Ayr KA7 2SB.
GM3AAA-ZZZ	J. Johnston, GM3LYY, "The Dolphins", Montgomerie Drive, Fairlie, Ayrshire.
GU calls	M. Allisette, GU4EON, Springbank, Lez Ozouets Road, St Peter Port, Guernsey, CI.
GW2, 3, 4, 5	J. Reid, GW3ANU, 28 Waterson Road, Gabalfa, Cardiff CF4 2SS.
GW6 and 8	J. Lewis, GW8UZL, 14 Gareg y Gad, Llanfair PG, Anglesey LL61 5QF.
BRS and A	D. Borne, G4CYW, "Roughways", Chubb Tor, Yelverton, Devon PL20 6HY.

Microwaves

*by Charles Suckling, G3WDG**

2C39 cathode bias circuits

Active bias circuits in 2C39 power amplifiers have an advantage over simple resistive circuits in that the bias voltage is independent of the input drive level, thus improving linearity. A suitable circuit was described by G4PMK and G3SEK in their article "More gain from 1·3GHz power amplifiers" (*Rad Com* June 1983, p503). for operation at lower anode voltages (as specified in the article) this circuit works extremely well. If operation with higher anode voltages is envisaged, it is safer to include an extra resistor in the circuit, between the bottom end of the 1kΩ potentiometer and the ptt line. This prevents heavy, possibly damaging, currents flowing through the valve if the bias potentiometer is set inadvertently at the bottom of its travel during adjustment. The value of the added resistor determines the maximum standing current that can be set by the bias potentiometer. A value of 8·2kΩ was found suitable: maximum standing current is then limited to about 80mA. Many thanks to Howard Ling, G4CCH, for suggesting this modification.

Microwave eme news

The interest in eme operation above 1GHz is growing rapidly, with many new stations coming on 1·3GHz, and a series of regular tests on 2·3GHz planned for 1984. Stations who have recently become active on 1·3GHz include HB9SV, K5JL, F6EZA, OE5JFL, VK2AMW (welcome back after many years absence), YU2RGC and WA8NLC. One station who will be missed on 1·3GHz is Z25JJ, who was the only station in the African continent on 1·3GHz eme. He has emigrated to South Africa and hopes to transport all his equipment to his new QTH, including his 32ft dish. With any luck he should be back on during 1984. In the meantime, ZS6NG is working hard to get on, to keep Africa on the air on 1·3GHz eme.

The ARRL International EME Contest generated high levels of activity on 1·3GHz in October. As a measure of the activity, the OE9XXI group reports making 14 contacts using its new 25ft dish during one day's operation.

Things are looking brighter too on 2·3GHz, which for many years has seen only sporadic activity. The good news is that the DF0EME group is planning to be active on 2·3GHz eme every month during the regular skeds weekend for the 2h before their local moonset. This should provide the necessary catalyst to get activity going. It should be possible to receive them using only a 5 or 6ft dish, as they are using a large dish and very high power. If anyone is interested in listening to these tests please contact me for further details. News of these and other tests can be heard on the eme activity frequency on Oscar 10 (145·95MHz downlink, and on mode L).

Observations on the Microwave Committee local oscillator board

Since the publication of the high-quality uhf source for microwave applications (*Rad Com* October 1981) many people have built this board with excellent results. When used to produce the commonly-used frequencies of 384 or 378·667MHz, there is usually no problem in achieving the specified 100mW output power. At other frequencies, however, problems have arisen with low output power. For example, one of my boards which would produce over 250mW at 384MHz gave only a few milliwatts when used with a different crystal for operation at 360MHz. Various things were tried to improve the performance. After replacing a suspect bypass capacitor (C6) the power level was back to normal, but decayed to a very low level as the capacitor cooled down after being soldered in place. The power output could be recovered either by heating the capacitor using a soldering iron, or by cooling it with freezer spray!

It appears that the value of this bypass capacitor is critical due to a stray resonance effect on the board. As the resonant frequency is moved away from the operating frequency (by altering the capacitance of C6 by changing its temperature) the problem goes away. Bypass capacitors C1 and C3 also exhibit similar effects. The problem was cured simply by snipping off part of C6 with a pair of sidecutters! A similar problem with another board was cured by adding extra trapezoidal leadless disc bypass capacitors on either side of C6, mounted on the copper track side of the board. I would be interested to know whether anyone else has had similar problems with this board, and if any other cures have been found.

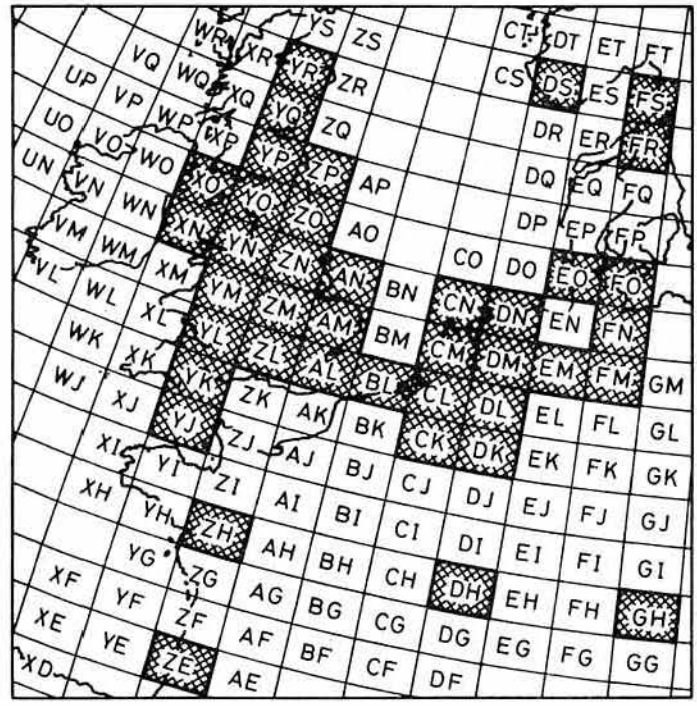
John Wilkinson, G4HGT, has sent in some comments regarding construction of this board. As described, the pcb has an etched area on the groundplane side under the 2N4427, which is unnecessary—without this, the groundplane can be left unetched making the board much easier to process. He has found that the milling method described for making the slots for the leadless disc capacitors can be improved by mounting the board on a piece of wood clamped to the table of a vertical drill stand. The drill bit is then fed through one of the holes previously drilled in the board, continuing into the wood underneath to a depth of about 10mm. This holds the drill bit firmly in position, preventing it from bending during the "milling" operation.

Recent awards

The following awards were recently issued:

1·3GHz Counties & Countries Award: G6ADE, G4ROB, G4PEC.
1·3GHz Distance Award: G6ADE, GW3CBY, G4FRE, G8PPR.
1·3GHz/5 Squares: GM8MBP, G6DER, G8ULU, GW3CBY.
1·3GHz/10 Squares: G8ULU, G8PPR.
1·3GHz/15 Squares: G6ADE, G4PEC.
1·3GHz/40 Squares: G8PNN, G4KCT.
1·3GHz/50 Squares: G4LRT.

G4KCT has supplied a map of the squares worked for his 40 squares award, which is shown below.



The squares (shaded) worked by G4KCT for his 40 Squares Award

In reply to a number of enquiries the vhf/uhf awards manager reports that 1·3GHz stickers are available up to 70 squares worked. □

*46 Windsor Close, Towcester, Northants.

EPHEMERIS
Satellite news and views
*by R. O. Phillips, G4IQQ**

THE YEAR of 1983 was, on balance, a very good one for the amateur satellite community. On the plus side, control of the UOSAT satellite was regained and the long awaited launch of the Phase 3B satellite took place. Regrettably, Oscar 8 carried no more traffic after the middle of the year and the two Russian satellites RS5 and RS7 also became unavailable.

The prospects for 1984 and beyond look to be very good indeed: UOSAT-B should be in orbit in a few months time, and AMSAT will have another opportunity to achieve the highly inclined elliptical orbit when the Phase 3C satellite is launched. Coupled with the space shuttle "Get-away-specials" and the surprises of the USSR amateur space programme there should be plenty of scope to satisfy all tastes for some time to come.

Satellite proposals
UOSAT-B

A great deal of effort has been put into the construction of the satellite as well as co-ordination with the launch agency, NASA. Launch will take place some time after the beginning of March 1984, together with Landsat-4 on a Delta 2920 vehicle. The solar array panels, which should produce a peak output of around 30W, are due to be delivered to the University of Surrey during January, by which time the nicad batteries to be flown will have been selected from a batch of 50. The body of the spacecraft will measure approximately 14 by 14 by 25in and the total mass will be of the order of 60kg. A 60-channel telemetry system is proposed with the capability to dwell on a particular channel if required. A built-in calendar/clock will also be provided.

Transmission rate for the telemetry data will be selectable by ground command as 300, 600, 1,200 or 2,400bps. Control of the spacecraft can be maintained by means of telecommand, or automatically under the on-board 1802 microprocessor. No information is yet available on the frequencies to be used though it seems likely that 145MHz will continue to carry many of the experiments as on the first flight spacecraft.

Satellite status reports
UOSAT

Experiments continue with transmission of images from the ccd camera as well as the recording of specific sets of data for an entire orbit. The schedule for spacecraft operations remains the same as that indicated in the November 1983 issue of *Radio Communication*.

RS

Followers of the mode A (144-28MHz) transponders continue to enjoy the excellent performance of RS6 and RS8. In fact, while the dx capability of these two satellites is not as good as that of Oscar 10, contacts to Europe and North America are probably easier at present by RS due to the lower levels of activity on these satellites.

Oscar 10

The attempts to overcome the problem of the antenna switching relay of the mode L transponder seem to have been largely successful, with much improved downlink signals at 436MHz. Activity on this transponder, which is operational on Wednesdays and Saturdays, is still fairly low —but this is hardly surprising as the uplink frequency of 1,269MHz is not one that is normally used for terrestrial amateur communications. In general the health of the satellite appears to be very good, though a number of telemetry watchers have noted that the battery voltage under loaded conditions is somewhat lower than during the first months of the life of the satellite. It should be possible to maintain the desired battery voltage by appropriate selection of the on/off ratio of the transponders. A report from DJ4ZC of AMSAT-DL indicated that the situation was under control and no serious problems were anticipated.

A slip of the pen went unnoticed in the November issue when I stated that the rotation of the orbital plane of the satellite would result in the apogee, ie the highest point of the orbit, occurring over the equator in May 1984. In fact this event is due to take place in May 1985. A more complete picture of the situation is indicated in Fig 1, which shows the approximate latitude of the apogee until early 1986.

Pat Gowen, G3IOR, sent in a detailed report of the present state of play with Oscar 10 as seen from his QTH in Norwich (when not operating/W3). Pat estimates that around 82 DXCC countries are presently active on the mode B transponder, of which he has worked 62. Best dx so far is VK7ZIF at a distance of 10,987 miles, which may well be the current record—any offers? He suggests that, while ZL is out of range from the UK with the present orbital parameters, this condition should change as the latitude of the apogee moves down towards the equator as discussed above. Stuart Jones, GW3XYW, from Swansea, finds operating through Oscar 10 something of a luxury after previous experiences on Oscars 6 and 7. In particular he notes that contacts need not be rushed and there is little QRM. Stuart's list of contacts includes many from Europe and North America as well as Brazil, Japan and Easter Island. A brief period of activity on the mode L transponder produced DL, DJ, OE, and ZS6.

Other news

The news bulletin transmissions via Oscar 10 continue to attract considerable attention and most of the initial bugs have been sorted out. Each bulletin, which lasts for about 30min, is transmitted either once or twice each Sunday depending on the particular orbital conditions. Reception reports and/or comments on the subject matter would be welcome and should be sent either to AMSAT-UK or RSGB headquarters. An interesting feature during a recent transmission was the rapid decline of other traffic through the satellite at the time. This was probably due to these stations monitoring the bulletin.

The latest threat to the satellite segment of the 29MHz band is the growing availability of fm transceivers covering the frequency range 29·3 to 29·7MHz. These modified cb rigs are quite cheap in comparison with normal amateur radio prices and are therefore likely to be sold in substantial numbers. Amateurs operating such equipment would probably be totally unaware of the interference they might be causing to the reception of satellite signals in much the same way as they are when operating above 145.8MHz. The IARU/RSGB recommendation for this part of the spectrum is that the segment 29·3 to 29·55MHz be reserved for satellite communications. Perhaps a few polite reminders to this effect will be required in the near future. □

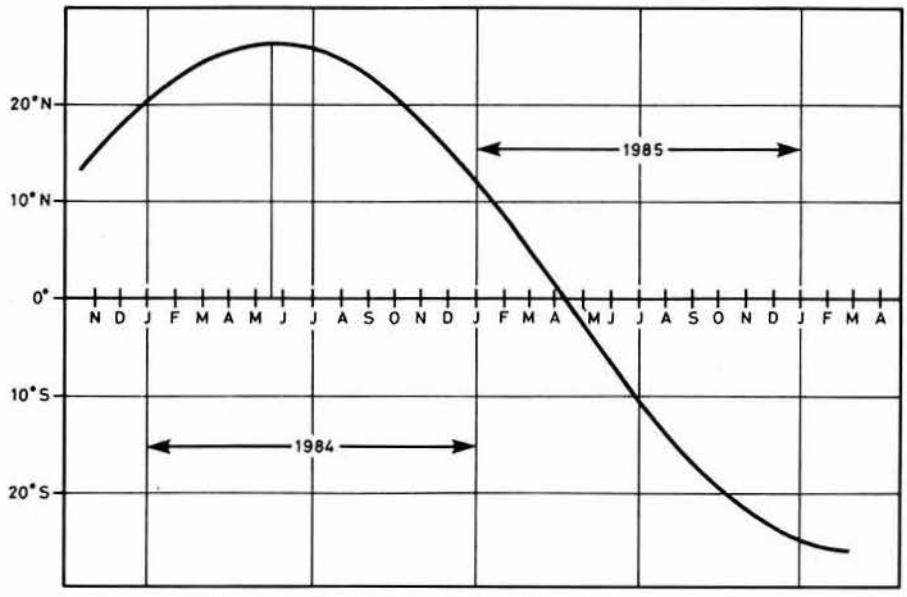


Fig 1. Approximate latitude of Oscar 10 at apogee

*170 Shirehall Road, Hawley, Dartford, Kent DA2 7SN.

The Month on The Air

*by John Allaway, G3FKM**

READERS WILL BE RELIEVED to hear that the proposal which was made by an American amateur to the FCC which would have extended the USA 28MHz repeater band into the satellite downlink band has been rejected. One of the dangers associated with some of the converted citizens band equipment currently reaching the amateur radio market is that this also operates in the satellite downlink band, and those using it are asked to please avoid 29,300 to 29,550kHz.

The writer would also like to point out that the highest frequency listed in the item on illegal cb transmissions within the 28MHz amateur band in November *MOTA*—28,305kHz—is within the beacon band and should be avoided by all.

G4OEC says that his callsign is being pirated on the hf bands by someone using ssb. He rarely uses this mode and has never had a contact outside the UK on the hf bands.

Overseas news

In a letter to G4OAA, 9L8VJ says that special class licences for vhf/uhf and repeater operation have recently been issued in Sierra Leone using the 9L8 prefix. Licensing for visitors has been simplified and they now use their own callsigns with the /9L1 suffix. Early application is advised (SLARS is at PO Box 10, Freetown, Sierra Leone). The Cheshunt & DARC is working with SLARS to activate a 28MHz beacon, and it is hoped to have this on the air by April. It will be located at Freetown, have the callsign 9L1FTN, and transmit on 28,272·5kHz. It will have 10W output to a vertical antenna on a 30ft mast at a location 400ft asl. The rf circuitry is based on a transceiver project described in *Radio Communication* April 1983. Keying will send "de 9L1FTN" followed by a long dash—except when it is running on standby power, when it will send eight dits before the callsign. Note that the frequency was previously used by TU2ABJ, which is now defunct. Some financial aid would be welcomed and donations may be sent via G4OAA (QTHR).

Bob Frost, VS6BQ, President of HKARTS, has notified that the 10MHz band has now been released to the amateur service in Hong Kong.

Ken Ruiz, ZB2MD/G4SGF, reports that his ZB2 callsign is apparently being used by a pirate. He has received a QSL from F6HAZ for an sstv QSO but says that he is not aware of any sstv activity in Gibraltar. Ken is presently in the UK and will not return to ZB2 until mid-1984. All three new hf bands—10, 18, and 24MHz, are available on the Rock, and ZB2GR is known to be very active on 10MHz.

Malcolm Prestwood, G3PDH (and also ex-A9XBC) has written to let his UK friends know that he has been in Singapore since last July and is now operational as 9V1VZ—mostly on cw. His address appears in "QTH Corner".

Expeditions

DL1VU was due to set forth for a Pacific tour around the middle of November, commencing in the Philippines and going on to Guam, Saipan, Nauru, and W. Kiribati, where he hoped to be on the air as T30CT. If the original schedule was followed Karl will still be at T30CT when this month's column appears, and should then appear as T2UVA from Tuvalu for a few weeks. Following this he will be at 5W1DC and then KH8/DL1VU before finishing from ZM7VU. Actual timings for the last few countries are not known at the time of writing but QSL managers for all the phases of the trip are as follows: KH2/DL1VU (DB9CI), KH0/DL1VU (DL1VU), KC6/DL1VU (DB5UJ), C21NI (DL3CM), T30CT (DL7NS), T2VUA (DG3MCA), 5W1DC (DF7CC), KH8/DL1VU (DK5EX) and ZM7VU (F6DYG). Operation will be mostly cw and frequencies given are 3,500-3,510, 7,000-7,010, 10,100-10,110kHz, 14,027, 18,073, 21,027, 24,900 and 28,027kHz. He will usually listen 1 to 5kHz higher in frequency.

According to the *DX Bulletin* WP4ATF and HI3RST/W4 propose to visit Desecheo Is during the first week in January. The report says that they hope to make 3,000 QSOs on ssb "and occasional cw operation".

DX News Sheet reports that K2FJ will visit E.Kiribati (T32) for a three week stay from 20 February.

Iris and Lloyd Colvin made 6,000 QSOs from W6QL/HK3 with amateurs in 133 countries. From there they went to San Andres Is to operate as W6KG/HK0. All QSLs go to the address given in "QTH Corner".

Steve, G4JVG/SM0, says that all QSLs sent to him direct for his expedition activity from Market Reef between 25 July and 1 August last year have been answered, and those sent via the bureaux were due to be dealt with in December when the Swedish bureau re-opened. Those who sent direct without return postage will also be answered this way. One QSL from a G got Steve's callsign completely wrong, had the wrong date, and was sent to the wrong place. To complete his sins he sent it direct but with no envelope or return postage!

VK9NS is planning a visit to the Kermadec Is, and at the time of writing five scientists and four amateurs were working out details. The first few weeks of 1984 have been mentioned as a target date.

DX news

G4JEF says that LA0DT/MM is operational every other month from a survey vessel in the North Sea. He uses the following frequencies: 3,789, 7,050, 14,303 and 21,303kHz (ssb), and 29,600kHz (fm). Operation was due in the period 14 December to 14 January, and operating periods from 1230 or 0030. QSLs go to G4JEF.

The Heard Is DX Club is still seeking donations (PO Box 90, Norfolk Is, Australia 2899) and full dx membership costs A$25 per annum. The Heard Is expedition cost more than A$100,000, and donations from individuals and small clubs came to only A$13,000.

ZD9BV is reputed to be a regular visitor to a net which meets on 21,335kHz from 1800 on Saturdays and Sundays. Jill, ZD9CA, joins the same net on weekdays around 1930, and is often to be found on 21,294kHz from 1700. "Bull", N4NX, is 9U5JB and should have an array of antennas by now. He has been reported on 28MHz ssb between 28,500 and 28,600kHz. From the Central African Republic TL8ER keeps schedules on Sundays at 0900 on 21,215kHz (with his brother F6GRY), and on other days appears on 14, 21, or 28MHz at the same time. TL8GE is also active on 14MHz, and TL8DC on the lf bands accompanied by TL8CK (who also operates on 21,290kHz after 2100).

Information from TU2NW (received via G4TUG) is that he often uses 14,195kHz—not 14,155kHz as suggested in November *MOTA*. In addition he also uses 7,040kHz ssb and is not always on the air on Fridays but is active nearly every Saturday when he meets QSL manager AK3F on 14,195kHz at 2100. Activity on top band is planned, and he will transmit on 1,825kHz and listen on other frequencies as announced.

IS0LYN, QSL manager for 3V8AA, reports that the latter has now moved to a QTH near Gabes (about 200km SE of Tunis). As there is a large stock of QSLs, this change will not be noted on them yet. Mashil has a TS130S and two-element beam antenna for 14, 21 and 28MHz, plus dipoles for 3·5 and 7MHz, and now depends on generator power.

DX stamps service

G3TXF now has mint stamps of useful denominations from the following countries—CT, DL, EA, F, HB, I, JA, OE, OH, OZ, PA0, SM, TA, VE, W, YB, ZS, 5T5 and 7X. Order forms and price details are available from 01-942 7853 or G3TXF (QTHR).

1983 28MHz Countries Table

G3VOF —185	G3XBY — 101	G4SDZ — 48
G3XQU —185 (ssb)	G4GGY — 92 (ssb)	G3KSH — 44
G3KHZ —183	G3TXF — 91 (cw)	G4RPX — 43
G3GIQ —151	G4GOF — 78 (ssb)	G3PXT — 40
G3JFH —135	G3XTJ — 66 (cw)	G3JFF — 36
G3KDB —122 (cw)	G4EHQ — 60	GM4RFE — 35
G3SXW —104 (cw)	G4PEL — 56	G3XBM — 35
G4OBK —104	G6HM — 53	G3PSM — 26 (cw)
G4MUW —101 (ssb)	G4PKP — 49	G4FVK — 24

RAFARS

A message from G3KSH asks that RAFARS members should please note that the "Overseas Net" operating on 14,280kHz is looking for VK and ZL members at 0745 on Tuesdays, and for W/VE members at 1945, also on Tuesdays. G3KSH is acting as net controller.

* 10 Knightlow Road, Birmingham B17 8QB.

Some of those that attended the recent Clipperton DX convention. L to r: F6FDK, who operated /CE0Z last year; HB9AMO; F6EYS; and ON7EJ and ON7WW, a husband and wife dxing team. *Photos* by G3ZAY

QRP activity

A reminder of the special activity weekends arranged during 1984 by the G- and other QRP clubs. These will be the Spring QRP CW weekend on 17-18 March; the Late Summer weekend; and the 1984 QRP Winter Sports (CW) which will take place daily from 26 December to 1 January 1985. Times and frequencies are the same for all three events and are as follows: 0900-1000, 14,060kHz; 1000-1100, 21,060/28,060kHz; 1100-1200, 7,030kHz; 1200-1300, 3,560kHz; 1300-1400, 10,106kHz; 1400-1500, 3,560kHz; 1500-1730, 21,060/28,060kHz; 1730-2000, 14,060kHz; 2000-2100, 7,030/10,106kHz; 2100-2200, 3,560kHz; and 2200-2300, 14,060kHz. Details of the Late Spring QRP SSB weekend will be given later (it is on 5-6 May). The G-QRP Club itself has a weekly activity net on Sundays from 1100 to 1230 and from 1400 to 1530 on the international QRP frequencies (listed above), and on Wednesdays on 3,560kHz from 2000 (local time). Full details of membership are available from Fred Garratt, G4HOM, 47 Tilshead Close, Birmingham B14 5LT.

Welcome

To the following who joined the Society during October: DJ6FO, EI7CX, EI9ED, K4IHP, KR6P, ON6OH, SM5EO, SM7IHK, VK4RK, VU2NBC, W4TFT, YB0BZZ, Z22AL, Z22AY, ZB2CF, 5Z4ZO and 8P6BX. Unlicensed new members include C. Shirzud and R. Mokhlesi (EP), M. Chandraratne (VS5), M. Kuso (OE), T. Murphy (EI), N. Hatjigavritl (SV), J. Gelston (EA6), H. Wen-Hua (BV) and A. Scott-MacIntyre (ZB2).

New Zealand Scout Jamboree

The 10th New Zealand Scout Jamboree will be held at Feilding (about 90 miles North of Wellington) from 2 to 10 January. About 10,000 Scouts and leaders—including many from Australia, the Pacific countries and elsewhere will be camping together under canvas. A wide range of radio, electronics and computer activities is planned. Not only will there be the traditional amateur radio station with, it is hoped rtty, sstv and Oscar capability, but also a receiving station for listeners, a kit-set construction project, direction finding and a computer system. ZL2JAM will be heard on or near the usual international Scout frequencies—3,740, 7,090, 14,290, 21,360 and 28,990kHz.

Contests

1984 CQ WW 160M DX Contest

2200 27 January to 1600 29 January (CW)

Single- and multi-operator (maximum of five operators). Exchange RST and country, USA state, or Canadian province. Contacts with own country count two points, with other countries on same continent five, and on others 10. The multiplier is the total of USA states, DXCC countries, and VE provinces worked. For each duplicate, false, or unverifiable contact three additional contacts will be removed from the log, and a second multiplier removed if the contact was a multiplier. Sample log and summary sheets are available from "CQ" but home-made sheets may be used using 40 QSOs per sheet and with columns giving date, times, callsigns, numbers sent and received, QSO points claimed and new multipliers. Indicate "CW" on envelope and post logs before 28 February to Don McCleon, N4IN, 3075 Florida Av, Melbourne, Fla, 32901, USA.

In the **1983** event **(cw section)** UK scores were as follows: **G3SZA** (174,087 points), **GW3NYY** (170,742), G4BUE (48,944), G4OBK (37,354), G3XWZ/A (36,864), **GM3OXC** (9,614), and G4ARI (3,604). In the **multi-operator section** scores were: **GW3YDX** (239,128), **G3RPB** (180,504), **GM3IGW** (162,305), GM4GRC (117,924) and G3FVA (6,886). Congratulations to **G3SZA** who won the European plaque. Particular credit is due to the late G3XTJ who, with G3YDX, operated as **GW3YDX** and came world first in the multi-operator section. This very notable success earned GW3YDX the W0AW Memorial Trophy.

The HA DX Contest

2200 21 January to 2200 22 January.

CW only—restricted to 3,500-3,590, 7,000-7,035, 14,000-14,090, 21,000-21,090 and 28,000-28,090kHz. Single-operator single- and multi-band, and multi-operator multi-band categories. Exchange RST and serial number (from 001). HA stations will send two letters to indicate their county. these are: BA, BE, BN, BO, BP, CS, FE, GA, HA, HE, HO, NO, PE, SA, SO, SZ, TO, VA, VE and ZA. Each QSO with HA counts five points and with other countries outside one's own continent three. QSOs with own continent do not count. The multiplier is the sum of HA counties worked on each band (maximum 100). Separate log sheets should be submitted for each band and a signed declaration included. Entries must be posted within six weeks of the contest to Radio Amateur League of Budapest, Budapest, PO Box 2, H-1553 Hungary.

REF Contest

0600 28 January to 1800 29 January (CW)

0600 25 February to 1800 26 February (Phone)

3·5 to 28MHz. Contacts should be made with Francophone countries—C3, CN, D6, DA1/2, F, FC, FB8, FG, FH, FK, FM, FO, FP, FR, FW, FY, HB, HH, J2, LX, OD, ON, TJ, TL, TR, TT, TU, TY, TZ, VE2, XT, YJ, 3A, 3B, 3V, 4U, 5R, 5T, 5U, 5V, 6W, 7X, 9Q, 9U and 9X. Single-operator entrants may only operate for 26h-the 10h rest may be taken in up to three parts. Exchanges consist of RS/T and serial number. F and ON stations will include two figures or letters to indicate their department/province. Each QSO counts one point. The multiplier is the total number (from each band) of departments, overseas departments, territories, DUF countries, Belgian departments, DA2/FBA, and 14DNF countries worked. Log and summary sheets should be obtainable from REF HQ. Send logs to B. Francillon, F6BDN, Sq Trudaine 2, 75009 Paris, France.

UBA Trophy 1984

0600 28 January to 1800 29 January (CW)

0600 25 February to 1800 26 February (SSB)

3·5 to 28MHz. Three classes-**(A)** Single-operator 3·5 and 7MHz, 16h operation only (also for listeners); **(B)** Single-operator all bands. 26h operation (also for listeners); **(C)** Multi-operator, single transmitter—all 36h. Exchange RS/T plus serial number (from 001). Belgian stations will indicate their province. QSOs with ON and Belgian Forces in Germany count 10 points, with French countries one point (see REF Contest). The multiplier is one for each Belgian province, BFG (BSO) or (FBA)—a maximum of 10 per band. Logs should show date, time, station worked, reports exchanged and serial numbers, points and multipliers. Use separate sheets for each band and include summary sheet showing scoring information, class, mode, name, callsign, full address and signed declaration that all contest rules and country regulations have been observed. Post before 1 March (cw section) or 1 April (ssb section) to UBA HF Contest Committee, Galicia Jan, ON6JG, Oude Gendarmeriestraat 62, B-3100 Heist of den Berg, Belgium. The contest is a good opportunity to acquire the Worked All Belgian Provinces Award (see "Awards").

YU DX Contest

2100 4 February to 2100 5 February.

CW only, 3,520-3,590kHz and 7,010-7,040kHz. Single- and multi-operator and listener sections. Exchange RST plus serial QSO number. QSOs with YU on 3·5MHz count 10 points, with Europe three points, and dx five. On 7MHz these count five, two and four respectively. The multiplier is the sum of the number of YU prefixes and DXCC countries worked on each band. Single-operator entrants must stay on a band for 30min, multi-operator at least 10min. Logs should show date, time, station worked, number sent/received, band, if new multiplier, points claimed and one log should be used for each band. Enclose summary sheet showing

QTH CORNER

BY4AA	Box 205, Shanghai, People's Republic of China.
FB8WJ	J. Emery, F8RV, 14 Bis Av, General Compons, F-31700 Blagnac, France.
FB8WK	BP 190, Mazamet 8181, France.
W6QL/HK3 } **W6KG/HK0** }	YASME Foundation, Box 2025, Castro Valley, Cal, 94546, USA.
P29BR	Box 793, Lae, Papua New Guinea.
P37A	via K1AR, 30 Champa Rd, Billerica, Mass, 01821, USA.
S79SM	Box 84, Mahe, Seychelles.
T32AQ	AD8J, 3905 Monet Ct.S, Allison Park, Pa, 15101, USA.
T32AR	W0RLX, 535 Mapleton Av, Boulder, Colo, 80302, USA.
T32AS	via AD1S, PO Box 32735, Oklahoma City, Okla, 73123, USA.
TA1UA	(no callsign please) PO Box 787, Istanbul, Turkey.
TR8KMJ	BP 129, Port Gentil, Gabon.
TU2NW	via AK3F, PO Box 573, Gettysburg, Pa, 17325, USA.
V3EO } **V30DX** }	via N6ADI.
VK9ND	PO Box 279, Norfolk Is, Australia 2899.
VP2MEV	via AJ6V, E. J. Radio, 897 Newell Rd, Palo Alto, Cal, 94303, USA.
VK2BQQ/LH	Box 3209, Sydney 2001, NSW, Australia.
XU1SS	JA1HQG (**new**) 4-3-9 Yuigahama, Kamakura, Kanagawa 248, Japan.
YI0BIF	Box 5864, Baghdad, Iraq.
3D2ZM	via K6ZM, 44 Toyon Tce, Danville, Cal, 94526, USA.
3D6AK	via G3WPF (**new QTH**) Sours Lodge, Sagars Rd, Styal, Wilmslow, Cheshire SK9 4HE.
4V2C	via NQ4I, 104 Bowfin Bay, Peachtree City, Ga, 30269, USA.
9V1VZ	M. H. Prestwood, 805 Holland Rd, Singapore 1027.

multipliers and total score plus signed declaration. Post before 15 March to SRJ, YU DX C, PO Box 48, 11001 Beograd, Yugoslavia.

Apologies to **GU3TXF** whose score was omitted from the list of British entrants in the results of the **1982 CQ WW CW Contest** in November *MOTA*. The operation took place from Alderney and a total of 2,828,504 points were scored by G3SXW, G3TXF and GW3WVG. This, of course, was top British score in the multi-operator single-transmitter class.

Awards

The Uiver Memorial Award

To commemorate the London-Melbourne race in 1934 which is to be reflown with an identical DC2 aircraft. QSOs and listener reports representing 50 "points" during the period 10 December 1983 to 10 February 1984 must be acquired and certified by two licensed amateurs. QSOs may be made with the following countries: PA, G, I, SV, TA, YK, YI, A6, AP, VU XZ, 9M, 9V, YB and VK. Each counts two points and up to five may be made with any country. If contact is made with cities where the Uiver lands then a premium of three points is counted (once only). The cities are: Amsterdam, Duxford, London, Rome, Athens, Adana, Aleppo, Baghdad, Abu Dhabi, Karachi, Jodphur, Alahabad, Calcutta, Rangoon, Alor Star, Kuala Lumpur, Singapore, Jakarta, Selaparang, Kupang, Darwin, Cloncurry, Charlesville, Albury and Melbourne. Apply before 1 April 1984 to W. Vrijenhoeff, Steijnkade 31, 2805 Gouda, Netherlands, enclosing 10 ircs.

Match Town Award

From SVARK, Jonkoping, to mark the 700th anniversary of their city. This is a four-colour certificate plus a silk streamer. European applicants need three points for QSOs with Jonkopking county (F6) during 1984—each station counts one point but club station SK7AX counts two. Send log extract plus 10 ircs to Award Manager, SVARK, PO Box 2035, S-561 02 Huskvarna, Sweden.

Worked All Belgian Provinces Award

This can be obtained by entering the UBA Contest and submitting a log. Send a list of QSO details with stations in all nine provinces worked during the test, together with the log, and enclose US$3 or 10 ircs.

VS5LH (centre) enjoying Japanese hospitality with JA45OU (left) and JA4JPO

RAF Halton Award

Available to licensed amateurs and listeners for contacts/confirmed reception reports with stations connected with RAF Halton Amateur Radio & Electronics Club between 10 June 1983 and 30 June 1984 on any bands/modes. Twenty-five points are required—10 are gained per QSO/report with club stations G4SQC, G6WCR, GB2HAS and GB2HAR, and five with members. Further information from (sae please), and claims to (enclosing £1 or five ircs) G8BVJ, 6 Mansion Hill, Halton, Aylesbury, Bucks HP22 5NL.

The Helvetia Award

New rules are now in effect for this beautiful award. It is given to those who have confirmed contacts with all 26 Swiss cantons and half-cantons since 1 January 1979. Cross-mode and crossband contacts do not count, and it is issued in four categories—(1) Telephony, telegraphy, or mixed. (2) All telegraphy. (3) RTTY, and (4) SSTV. QSLs must show clear evidence of the canton where the station was located, and they should be sent, together with a signed list showing callsigns, location, date, frequency band, and class of emission for each contact, to Kurt Bindschedler, HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland. Abbreviations for the cantons are as follows: AG (Aargau), AI (Appenzell Inner Rhoden), AR (Appenzell Outer Rhoden), BE (Berne), BL (Basle Country), BS (Basle City), FR (Fribourg), GE (Geneva), GL (Glatis), GR (Grisons), JU (Jura), LU (Lucerne), NE (Neuchatel), NW (Nidwalden), OW (Obwalden), SG (St Gall), SH (Schaffhausen), SO (Solothurn), SZ (Schwyz), TG (Thurgau), TI (Ticino), UR (Uri), VD (Vaud), VS (Valais), ZG (Zug) and ZH (Zurich). The Helvetia Contest, which is held on the last full weekend in April, is an excellent time to work the rarer cantons as stations frequently visit them to take part. The award is free, but sufficient ircs or equivalent must be sent to cover the cost of returning the QSL cards.

Please note that all applications for awards issued by ARI should now be directed to: The Secretary, ARI, Via Scarlatti 31, 20124 Milan, Italy. Former award manager I8KDB no longer deals with their issue.

Here and there

G3WW has written to say that, lest readers think that sstv has died, he has made QSOs with 20 countries recently on 14,230kHz using RGB colour and the new 24s single-frame colour system. Richard has now worked nearly 2,000 different stations on sstv—a total he believes may be the highest in the world.

The Solomon Is Radio Society is seeking funds to promote amateur radio in its developing country. In order to do this it has produced a special philatelic cover to celebrate the operation by W5LFL aboard the space shuttle *Columbia*. The envelope bears a 45c Solomon Is stamp (depicting *Columbia*) and "First Amateur Radio Operation From Earth Orbit" within the AMSAT logo, and it will be cancelled with the date of the first day of operation. It is available from PO Box 81, Honiara, Solomon Is, at a cost of US $1 or equivalent for direct air-mailing. Covers will be supplied in mint condition within a sealed envelope for an extra US $1 for up to 10 covers. (In this instance US $1 is being taken as being equivalent to five ircs.)

Around the bands

A review of the present position by G8KG reads as follows: "The slow decline in mean solar activity continued in October and November. Activity was quite high in the first two weeks, peaking at 140 sfu on 13 October, but had fallen to only 88 sfu by 22 October. In spite of this relatively low activity there was plenty of dx to be found on the higher bands during the CQ WW Phone Contest.

"In the next solar rotation the flux reached only 111 sfu on 7 November and had fallen to 82 sfu by 20 November, and between those two dates there was an unusually prolonged spell of magnetic disturbances so that hf conditions were generally poor on most days.

"The 27-day average solar flux, which provides a good idea of general trends, gives a dramatic picture of the steep fall in solar activity during 1983. During the last big upsurge of Cycle 21 in December 1982, the 27-day mean reached 210 sfu. By the end of March it had fallen below 110 sfu but recovered during the summer to around 130/140. By mid-November it had fallen below 100 sfu for the first time since it passed upward through that value in December 1977.

"Now is a good time to take stock. Not only was Cycle 21 the second highest on record, but the only high cycle to have a prolonged maximum lasting nearly three years. Furthermore, the smoothed sunspot number for the cycle's seventh birthday will almost certainly be higher than for any other recorded cycle at the corresponding age, as well as being, as already reported, on a par with the peak of Cycle 16. What of 1984? If the cycle behaves like its predecessors, the rate of decline should slow down at about this time—Cycle 20 actually climbed for much of its eighth year. One

Doug Smith, RS42590, operates from this comfortable position from his home in West Dulwich

cannot be sure, but it is quite possible that by the end of 1984 the smoothed sunspot number will only have fallen to about 50 (smoothed solar flux c 100 sfu) which is still a long way from minimum activity.

"It still looks as if the peak of the geomagnetic cycle was late in 1982, though recent rather high activity may conceivably alter this view. Rather high magnetic activity is a feature of the later stages of a solar cycle and can be more disruptive of hf operations than the low solar activity taken on its own. There is, however, some consolation in that high geomagnetic activity in the closing stages of a cycle seems to point to the next cycle being a high one (see *Radio Communication* May 1978, p405). So far the 20th century has seen two "low" cycles (14 and 16), three "average" ones (15, 17 and 20), and three "high to very high" (18, 19 and 21). It will be some while yet before we can begin to form a view about the next one. . . ."

Logs for the list below were supplied by: G2HKU, G5JL, G3s AAK, BDQ, GJ3EML, G3s GIQ, GVV, IGW, KDB, KHZ, KSH, YRM, G4s DJY, EHQ, FVK, KGG, GW4KGR, and G4s NKG/M, OBK, UOL and VGK.

As usual, stations listed in italics were using cw.

1·8MHz. 0000 ED9CM, 4X4NJ. **0100** *AA1K, 5N8ARY.* **0500** *AA1K, W2BXA, W8LRL.* **0700** *K5UR* (Ark). **1900** *CT1AOZ, JA6IEF.* **2000** *JY7ZZ, ZS5AB, ZS5BAK, 3D6AK, 4O3WCY.* **2100** *EA8QO, HZ1AB, T77C, VK6HD.* **2200** *KH8AC,* VE1ZZ, *W2FZY, N4SU, ZB2EO, 9H1CG.* **2300** *EA6ET, FC9VN,* SV8CS, Y22TO, 5B4EP, *5N8ARY.*

3·5MHz. 0000 DL1RK/CT3. **0200** FC9UC. **0400** *TJ1QS.* **0500** *VP2KBZ, ZF20BN.* **0600** CT2DL, *W6SZN/T2.* **0700** *HH2VP,* NP4A, PJ7A, TI1C, ZL4PO/C. **2100** RW9A, VK6HD. **2200** 4U1VIC. **2300** *4K1GDW.*

7MHz. **0200** *FB8WK, 3B9FK.* **0600** *V3CQ, W6-W7, ZL.* **0700** *JA,* LX0WCY, *ZB2EO,* 3X4EX. **1700** *8Q7BW.* **1900** FB8WK, *OH0AA.* **2000** *EA8QJ,* JT1AO, SU1RK, *VK3XB.* **2100** *KC7UU/5N6.* **2200** *CN8CU, FM7WU, TA2OW, TR8AG, VU2BK, 4K1GDW.* **2300** *DL1RK/CT3, HH2VP, K5GA/VP2V, 3V8AA.*

10MHz. **0600** *VM4AAA.* **0700** *SV1KW, VK1-VK5, ZL1,3,4.* **0800** *CU1LN, FO8FO, JA, VU2BK, W, KC7UU/5N6.* **0900** *6V3CC.* **1000** *DK0WCY, VE1BB.* **1400** *JA6HW.* **1900** *VO1AW, W1PL, ZL4NH.* **2000** *KP2J.* **2100** *VP2V/KSGA* **2200** *W1-W4, W9, 4Z4DX.* **2300** *W6KG/HK0, DL2GG/YV5.*

14MHz. **0500** *FK8AX.* **0700** FK0AQ, H44DX, *TT0CU,* VK2LHI, VP8AOH. **0800** CE0FQU, FK8CE, FO8IW, KC6DC, AD1S/KH5, KH6, VK9ND, VS5GA, *3D2ZM.* **0900** FO8GW, *NL7CV,* 9M8PW. **1000** VS5GX, *ZK9RW.* **1100** FK8ET, P29RR, VK9ZS. **1700** FB8WJ, G4CTQ/ST2, W6-W7, YI0BIF, *4K1QAV.* **1800** *J28DP,* 4S7PVR, 9X5MH. **1900** KH6GDR, *NL7G, S79SM, TR8JLD,* VP2VPH. **2000** *HL1CX,* NP4UR/V2A, ZD7BW, ZS3WCY, *KC7UU/5N6.* **2100** T77C, VP8MT, *4K1GDW.* **2200** VK6RU, ZD7CW. **2300** W6KG/HK0, VP8ASG.

18MHz. **1000** *G,LA,OZ.* **1600** *EL0BY/MM.*

21MHz. **0700** FK0AQ, JA (LP to 1000), VK, ZL. **0800** *BY8AA,* H44GP, *OD5LX, TA1UA, ZL, 3B8FG, 3B9FK.* **0900** A71BK, HL0K, 3V8AS, 8Q7AC. **1000** HZ1SA/M, JA (SP), YI0BSF. **1100** AP2P, *P29BR, 3D6AK, 4D6GEN,* 5N8BRC. **1200** VS6CP, *VU83AJ* (=VU2AJ). **1300** VU2GI. **1400** 5H3WCY. **1500** D44BC, SV1OL/SV5, V3EO, *V30DX, 4K1GDW, W5VW/5U, 9L1AP.* **1600** C6ANM, *G4ABI/ST2,* YC0VM. **1700** W6KG/HK0, V3EO, W6-W7, ZD9CA. **1800** T32AF. **1900** VP8MT, 3X4EX.

24MHz. No reports.

28MHz. **0800** FR7DV, VK, ZL. **0900** CE2AA, *YB5ASO, ZL2, ZL3,* 5N23RTF. **1000** A22BW, JY9CL, VQ9WT, KE6PU/4D1. **1100** OA4ZP, TR8DX, *8Q7QJ.* **1200** D44BS, *VP2KBZ, Z23JO, ZS.* **1300** *FR0FLO,* P47N, *TI2PZ,* W1-W4, *3B9FK, LA2WN/9L1.* **1400** FH8CP, HZ1AB, TI1C, V3EE, V30AA, 9K2BE. **1500** S83H, TZ6FIC, VP8AOD (S Orkney), VP8QG, ZD7BW, *3D6AK.* **1600** G3ZGC/J6L, VP8AQA, W6-W7 (to 1800). **1700** G4CTQ/ST, VP2KBZ, VP2VDH. **1800** VP2MIX. **1900** *VP9LB.* **2000** *W6KG/HK0.*

Thanks to all contributors and to the authors of the following: *Lynx DX Group Bulletin* (EA2JG/EA3CBQ), *DX'press* (PA0GAM), *CQ Magazine* (W1WY), *DXNL* (DL3RK), the *DX Bulletin* (K1IN), the *Long Island DX Bulletin* (W2IYX), *DX News Sheet* (G3XTT/G3ZAY), the *Ex-G Radio Club Bulletin* (GI3OEN/W6), and *Long Skip* (VE3GCO).

Closing date for **March** issue is **26 January**—please send all items to reach G3FKM no later.

RAYNET

*by Geoff Griffiths, G3STG**

Chairman, Raynet Committee

Raynet membership records

Taff Crane, the Raynet registration secretary, told me just a few days ago that she has been serving the network by maintaining the membership records and keeping track of controller nominations and appointments for more than 10 years. The amount of work she must have done for us in that time has been phenomenal, but the strength of Raynet—as with so many other aspects of amateur radio—is the amount of time that so many volunteers give to ensure a smooth operation.

Nevertheless, the maintenance of a manual system of record keeping has been not only very time-consuming and demanding of space, but has also placed limitations on the amount of information which could be kept and readily extracted from the system for the benefit of members. The Raynet Committee has been concerned for some time about the workload and limitations imposed by the manual system, and the move of the Society headquarters, together with the upgrading of the computer facilities, have given us a rare opportunity to look afresh at the possibilities.

Subject to the completion of the necessary software, it is proposed to institute a computer-based membership registration scheme using the headquarters computer, to take effect from 1 May 1984. Full details of the new scheme will be circulated to all Raynet controllers and zonal representatives during March, together with supplies of the new stationery and membership application forms. In the meantime, new membership applications, renewals and group and county controller nomination forms for registration up to the end of April 1984 should be forwarded, as before, via your group controller to: Mrs Taff Crane, "Greta Woods", Bromley Road, Ardleigh, Colchester, Essex CO7 7SF.

NEC 1984

The afternoon sessions for Raynet controllers and members which are to be held as part of the symposium activity at the NEC in April will give members an opportunity to see at close quarters the new registration documents, and to discuss many matters relating to the practical operation of Raynet, and its relationship with the user services.

Zonal representative elections

The Raynet Committee has regretfully accepted the resignations of the zonal representatives for Zones 5 and 10, and the attention of members of groups in these zones is drawn to the notice of nomination and election procedures detailed on page 20 in this issue.

We couldn't let this item go past without recording a note of thanks to Eric Yeomanson, G3IIR, and Mike Oldham, G6DDQ, for all their work as zonal representatives, and sending best wishes to both on behalf of all members.

Undoubtedly, Raynet groups and members now feel a much closer link with each other and with the rest of the network because of the efforts put in by the zonal representatives. If you don't know who your zonal representative is, then find out and invite him to visit your group soon!

Membership survey 1984

Controllers and group secretaries all over the country can now heave a sigh of relief because the Raynet Committee has decided not to inflict an annual survey upon you this year. The gathering of the information and its collation and despatch is always a chore to busy members, and with the advent of the computerized membership scheme, much of the need disappears—but beware! Zonal representatives still need to be kept up to date by groups on their activities, so no doubt your representative may soon be in touch.

Talkthrough permits

Where groups intend to make use of the manned talkthrough concession on 144MHz, 432MHz or crossband, application should be made to G3STG, QTHR, giving as much notice as possible. Quote the group concerned, time and date of operation, name of the exercise and user service so that the

* 11 The Grove, Asford, Melton Mowbray, Leics LE14 3UF.

appropriate authorization document may be issued. Advice should always be sought from the committee before using any of the local repeaters for Raynet talk-through.

User service exercises

We have now reached the end of the first year of operation of the revised licence conditions applying to formal user service operation, and groups are asked to ensure that a complete record of these exercises has been notified to headquarters on the small yellow cards. It is important to be able to build up an accurate picture of activity through the year to assist further discussions with the DTI.

Controllers are always encouraged to submit reports of their group's activities of all types to headquarters on the reporting forms so that we can share information on what is going on around the groups. Reports received recently include activities carried out by groups in Cambridgeshire, Doncaster, Cornwall, Glamorgan, Hampshire, Scottish Highlands, Leeds, Reading, Lincolnshire, Slough, Staffordshire, and Trafford & Salford.

The 80m Net

All controllers are reminded of the National Raynet Net which takes place on 3·79MHz every Sunday morning at 0830. On the first Sunday of the month, it is particularly worthwhile monitoring or calling in order to pick up the latest items of news, and the net control callsign to listen for on those Sundays is G4NRC. Hope to see you there soon. □

HF propagation predictions for January 1984

Using the table

The time is presented vertically at two-hour intervals 00(00)gmt to 22(00)gmt for each band, ie $\frac{0}{0}$ = 0000, $\frac{0}{2}$ = 0200, $\frac{0}{4}$ = 0400 etc.

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. Additionally 50MHz F-layer and 1·8MHz openings are indicated by a dagger (†) sign in the 28 and 3·5MHz columns respectively. The higher probability figures are printed in **BLACK**, lower probability in RED and lowest probability in GREEN type.

	28MHz				21MHz				14MHz				10MHz				7MHz				3·5MHz			
GMT	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122	000	001	111	122
	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802	024	680	246	802
EUROPE																								
Moscow	...	.15	63.	...	...	69	982	...	...	188	888	1..	43.	666	568	722	885	643	335	888	†5	3..	.2	5††
Malta	...	.25	431	...	...	79	885	...	...	187	789	61.	562	665	568	974	998	742	236	899	†††	4..	.3	†††
Gibraltar	...	.2	21.	...	...	27	775	...	...	88	888	61.	232	.86	567	973	898	663	335	799	†††	†3.	.2	5††
Iceland	...	...	11.	...	...	.2	774	...	...	18	889	4..	.1.	.57	678	82.	675	164	446	786	†††	†32	.23	5††
ASIA																								
Osaka	...	...	...	...	...	3.	...	...	...	74	...	...	1..	163	123	1.2	1..	.31	.13	643	...	...	...	45.
Hong Kong	...	32	...	...	...	77	3..	...	...	156	53.	...	1..	.23	334	21.	1..	.1	.13	674	...	...	...	4†4
Bangkok	...	57	51.	...	...	79	861	...	...	26	567	...	2..	..3	336	422	3..	..1	.13	777	...	...	...	4†5
Singapore	...	35	43.	...	...	68	882	...	...	25	567	...	2..	..3	336	523	2..	...	.13	776	...	...	...	4†3
New Delhi	...	55	4..	...	...	178	84.	...	...	224	563	...	41.	..1	335	234	73.	...	.13	678	5..	...	...	45†
Teheran	...	67	64.	...	...	277	882	...	1..	533	567	1..	642	31.	236	645	873	...	.13	788	†5.	...	...	455
Colombo	...	67	74.	...	...	157	883	...	...	112	568	2..	22.	...	236	745	61.	...	.13	778	3..	...	...	45†
Bahrain	...	76	54.	...	...	276	882	...	2..	522	567	311	742	2..	236	866	873	...	.13	688	†5.	...	...	455
Cyprus	...	78	761	...	...	198	997	...	32.	766	678	632	885	633	357	987	997	31.	124	788	††4	...	.2	4††
Aden	...	77	651	...	...	266	786	...	3..	411	368	632	832	1..	.36	887	872	...	.13	687	†4.	...	...	455
OCEANIA																								
Suva (S)	...	...	1..	...	...	.2	54.	...	...	.6	666	1..	...	.44	346	4..	...	.31	113	2..	...	...	...	...
Suva (L)	...	21	...	...	...	75	42.	22.	..1	186	556	731	...	353	235	51.	...	13.	.2	2..	...	...	...	...
Wellington (S)	...	...	1..	...	...	.4	63.	...	...	56	665	...	...	.63	346	2..	...	.31	113	2..	...	...	...	...
Wellington (L)	...	...	...	...	...	21	...	...	..1	.75	322	521	...	163	224	41.	...	.31	.2	1..	...	...	...	...
Sydney (S)	...	22	21.	...	...	77	76.	...	...	166	666	...	...	.33	346	3..	...	.11	.13	51.	...	...	...	3..
Sydney (L)	...	...	...	...	...	.4	1..	...	...	.46	542	541	...	.43	234	73.	...	.11	.2	41.	...	...	...	...
Perth	...	44	31.	...	...	168	763	...	...	126	568	2..	1..	..3	236	743	...	...	.13	772	...	...	...	44.
Honolulu	...	...	...	...	...	...	...	...	...	...	...	4..	.12	.11	213	4..	..3	231	113	1..	...	4..	...	...
AFRICA																								
Seychelles	...	12	43.	...	...	244	784	...	2..	1..	368	742	821	...	36	888	84.	...	.13	678	†..	...	...	45†
Mauritius	...	35	541	...	...	145	786	1..	31.	1..	268	753	851	...	36	898	73.	...	.13	688	5..	...	...	4††
Nairobi	...	54	552	...	...	165	687	2..	51.	41.	158	874	962	1..	.25	898	873	...	.3	688	†5.	...	...	355
Harare	...	13	442	...	...	45	577	31.	64.	31.	.37	986	983	1..	..4	899	872	...	.2	688	†4.	...	...	3††
Capetown	...	12	554	...	...	44	568	53.	75.	211	125	897	983	2..	...2	699	873	...	...	378	†4.	...	...	.4†
Lagos	...	58	766	1..	...	86	668	631	77.	251	115	898	996	52.	..2	699	788	3..	...	488	4††	...	...	.5†
Ascension Is	...	26	434	1..	...	77	556	521	663	.62.	.12	688	998	33.	...	379	888	51.	...	158	†††	2..	...	.2†
Dakar	...	17	766	1..	...	68	667	72.	554	.74	113	787	989	351	...	489	878	72.	...	168	54†	4..	...	.3†
Las Palmas	...	.7	765	1..	...	59	889	61.	233	.87	667	884	888	474	334	799	989	852	112	589	†††	†2.	...	25†
S AMERICA																								
South Shetland	...	..1	223	...	...	46	666	42.	443	.76	422	244	456	243	1..	.13	233	32.	...	...	...	...	...	...
Falkland Is	...	..2	246	2..	...	36	665	52.	444	.76	31.	134	688	263	...	.13	466	53.	...	..1	.34	3..	...	...
Rio de Janeiro	...	..2	212	1..	...	.7	544	42.	444	.55	11.	155	889	262	...	.36	888	73.	...	..4	†††	4..	...	...
Buenos Aires	...	...	213	2..	...	15	544	41.	333	.76	21.	.34	788	263	...	..4	688	731	...	..1	3††	4..	...	...
Lima	...	...	665	2..	...	...	865	41.	1.2	.12	521	.12	557	153	2..	..3	588	631	...	...	2††	5..	...	...
Bogota	...	...	665	2..	...	...	876	51.	..1	..2	521	122	557	143	2..	..4	688	631	...	..1	3†5	5..	...	...
N AMERICA																								
Barbados	...	...	665	2..	...	..3	866	51.	1.2	..6	511	253	657	133	2..	.26	887	631	...	..4	†54	5..	...	...
Jamaica	...	...	376	2..	...	...	786	5..	..1	..1	541	132	446	133	31.	..4	688	541	...	..2	4†5	4..	...	...
Bermuda	...	...	376	2..	...	...	887	61.	..1	..4	542	352	546	123	31.	136	887	631	...	.15	††5	5..	...	..2
New York	...	...	.65	1..	...	...	588	6..	...	..1	664	441	445	.23	331	135	778	531	...	.14	555	5..	...	...
Mexico	...	...	.45	1..	...	...	.87	4..	...	...	263	11.	245	.32	23.	..1	378	541	.1.	...	.5†	4..	...	...
Montreal	...	...	.55	1..	...	...	588	5..	...	..2	665	541	445	.13	332	245	788	531	.1.	.14	555	5..	...	..2
Denver	...	...	..3	...	...	...	.27	4..	...	...	.66	42.	345	.21	133	112	478	431	.11	..1	.5†	5..	...	...
Los Angeles	...	...	..1	...	...	...	..6	3..	...	...	26	41.	244	.12	.34	1.1	168	431	.11	...	.3†	5..	...	...
Vancouver	...	...	...	...	...	...	..1	2..	...	...	.7	61.	243	.12	.25	421	268	331	.13	1.1	.3†	4..	...	...
Fairbanks	...	...	...	...	...	...	...	...	...	..1	.12	4..	242	.23	235	731	345	231	113	532	.23	4..	...	2..

The provisional mean sunspot number for October 1983 issued by the Sunspot Index Data Centre, Brussels, was 55·2. The maximum daily sunspot number was 130 on 11 October, and the minimum was 15 on 30 October. The predicted smoothed sunspot numbers for January, February, March and April 1984 are, respectively: (classical method) 64, 62, 61 and 59; (SIDC adjusted values) 64, 62, 61 and 59

SWL News

*by Bob Treacher, BRS 32525**

Greetings

With the festive season behind us, I would like to wish all readers a happy and successful 1984. January is traditionally a good month for dxing, particularly on the lower frequency bands, and with many taking extended holidays during the early part of the month there is hopefully plenty of interest on all the bands. It seems that the year may get off to a good start with activity from 1A0KM on all bands, including 1·8MHz. There is also the lf challenge, which runs for the whole of January. Rules in last month's piece.

The *73 Magazine* 40 and 80m contests are on 7 and 8 January respectively, while the following weekend is the turn of 160m. The last weekend in the month is one for cw types with CQ WW 160. Plenty here for anyone with an interest in dxing on the lower frequency bands and every chance that last year's total of 14 entries to the lf challenge will be beaten.

28MHz Set Listening Periods

The slps arranged for five periods during August and September produced sufficient logs to gauge propagation characteristics during the summer months at this period of the sunspot cycle. Details of the entries and scores are as follows:

	13·8		21·8		3·9		11·9		17·9	
	Stns	DXCC	Stns	DXCC	Stns	DXCC	Stns	DXCC	Stns	DXCC
E. Carling	—	—	66	19	9	6	54	18	9	3
BRS44395	25	9	39	17	7	3	3	2	—	—
BRS25429	—	—	46	13	—	—	25	12	—	—
BRS32525	—	—	—	—	2	1	17	10	—	—
BRS62088	—	—	—	—	—	—	9	5	—	—

Conditions on the whole were quite poor. 21 August provided the best propagation, with 24 countries reported during the three hours from 0900–1200. The majority of stations logged emanated from Europe, but NL7G (0914), A22BW, A81LC, Z23JO, ZSs, 3B9FK, 3V8AM, 4X6KA and 5N9GM were audible. By comparison, only 15 stations were heard in only six countries during the 3h from 1200–1500 on 3 September. Best dx were several ZSs, together with 5N0DPP. Eric Carling found conditions quite good on 11 September, logging 54 stations in 18 countries. There were many DLs audible, but dx to the south was quite plentiful between 1500 and 1800. PY, LU, CE, VP8, CP, CX and ZP were copied from South America. A82LC and 9J2FC represented the African continent, while AK1A, VO1MP and KC1F were logged from the North American continent. To summarize, short skip predominated in all but the last slp. During this period there was reasonable propagation to Africa. At 0903 OE6JGG was heard working FB8WH, but there was no copy of the FB8 in G-land. 3B9FK gave Eric Carling his 154th country on 28MHz during 1984. The third slp found very poor propagation, whereas the fourth period coincided with the WAE contest. Central Europeans were heard working strings of Ws, but only three Ws were heard here during the whole period. The fifth period should have produced signals from the Caribbean and USA, but unlike other days in early September, the band was poor and seemed to close at around 1930. An interesting exercise in the study of propagation. The idea will be repeated during 1984. My thanks to those who sent in logs.

HF news

CQ WW and the hf challenge certainly kept our reporters busy at the end of October. Most commented on hoards of new countries, particularly on 1·8MHz. It seems that over 60 countries were active on that band during CQ WW, with dx signals from VK6HD, 5N8ARY, TI1C, FR0FLO, HZ1AB, 5B4EP, JY8RF, NP4A, PJ7A, RH8EAK, TR8JD, V30AA, 3V8AS, 4X4NJ and 9Y4W, all audible on ssb. Not too many reports on 3·5MHz dx, but 7MHz was rather good, with dx audible until 1000. VO1CV was 59 at 0954, K4JPD/C6A, 58 at 0919, and V30AA, 59 at 0850 —all well after our sunrise. On the higher frequency bands, all the Caribbean dxpeditions were putting in loud signals, and from the Far East YB0ARA and VS6DO were good copy. Eric Carling logged 127 countries during the contest on 28MHz. Best dx on that band included A22BW, J28DX, JT1KAI, TZ6FIC, 4D1AU, 9U5JB and 9Y4RD/SU. Outside of CQ WW, the biggest non-event of the year for most Europeans was the poor signal from the AD1S/KH5 expedition. Band conditions were quite bad, and although Robert Small, BRS8841, heard their marginal signals on 14MHz ssb at 1715, it is thought that few, if any, G stations actually made it to the KH5. Fortunately, many did not require KH5 on 21 or 14MHz in view of the fairly recent K6LPL/KH5 trip, but copy on 7MHz would have been gratefully received by those of us that dx seriously on that band. The only problem could arise if separate DXCC status is given to Jarvis Is, when failure to log the expedition's signals might well prove to have been very costly. However, separate status is considered unlikely. DF3NZ/ST2 continued to be very active, also using his 6U1WCY callsign. ZL4PO/C had also been reported from Chatham Is on 3·5MHz at 0708 in mid-November. 3V8AS (DJ6QT) had been very active on 1·8MHz, giving many another new one on the band, following his CT3 operation in 1982. With the hf bands closing quite early towards the end of November, little real dx seemed to be on the bands after our reporters returned from work. However, 7MHz had provided JT1AO and UK0AMM (Z.18) before 1800. The YASME HK0 trip provided a pleasant addition to several all-time lists, while stations in 6W8 were enjoying using their 6V prefixes for World Communications Year. This year 6W is to be regionalized from 1 to 0, so look out for these new prefixes. Robert Small reported a few good QSLs returned during November, including T2ADE, A35PG, ZK9RW, FK0AQ, FO8GW, TL8CN, ZK2RS and two cards from YB5ASO for 7 and 3·5MHz cw reports.

Mike Dawson, BRS44083, wrote for the first time listing some dx he had heard. ZD9BV and J28AZ were his best catches at the end of November using an SAIT MR1411 digital receiver and FRG7.

Adrian Nash, RS84734, also put pen to paper for the first time to mention VK5MS logged at 0639 on 7MHz. VKs are fairly common on 7MHz, with VKs on 7·099kHz every morning and VK6s on the band at their sunset—about 2130–2200 our time during January. Martin Parry logged his first JA on 3·5MHz and caught 3X4EX on 7MHz for two new countries.

Brad Bradbury, BRS1066, wrote to update his 24MHz activity. 5N7HKR, F, DL, GW, OZ and HB9 had been added. On 1·8MHz he reported QSLs from C30AAN, HB0NL and 4U1ITU.

Paul Crankshaw, BRS48909, commented mainly on CQ WW sorties on 28 and 1·8MHz, both with good results. Eight new countries were added on 1·8MHz, while on 28MHz he caught FR0FLO, T77V and OX5JM.

1983 UHF/VHF SQUARES/COUNTRIES TABLE

Station	QTH loc	70MHz Square	70MHz Countries	144MHz Square	144MHz Countries	432MHz Square	432MHz Countries	Total	Via*
BRS32525	AL	—	—	107	26	27	10	170	abd
BRS52543	YN	21	6	72	19	14	5	137	abc
BRS25429	ZN	—	—	110	25	—	—	135	ab
RS49875	YN	—	—	48	15	18	10	91	a
BRS50134	YJ	—	—	75	16	—	—	91	ab
RS49327	YN	—	—	46	15	18	10	89	a
BRS62088	AL	—	—	49	15	11	5	80	ab
ARS53844	YN	—	—	29	11	11	4	55	a

a = tropo, b = Es, c = AR, d = MS.

1983 HF COUNTRIES LIST

Station	28	21	14	7	3·5	1·8	Total	Mode
BRS8841	144	217	229	145	129	42	906	ssb/cw
BRS48909	148	205	216	140	117	48	874	ssb
BRS52543	130	200	203	135	135	33	836	ssb
BRS25429	137	189	178	125	132	42	803	ssb
BRS44703	113	164	178	113	120	43	731	ssb
BRS50134	128	175	170	114	111	30	728	ssb
BRS25901	112	171	189	110	101	36	719	ssb/cw
ARS53844	122	178	163	104	88	39	694	ssb
BRS44395	106	186	157	113	68	40	670	cw
BRS1066	87	141	138	106	71	48	591	cw
RS49327	101	144	169	74	51	13	552	ssb/cw
ORS45992/7Q7	114	169	179	47	11	0	520	ssb
ORS46084/7Q7	103	161	147	62	20	0	493	ssb
RS49875	82	141	163	60	38	6	490	ssb/cw
BRS42979	45	66	87	48	65	23	334	ssb/rtty/sstv
BRS18529	15	54	74	70	94	17	324	ssb
EI835	22	53	100	25	23	3	226	ssb
BRS62088	16	29	47	51	49	8	200	ssb

Here and there

G4INP passed on the news that Sinclair Amateur Radio Users Group has now published a design for a complete single-board rtty set-up for both the ZX81 and the Spectrum, with programs. The unit can be built in receive-only for around £15. The set-up has the computer interface, terminal unit and afsk generator all on one tiny board. PCBs and kits are available from G4INP, QTHR, and you do not have to be a member of SARUG to benefit.

Finale

News, views, and comments for inclusion in the March issue, together with final scores for the 1983 tables should reach your scribe no later than 17 January with late copy by 25 January. □

*79 Granby Road, Eltham, London SE9 1EH.

Contest News

1·8MHz Town & County Contest rules

Following the introduction of this short duration inter-G phone contest in 1982, there have been a number of requests for it to become a regular event in the RSGB contests calendar. Apart from a minor change in the contest exchange format, the rules are the same as for the 1982 contest.

TRANSMITTING SECTION

1. Eligible entrants. All fully 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. All entrants must operate within the terms of their licence.

2. Period. From 2100 to 2400gmt Saturday 17 March.

3. Frequencies/mode. 1·915–2·0MHz phone only.

4. Contest exchange. RS and serial number (starting at 001) together with operator's town and three-letter county code (as published in this issue of *Rad Com*). In the case of "country" entrants the nearest town in the same county must be given. Scottish entrants should use their region code.

5. Scoring. Three points for each completed contact with a station in the British Isles, with a bonus of five points for the first contact with each new county/region. Contacts with stations outside of the UK will not count for points.

6. Logs. All logs must follow the standard RSGB contest log-sheet format, with 40 contacts per page (one side only). Columns should be headed: date/time (gmt); callsign; RS/serial number sent; RS/serial number received; town/county code received; bonus points; QSO points. The entry must be accompanied by the following declaration: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute." The declaration must be signed and dated. The entrant must give details of the equipment and the antenna used and show the town and county code sent. (RSGB log sheet HFC1 and cover sheet HFC2 fully meet these requirements).

7. Address for logs. HF Contests Committee, c/o R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon CR0 7HY.

8. Closing date for logs. Logs must be postmarked no later than 2 April 1984.

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

RECEIVING SECTION

1. Rules 1, 2, 3, 5, 7 and 8 as for the transmitting section will apply.

2. Logging. A station may only appear once in the column headed "station heard". The callsign of the stations being worked may only be repeated once in every three contacts logged. Entrants should log the callsign of the station heard, RS/serial number and town/county code given by that station, and the callsign of the station being worked.

3. Awards. Subject to a minimum of 10 entries, certificates of merit will be awarded to the leading three receiving entries. If less than 10 entries are received, certificates will be awarded at the discretion of the HF Contests Committee.

4. Holders of British Class B transmitting licences may also enter the receiving section.

First 1·8MHz Contest 1984 rules

TRANSMITTING SECTION

1. Aim of contest. To encourage the use of the 1·8MHz band.

2. Eligible entrants. Single-operator stations only. British Isles entrants must also be members of the RSGB. **Entrants must operate in accordance with the terms of their licences.**

3. Period. 2100gmt Saturday 11 February to 0100gmt Sunday 12 February 1984.

4.Sections

(a) British Isles stations.

(b) Overseas stations including EI.

5. Frequencies/mode. 1·81–2·0MHz cw only. British Isles stations should note that overseas stations may be allocated different parts of the band.

6. Contest call and exchange. CQ test, RST plus serial number starting at 001. British Isles stations must also give their county code as published in this issue of *Radio Communication*.

7. Scoring

(a) British Isles section. Three points for each contact, with a bonus of five points for the first contact with each new British Isles county/region, and the first contact with each new country outside the British Isles.

(b) Overseas section. Three points for each contact with a station in the British Isles (not EI), with a bonus of five points for first contact with each new county/region.

8. Logs. Entries must be clearly written or typed on one side only of RSGB hf contest log sheets (Form HFC1) or international A4 size paper using blue or black ink. Log sheets to be headed: date/gmt; callsign; RST/number sent; RST/number received; code received; bonus points. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. For unmarked duplicate contacts for which points have been claimed, additional penalty points may be deducted (eg 10 times the claimed score for the contact).

9. Declaration. Each entry must be accompanied by the following declaration, signed and dated: "I declare that this station was operated strictly in accordance with the rules and spirit of the contest, and agree that the decision of the Council of the RSGB shall be final in all cases of dispute".

10. Address for logs. RSGB HF Contests Committee, c/o R. A. Treacher, BRS32525, 79 Granby Road, Eltham, London SE9 1EH, England.

11. Closing date for logs. Logs must be postmarked no later than Monday, 27 February 1984.

12. Awards

(a) The Somerset Trophy will be awarded to the winning station in the British Isles section, and certificates of merit to the second and third placed entrants.

(b) The Maitland Trophy will be awarded to the Scottish entrant with the highest aggregate number of points in this contest combined with the second 1·8MHz Contest 1983.

(c) Certificates of merit will be sent to the first three stations in the overseas section, and to the leading entrant from each overseas country.

(d) A certificate of merit will be awarded to the highest placed log from an entrant who has not entered a First 1·8MHz Contest before. Candidates for this award should mark their entries "First-time Award".

(e) A certificate of merit will be awarded to the highest placed UK entrant who has achieved pensionable age on or before 12 February 1984. Candidates for this award should mark their sheet "Senior Citizen's Award".

RECEIVING SECTION

1. Transmitting section rules 1, 2, 3, 4, 5, 7, 8, 10 and 11 will apply.

2. Logging. A station may appear once only in the column headed "station heard". The callsigns of the stations being worked may only repeat once in every three contacts logged. Entrants should log the callsign of the station heard; RST/serial number and county code 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.

4. Holders of British Class B licences may enter the receiving section.

February 432MHz Fixed Contest rules

0900–1500gmt, 19 February

The following general rules, published in the supplement to the January 1984 issue of *Radio Communication*, will apply: 1, 2, 3, 4b & 4d, 5a, 6a, 7a, 9, 10a, 11a, 12b, 13–24.

All entries and check logs to: VHF Contests Committee, c/o M. Pharaoh, G3LCH, 49 Streathbourne Road, London SW17 8QZ.

February 144MHz CW Contest rules

0900–1500gmt, 5 February

The following general rules, published in the supplement to the January 1984 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6b, 7a, 9, 10a, 11a, 12b, 13–24.

All entries and check logs to: VHF Contests Committee, c/o G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London SE23 3BN.

70MHz Cumulative Contest rules

1000–1200gmt, 29 January, 12 February, 26 February, 11 March
0900–1100gmt, 25 March, 8 April, 22 April

The following general rules, published in the supplement to the January 1984 issue of *Radio Communication*, will apply: 1, 2, 3, 4a, 5a, 6a, 7a, 9, 10a, 11b, 12a, 13–24.

All entries and check logs to: VHF Contests Committee, c/o C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Oxon OX12 7DQ.

RSGB Listener Championship 1984 rules

1. RSGB hf receiving contest general rules do not apply.

2. No entries for the championship are required.

3. The championship will be decided on the basis of the listener contests held between 4 February and 21 October 1984.

4. Points will be awarded to the leading eight UK receiving stations in the results published in *Radio Communication* as follows:

	Position							
Contest	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
7MHz Phone	70	55	50	45	35	25	15	5
7MHz CW	70	55	50	45	35	25	15	5
1·8MHz Town & County	50	35	30	25	20	15	10	5
Region Round-Up	50	35	30	25	20	15	10	5
21/28MHz Phone	80	65	55	45	35	25	15	5
21MHz CW	80	65	55	45	35	25	15	5

5. A table will be published in *Radio Communication* showing the points gained by each receiving station, and certificates will be awarded to the winner and the runner-up.

Dartford Heath DF Qualifying Event results

As usual the hard core of the df movement made their way south for this annual gathering, and 14 teams in all assembled at Dartford Heath. Their quest? To locate two of the club's hidden transmitters.

Colin Merry, station A, was hidden in brambles near Biggin Hill Airport where most competitors headed first.

Station B, manned by Charles Oliver, was in a well-disguised hillside cave dwelling at Halling, near Snodland. The transmitter operator here had great trouble locating the transmitter once it had been set up!

Contests Calendar

January-April	70MHz Cumulative *(Rules in January issue)*
7 January	40m World SSB Championship *(Rules in December* MOTA)
7, 15 January	3·5MHz Cumulative *(Rules in December issue)*
8 January	AFS *(Rules in December issue)*
8 January	75m World SSB Championship *(Rules in December* MOTA)
14-15 January	White Rose RS SWL *(Rules in November issue)*
15 January	160m World SSB Championship *(Rules in December* MOTA)
17, 26 January	1·8MHz Cumulative *(Rules in December issue)*
21-22 January	HA DX *(Rules in January* MOTA)
21, 29 January	7MHz Cumulative *(Rules in December issue)*
22 January	Swale ARC 144MHz *(Rules in October issue)*
25 January	RTTY World Championship *(Rules in December* MOTA)
27-29 January	CQ WW 160M DX (CW) *(Rules in January* MOTA)
28-29 January	REF (CW) *(Rules in January* MOTA)
28-29 January	UBA (CW) *(Rules in January* MOTA)
29 January	Swale ARC 432MHz *(Rules in October issue)*
4, 5 February	7MHz Phone *(Rules in September issue)*
4-5 February	YU DX *(Rules in January* MOTA)
5 February	144MHz CW *(Rules in January issue)*
11 February	1st 1·8MHz *(Rules in January issue)*
19 February	432MHz Fixed *(Rules in January issue)*
25, 26 February	7MHz CW *(Rules in September issue)*
25-26 February	UBA (SSB) *(Rules in January* MOTA)
25-26 February	REF (Phone) *(Rules in January* MOTA)
3, 4 March	144/432MHz & SWL
10, 11 March	Commonwealth *(Rules in November issue)*
17 March	Town & County *(Rules in January issue)*
1 April	ROPOCO 1
8 April	432MHz CW
15 April	Low Power
May-September	10GHz Cumulative
May-September	Microwave Cumulative
5, 6 May	432MHz-24GHz
19, 20 May	144MHz & SWL
20 May	Region Round-up
2, 3 June	HF NFD
3 June	70MHz & SWL
9 June	1,296MHz Trophy
10 June	432MHz Trophy & SWL
23, 24 June	Summer 1·8MHz
7, 8 July	VHF NFD & SWL
15 July	Low Power Field Day
4 August	432MHz Low Power & SWL
5 August	144MHz Low Power & SWL
19 August	1,296/2,320MHz
26 August	ROPOCO 2
1, 2 September (prov)	SSB FD
1, 2 September	144MHz Trophy and IARU VHF & SWL
16 September	70MHz Trophy & SWL
October-December	432MHz Cumulative
October-December	1,296MHz Cumulative
6, 7 October	432MHz-24GHz & IARU UHF
7 October	21/28MHz Phone
21 October	21MHz CW
28 October	70MHz Fixed
3, 4 November	144MHz CW & Marconi Memorial
10, 11 November	2nd 1·8MHz
12, 20, 28 November, 6, 14, December	28MHz Cumulatives
2 December	144MHz Fixed
16 December	70MHz CW

Both transmitters were located such that easiest access and the best route between the two required knowledge of roads on adjoining maps—not always carried by some competitors. Brian Bristow appeared to be one of these, having left his vehicle several miles short of the B transmitter. He was not particularly impressed with this df technique, gave up his quest for the A transmitter, and went home in disgust! Having heard the bitter comments while dismantling the B station, I conclude that Dartford Heath's reputation seems preserved for yet another year!

Posn	Name	Club	Time of arrival Station A	Station B
1	W. North	Mid-Thames	1448	1619
2	M. Hawkins	Chelmsford	1453	1621
3	A. Williams	Braintree	1448·75	1622
4	R. Brocks	Chelmsford	1449	1627
5	P. Lisle	Mid-Thames	1628	1511
6	E. Mollart	Mid-Thames	1448·5	1630
7	D. Newman	Slade	1450·5	—
8	W. Pechey	Mid-Thames	1454	—
9	T. Gage	Mid-Thames	1508	—
10	B. Bristow	Mid-Thames	—	1511·5
11	C. Wells	Mid-Thames	—	1512
12	I. Butson	Colchester	—	1512·5
13	P. Woollett	Dartford Heath	1628	—
14	F. Mepham	Mid-Thames	—	—

R. Brocks and P. Lisle qualify for the National Final

RSGB DF National Final Contest results

The df final this year was run by the South Manchester RC in the Blackburn and Burnley area. Fourteen teams assembled at the start near Padiham on a fine sunny day. Also present were Mr Don Baptiste, RSGB President, Mr Basil O'Brien, G2AMV (past-President) and his wife Eileen, G3WIO. Good signals were received from all stations (the loudest was furthest away!) and most teams chose the C station first.

Transmitter A, G3FVA/P, operated by Dave, G4JLG, and Colin, G8LQO, was situated some nine miles south of the start (and over three- quarters of a mile from any road!), the site being a wooded hillside overlooking a reservoir. The wood contained many steep gulleys which were likely to slow down teams. The transmitter crew reported several people in the area for some time, one competitor (who, as always, remains nameless) spent a happy afternoon running over the adjacent moors.

Transmitter B, G3UHF/P, operated by Mike, G4ROM, and Dave, G8UQC, was situated over 12 miles from the start, to the south east, on a 45° hillside. The hillside was "graced" with 1km antennas at top and bottom and between the two a further leg was placed. The operators had to stand upright all afternoon on a ledge overlooking a "nasty" drop. They were hidden by thick bracken, but were able to observe (with satisfaction) competitors in various states of exhaustion traversing the hillside. One competitor, on running through a farmyard one mile distant, was told by the farmer "You on this radio hunt? Ye'd better hurry, you've only 10 minutes left!" The news must have gone on the grapevine.

Transmitter C, G3WFT/P, operated by Dave, G3WFT, and Trevor, G8TYX, was located nine miles south of the start on a large rhododendron-covered hill. The antenna had been placed to afford competitors the maximum exercise (and a good view), being over 1km long. The station was hidden under the roots of a large rhododendron bush. The operators could hear noises, ie splintering of wood, cries of help and "oh! ****", plus assorted threats, for at least half an hour before Derick Newman's navigator found the tx *without* a receiver. During the afternoon several teams appeared, two requiring first aid and plasters!

After the event a fine buffet tea was enjoyed by all at the club hq in Sale. The results were then announced, the winner being Peter Lisle of Mid-Thames, who was presented with the RSGB DF Trophy by Mr Don Baptiste. Peter also won the South Manchester DF Trophy.

The President expressed his enjoyment of the event and thanked the South Manchester RC for running it, all competitors for coming, and especially Mary Holland for the excellent buffet tea.

The South Manchester Club would like to say thank-you all who competed, starters, all who operated stations and assisted in other ways, and to Mary Holland.

Posn	Name	Club	Time at A	Time at B	Time at C
1	P. Lisle	Mid-Thames	1513	1620	1435
2	C. Merry	Dartford Heath	1511	1621	1421
	C. Plummer	Mid-Thames	1539	1445	1621
4	D. E. Newman	Slade	1519	1622	1417
5	A. Williams	Braintree	1521	1417	1628
6	D. Brocks	Chelmsford	1505	1629	1419
7	M. Hawkins	Colchester	1405	1629	1506
8	R. Parsons	Burton-on-Trent	1512	1629	1418
9	B. Poole	Mid-Thames	1521	—	1417
10	C. Wells	Mid-Thames	1414	—	1527
11	E. L. Mollart	Mid-Thames	1529	—	1437
12	T. C. Cage	Mid-Thames	1542	—	1421
13	G. Whenham	Coventry	1421	—	1558
14	T. Judd	Mid-Thames	—	1555	—

South Manchester Quadruple Night DF Event

Date: 25 February 1984
Map: OS Sheet 109, 1:50,000 series, Manchester
Assembly: 1900gmt for 1920gmt start
Location: Sale Moor Community Centre, Sale, ngr798909

Competitors requiring supper should notify Mr D. Bolton, tel 061-998 4245 or Mr D. Holland, tel 061-973 1837, not later than 18 February.

Cray Valley RS 13th SWL Contest results

Certificate winners in this contest were:

CW SECTION SINGLE-OPERATOR

Name/Station	QSOs	Country multipliers	Total
John Goodrick, BRS44395	514	169	86,866
Brian Coyne G-SWL	448	179	79,834

PHONE SECTION SINGLE-OPERATOR

Name/Station	QSOs	Country multipliers	Total
Jean-Jacques Yerganian ONL-383	634	259	164206
Martin Parry BRS52543	709	222	157398
Alex Choglokov QAI169656	664	200	132800
D. Gordon BRS43752 (GW)	639	191	122049
Paul Crankshaw, BRS48909 (GM)	541	207	111987
R. Smit, NL8297	462	181	83622
Tina Keil EI835	507	154	78078
Ian le Page, BRS40292 (GU)	516	148	76368
Yukio Masuda, JAI23967	563	125	70375
Ewald Bartunek, OE1109976	403	118	47554
Ilan Kazir, 4X4 1401	256	156	39936
Bob Hertzberg, WDX911K	286	88	25168
Anthony Newman, L40054 (VK4)	196	111	21756
Sohail Anjum, AP134/HZ	100	63	6300

PHONE MULTI-OPERATOR

Name/Station	QSOs	Country multipliers	Total
Ian Cuthbertson and Paul Constanza (Bravo Romeo DX Group) VK3-SWLs	126	55	6930

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

Alterations and additions to this list should be sent to the organizer Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex

Time	Callsign	MHz	Mode	Town	Notes
Sundays					
1015	G3CGD	1·875	A1A/A3E	Cheltenham, Glos	
1100	G2FXA	1·910	A1A/A3E/ J3E	Stockton-on-Tees	
1100	G3BLS	145·250	F2A	Osney, Oxford	[1]
1130	G4BFJ / G4DKK	144·625	F2A/F3E	Banstead, Surrey Tooting, SW London	
1200	G3PER	145·575	F2A/F3E	Heysham, Lancs	[1]
1200	G3HVI	145·250	F2A/F3E	Stoke-on-Trent, Staffs	[1]
1200	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1830	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1830	G4NHG	145·250	F2A/F3E	Stoke-on-Trent, Staffs	[1]
1830	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1845	G4OBK	1·875	A1A/J3E	Chorley, Lancs	
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G3LDW	144·160	A1A/J3E	Halesowen	[1]
2000	G4OJD	145·250	F2A/F3E	Brixham, Devon	[1]
2000	G4TKM	145·425	F2A/F3E	Birmingham	[1]
2005	G3OLU	145·375	F2A/F3E	Braintree, Essex	
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2030	G3ORP / G4UAQ	144·250	A1A/J3E	Maidstone, Kent	[6]
2100	G3HOH	144·525	F2A/F3E	Stockport, G Manchester	[1]
2100	G4EWK	144·850	F2A	Burton-on-Trent, Staffs	[7]
2100	GW4LLE	145·525	F2A/F3E	Haverfordwest, Dyfed	
Mondays					
1100	G4IRI	3·550	A1A/J3E	Bolton, Lancs	
1830	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1845	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1900	G3CMH/A	144·250	A1A/J3E	Yeovil, Somerset	[1]
1900	G8QR	145·250	F2A/F3E	Norwich, Norfolk	[1]
1900	G3TPY	145·275	F2A/F3E	Chester, Cheshire	[1]
1900	G4ILD / G3ZQS	145·400	F2A/F3E	Rishton, Lancs Darwen, Lancs	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1915	GM4RSJ	145·550	A2A/F3E	Prestwick, Strathclyde	[1]
1930	G4BFJ / G4DKK	144·625	F2A/F3E	Banstead, Surrey Tooting, SW London	
1930	GI3SXG	144·100	A1A/J3E	Newtownards, Co Down	
1930	G4LLU / G4JSQ	144·160	A1A/J3E	Wolverhampton, W Midlands	[1]
1930	G4NZA	144.650	A2A/F3E	Wellington, Somerset	[1]
1930	G4SXU	145·250	F2A/F3E	Harrogate, N Yorks	[1]
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
2000	G2FXA	145·525	F2A/F3E	Stockton-on-Tees	[1]
2000	G4IRI	3·550	A1A/J3E	Bolton, Lancs	
2000	G3GMS	145·250	F2A/F3E	Whitley Bay, T & W	[1]
2000	G4INM	145·250	F2A/F3E	Chelmsford, Essex	[1]
2000	G4PYR	1·880	A1A/J3E	Solihull, W Midlands	
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2030	G3ASR	1·875 / 144·175	A1A/J3E A1A/J3E (lsb)	Harrow, Middx	[1] [12]
2030	G2FKO	145·525	F2A	Bideford, Devon	
2030	G4ICC	3·535	A1A/J3E	New Duston, Northants	
2100	G3AVJ	145·250	F2A/F3E	Huyton, Merseyside	[1]
2100	G3WOR	144·250	A1A/J3E	Lancing, Sussex	[14]
2230	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
Tuesdays					
1100	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1200	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1845	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1900	G3WQK	144·775	F2A	Eastbourne, E Sussex	[1]
1900	G4RS	3·565 / 145·525	A1A/J3E F2A/F3E	Catterick, N Yorks	[1]
1915	GM4RSJ	145·550	A2A/F3E	Prestwick, Strathclyde	[1]
1930	G4BFJ / G4DKK	1·950 / 144·625 / 144·625	A1A/J3E F2A/F3E F2A/F3E	Banstead, Surrey Tooting, SW London	
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1930	G4DAL	145·575	F2A/F3E	Lancaster, Lancs	[1]
2000	G3VHE	145·350	F2A	Swindon, Wilts	[1]
2000	GM4ELV	144·250	A1A	Arrochar, Strathclyde	
2000	G4FEX	145·250	F2A/F3E	Horsley Woodhouse, Derbyshire	[1]
2000	G4INM	145·250	F2A/F3E	Chelmsford, Essex	[1]
2000	G4OJD	145·250	F2A/F3E	Brixham, Devon	[1]
2000	G4RCL	145·250	F2A	Great Yarmouth, Norfolk	[16]
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2030	G4PDP	144·250	A1A/J3E	Biggleswade, Beds	[1]
2030	G3IRM	1·975	A1A/A3E	Bury St Edmunds, Suffolk	
2030	G3OHM/A	144·180	A1A/J3E	Birmingham	
2030	G3KGU	1·910	A1A/A3E	Theydon Bois, Essex	
2030	G2FKO	145·525	F2A	Bideford, Devon	
2100	G4EWK	144·850	F2A	Burton-on-Trent, Staffs	[7]
2100	G3AVJ	145·250	F2A/F3E	Huyton, Merseyside	[1]
2100	G3HOH	144·525	F2A/F3E	Stockport, G Manchester	[1]
2200	G3AWL	144·110	A1A/J3E	Easington, Co Durham	[8]
2300	G4PEF	145·250	F2A/F3E	Willesden, London NW	[1]
2230	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
Wednesdays					
1100	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1830	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1845	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1900	G3TPY	145·275	F2A/F3E	Chester, Cheshire	[1]
1900	G4ILD / G3ZQS	145·400	F2A/F3E	Rishton, Lancs Darwen, Lancs	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1900	G2ABC	145·250	F2A/F3E	Truro, Cornwall	
1900	G3ULY / G4EXD	3·583 / 145·475	A1A F2A	Culgaith, Cumbria	[1]
1900	G3KWT	145·550	F2A/F3E	Leeds, Yorks	
1915	GM4RSJ	145·550	A2A/F3E	Prestwick, Strathclyde	[1]
1930	G4NNS / G4BFJ / G4DKK	144·625	F2A/F3E	Sunbury-on-Thames, Middx Banstead, Surrey Tooting, SW London	
1930	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1930	G4FKH	3·550	A1A	Chelmsford, Essex	[1]
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G4SXU	145·250	F2A/F3E	Harrogate, N Yorks	[1]
1930	G4LHI	145·250	F2A/F3E	Huntingdon, Cambs	[1]
2000	G4INM	145·250	F2A/F3E	Chelmsford, Essex	[1]
2000	G2FXA	144·250	A1A/J3E	Stockton-on-Tees	[1]
2000	GW4KDP	145·550	F2A/F3E	Barmouth, Gwynedd	[1]
2000	G3SWP	145·250	F2A/F3E	Doncaster, S Yorks	[1]
2000	G4BPI/A	145·475	F2A/F3E	Scarborough, N Yorks	[3]
2000	G4RCL	145·250	F2A	Great Yarmouth, Norfolk	[16]
2000	G4PYR	1·880	A1A/J3E	Solihull, W Midlands	
2030	G2FKO	145·525	F2A	Bideford, Devon	
2100	GW4LLE	145·525	F2A/F3E	Haverfordwest, Dyfed	
2130	GM4HYF	28·350 / 145·375	A1A F2A	SE Glasgow	[1]
2230	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
2300	G4PEF	145·250	F2A/F3E	Willesden, London NW	[1]
Thursdays					
1100	G4IRI	3·550	A1A/J3E	Bolton, Lancs	
1830	G4NHG	145·250	F2A/F3E	Stoke-on-Trent, Staffs	[1]
1830	G4ILD / G3ZQS	145·400	F2A/F3E	Rishton, Lancs Darwen, Lancs	[1]
1830	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1845	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1900	G3TPY	145·275	F2A/F3E	Chester, Cheshire	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1900	G3BLS	145·250	F2A	Osney, Oxford	[1]
1900	G3ZRZ	1·975	A1A/A3E	Blackpool, Lancs	
1900	G4RS	3·565 / 145·525	A1A/J3E F2A/F3E	Catterick, N Yorks	[1]
1915	GM4RSJ	145·550	A2A/F3E	Prestwick, Strathclyde	[1]
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G4BFJ / G4DKK	1·950 / 144·625 / 144·625	A1A/J3E F2A/F3E F2A/F3E	Banstead, Surrey Tooting, SW London	[15]
1930	G3ASR	1·875 / 144·175	A1A/J3E A1A/J3E (lsb)	Harrow, Middx	[1] [11] [12]
1930	G4NZA	144·650	A2A/F3E	Wellington, Somerset	[1]
2000	G2ACZ	1·819	A1A	Mablethorpe, Lincs	
2000	G4IRI	3·550	A1A/J3E	Bolton, Lancs	
2000	GM4ELV	144·250	A1A	Arrochar, Strathclyde	
2000	G4OJD	145·250	F2A/F3E	Brixham, Devon	[1]
2000	G4INM	145·250	F2A/F3E	Chelmsford, Essex	[1]
2000	G3GMS	145·250	F2A/F3E	Whitley Bay, T&W	[1]
2000	G4RCL	145·250	F2A	Great Yarmouth, Norfolk	[16]
2030	G2FKO	145·525	F2A	Bideford, Devon	
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2100	G3WOR	144·250	A1A/J3E	Lancing, Sussex	[14]
2100	G4EWK	144·850	F2A	Burton-on-Trent, Staffs	[7]
2100	G3AVJ	145·250	F2A/F3E	Huyton, Merseyside	[1]
2100	G3HOH	144·525	F2A/F3E	Stockport, G Manchester	[1]
2200	GM4HYF	28·350 / 145·375	A1A F2A	SE Glasgow	[1]
2230	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
Fridays					
1100	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1830	G4ILD / G3ZQS	145·400	F2A/F3E	Rishton, Lancs Darwen, Lancs	[1] [1]
1830	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1845	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
1900	G3TPY	145·275	F2A/F3E	Chester, Cheshire	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1900	G4FIM	145·550	F2A/F3E	Leeds, Yorks	
1930	G4ILW	145·550	F2A/F3E	Gateshead, T & W	[1] [10]
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G4IAV	145·275	F2A/F3E	Atherton, G Manchester	
1930	G3HVI	145·250	F2A/F3E	Stoke-on-Trent, Staffs	[1]
1930	G4BFJ / G4DKK	144·625	F2A/F3E	Banstead, Surrey Tooting, SW London	
2000	G3RR	145·550	F2A/F3E	Barnoldswick, Lancs	
2000	G4INM	145·250	F2A/F3E	Chelmsford, Essex	[1]
2000	G4RCL	145·250	F2A	Great Yarmouth, Norfolk	[16]
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2030	G3CAR	144·625	F2A/F3E	High Wycombe, Bucks	[1]
2030	G2FKO	145·525	F2A	Bideford, Devon	
2100	G3AVJ	145·250	F2A/F3E	Huyton, Merseyside	[1]
2200	G3AWL	144·110	A1A/J3E	Easington, Co Durham	[8]
2230	GM4RZJ	145·475	F2A/F3E	Thurso, Caithness	[1]
Saturdays					
1200	G3GNS	1·910 / 3·550 / 144·250	A1A	Locking, Avon	[13]
1830	GM4RZJ	145·275	F2A/F3E	Thurso, Caithness	[1]
1900	G3RLO	144·525	F2A/F3E	West Bridgford, Notts	[1]
1930	GW4OXB	145·275	F2A/F3E	Swansea, West Glam	[1]
1930	G4TDQ	144·160	A1A/J3E	Wolverhampton, W Mids	[1]
2000	G4FEX	145·250	F2A/F3E	Horsley Woodhouse, Derbyshire	[1]
2000	G4TKM	145·425	F2A/F3E	Birmingham	[1]
2030	G2FKO	145·525	F2A	Bideford, Devon	
2030	G4NRO	144·525	F2A/F3E	Atherton, G Manchester	[1]
2100	GW4LLE	145·525	F2A/F3E	Haverfordwest, Dyfed	

Notes

All times are clock time
[1] Omnidirectional
[2] Horizontal to SE
[3] Vertical to S
[4] Horizontal to NW
[5] Vertical to E
[6] Tilted polarization to N and S
[7] To SW
[8] To S
[9] To NE
[10] Vertical to N
[11] First and third Thursdays in each month
[12] Horizontal
[13] Reports to RAFARS Locking
[14] Horizontal to E and W
[15] Starting speed 12wpm
[16] Vertical to W

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, plus basic unchanged information on other affiliated organizations which was last published in the **July 1983** issue. Unchanged details will be published again in **July 1984.**

RSGB affiliated organizations are requested to report all programmes and news items to their regional representatives regularly. Information for inclusion in the **March** issue should reach them by **5 January** and for the **April** issue by **8 February.**

Club programmes are given in order of date, subject time and place of the 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 W. R. Parkinson, G3FNM, 141 Norris Road, Sale, Cheshire M33 3JR. Tel 061 973 1472.

Area representatives in Region 1

G. L. Adams	G3LEQ	Knutsford
E. C. Baines	G6CQZ	Bacup
A. M. Cooper	G3TKD	Chester
B. Donn	G3XSN	Liverpool
I. F. M. Duthie	G8TCJ	Carlisle
D. Fleet	G8MAI	Stoke-on-Trent
J. R. Fogg	G8UZZ	Wirral
F. Harrison	G3XII	Leyland
J. Heywood	G4IAL	Hazel Grove
N. Horrocks	G2CUZ	Ainsdale
N. Jenkin	G4CGT	Darwen
G. Lancefield	G3DWQ	Walton-le-Dale
A. B. Langfield	G3IOA	Manchester
A. Leaver	G4ECB	Colne
R. J. B. Morgan	GD3KGC	Douglas
R. F. Redhead	G4FXG	Poulton-le-Fylde
E. A. Thorne	G3ART	Crosby, Nr Maryport
D. A. Yorke	G4JLG	Worsley

Accrington (NW Repeater Group)—19 January, 8pm. Globe Bowling Club, Willows Lane, Accrington. Sec Howard Aspinall, G3RXH.

Ainsdale (AARC)—Alternate Tuesdays. 3 January (AGM), 17 January (CW practice), 31 January (CW practice), other Tuesdays (Noggin and natter). Ainsdale Scout HQ. Details from sec David Norris, G4TUP, 148 Sefton Street, Southport PR8 5DA, tel 35947.

Barnoldswick (Rolls-Royce ARC)—4 January (Surplus equipment sale), 1 February (Micro night—bring along your computer to show what it can do—monitors will be available), 8pm. Rolls-Royce Sports & Social Club, Barnoldswick. Morse classes Mondays, 7.30pm. Sec Leslie Logan, G4ILG, tel 0282 812288.

Blackburn (East Lancs ARC)—First Tuesday in each month, 7.30pm. Shadsworth Leisure Centre, Blackburn. Sec Simon Eatough, G4GVQ, tel 0254 57864.

Bolton (B & DARS)—Wednesdays, 8pm. Horwich Leisure Centre, Horwich. Pro Keith Pope, G6CGZ, tel 0204 62443.

Bolton (BTC ARC)—Details from sec c/o Electronics Dept, Bolton Technical College, Manchester Road, Bolton.

Bolton (Edbro RC)—Details from A. L. Brown, c/o Edbro Ltd, Lever Street, Bolton.

Bolton (Norweb ARC)—Information from C. J. Moulding, G4HYG, c/o Sports & Social Club, Norweb Electricity, Manchester Road, Bolton BL3 2QN.

Bolton (Red Rose RS)—Details from sec Geoff Mollison, G8VCW, tel Bolton 21424.

Bury (BRS)—10 January ("Fault finding techniques", by Fred Burnett, G3RSM, together with a panel of experts to diagnose faults in equipment brought to the meeting), 3, 17, 24, 31 January (Informal), 8pm. Mosses Community Centre, Cecil Street, Bury. 5 February (Sunday Ham Feast—the rally with a difference, commencing 11am at the above venue. Talk-in on S22). Sec Brian Tyldsley, G4TBT, 4 Colne Road, Burnley, tel 0282 24254.

Carlisle (Border Television ARC)—Details from sec, Border Television Ltd, Television Studios, Carlisle, Cumbria.

Carlisle (ARS Cumbria)—Details from Mr D. Youngman. C/Avionics, RAF, Carlisle, Cumbria.

Chester (C & DRS)—Tuesdays except the first Tuesday in each month, 8pm. Chester RUFC, Hare Lane, Vicars Cross, Chester. Sec Chris Hopley, G8ICT.

Congleton (CARC)—Details from RS42758, 156 Holmes Chapel Road, Congleton, Cheshire CW12 4QB.

Crewe (South Cheshire ARS)—Second Monday in each month. RAOB Social Club, Earle Street, Crewe. Sec B. G. F. Roe, G4LVR, tel 0270 665661.

Eccles (E & DARS)—Tuesdays, 8pm. The Duke of York Hotel, Church Street, Eccles. Sec Chris Harrison, G8KRG, 53 Peveril Close, Whitefield, Manchester M25 5NS, tel 061-773 7899.

Fylde (FARS)—3 January (AGM), 17 January (Informal meeting with morse class), 7 February ("Public service radio", by John Parkinson, G6DNK), 7.45pm. Kite Club, Blackpool Airport. Pro F. Whitehead, G4CSA, tel 0253 737680.

Isle of Man (IoMARS)—Mondays, 8pm. Keppel Hotel, Creg-Ny-Ba. Sec Anthea Matthewman, GD4GWQ.

Kendal (Westmorland RS)—Second Tuesday in each month. Strickland Arms on the A6 near Kendal. Sec Neil Martin, G6OPO, tel 0539 31476.

Leyland (LHARG)—Second Monday in each month, 7.30pm. Astley Park Sports Club, Hallgate, Astley Village, Chorley. Sec Arthur Jolly, G4JCO.

Liverpool (L & DARS)—3 January ("Flight control", by G6DXF), 10 January (Natter night), 17 January (Junk sale), 24 January (Visit by a representative of Melbren Air), 31 January ("Operating techniques", by G3XSN), 7 February (Natter night), 8.15pm. Wavertree Conservative Club, Church Road, Liverpool 15. Sec Alan White, G6XBN, 325 Brodie Avenue, Liverpool L19 7NE, tel 051-427 3243.

Liverpool (Riverside ARS)—Details from sec, c/o Dept of Elect & Rad Engineering, Riversdale College of Technology, Liverpool L19 3QR.

Liverpool (Sefton ARC)—Alternate Wednesdays. Liverpool Prison Officers Social Club, Hornby Place, off Hornby Road, Walton, Liverpool. Sec Mike Webb, G6ICR, tel 051-487 0756.

Liverpool (UoLARS)—Informal meetings in the shack each lunchtime at the top of the Old Union Building, 2 Bedford St North, Liverpool 7. Enquiries to sec Haroon Lakhaney, c/o Rad Soc, Guild Office, 2 Bedford Street North, Liverpool 7.

Macclesfield—Second and fourth Tuesdays each month, 8pm. Fermain Club, Oxford Road, Macclesfield. Sec Dave Lucas, G6HLQ, tel Macclesfield 28610.

Manchester (ICLR&ES)—Information from sec c/o 4TB, International Computers Ltd, Wenlock Way, West Gorton, Manchester M12 5DR.

Manchester (M & DARS)—Wednesdays, 7.30pm. Newton Heath Community Centre, 203 Droylsden Road, Newton Heath, Manchester. Sec John Dent, G4LRR.

Manchester (MUARS)—Informal meetings most lunch-times and Wednesday afternoon in the shack on the first floor on the north side of the Students' Union Buildings. Sec Richard Skobelski, G6ROQ. Enquiries for atv skeds on 70cm for 1984 to the society.

Manchester (Openshaw TCRC)—Information from the college, Whitworth Street, Openshaw, Manchester M11 2WH.

Manchester (South Manchester RC)—6 January (Mini lecture contest), 13 January ("The good old days", by Don Barber, G2AKR), 20 January ("Digital speech", by Geoff Laing, G6KLQ), 27 January (Films: "One man's meat", and "This is ham radio"), 3 February (Radio clinic), 8pm. Sale Moor Community Centre, Norris Road, Sale. Informal meetings in club shack Mondays. Sec David Holland, G3WFT, tel 061-973 1837.

Manchester (UMIST RS)—During term time, Wednesday afternoons in the shack on L floor in the main building. Thursdays, 8pm, in the Union Bar. Contacts are Dave Crye, G6BSK, or Dave Brooke, G6GZH, c/o Shack, tel 061-236 3311, ext 2945, or c/o Radio Society, UMIST Union, Box 88, Sackville Street, Manchester M60 1QD.

Manchester (West Manchester RC)—Wednesdays, 8pm. Atherton & Tyldesly Scout HQ, Shuttle Street, Tyldesly. Sec Dennis Tennant, G4KCB.

Maryport (Solway RC)—Information from sec J. Aldersey, Maryport Educational Settlement, High Street, Maryport, Cumbria CA15 6BQ.

Morecambe (MBARS)—Fortnightly meetings. Details from sec Bill Delamere, G3PER, tel 0524 52659.

Oldham (OARC)—Mondays, 8pm. Devonshire Arms, 13 Elliott Street, Lees, Oldham. Sec Mrs F. Butterworth, G4SPX, 26 Torwood Road, Chadderton, Oldham OL9 0RA, tel 061-652 8862.

Ormskirk (O & DARC)—Contact sec Mike Coverdale, G4LTI, tel 0695 78326, for programme and venue.

Penrith (Eden Valley RS)—Third Thursday in each month, 7.30pm. Two Lions Hotel, Great Dockray, Penrith, Cumbria. Club net 7pm, Thursdays, 3·650MHz. Sec Stuart Marsh, G4JHV, tel 0768 88260.

Preston (PARS)—Alternate Thursdays, 8pm. Lonsdale Club, Fulwood Hall Lane, Fullwood, Preston. Sec George Earnshaw, G3ZXC, tel 0772 718175.

Rossendale (Rossendale Valley ARC)—Wednesdays, 8pm. 4 Bacup Road, Rawtenstall. Sec Mrs Celia Adams, G6GZM, tel 0706 220935.

St Helens (StH & DARC)—Thursdays, 7.45pm. Conservative Rooms, Boundary Road, St Helens. Pro Alan Manchester, G6FJU, tel 0744 56889.

Salford (Dial House RS)—Wednesdays, 5.30pm. Dial House, 21 Chapel Street, Salford. Details from sec, Manchester Central Area Sports & Social Club, c/o M43, Dial House.

Salford (UoSCS)—Wednesday afternoons from 1.30pm. Shack on the top floor of the Clocktower, The Pavilion, Castle Irwell Students Village. Contact Paul Wells, G4GMV, c/o SUCS, Students Union, University of Salford, University Road, Salford M5 4WT.

Skelmersdale (S & DARC)—Thursdays, 8.30pm. Dunlop Sports & Social Club, Skelmersdale. Sec George Rogers, 113 Foxfold, Fosters Green, Skelmersdale.

Stockport (SRS)—Second and fourth Wednesdays in each month, 8pm. Blossoms Hotel, corner of Bramhall Lane and Wellington Road, Stockport. Sec Stan Aspinall, G3VSA, tel 061-437 1437.

Tarporley (Mid-Cheshire ARS)—Wednesdays, 8pm. Cotebrook Village Hall, Sadlers Lane, off the A49, Tarporley. Sec Rick Dodd, G8PNL, tel Winsford 57766.

Thornton Cleveleys (TCARS)—Mondays, 7.30pm. Norbreck 1st Scout Hut, Carr Road, Bispham. Sec Miss Janet Atkinson, 26 Lancaster Avenue, Thornton Cleveleys, tel Blackpool 826451.

Wallasey (St Dunstan's ARS)—Information from E. C. John, G3SEJ, 52 Broadway Avenue, Wallasey, Merseyside L45 6TD.

Warrington (WARC)—Tuesdays, 7.30pm. Grappenhall Community Centre, Bell House Lane, Warrington. Sec Bill Green, G8HLZ, tel 0925 814740.

Warrington (Racal Communication RS)—Information from sec, c/o Racal Communications Ltd, Chesford Grange, Warrington, Cheshire W81 4RH.

Warrington (UKFM Group Western)—5 January, 2 February, 8pm. Grappenhall Community Centre, Bell House Lane, Warrington. Sec Gordon Adams, G3LEQ, tel 0565 4040.

Warrington (10th Warrington Scout Group ARC)—Information from sec, c/o 41 Highfield Avenue, Great Sankey, Warrington, Cheshire WA5 2TW.

Wigan (Douglas Valley ARS)—Thursdays except the second in each month. Shevington Conservative Club, Shevington, Wigan. Sec Dave Harrison, G4NDJ.

Wigan (WCTARC)—Information from J. R. Hesford, Dept of Electrical Engineering, Wigan College of Technology, Parsons Walk, Wigan WN1 1RR.

Wirral (WARS)—4 January (Sale of surplus equipment), 18 January (Film night "Satellite communications"), 1 February ("Insight into microprocessors", by Frank Smith, G3YGL), 7.45pm. Guide Hut, Westbourne Road, West Kirby. Sec Cedric Cawthorne, G4KPY, tel 051-625 7311.

Wirral (W & DARS)—11 January (AGM), 25 January (Junk sale), 8pm. Irby Cricket Club, Mid Hill Road, Irby. D & Ws on 4 January. Green Lodge, Hoylake; 18 January, Victoria Lodge, Tranmere. 1

February, Bassett Hound, Thingwall. Sec Gerry Scott, G8TRY, tel 051-630 1393.
Woodford (RATEC)—Mondays, 8pm. British Legion Club, Moor Lane, Woodford. Sec N. D. Spears, G4RWI, 58 Cheadle Road, Cheadle Hulme, Cheshire.

REGION 2—RR to be appointed
Area representatives in Region 2

G. S. Bates	G6RIL	Maltby
S. A. Berry	G4IWR	Hull
P. N. Butterfield	G4AAQ	Pontefract
K. R. Cass	G3WVO	York
K. M. Cleary	G4ATZ	Wetherby
J. Clegg	G3FQH	Huddersfield
B. Crisp, MA FRSA	G5PW	Cleckheaton
I. R. Firth	G3WWF	Leeds
J. R. Simpson	G3CAA	Scarborough
S. Thompson	G4RCH	Leeds & Morley
M. J. Topham	G8NUC	Bradford
M. J. Valentine	G4ANP	Mexborough

Barnsley (B&DARC)—Mondays, 7.30pm. Warren Hotel, Quarry Lane, Barnsley. The club is in the process of preparing new premises, which will include a 90ft tower. Details from K. W. Roberts, 2 Earning View, off Twibell Street, Barnsley, tel Barnsley 297365.
Barnsley (UK FM Group Northern)—First Sunday in each month. 7.30pm. The Royal Hotel, Barnsley. The club thinks it would be nice to see as many members as possible at these monthly meetings. Details from sec G4LUE.
Denby Dale (DD&DARS)—Second and fourth Wednesday in each month, 7.30pm. Pie Hall, Denby Dale. Sec J. Clegg, G3FQH.
Doncaster (DMIofHEARC)—Mondays, 8pm. Gertrude Bell Hall, Church Street, Armthorpe, Doncaster. Sec Brian Coupe, G8GTG, tel Don, 770663. Club call is G3UER.
Goole (GR&ES)—Tuesdays, 3 January (Natter night), 10 January (Video evening), 17 January (On the air), 24 January (Short wave listening), 31 January (Computing night). 7.45pm. Junior Chamber Buildings, Boothferry Road, Goole. Details from G8IOH or G8VHL.
Halifax (H&DARS)—First and third Tuesday in each month, 7.30pm. The Running Man PH, Pellon Lane, Halifax. Details from sec David Moss, tel Halifax (0422) 202306.
Halifax (Northern Heights ARS)—First and third Wednesday in each month, 8pm. Bradshaw Tavern, Bradshaw, Halifax. Sec G6CJL, 5 Park Fields, Moor End Road, Halifax HX2 0RF, tel Halifax 54635. Club net frequency 145·275MHz.
Harrogate Repeater Group—By the time you read this the equipment should be at the site and may even be operational. Chairman G4ATZ.
Hornsea (HARS)—Wednesdays, 8pm. The Mill, Mill House, Atwick Road, Hornsea. Sec M. Willerby, G4MWE.
Hull (H&DARS)—Mondays, 7.30pm, cw classes. Tuesdays and Thursdays, 7.15pm, RAE classes. Fridays, club night. West Park Recreation Centre. Walton Street, Anlaby Road, Hull. Sec G6VOM.
Hull (HUR&ES)—Tuesdays, 1.15pm. Room 313B, University Union Building, Cottingham Road. Details from G4KWZ or G4EZP, c/o Hull Students' Union.
Leconfield (Army School of Mechanical Transport, ASMT/RCTARS)—Fridays, 7pm, and coffee at lunch times. Signals Division, Normandy Barracks, Leconfield. CW classes, 7pm, Fridays. Sec G4NQI, address as above.
Leeds (British Young Ladies Amateur Radio Association)—Sec G4EZI, Mrs D. Hughes, 3 Primley Park Crescent, Leeds LS17 7HY.
Leeds (White Rose RS)—Wednesdays, 8pm. Moortown Rugby Football Club, Moss Valley, Alwoodly, Leeds 17. Club net, 8pm. Thursdays, 3·775MHz, or 21·35MHz, depending on propagation. Sec G6HBY, tel 0532 576887, pro G4OAT.
Leeds (L&DARS)—Mondays, 8pm. Old Hall Golf Club, Woodhall Lane, Calverly, Leeds. Sec G6CJI, tel Dewsbury 455516.
Maltby (MARS)—Fridays. Methodist Church Hall. Blyth Road, Maltby. Sec G3ZHI, tel 0909 814911.
Manden (Pennine ARS)—New club. Meetings fortnightly. The Olive Branch Inn, Manchester Road, Manden. Details from J. S. Shaw, G4RAJ, 48 Oaklands Drive, Dalton, Huddersfield HD5 8PR, tel Huddersfield 35955.
Mexborough (M&DARS)—Fridays, 8pm. Harrop Hall, Dolcliffe Road, Mexborough. Sec Mrs G. Drohan, 5 Swinburn Avenue, Adwick-le-Street, Doncaster.
Otley (OARS)—Tuesdays, 8pm. RAOB Club, Otley. Correspondence to joint secs A. Jordan, G6SPU, and P. Tootill, G6OAC, tel 0532 504381.
Pontefract (P&DARS)—First Thursday in each month, 8pm. The Carleton Community Centre, Pontefract. Pro G4TGU, tel Leeds 871484.
Ripon (R&DARS)—Thursdays, 7pm. St John Ambulance Hall, Ripon. Sec G6CUG, tel 0845 24945. Club call G4SJM.
Scarborough (SARS)—Mondays, 7.30pm. Scarborough Cricket Club, North Marine Road, Scarborough. Sec G6CXK.
Sheffield (SARS)—First and second Monday in each month. Firth Park Pavilion, third Monday (Informal). Sheaf House Hotel, Bramell Lane, Sheffield. Sec G8VQS, tel 0246 31696.
Spen Valley (SVARS)—Thursdays, 8pm. Old Bank Working Men's Club, Mirfield, W Yorks. Sec G4MNW.
Wakefield (NWRC)—Thursdays, 7.45pm. Carr Gate Working Man's Club, Wakefield. Sec G4RCH, tel 0532 536633.
Wakefield (W&DRS)—Second and fourth Tuesday in each month, 8pm. Room 2 Kingswell Suite, Holmfield House, Denby Dale Road, Wakefield. The society has two 144MHz 16-element Tonna beams, and a Datong morse tutor, which can be hired by members. Details from sec Walter Parkin, G8PBE, tel Wakefield 378727.
Wharfdale Repeater Group—Sec G3KKP.
York (YARS)—Fridays, 7.30pm. United Services Club, Micklegate, York. Sec Keith Cass, G3WVO.

REGION 3—RR L. W. Craven G4EQI, Grass Moor, Radford Road, Alvechurch, Birmingham B48 7DT. Tel 021445 1347.

Area representatives in Region 3

W. F. M. Hahn,	G3UOL	Coventry
J. K. Harvey,	G4IVJ	S Birmingham
S. H. Jesson,	G4CNY	Hereford
B. A. Jones,	G8ASO	Worcester

Atherstone (AARC)—Second and third Thursdays in each month, 7.30pm. Tudor Centre, Coleshill Road, Atherstone. Sec G6BEO, tel Hinkley (0455) 212051.
Birmingham (Midland ARS)—17 January ("Nuclear power", by G6JEB), 7.30pm. 294a Broad Street, Birmingham B1 2DS. Sec G8BHE, tel 021-422 9787.
Birmingham (Slade RS)—First Friday in each month, 7.45pm. Kingsbury Road Community Centre, 75 Kingsbury Road, Erdington, Birmingham. Sec G4FGF, tel 021-770 3474.
Birmingham (South Birmingham RS)—Regular lectures first Wednesday in each month. Thursdays, hf night on the air, Fridays, construction and morse classes, 7.30pm. Hampstead House, Fairfax Road, (Condover Road) West Heath, Birmingham B31 3QY. Sec G8RGQ, tel 021-459 8312.
Birmingham (University of Aston ARS)—Activities on hf, vhf and uhf. Club rigs available. Callsigns G3UOA and G8PGM. Meets Fresher Fayre, 1pm, Chairman M. Beach, St Peters College, College Road, Birmingham B3 3TE.
Birmingham (UoBARS)—Very active in contests and holds RAE class. Meets every lunchtime during term, and Fridays, 7.30pm. Club room on second floor of Students Union, side entrance near Midland Bank. Sec Martin Alcock, G6KJJ, Guild of Students, Edgbaston Park Road, Birmingham.
Bromsgrove (BARS)—Second Tuesday in each month. Very active with display stations and contests. Rigby Lane School, Rigby Lane, Bromsgrove, 8pm. Sec Alan, G4LVK, tel 021-445 2088.
Bromsgrove (B&DARS)—Fridays, 8pm. Club intends to enter annual SSB NFD Contest also special event stations. Avoncroft Art Centre, Bromsgrove. Asst sec G4NWQ, tel 021-476 6965.
Burton-on-Trent (B-on-T&DARS)—Wednesdays, 8pm. Stapenhill Institute, Main Street, Stapenhill, Burton-on-Trent. Sec G3ACR, tel Burton (0283) 43118.
Cannock Chase (CCARS)—Thursdays, 8pm. Bridgtown War Memorial Club, Union Street, Bridgtown, Cannock Chase. Pro G8HZP, tel Cheslyn Hay (0922) 416419.
Coventry (CARS)—6 January (Computer evening), 13 January (G2ASF on the air), 20 January (Annual dinner), 27 January (G2ASF on the air), 8pm. Baden Powell House, 121 St Nicholas Street, Radford, Coventry. Sec Dave, G8OMB, tel Coventry (0203) 396936.
Coventry (CTARS)—Mondays, 7pm. Winfray Annexe, Coventry Technical College. Chairman Roger, G3ZFR, tel Coventry (0203) 365117.
Droitwich (DARC)—First Monday in each month, 8.30pm. Scout HQ, Station Road, Droitwich. Sec G4HFP, tel Stourport-on-Severn (02993) 3818.
Dudley (DARC)—24 January ("Running a successful cinema" by Michael Jackson), 7.45pm. Central Library, Dudley. Sec Mrs Wilding, G4SQP, tel Codsall (209) 5636.
Halesowen (MEB Sports & Social Club)—First and fourth Tuesdays in each month, 10 January (General meeting) 8pm. MEBHQ Social Club, Mucklow Hill, Halesowen. Sec G4RWH, tel 021-747 8784.
Hereford (HARS)—Meetings first and third Fridays in each month, 8pm. Lord Scudamore School, Friar Street, Hereford. Informal meetings held at Antelope Inn, Barton Street, Hereford. Sec G4CNY, tel Hereford (0432) 273237.
Kidderminster (K&DARC)—Tuesdays, fortnightly, 8pm. Aggborough Community Centre, Hoo Road, Kidderminster. Sec G8WOX, tel Kidderminster (0562) 751584.
Lichfield (Lichfield Chad RC)—Mondays, 8.30pm. Naval Club, Burton Old Road, Lichfield. Sec Grahame, G4ESK, tel Lichfield (54) 23919.
Malvern Hills (MHRAC)—Second Tuesday in each month, 7.30pm. Red Lion Inn, St Ann's Road, Malvern. Sec Steve, G4GFX, tel Malvern (06845) 62900.

At the Scarborough "Focus on Leisure" exhibition, the Mayor, Councillor David Jeffels, is shown with, l to r: Margaret Crofts; Eric McKie, chairman of Scarborough Council for Voluntary Service, and Mick Jefferson, chairman of Scarborough ARS. *Photo* courtesy of Scarborough and District Newspapers Ltd

Much Wenlock (Wenlock ARES)—Second and fourth Monday in each month, 8.30pm. Raven Hotel, Much Wenlock. Sec Ed, G3ZSL, tel Bridgnorth (0746) 861332.
Redditch (RRC)—Second and fourth Thursday monthly, 8pm. WRVS Centre, Ludlow Road, Redditch. Sec Ray, G3EVT, tel Alcester (0789) 762041.
Rugby (RATS)—Wednesdays, 7.30pm. Cricket Pavilion entrance to B Building, Rugby Radio Station, A5 trunk road, Hillmorton, Rugby. Sec Barry, G4ECO, tel Rugby (0788) 75935.
Shrewsbury (Salop ARS)—Thursdays, 8pm. Albert Hotel, Smithfield Road, Shrewsbury. Sec G3UQH, tel Shrewsbury (0743) 83375.
Solihull (SARS)—17 January ("Home construction—QRP", by Rev George Dobbs, G3RJV), 7.30pm. The Manor House, High Street, Solihull. Sec G6HSZ, tel 021-742 3378.
Stafford (S&DARS)—Tuesdays 8pm. Coach & Horses Motel, Pasturefields, Staffs. Sec G4RSW, tel Stafford (0785) 46306.
Stoke-on-Trent (North Staffs ARS)—Mondays, 7.30pm. Harold Clowes Community Centre, off Dawlish Road, Bentilee, Stoke-on-Trent. Sec Kevin G8FGR, 61 Westacre, Bucknall, Stoke-on-Trent.
Stoke-on-Trent (SonTARS)—Thursdays, 7.30pm. 2a Racecourse Road, Oakhill Road, Stoke-on-Trent. Sec G4IMV, tel Newcastle (0782) 613207.
Stourbridge (StARS)—2 January (Informal), 16 January (Annual constructors contest), 8pm. The Garibaldi, Cross Street, Stourbridge. Sec Malcolm, G8JTL, tel Lye (593) 4019.
Stourbridge (Wordsley)—First and third Thursdays in each month, 12 January ("Effects of the Solar System on amateur radio," by G6YQH), 26 January ("Effects of IEE regulations on amateur radio", by Tony Sands), 8pm. Vine Inn, Camp Hill, Wordsley, West Midlands. Sec Andrew, G4TGM, tel Kingswinford (2) 295082.
Stratford-upon-Avon (S-upon-A&DARC)—9 January ("Maritime radio services", by Terry, G3MXH), 23 January (Construction evening). The Control Tower, Bearley Radio Station, Bearley, nr Stratford-on-Avon. Sec David, G8OVC, tel Stratford (0789) 750584.
Sutton Coldfield (SCARS)—Lectures second and fourth Monday in each month. Central Library, Sutton Coldfield. Sec G8TUR, tel 021-353 2061.
Tamworth (TARS)—Second Monday in each month, 8pm. The Rugby Club, Cotton Green, Tamworth. Sec G4BKA, tel Tamworth (0827) 283952.
Telford (T&DARS)—Wednesdays, 8pm. Phoenix Centre, Webb Crescent, Dawley. Sec G8UGL, tel Telford (0952) 584173.
Walsall (WARS)—Wednesdays, 8pm. Regular morse instruction. Forest Community Centre, Hawbush Road, Leamore, Bloxwich. Sec Bob, G4FAJ, tel Brownhills (05432) 2169.
Warwick (Mid-Warwickshire ARS)—10 January (Discussion evening), 24 January (Members are invited to bring their homebrew equipment), 8pm. 61 Emscote Road, Warwick. Sec Carol, G6LKP, tel Southam (092681) 4765.
Willenhall (W&DARS)—Alternate Wednesdays, 8pm. Saracens Head, Bloxwich Road South, Willenhall. Sec David, G4FAQ, tel Wolverhampton (0902) 730300.
Warwick University—Affiliated but no news received since 1977! Last known address, University of Warwick ARS, Students Union, Coventry. CV4 7AL. Anyone with information, please contact G4EQI, RR3.
Wolverhampton (WARS)—Mondays, 8pm. Chamber of Commerce & Industry, 93 Tettenhall Road, Wolverhampton. Sec David, G6AKN, tel Wolverhampton (0902) 782883.
Worcester (W&DARC)—9 January (Discussion evening), Oddfellows Club, New Street, Worcester. 23 January (Informal), Pheasant Inn, New Street, Worcester, 8pm. Sec Alasdair, tel Evesham (0386) 41508.

REGION 4—RR M. Shardlow, G3SZJ, 19 Portreath Drive, Darley Abbey, Derby DE3 2BJ. Tel Derby (0332) 556875.

Area representatives in Region 4

B. Bennett	G3EAM	Lincoln
J. C. Burbanks	G3SJJ	Nottingham
A. W. Faint	G6GWH	Leicester
A. R. Kiddle	G4HVC	Newark
D. H. Lander	G4LQL	Mansfield
F. Pickersgill	G3XXN	Worksop
J. Shardlow (Mrs)	G4EYM	Derby
J. A. Sheardown	G8TIY	Scunthorpe
B. Thompson	G4KAL	Grimsby

Chesham & DARS have recently started a weekly construction course. Ann Webber (l) and Shirley Hesketh, G4HES, are seen here on the "first night". *Photo:* J. Alldridge, G4UXA

Bolsover (BARS)—Wednesdays, 7.30pm. The Angel Hotel, Bolsover. Sec Ian Mellows, G6KCZ, tel Mansfield 811129.
Bourne (BARS)—First and third Tuesdays in each month, 7.30pm. Village hall, Edenham. Sec Ian Bothwell, G6SBE, tel Bourne 424426.
Buxton (BARS)—10 January ("Home construction", talk by G8TYY), 24 January (Informal), 8pm. Egerton Hotel, 36 St Johns Road, Buxton. Sec Derek Carson, G4IHO, tel Buxton 5006.
Derby (D&DARS)—4 January (Junk sale), 11 January (Year in retrospect), 18 January ("The Secret War" or "What did you do in the war Daddy?"), 25 January (Natter night), 1 February (Junk sale), 7.30pm. 119 Green Lane, Derby. Sec Jenny Shardlow, G4EYM, tel Derby 556875.
Derby (NHARG)—Fridays, 7.45pm. Nunsfield House, Boulton Lane, Alvaston, Derby. Sec Ian Cage, G4CTZ, tel Derby 799452.
Eastwood (Notts & Derby Border ARC)—Tuesdays, 7.30pm. Hand & Hart, Cotmanhay. Sec Peter Fretwall, G4UFC, tel Ilkeston 302990.
Grantham (GRC)—Third Tuesday in each month, 8pm. Shirley Croft Hotel, Harrowby Road, Grantham. Sec John Kirton, G8WWJ, tel Grantham 5743.
Grimsby (GARS)—Alternate Thursdays, 7.30pm. Cromwell Social Club, Cromwell Road, Grimsby. Sec Reg Scarlett, G4HZF.
Heanor (SE Derbyshire ARS)—Tuesdays, 7.30pm. SE Derbyshire College, Ilkeston Road, Heanor. Sec S. Cope, G6ETO, tel Langley Mill 3753.
Hinckley (HARES)—Wednesdays, 7.30pm. John Cleveland College, Butts Lane, Hinckley. Sec Tony Chamberlin, G6HQT, tel Leicester 870137.
Ibstock (IARS)—Sec Ted Bowen, G4JKQ, tel Ibstock 60396.
Leicester (Leicester Repeater Group)—Sec Geoff Dover, G4AFJ, tel Nottingham 875200.
Leicester (LRS)—Mondays, 7.30pm. Sundays, 10.30am. Gilroes Cottage, off Groby Road, Leicester. Sec Frank Elliott, G4PDZ, tel Leicester 871086.
Leicester (Radio Camping & Caravan Club)—Sec Roger Bridgewater, G8RRB, tel 0543 432652.
Loughborough (L Falcon ARC)—Fridays, 8pm. Brush Sports & Social Club, Fennel Street, Loughborough. Sec Peter Crooks, G4KGG, tel Loughborough 268561.
Louth (L&DARS)—First Wednesday in each month, 7.30pm. Church Rooms, Eastgate, Louth. Sec Chuck Turner, G8ZVF, tel Grimsby 822482.
Lincoln (LSWC)—11 January ("Aurora—what causes it?", tape/slides by G2FKZ), 25 January (Activity night/night on the air), 8pm. City Engineers Club, Waterside South, Lincoln. Sec Pam Rose, G4STO, tel Gainsborough 788356.
Mansfield (MARS)—First Friday and third Tuesday in each month, 7.30pm. Victoria Social Club, Princes Street, Mansfield. Sec Duncan Walters, G4DFV, tel Mansfield 648679.
Mansfield (Central Notts VHF C)—Sec Graham Ridgeway, G8UYD, tel Mansfield 652093.
Melton Mowbray (MMARS)—20 January ("Simple construction techniques", by G4NNZ), 7.30pm. St John Ambulance Hall, Asfordby Hill, Melton Mowbray. Sec Richard Winters, G3NVK, tel Melton Mowbray 63369.
Newark (N&DARS)—5 January (AGM), 7.30pm. Palace Theatre, Appleton Gate, Newark. Sec Roger Hiscock, G4MDV, tel East Stoke 539.
Nottingham (ARCON)—5 January (Forum), 12 January (HF propagation, by G3SJJ), 19 January (Activity night), 26 January ("The RSGB and you", by G3SZJ), 2 February (Forum), 7.30pm. Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham. Sec Phil Barber, G4OSL.
Stamford (S&DARS)—4 January (AGM), 18 January (TBA), 8pm. The Anchor Hotel, Stamford. Sec David Bradberry, G4OZM, tel Stamford 54433.
Scunthorpe (S&DARC)—Tuesdays, 7.30pm. Grange Farm Hobbies Centre, Franklin Crescent, Scunthorpe. Sec Joe Sheardown, G8TIY, tel Scunthorpe 732438.
Skegness (S&DARS)—First and third Tuesdays in each month, 7.30pm. The White Swan, Burgh-le-Marsh, Skegness. Sec Clive Ironmonger, G6HYF.
Spalding (S&DARC)—Second Friday in each month, 8pm. The Maple Room, White Hart, Market Place, Spalding. Sec Ian Buffham, G3TMA, tel Spalding 3845.
Wigston (WRC)—Fridays, 7.30pm. United Reform Church, Wigston Magna. Sec Roy Tabberer, G6HAJ, tel Leicester 403107.

REGION 5—RR J. S. Allen, G3DOT, 77 Rosslyn Crescent, Luton LU3 2AT, Bedfordshire. Tel 0582 21151, works or 0582 508515 home.

Area representatives in Region 5

L. Critchley	G3EEL	Peterborough
C. M. Goadby	G8HVV	Cambridge
N. A. Gunn	G8IFF	Milton Keynes

Bedford (B&DARC)—Wednesdays. Ravensden. Sec Les, G4PSE.
Cambridge (C&DARC)—Fridays, 13 January (Martin, G8OFA, talks on "Getting going on 10GHz"), 20 January (Informal, morse class, operating club station G2XV), 27 January (Steve, G6AZI, talks on "Satellites" (probably) or similar), 7.30pm. Coleridge Community College, Radegund Road, (a turning off the well-known Coleridge Road in the south of the city), during term time. Publicity Officer, David, G2FKS (to whom all enquiries regarding the club should be addressed). Sec Dave, G8JKV.
Cambridge (CUWS) (G6UW)—Informal meetings Sundays, 7pm during term time. St John's College Buttery Bar. Sec Laurence Barber, G8NJJ, of Selwyn College.
Corby (CARG)—Fridays, 8pm. Hightrees Scout Centre, The Nook, Corby, Northants. Sec, P. Richardson, G8MLA, PR R. Buttery, G8IZU.
Dunstable Downs (DDRC)—Fridays, 8pm. Chews House, Dunstable. Sec P. G. Seaford, G8XTW.
Leighton Linslade (LLRC)—Mondays, 7-10pm. Vandyke Community College, Room A64, Vandyke Road, Leighton Buzzard. Sec Peter Brazier, G6JFN.
Luton (Kent Process Controls ARC)—First Wednesday in each month, 8pm. Club House, Tenby Drive, Luton. The club is open to all licensed amateurs and swls in the Brown Boveri Kent Group and Brown Boveri Co. Sec G3DOT.
March (M&DARS)—Tuesdays, 7.30-9.30pm. The club have a new venue—Room 7, March Adult Education Centre, Station Road, March, Cambridgeshire. Sec G4KPZ.
Northampton (NRC)—8pm. Kingsthorpe Community Centre. Sec Keith Howell, G6MFS, 9 Pytchley Way, Brixworth, Northampton, tel Northampton 881464.

Peterborough (GPARC)—Fourth Thursday in each month during term time, 7.30pm. Southfields Junior School, Stanground, Peterborough. Sec Frank Brisley, G4NRJ, tel 0733 231848.
Peterborough (PR&ES)—Fortnightly. Peterborough College of Adult Education. Sec D. Wilson, G4KSW.
St Neots (SN&DARS)—9 January (Computer night with demonstration of a Comart mainframe computer), 23 January (Natter night), Horseshoe Inn, Offord Darcy, nr Huntingdon. Sec G8XSO.
Shefford (S&DARS)—The society meets every Thursday. 5 January (Club reopens after Christmas break), 26 January (AGM and election of officers for 1984), 8pm. Church Hall, Shefford, Bedfordshire. Sec Alan, G4PSO.
Wellingborough (Nene Valley RC)—4 January (No meeting), 11 January (Natter night or "What did Father Christmas bring you?"), 18 January ("RAF communications", by Gordon Abrams), 25 January (AGM, election of officers for 1984, and prize giving), 8pm. Dolben Arms in Finedon for lectures and natter nights; transmitting and morse classes from the club room at the First St Mary's Scout Hall, Finedon. Sec Lionel, G4PLJ.

REGION 6—RR F. S. G. Rose, G2DRT, 84 Cock Lane, High Wycombe, Bucks HA3 7EA. Tel Penn (049481) 4240.

Area representative in Region 6
C. Sharpe G2HIF Wantage

Amersham (Forest Glade DX Group)—Details c/o 100 Chestnut Lane, Amersham, Bucks HP6 6EE.
Aylesbury (AVRG)—Details from David Roberts c/o Hunters Moon, Buckingham Road, Harwick Road, Aylesbury, Bucks.
Aylesbury (AVRS)—24 January (AGM), 21 February ("Amateur moonbounce", by Peter Blair, G3LTF). Details from Cathy Clark, tel 0844 51461.
Banbury (BARS)—The club night had to be altered to the last Thursday in each month. St Paul's Church Hall, Warwick Road, Banbury. For details contact sec T. Burrell, G8OZH.
Bracknell (BARC)—Details c/o 8 Toll Gardens, Bracknell, Berks.
Bracknell (Sperry Gyroscope ARS)—Details c/o Sports & Social Club, Downshire Way, Bracknell, Berks RG12 1QL.
Chesham (C&DARS)—Wednesdays, 8pm. Stable Loft, Bury Farm, Pednor Road, Chesham. Details from sec John Alldridge, G6LKS, tel Chesham 786935.
Didcot (Rutherford Labs RC)—Details c/o J. D. Gilbert, Bldg R25, Chilcot, Didcot, Oxon OX11 0QX.
Farnham VHF Group—Details c/o 31 Pigott Road, Wokingham, Berks RG11 1PZ.
RAF Halton (AR & E Club)—First Thursday in each month (Formal), 8pm, other Thursdays (Informal). Club/RAFARS Bucks area net 144·175MHz (ssb), 7pm, Mondays. Further details of club and the RAF Halton Award from Sqn Ldr Tony Gilchrist, G8BVJ, Wendover 623535, ext 5014, or Wendover 623316.
Harwell (HARS)—17 January (Meeting to be arranged). Details from Cliff Sharpe, G2HIF, tel Wantage 3497.
High Wycombe (Chiltern ARS)—Second Wednesday (Informal), 7.30pm. Last Wednesday (Formal), 7.30pm for 8pm. Science Block, Sir William Ramsay School, Rose Avenue, Hazelmere, High Wycombe. The club runs a double tutorial on morse code and theory: Mondays (cw), 8pm. Tuesdays (theory), 8pm. RAE classes started in June. Details from G4PGZ or G3NCL. Details from sec G3NCL, tel High Wycombe 712020.
High Wycombe (Mid-Thames DFC)—Details c/o Lowfield House, Bolter End Lane, High Wycombe.
Langley (LCARS)—Details c/o Station Road, Langley, Berks SL6 7UF.
Maidenhead (Home Counties ATG)—Details c/o 33 Switchback Road North, Maidenhead, Berks.
Maidenhead (M&DARS)—First Thursday and third Tuesday in each month. Details from Roger Hemmings, G3VCT.
Milton Keynes (MK&DRS)—Second Monday in each month, 8pm. Lavatt Hall. Sec Dave White G3ZPR.
Milton Keynes (Robson Nats Cote Apprentice Technical Club)—Details c/o Bletchley Park, Milton Keynes MK3 6EF.
Newbury (N&DARS)—Please note new sec Mike Fereday, G3VOW, tel Newbury 43048.
Oxford (O&DARS)—Details c/o Rush Common House, Porchester Crescent, Abingdon, Oxon.
Oxford (OURS)—New students interested in amateur radio please contact Robert Henshaw, G4GCM, Trinity College.
Oxford (RAFARS Oxfordshire area group)—18 January, 7.30pm. Civil Service Club, Marston Road, Oxford. Join their monthly net, last Sunday of each month, 1200h (local) on 3,710kHz, + or − 5kHz. Details from area rep Eric Palmer, G3FUC, tel Maidenhead 20107.
Reading (Ariel RG)—Details c/o 57 St John's Road, Caversham, Reading RG4 0AL.
Reading (R&DARS)—Details c/o Chris Young, G4CCC, tel Reading 471761.
Reading (Racal S&S Club)—Details c/o PO Box 112, Reading RG2 0QI.
Slough (Burnham Beeches RC)—First and third Mondays in each month, 8pm. St John Ambulance HQ. Burlington Avenue, Slough. Sec Tony Alderman, G4LQD, tel 02814 3286.
Slough (McMichael ARC)—Details c/o J. Parry, McMichael Ltd, Slough, Bucks SL2 5EL.
Slough (S Bucks Contest Group)—Details c/o 47 Severn Crescent, Langley, Slough SL3 3UU.
Vale of the White Horse (VWHARS)—Details from sec G3SEK, tel 0235 31559.

REGION 7—RR to be appointed
Addiscombe (AARC)—Tuesdays (Informal), 9pm. Lion Inn, Pawsons Road, Croydon. Sec Peter Hart, G3SJX, tel 01-656 9054.
Ashford (Echelford ARS)—7.30 for 8pm. The Hall, St Martins Court, Kingston Crescent Ashford, Middx. Club nets Sundays, 10am, 1·93MHz plus or minus QRM, Wednesdays 8-9pm, 144·575MHz fm. Sec Alf Othen, G8FSZ, tel Byfleet 48307.
Bexleyheath (North Kent RS)—Second and fourth Tuesday in each month, 8pm. The Pop-in Parlour, Graham Road, Bexleyheath. Details from J. R. Frampton, 84a St James Way, Sidcup, Kent.
Biggin Hill (BHARC)—24 January (AGM), 8pm. Biggin Hill Memorial Library, Church Road, Biggin Hill. Sec Ian Mitchell, G4NSD.
Coulsdon (CATS) (G4FUR)—6 January (Annual dinner dance, tickets £9.50 from committee members), 9 January ("RAC communications"), 7.30 for 8pm. St Swithuns Church Hall, Grovelands Road, Purley, Surrey. Sec Alan, G6HC, tel 01-684 0610.
Cray Valley (CVRS)—First and third Thursday in each month, 8pm. Christchurch Centre, Eltham High Street, Eltham SE9. Details from Chris Henderson, G4FAM.
Croydon (Surrey Radio Contact Club)—First and third Monday in each month, 8pm. TS Terra Nova, 34 The Waldrons, Croydon. Sec Ray Howells, G4FFY, tel 01-642 9871. The second meeting in each month is an informal discussion with an opportunity to practice cw.
Crystal Palace (CP&DRC)—21 January ("Computers for the radio amateur", by Bob Burns, G3OOU), 8pm. All Saints Parish Rooms, Upper Norwood, SE19. Sec Geoff Stone, G3FZL.
Dorking (D&DRS)—Second and fourth Tuesday in each month, 8pm. Star & Garter Hotel, Dorking Station. Club net Sundays, 0730gmt, 3·780MHz. Sec G3AEZ, tel 0306 77236.
Guildford (G&DRS)—Second and fourth Friday in each month, 8pm. Model Engineers HQ, Stoke Park, Guildford. Sec Helen Mullenger, G8SXB, tel Aldershot 20384.
Guildford (UHF Repeater Group)—First Thursday in each month, 8.45pm. Anchor & Horseshoe, Burpham, Guildford. Details from Roger Taylor, G4HZA, 6 High Street, Chobham, Woking, Surrey, tel Chobham 7552.
Kingston (K&DARS)—Third Wednesday in each month, 8pm. Alfriston, 3 Berrylands Road, Surbiton. Details from Brian Smythe, G3ODH, tel Epsom 26005.
New Cross (Clifton ARS)—Fridays, 8pm. Above the New Cross Inn, Clifton Rise, London SE14. Details of programmes from R. Hinton, 42 Sutcliffe Road, Welling, Kent.
Redhill (Reigate ATS)—Third Tuesday in each month, 8pm. Constitutional & Conservative Club, Warwick Road, Redhill. Sec Chris Barnes, G8FEE, 25 Hartswood Avenue, Reigate RH2 8ET.
Sutton & Cheam (S & CRS)—Fridays, twice monthly, 8pm. Sutton College of Liberal Arts, Nicholas Way, Sutton, and at the Sea Cadets HQ, Church Path, Beddington. Details from George Brind, G4CMU, tel Banstead 54497.
Thames Ditton (Thames Valley ARTS)—First Tuesday in each month, 8pm. Thames Ditton Library, Watts Road, Giggs Hill, Thames Ditton. Sec Julian Axe, G4EHN, tel 01-946 5669.
Wimbledon (W&DRS)—13 January (Natter night and cw practice), 27 January ("Basic radio theory", Geoff Mellett, G4MVS), 8pm. St John Ambulance HQ, 124 Kingston Road, SW19. Sec G4MVS.

REGION 8—RR M. Elliott, G4VEC, 20 Haysel, Sittingbourne, Kent ME10 4QE. Tel 0795 70132.

Area representatives in Region 8

J. Brooker MBE	G3JMB	Haywards Heath
G. D. Edy	G4AXD	Maidstone
J. C. Greenhow	G3PEY	Tunbridge Wells
B. A. Hancock	G4NPM	Sheerness
K. J. Homewood	G8NPC	Hastings
A. D. Ralph	G8XLH	Chatham
G. Williams	G3LQI	Worthing

Brighton (B&DRS)—Every second Wednesday in each month, 7.45pm. YMCA, Marmion Road, Hove. Details from sec Wendy Firmager, 26 Brownleaf Road, Brighton.
Burgess Hill (Mid-Sussex ARS)—7.30 for 8pm. Marle Place Adult Education Centre, Leylands Road, Burgess Hill, West Sussex. Details from sec Bob Hodge, G4MMI, c/o Corner House, Manor Gardens, Hurstpierpoint, tel Hurstpierpoint 833559.
Canterbury (East Kent ARS)—5 January (Natter night, and club construction project), 19 January (Talk on crime prevention, and marking of equipment), 2 February (Annual junk sale), 16 February (Natter and club project), 1 March (Talk on QRP working by Ian, G3ROO). The Cabin, Kings Road, Herne Bay. The club will be putting on a mobile rally in August 1984, with space for approx 60 stands. Full details available soon. Details from Stuart Alexander, G6LZG, tel Canterbury 68913.
Canterbury (UoKARS)—Mondays, 7.30pm. Radio Shack, behind Maintenance Buildings, off Giles Lane. Talk-in on S15. Meetings consist of cw practice and then drink and chat. Details from G6FRX.
Chichester (CARC)—First Tuesday and third Thursday in each month, 7.30pm. Fernleigh Centre, North Street, Chichester. Details from S. Talbott, or club sec, G4ETU, tel West Ashling 463.
Crawley (CARC)—Fourth Wednesday in each month (Formal). Second Wednesday in each month (Informal, at a club member's QTH). Trinity United Reform Church, Ifield Drive. Sec David Hill, G4IQM, tel Crawley 882641.
Dartford (DDFC)—Steve, G4NKM, is the one to contact at Malt Shovel PH if you are interested in DFing, as all are made welcome.
Dover (SEKYMCARC)—Wednesdays, 7.30 for 8pm. Leybourne Road, Dover. Sec A. R. F. Moore, G3VSU, 42 Nursery Lane, Whitfield, Dover, Kent CT16 3HG, tel Dover (0304) 822738.
Eastbourne (Southdown ARS)—First Monday in each month, 7.30 for 8pm. Chaseley Home for Disabled Ex-servicemen, Southcliff, Eastbourne. Details from Tom, G4MVN, or tel Peter, G8IQO, 763123.
Gravesend (GRS)—Mondays, 8pm. Windmill Tavern, Shubbery Road. Details from sec, G4NBQ.
Hastings (HERC)—Wednesdays, 8pm. First, second, fourth and fifth Wednesday is micro night, first Wednesday, committee meets, all at Ashdown Farm Community Centre. Third Wednesdays in each month (Main meeting at West Hill Community Centre). Details from Alan Beecher, G8VEM, tel Hastings 216516.
Horsham (HARC)—First Thursday in each month, 8pm. Guide HQ, Denne Road, Horsham. Details from Tony Wadsworth, G3NPF.
Kent Repeater Group—The group, by annual subscription, supports five repeaters: GB3KN; GB3KS; GB3NK; GB3EK and GB3CK. Details of meetings and subscriptions etc from Martin Stoneham, G4RVV, QTHR as G6CVG. The group can also provide speakers for other clubs in the area.
Maidstone (MYMCAARC)—Fridays, 8pm. "Y" Sports Centre, Loose Road. First and third Fridays are for beginners mainly, but all are welcome. Details from G4GKW or G4EMC.
Margate (Radio Club of Thanet)—10 January (Talk on satellite working by G8SBS), 24 January (Computer event), 8pm. The club now meets at The Grosvenor Club, Grosvenor Place, Margate, Kent. Details from I. B. Gane, G4NEF.
Medway (MARTS)—Fridays, 7.30 for 8pm. Details from Peter Poole, G4EVY, tel Medway 76463, 6.30-9.30pm only please.
Sussex Repeater Group—This group is responsible for GB3SR and GB3BP on 144MHz. GB3BR, GB3HO and GB3NX on 432MHz and GB3WX, GB3CP and GB3HM on 1·3GHz. Details from G4GNX.
Swale (SARC)—Mondays, 7.30pm. A cw course is planned for Thursdays and RAE lessons on Fridays. Nina's Restaurant, 43 High Street, Sittingbourne, at 7.30pm on club nights. Sec Brian Hancock, G4NPM.
Tunbridge Wells (West Kent ARS)—3, 17

Apologies

G2MI pointed out several callsign errors in the Medway Amateur Receiving & Transmitting Society photograph caption (*Rad Com* November 1983, p1015), and the sender of the photograph apologises for these errors arising from the faded original. Third from left, top row is G5XB, not G6XB; sixth from left is G5MM, not G6MM; and second from left, lower row is the late G5FN, not G6FN.

January (Informal). Drill Hall, Victoria Road, Tunbridge Wells. 13 January ("DXpedition to Andorra, 1973 and 1979" by Roger Hood, G3IHA). Adult Education Centre, Monson Road, Tunbridge Wells. 27 January (Electronics, further details to be advised). Details from Brian, G4MXL, tel 0892 32877.

Worthing (W&DARC)—Tuesdays, 7.30 for 8pm. Pond Lane Amenity Centre, Worthing. Details from Joyce Lillywhite, tel Worthing 63062.

REGION 9—RR W. J. Colclough, G3XC, Highview, Indian Queens, St Columb, Cornwall TR9 6LL. Tel 0726 860485.

Area respresentatives in Region 9

A. C. Courtney	G8XIP	Exeter
H. G. Hughes	G4CG	Barnstaple
N. J. A. Hearn	G6IEP	S W Devon
A. P. Rider	G6GLP	S Devon
A. E. Warne	G3YJX	Wadebridge

Axe Vale (AVARC)—First Friday in each month, 7.30pm: Cavaliers Inn, Axminster, Devon. Sec Bob Newland, G3VW, Ham House, Lyme Road, Uplyme, Lyme Regis, Dorset, tel 02974 5282. Pro Roger Jones, G3YMK, tel 0404 864468.

Camelford (North Cornwall RC)—First Wednesday in each month, 7.30pm. Warmington House, Camelford, North Cornwall. Chairman, Mike Frances, G3LOV; treasurer, G6LJQ; sec Jack Boundy, G8ZOK.

Caradon Hill Repeater Group (GB3CH RB2)—Chairman, P. H. Woodward, G6CIY; treasurer, G6OVL; sec Chris Bartram, G4DGU, 23 Tuckers Park, Bradworthy, Holsworthy, North Devon EX22 7TL, tel 0409 24543.

Cornish (CRAC)—First Thursday in each month; Computer section, 16 January ("Sequential and random files", by Clive Bowden, G3OCB). For location contact pro. President, Bert Hammett, G3VWK; treasurer, Peter Smart, G4SDU; chairman, David Blackford, G3NPB; sec, John Vinton, G6GKZ; magazine editor, Geoff Cooper, G3VJB; pro Simon Rodda, G4PEM, Cliff Hotel, Penzance, Cornwall, tel 0736 3948 or 3524. Cornish award manager Ted Bowden, G2AYQ, for details, sae please.

Exeter (EARS) (G6ARE)—9 January (Talk by HM Coastguards), 7.30pm. Community Centre, St Davids Hill, Exeter. Informal meetings held on all other Mondays. Emannuel Scout Hut, Okehampton Road, Exeter. Chairman, R. Williams, G3RSJ; treasurer, R. Donno, G3YBK; sec F. Stower, G6FGS; pro Rodger Tipper, G4KXR, tel 0392 75858. A newsletter is now available which contains a programme of events and other news items and useful information, available from pro, sae please.

Exeter (EUARS)—Sundays during term, 2.30pm. Room 225, Applied Science Building, North Park Road, Exeter. Contact Miss Bellchambers, G8ZPJ, Devonshire House, Stockers Road, Exeter EX4 4PZ.

Exmoor (ERC) (G8SSS)—Thursdays, 8pm. Loughrigg, East Street, South Molton, Devon. Sec Peter Dixon, G4JBR, tel 07695 2738.

Exmouth (EARS) (G4HOB)—Alternate Wednesdays, 7.30pm. 6th Exmouth Scout Hut, Marpool Hill, Exmouth, Devon. Chairman, Alec Atkins, G3RRK; treasurer, Steve Gurney, G8UXJ; sec Hugh Edwards, G4RUT, Crimond, The Common, Exmouth, Devon, tel 03592 73157.

Newquay (N&DARS) (G4ADV)—4 January (AGM), 18 January ("HF QRP dx", by Ken Elliot, G4NTX), Drill Hall, Crantock Street, Newquay. Chairman, Frank Kneebone, G6CEP; treasurer, Brian Pearce, G8GOR; sec Pat King, G4GFY, tel 0872 71133. Club repeater GB3NC—repeater manager and sec W. J. Colclough, G3XC, treasurer, Ted Warne, G3YJX.

North Devon (NDARC)—Odd months, fourth Wednesday, 7.30pm. Community College, Abbotsham Road, Bideford, Devon. Even months, fourth Wednesday, 7.30pm. Community College, Chaddiford Lane, Pilton, Barnstaple, north Devon. Chairman, Les Hawkyard, G5HD; treasurer, Geoff Beal, G4ELU; sec George Hughes, G4CG, tel 0271 3683.

Paignton (South Devon RC)—4 January ("Antennae topics and home construction", by G5MZN), 11 January (Video or slide show (RSGB)), 25 January (AGM), 7.30pm. Gerston Hotel, Victoria Street, Paignton. Chairman, P. Shuffell, G4SBX; sec M. Waite, G4SBH, 37 Isaacs Road, Barton, Torquay, Devon, tel 0803 34640; treasurer, G. Brooking, G6YKH; pro B. Guy, G4OJD.

Plymouth (PPARS)—Meetings during term 12h per day. Sec Jeff Key, G8VTW, ARS Plymouth Polytechnic, Students Union, Drake Circus, Plymouth, Devon.

Plymouth (PARC)—Please note change of title to Plymouth Amateur Radio Club. Club call G3PRC. Alternate Mondays, 7.30pm. Hyde Park Infants School, Hyde Park Road, Plymouth. President, Harry Griffiths, G2DFH; chairman, Dave Whitbread, G6EQM; treasurer, Ken Everett; sec Cyril Stevens, G6XZG, PO Box 46, Plymouth PL1 1SY; pro Mike Newcombe, G4FJZ.

Saltash (S&DARC)—First and third Fridays in each month, 6 January (Slide show by Chris Gallacher, G4JCX, "A journey through Scandinavia and eastern Europe (extending to north of the Arctic Circle and including Moscow)"), 7.30pm. Burraton Toc H Hall, Saltash. President, Harry Griffiths, G2DFH; chairman, J. Miller, G8NSP; treasurer, G. Huntley, G4LXB; sec R. Rayment, 142 Mile House Road, Stoke, Plymouth, tel 0752 50793.

St Austell (English China Clay RC) (G6ECC)—16 January (AGM and projects for New Year), 30 January ("QRP and test gear", by G3HMP), 7.30pm. Pentewan Labs, Pentewan Road, St Austell, Cornwall. Chairman Maurice Richards, G3WKF; treasurer, Tony Turner, G6EKZ; sec Mike Porter, G4OKS, tel 0726 850818; pro Jack Redfearn, G8HSZ, tel 0726 3647. Morse classes are now in progress, contact pro for details. During last year the club took part in vhf field days, combining with the Newquay club station, G4ADV. Stations were operated on behalf of the Bugle and Veryan groups of Scouts during JOTA. A week's portable hf operation was undertaken during the summer from a site near Fowey. A club project, a five-element mono beam for 21MHz was constructed and was raised to a height of 80ft by means of a jin pole and tackle. World-wide contacts were made.

St Ives (St County Secondary School) (G4DWB)—Repeater, GB3SI. Contact David Blackford, G3NPB, for details of repeater etc, QTH Higher Tregenna, St Ives, Cornwall.

Tiverton (South West TRC) (G4TSW)—Mondays, 7.30pm. The Queens Head, Castle Street, Tiverton, Devon. Sec V. W. Baldry, G6IVU, PO Box 3, Tiverton, Devon EX16 6RS, tel 0884 253319.

Torbay (TARS) (G3NJA, G8NJA)—Fridays, 7.30pm. Special meetings last Saturday in each month. Bath Lane, rear of 94 Belgrave Road, Torquay. Chairman, Derek Webber, G3LHJ; sec, Mrs M. Rider, 7 Kingston Close, Kingskerswell, Devon TQ12 5EW, tel 0804 75130; pro Tony Rider, G6GLP, QTH etc as per secretary. Information and tickets for annual dinner from sec.

REGION 10—RR E. J. Case, GW4HWR, 2 Abbey Close, Tyrhiw, Taffswell, Mid-Glamorgan, CF4 7RS. Tel 0222 810368.

Abergavenny & Nevill Hall (A&NHARC)—Thursdays, 7.30pm. Pen y Val Hospital, Above Male Ward 2, Abergavenny. As a group project the club is trying to convert a domestic receiver to a communications receiver. Morse classes are in progress during club nights, the class is run by Edith Bracey, GW6SHE, who uses a morse talker for these classes. By the time this appears in print she will be GW4; as she has passed her morse test. Manual morse is taken by Fred Wybrew, GW4TUL, and Gough Griffiths, GW3ONN.

Aberystwyth (ARSGBG)—Second Tuesday in each month. Bay Hotel (on the sea front, opposite the bandstand). Sec J. Mike Pryse, GW4JXB, Nythfa, Garth-Penrhyncoch, Aberystwyth, tel 0970 828446.

Barry (BCoFERS) (GW3VKL, GW4BRS and GW6BRC)—Thursdays, 7.45pm. Barry College of Further Education Annexe, Weycock Cross, Barry. Slow morse class followed by constructional projects in the shack with films or lectures in the hall. Sec Simon Lloyd Hughes, GW8NVN.

Blackwood (BARS) (GW6GW)—Fridays, 7pm. Oakdale Comprehensive School, Oakdale, Blackwood, Gwent. This club does not meet during the school holidays. Sec Wynn Wright, GW8UAM.

Bridgend (B&DARC) (GW4LNP)—Second Wednesday in each month, 7.30pm. NCB Social Club, Tondu, Bridgend. Sec Peter Lynn, GW8WCI, tel Bridgend 861115.

Cardiff (CRSGBG) (GW5BI)—9 January ("Broadcasting techniques using British Telecom plant", an illustrated talk by Dave Thomas, GW3RWX), 7.30pm. Pantmawr Hotel, Tyla Teg, Pantmawr Estate, Whitchurch, Cardiff. Sec Cyril Laws, GW6ZHP, tel Cowbridge 3212.

Loughor (LAR&EC) (GW4HVJ)—Tuesdays fortnightly, 7.30pm. Loughor Scouts Hall, Heol Cae Tynewydd, Gorseinon. Sec Tim Griffin-Thomas, GW8TYS, tel Gorseinon 893392.

Newport (NARS) GW4EZW)—9 January (Ross Clare, GW3NWS on "TVI"), 16 January (BC repeater, how it works), 23 January (Richard, GW6BVT, "Manufacture of pcb boards and various applications"), 7pm. Brynglas House, Brynglas Road, Newport. Sec Robert Johns, GW4NXD, tel Pontypool 56348.

Pembroke (PRSGBG) (GW2OP)—Last Friday in each month, 7.30pm. The Defensible Barracks, Pembroke Dock. Sec Martin Shelley, GW3XJQ, tel Pendine 267.

Pontypool (PARS) (GW3RNH)—Sec G. A. Smith, GW6JRB.

Port Talbot (BSCARS) (GW3EOP)—Thursdays, 7.30pm. BSC Sports & Social Club, Margam. The club will be operating the St David's Day special event station on 1 March. As in past years the station will celebrate the National Day of Wales. More details of this event will be published later. Sec Reg Bray, GW4ESV, tel Briton Ferry 821993.

Powys (PARC) (GW4HVN)—Thursdays, 7.30pm. The Cricket Pavilion, Montgomery. Sec Mike Smith, GW4DWX, tel Welshpool 2068.

Rhondda (RARS)—Thursdays fortnightly, 7.30pm. National Union of Mineworkers' Club, Tonypandy. Sec John Howells, GW4BUZ, tel Tonypandy 432542.

Llandaff (SGIHEARC) (GW3RNW & GW1AAA)—Tuesdays, 6pm. Room A208, Llandaff Centre, Western Avenue, Cardiff. Sec Steve Williams, GW6CUR, 301 Newport Road, Cardiff.

Swansea (SARS)—First and Third Thursdays in each month, 7.30pm. Lecture Room N, Applied Sciences Building, Swansea University. 2 February (Richard, GW8TVX, will present a slide show of "aircraft displays 1983"), 19 January (Steve, GW3VPL will talk on "repeater technology"). Further details from Roger Williams, GW4HSH, tel Swansea 404422.

REGION 11—RR B. H. Green, GW2FLZ, 1 Clwyd Court, Tan-y-Bryn Road, Colwyn Bay, Clwyd LL28 4AH. Tel 0492 49288.

Area representatives in Region 11

A. R. Evans	GW4HDR	Rhyl
E. C. Jones	GW4JPP	Tywyn
J. Lawson-Reay	GW8WFS	Llandudno

Anglesey (AARG)—Second and fourth Tuesday in each month, 7pm. Primary School, Benllech, Anglesey. Sec Mr C. Williams, GW6DOK, tel Gaerwen 603.

Bangor (University College of North Wales ARS)—The Rockets Room, Room 261, School of Electronic Engineering Science, Dean Street, Bangor, Gwynedd.

Colwyn Bay (Conwy Valley ARC) (GW6TM)—12 January (Talk by Cedric Cawthorne, G4KPY, on "Switched mode power supplies"), 7.45pm. Green Lawns Hotel, Bay View Road, Colwyn Bay. The club is pleased to announce it has enrolled its hundredth member. Sec Mr J. N. Wright, GW4KGI, 46 The Dale, Woodlands, Abergele, Clwyd LL28 7DS, tel 0745-823674.

Dolgellau (Meirion ARS) (GW4LZP)—Meetings at Nannau Country Club, Llanfachreth. Sec Mr Bob Halhead, GW3KOR.

Menai Bridge (Ysgol David Hughes Radio Club)—No further details.

Rhyl (R&DARC) (GW4ARC)—2, 16 January, 7.30pm. 1st Rhyl Scout HQ, Tynewydd Road, Rhyl. Sec Mr John McCann, GW4PFC, 67 Ashley Court, St Asaph, Clwyd LL17 0PL, tel 0745-583467.

Sealand Deeside (RAF Sealand ARC)—Contact E. E. Hewins, OIC, Radio Wing No 30, MU RAF Sealand, Deeside, Clwyd.

Wrexham (WARS)—Wednesdays twice monthly. Contact Mr Peter Higgs, GW4IGF, tel Rossett 570212. Meetings held in Friends Meeting House, Holt Road, Wrexham. Sec Mr N. Woods, GW4OXG, tel Wrexham 265325.

REGION 12—RR M. R. Hobson, GM8KPH, 4b Tummel Crescent, Pitlochry, Perthshire.

Area representatives in Region 12

R. Adam	GM4ILS	Moray
G. G. Brooks	GM4NHX	Caithness
B. Q. Deans	GM6PQE	Angus
R. M. Grant	GM4DQJ	Scone
G. W. A. Pople	GM4DKL	Kildary

Aberdeen (AARS)—Fridays, 7.30pm. Club rooms, 35 Thistle Lane. Details from Don Travis, tel Pitcaple 251.

Benbecula—Jim Thomson, GM3CXF, is trying to form a club in the Uist/Benbecula area. Interested parties should contact Jim on 0870 2051, ext 25, during office hours, or 0870 2413 at other times, or write to him at No 2 Bungalow, Balivanich Aerodrome, Benbecula, Western Isles PA88 5LA.

Dundee (Kingsway TCARG)—Tuesdays, 7pm. St Micheals School, Graham Street, Dundee. Sec Berni Deans, GM4TQN, Cavendish, 4 Deanbank Street, Dundee DD2 2EA.

Elgin (Moray Firth ARS)—Details from sec Rev Stan Bennie, GM4PTQ, tel Buckie 32312. New area representative—Ron Adam, GM4ILS, tel 0343 45842.

Fort William—Members in Fort William have formed an *ad hoc* group which meets on the first Thursday of each month, 7.30pm. West End Hotel, Fort William, Further information from Norman Baird, GM4JNB, PO Box 6, Fort William, or try a call on S20.

Grampian Repeater Group—President, GM8MHU, sec/treasurer, GM8HGD; project manager, GM6GJZ; committee—GM6AXU, GM3DNV, GM3DWX, GM8FFX. Members should note that the Peterhead uhf repeater GB3PD should now be operational on RB10. Details from sec Alec Jones, GM8HGD, tel Peterhead (0779) 2413.

Invergordon (Easter Ross RC) (GM4MFL)—Fridays, 7.30pm. Community Room, South Lodge School, Invergordon Details from George, GM4DKL, tel 086-284 2556.

Orkney (Kirkwall)—First Wednesday in each month, 7.30pm. Lynnfield Hotel, Kirkwall. Information from Bill, GM3IBU.

Perth (P&DARG)—Tuesdays, 8pm. Perth City Sports & Social Club, Leonard Street, Perth. Further details from new sec Mike Clark, GM6OFO, tel 0738 28621.

Shetland (Lerwick RC)—Thursdays, 7pm. Room 14, Islesburgh Community Centre, King Harold Street, Lerwick. Details from Arthur, GM4LBE, tel 0595 4270.

Speyside Repeater Group—Information from Ron, GM4ILS, tel 0343 45842.

REGION 13—RR Andrew Givens, GM3YOR, 41 Veronica Crescent, Kirkcaldy, Fife KY1 2LH. Tel Kirkcaldy (0592) 200335.

Area representatives in Region 13

D. G. L. Anderson	GM4JJJ	Dunfermline
J. McVicar	GM8GEC	Musselburgh

Berwick-upon-Tweed (Borders ARS)—First and third Friday in each month, 7.30pm. Tweedview Hotel, Tweed Street, Berwick-upon-Tweed. Details from GM3YPI, tel Eyemouth 50492.

Dalgety Bay (Marconi Space & Defence Systems ARC)—Details from GM4HRL.

Dunfermline (DARS)—12 January (Illustrated talk "Microcircuitry"), 7.30pm. Room 7, Old High School, Priory Lane, Dunfermline. Details from GM8IID, tel 728778.

Edinburgh (E&DARC) (GM4HAM)—Tuesdays, 7.30pm. City Observatory, Catton Hill, Edinburgh. Details from GM3RFQ.

Edinburgh (Ferranti Recreation Club ARS) (GM4FER)—Membership restricted to company personnel. Details from GM8JKG, tel 031-441 5684. Visits by other clubs by prior arrangement.

Edinburgh (GB3ED Repeater Group)—Details from GM3GBX, tel 031-447 2611.

Edinburgh (Heriot-Watt UARC) (GM3WEE)—Wednesdays, 2.30pm. Mountbatten Buildings, 31-35 Grassmarket, Edinburgh.

Edinburgh (Leith Nautical College AR&EC) (GM4AXG)—Thursdays, 6.30pm. Leith Nautical College, 24 Milton Road East, Edinburgh. Details from Michael Gathergood, GM4KFK, Halls of Residence, Leith Nautical College.

Edinburgh (Lothians RS)—12 January ("Use of radio in Scotland by British Telecom", by GM4MVT), 26 January (Visit), 9 February ("Black box night", by GM8GEC), 7.30pm. Harwell House Hotel, 13 Ettrick Road, Edinburgh EH10 5TJ. Details from GM4HWO, tel 031-332 5502.

Glenrothes (G&DARC)—Wednesdays and third Sunday in each month, 7.30pm. Provosts Land, Leslie, Fife. Details from GM4LYQ.

Kelso (KARS)—Mondays, 7.30pm. Abbey Row Community Centre, Kelso. Details from GM3VLB, tel 24664.

Lothians Raynet Group—Details from GM3OWU.

Scottish Borders Repeater Group—Details from GM4BDJ, Cairndhu, Walter Street, Langholm, Dumfries-shire, tel 0541 80018.

St Andrews (UoStAR&ES) (GM4BGA)—Details from GM4JWV, tel 74507.

REGION 14—RR to be appointed

Area representative in Region 14

J. G. Gaughan	GM4EO	Helensburgh

Ayr (AARG)—Second and fourth Friday in each month, 7.30pm. Community Leisure Centre, 24 Wellington Square, Ayr. Details from sec R. D. Harkess, GM3THI.

Central (CSFMG)—The Central Scotland FM Group maintains repeaters in Fife, Ayrshire and Central Scotland. Membership details from Colin Dalziel, GM8LBC.

Dumfries (D&G REC)—First and third Monday in each month, 7.30pm. Cargenholm Hotel, New Abbey Road, Dumfries. Details from GM4NNC.

Glasgow (WoSARS)—Fridays, 7.30pm. 22 Robertson Street, Glasgow. Morse classes. Details from Ray James, GM4CXM.

Helensburgh (HARC)—First and third Wednesday in each month, 7.30pm. John Logie Baird School, Helensburgh. Operational night Thursdays. Details from sec Barrie Spink, GM6CBF.

Irvine (Cunninghaeme & DARC)—Thursdays, 7.30pm. 1 Bonnyton Row, Girdle Toll, Irvine. RAE and cw classes. Details from Rodger Bryce, GM3JOB.

Motherwell (Mid-Lanark ARC)—Fridays 7.30pm. Wrangholm Hall Community Centre, Jerviston Street, Motherwell.

Stirling (S&DARS)—Second and fourth Wednesday in each month. Details from Gordon Hudson, GM4SVM, tel Stirling (0786) 5834.

Stranraer (Wigtownshire ARC)—Thursdays, 7.30pm. The Community Centre, Lewis Street, Stranraer. Details from J. N. MacDonald, GM4LQS.

REGION 15—RR J. T. Barnes, GI3USS, Whitegables, 95 Crawfordsburn Road, Bangor, Co Down BT19 1BJ. Tel 0247 3948.

Area representatives in Region 15

R. J. G. Burnside	GI6DGP	Belfast
D. F. Campbell	GI4NKD	Craigavon
J. Chapman	GI4LVC	Magherafelt
C. J. T. Corderoy	GI4CZW	Enniskillen
A. T. Hamilton	GI4HVI	Castlerock
H. M. Irvine	GI3TLT	Kircubbin
W. P. McMichael	GI4LKA	Greenisland
S. G. Moore	GI8YTH	Belfast
J. A. Porter	GI3GGY	Londonderry
P. S. Valentine	GI3RKE	Omagh

Antrim (ANDARC)—Third Thursday in each month, 7.30pm. Clotworthy House, Castle Grounds, Antrim. Sec GI4FUM NOT QTHR. Tel Antrim 64672.

Ballyclare (East Antrim ARC) (GI4KKK)—Second Tuesday in each month. Fairview Primary School, Ballyclare. The club held its agm in September and elected as chairman GI4JXM. GI4LKA was re-elected sec, and treasurer was GI4KIS. The committee consists of GI4BWM and GI4PRH.

Ballymena (BRC)—Thursdays, morse class, 8-9pm; Club meeting, 9pm. Sundays (Club get-together) 3pm. 70 Nursery Road, Gracehill. Details from sec GI4HCN.

Banbridge (Mid-Ulster ARS)—Sundays, 3pm. GI4BAC QTH. Details from GI4NVD.

Bangor (B&DARS) (GI3XRQ)—First Friday in each month. Sands Hotel, Bangor. At the agm a committee of 12 was elected, with GI4NAE as chairman, GI4OCK as sec and pro, and GI3USS as treasurer.

Belfast (BRSGBG)—Third Wednesday in each month, 8pm. 90 Belmont Road, Belfast. At their AGM the club re-elected all officers.

Belfast (COBYMCAARC) (GI6YM)—Tuesdays, 7pm; Saturdays, 2.30pm. Club Room, Fourth Floor, YMCA, Wellington Place, Belfast. Sec GI6BJO.

Belfast (College of Technology ARS) (GI2BX)—Almost certainly the oldest GI callsign is now used by the club on 144MHz and hf at lunchtimes. An interesting programme is being arranged. For details contact the sec, James Barr, 121 Kitchener Street, or at college, tel Belfast 227244, ext 243.

Belfast (Queens UoBRC)—Tuesdays, in term-time, 7pm. 37 Fitzwilliam Street, next to Students Union, Club station GI3LLQ/GI6FQB on all bands, 3·5 to 432MHz. RAE and morse tuition available. Activities include electronics and computing. Details from GI6JHF, tel 0232 703027, or 0232 661111, ext 4017, daytime.

Coleraine (C&DARS) (GI4NRQ)—Fridays, 8pm. Flowerfield Arts Centre, Portstewart. Sec GI4LNJ.

Coleraine (NWARC) (GI4DBB)—First Tuesday in each month, 8pm. New venue—The Scout Hall (1st Coleraine Troop), The Crescent, Coleraine, which is located between Bushmills and Ballycastle Roads in Coleraine and adjacent to the playing fields. The committee elected at the agm consisted of GI4AVE, chairman; GI4KIG, treasurer; GI8NBW, secretary; GI4JNS and GI3KVD. Programme details from GI8NBW, tel Ballymoney 62127 or 62238 (office hours only).

Craigavon (MVARC)—Second Sunday in each month, 3pm. QTH of GI4BAC, Banbridge. Details from sec Victor, GI4BDL, tel 0762 881366.

Enniskillen (Lough Erne ARC)—Third Monday in each month. Railway Hotel, Enniskillen. The club held their agm at Lakeland Forum and elected GI4NRE as chairman; GI6UHA, sec; GI6ZCC, treasurer; and three other committee members —GI4PCY, GI4UHP, and GI4CZW.

Larne (L&DARS) (GI4PHA)—First and third Wednesdays in each month, 6.30pm. Room 270, Larne Technical College. Chairman GI4RXP. Details from sec Bill, GI4CPP, tel Larne 5407. The club's vhf contest was won by Don, GI4MVQ.

Lisburn (LVARS) (GI4GTY)—Second Monday in each month, 7.30pm. Rathvarna Teachers Centre. Details from sec GI6UFU, tel Hillsborough 683118.

Londonderry (NW of IARC) (GI4CFH)—First Monday in each month, 7.30pm. the New Boathouse, Victoria Road, Prehen, Londonderry. Sec GI4OUN.

Magherafelt (MARS) (GI4MFT)—First Tuesday in each month, 8pm. 12 Garden Street, Magherafelt. RAE course at local Technical College, Mondays. CW classes at club QTH, Tuesdays. Details from sec Jack, GI4LVC, tel 0648 32096.

Moy (Armagh, Dungannon & DRC)—Second Tuesday in each month, 8pm. Pony Club, Moy. Details from Kevin Boyd, GI4SLQ, tel Moy 84597.

Omagh (West Ulster ARC)—Second Monday in each month, 8pm. McAleers, Campsie, Omagh. Sec GI4OHW (Ex-GI8XQM).

REGION 16—RR T. D. Howe, G3PLF, 18 Vange Hill Drive, Basildon, Essex SS16 4DD. Tel 0268 24453.

Area representatives in Region 16

R. A. E. Hillson	G4OWX	Hadleigh
F. R. Howe	G3FIJ	Colchester
R. W. Howe	G3PLB	Basildon
J. R. Tootill	G4IFF	Ipswich
L. V. G. Turner	G4CUT	Chelmsford
C. W. Weller	G4ONH	Braintree

Basildon (Marconi ARS)—First Monday in each month, 8pm. Permanent hf and vhf installation can be used by members at any time by prior arrangement with the committee. Pre-printed "Tornado" QSL cards are available free to members on request. Visitors are most welcome. Details from Chris Mitchell, G8PKM (not QTHR), tel Chelmsford 323323, or Basildon 22822 ext 3295.

Braintree (B&DARS)—First Monday in each month (Informal), 8pm. Third Monday in each month (Formal), 7.45pm. Braintree Community Centre, Victoria Street. Details from Jeff Roberts, G6OIX, tel Braintree 44857.

Bury St Edmunds (BStERS)—Third Tuesday in each month, 7.30pm. Guidhall, Guildhall Street. Details from John Munro, G3GBB, 29 Angel Hill, Bury St Edmunds.

Canvey Island (South Essex ARS)—Wednesdays, 7.30pm. The Paddocks Community Centre, Long Road, Canvey Island. Details from G6BYH, tel Canvey Island 683526.

Chelmsford (CARS)—First Tuesday in each month, 7.30pm. Marconi College, Arbour Lane. Details from Andrew Mead, G4KQE, tel Silver End 83094.

Colchester (CRA)—12 January ("Deep sea diving", by John Barnard), 26 January ("The amateur radio repeater network and its administration"), 7.30pm. Colchester Institute, Sheepen Road. Details from Frank Howe, G3FIJ, tel Colchester 851189.

Felixstowe (FARC)—Tuesdays, 8pm. Felixstowe Golf Club. Details from John Hobin, G3XIX.
Great Yarmouth (GYRS)—Thursdays fortnightly, 7.30pm. STS Sports & Social Club, Beevor Road, South Denes. Details from A. D. Besford, G3NHU.
Harlow (H&DRS)—Tuesdays, 7.30pm. Mark Hall Barn, First Avenue. Details from Cilla Mann, G4KVR, c/o Mark Hall Barn, First Avenue, Harlow.
Haverhill (H&DRS)—Fridays, 7.30pm. Copse Hall Farm, Steeple Bumpstead Road. Details from Dave Hickford, G4MVK, tel Haverhill 61207.
Ipswich (IRC)—Second and last Wednesday in each month, 8pm. Club Room, Rose & Crown, Norwich Road. Details from Jack Tootill, G4IFF, tel Ipswich 44047.
Loughton (L&DRAS)—6 January (Informal), 20 January (East London RSGB Group, G3HCQ/G8VZD), 8pm. Loughton Hall, Rectory Lane. Details from C. Knowles, G6FWT, tel 01-508 7190.
Lowestoft (LD & Pye ARC)—Details from Alan Seago, G4KDL, tel Lowestoft 66289.
Martlesham (MRS)—Wednesdays, 7.30pm. British Telecom Research Labs. Martlesham Heath. Please contact G3ZNU first.
Norwich (Norfolk ARC)—Wednesdays, 7.45pm. Crome Centre, Telegraph Hill East. Details from Peter Forster, G3VWQ, tel Norwich 37709.
Saffron Walden (SW&DRAS)—Third Wednesday in each month, 8pm. Details from Garry Morton, G6KDW, tel Saffron Walden 22715.
Southend (S&DARS)—Fridays, 8pm. Civic Suite, Council Offices, Hockley Road, Rayleigh. Details from G3YOA.
Stanford-le-Hope (SIH&DARC)—Mondays, 8pm. The Scout Hut, Hardie Road. Details from Alan Taylor, G4KJI, tel Stanford-le-Hope 5057.
Stowmarket (S&DARS)—First Monday in each month, 7.30pm. 9 January (Presidential Uphejla, the club president, G4BJO). Red Cross Hut, Station Yard. Details from Jim Lowe, G8SCB, tel Needham Market 721296.
Thurrock (TARC)—First and third Tuesday in each month, 8pm. Grays Park Hall, Orsett Road, Grays. Details from G3KMD.
Vange (VARS)—5 January (Junk sale), 12 January ("Mobile 20 years ago," by G3PLB), 19 January (AGM), 26 January (St John Ambulance Brigade), 7.30pm. Main Hall, Barstable Tenants Community Association, Long Riding, Basildon. Details from Mrs D. Thompson, 10 Feering Row, Basildon SS14 1TE.

REGION 17—RR H. G. Cunningham, G8FG, 235 Station Road, West Moors, Wimborne, Dorset BH22 0HZ. Tel Ferndown (0202) 876018.

Area representatives in Region 17

P. G. Brooker	G3WXC	Cowes
T. M. Emery	G3KWU	Southampton
M. A. Lawrence	G4JXO	Portsmouth
J. E. Martin	GU3YIZ	Guernsey CI
D. I. Mason	G3ZPR	Poole
L. V. Mayhead	G3AQC	Southampton
A. D. Morrissey	GJ3YLI	Jersey CI
A. C. A. Newman	G2FIX	Salisbury
P. J. Sterry	G3CBU	Basingstoke
M. J. Stevens	G3CPN	Ferndown
G. S. Symons	G3DSS	Sturminster Newton
G. M. Taylor	G8HVY	Weymouth

Andover (ARAC)—First Tuesday and third Wednesday in each month, 8pm. For venue contact sec, G4OZL.
Basingstoke (BARC)—Second Tuesday in each month, 7.30pm. The Swan, Sherbourne St John, nr Basingstoke. Sec G4SQZ.
Basingstoke (UK FM Group Southern)—First Wednesday in each month, 7.30pm. Chineham House, Shakespeare Road, Basingstoke. Sec G3KWU, tel 0703 812453.
Bournemouth (BRS)—6 January (No meeting), 20 January (QRP operating), 7.30pm. Kinson Community Centre, Kinson, Bournemouth. Sec G4EKE, tel Ferndown (0202) 877945.
Chippenham (C&DARC)—Tuesdays, 7.30pm. Chippenham Sea Scouts HQ. Sec G8UGY, tel Bromham (0308) 850289.
Eastleigh (Itchen Valley ARC)—Fortnightly, St John Ambulance HQ, Blenheim Road, Eastleigh. Sec G4PPJ, tel Botley (04892) 3312.
Fareham (F&DRS)—4 January ("Pre-amplifiers", by G6BBS), 18 January ("Power distribution", by G8GNB), 25 January (AGM), 7.30pm. Portchester Community Centre. Sec G4ITG, tel Fareham (0329) 234904.
Farnborough (F&DRS)—Second and fourth Wednesday in each month, 7.30pm. Railway Enthusiasts Club, Access Road, off Hawley Lane, Farnborough. Sec G4BJQ, tel Farnborough (0252) 543036.
Gosport (Rowners & DARS)—First and third Monday in each month, 7.30pm. Hardway Community Centre, Gosport. Sec G6OTY, tel Locksheath (04985) 2541.
Gillingham (Blackmore Vale ARS)—Second Tuesday in each month, 7.30pm. Contact sec G3WRV for venue.
Guernsey (GARS)—Tuesdays and Fridays, 8pm. The Lodge, La Corbinerie, Oberlands, St Martins. Sec Mrs Wild, tel 0481 25858.
Horndean (H&DARC)—Second Thursday in each month, 7.30pm. Merchiston Hall, Horndean. Sec G6OIV.
Jersey (JARS)—The club QTH, Le Hocq Tower, St Clement, is now open on Fridays, 7.30pm, and Sundays, 9.30pm. Morse tuition only on Tuesdays, 7.30pm. Sec GJ4TXB, tel 24328.
Jersey (JAEC)—11 January ("The BBC micro", by GJ4TBW), 9 February (AGM), 8pm. The Communication Centre, St Brelade. Sec GJ4TXB, tel 53333.
Liphook (Three Counties ARC)—Meets at the Railway Hotel, Liphook, 7.30pm. For dates contact sec G6SOQ.
Portsdown Hill Repeater Group—Sec G8GNB, tel Titchfield (03294) 41456.
Portsmouth (Marconi EARS)—Last Tuesday in each month, 8pm. Broad Oaks Canteen, Portsmouth Airport. Sec G3FWE.
Portsmouth (P&DRS)—Thursdays, 7.30pm. Portsmouth Community Centre, Malins Road, Buckland. Sec G3JZV.
Poole (PARS)—Meetings held at the Poole Technical College, 7.30pm. Contact sec G3ZYD, tel Poole (0202) 671562 for dates.
Salisbury (SR&ES)—Tuesdays, 7.30pm. Grosvenor House, Churchfields Road, Salisbury. Sec G2FIX, tel Salisbury (0722) 743837.
Southampton (SARS)—Wednesdays, 7.30pm. Bittern Park School, Dimond Road, Bittern. Details from G4LDK, tel Burlesdon (042121) 3451.
Southampton (SUARC)—Tuesday evenings, informal meeting every lunchtime. Clubroom, Old Union Building. Sec G4LYL.
Southampton (Waterside Short Wave Club)—Fourth Tuesday in each month, 7.30pm. Blackfield Community Centre, Blackfield. Sec G6DLJ, tel Fawley (0703) 891875.
Swindon (S&DARC)—Thursdays, 7.30pm. Park School, Marlowe Avenue, Swindon. Sec G4IYW, tel Swindon (0793) 27227.
Weymouth (SDRS)—2 January (Film), 6 February (Great top band race), 7.30pm. Army Bridging Camp, Wyke Regis, Weymouth. Sec G3ZGP, tel Weymouth (0305) 812893.
Wimborne (FRARS)—1 January (No meeting), 8 January ("Use of computers", by the Dorset Police), 15 January ("Nick's rambles", by G8MCQ), 22 January ("Fault finding", by G8YCA, part one), 29 January ("Fault finding", by G8YCA, part two), 7.30pm. Flight Refuelling Social Club, Merley, Wimborne. Sec G8VFY, tel Wimborne (0202) 882271.
Winchester (WARC)—21 January ("VHF radio twenty years ago", by Ray Hills), third Saturday in each month, 7.30pm. The Scouts Log Cabin, Stockbridge Road, Winchester. Sec G3SHQ, tel Twyford (0962) 713003.
A very happy new year to all in Region 17.

REGION 18—RR W. A. Ricalton, G4ADD, 4 South Road, Longhorsley, Morpeth, Northumberland NE65 8UW. Tel Longhorsley 259.

Consett (C&DARC)—Mondays, 7.30pm. RAFA Club, Sherburn Terrace, Consett. Sec G8WEJ.
Durham (DURES)—Physics Dept, Science Site, Durham University.
Easington (EAR&EC)—Tuesdays and Thursdays, 7.30pm. Easington Village Working Mens Club. RAE and morse tuition if required. Sec G4GXI.
Great Lumley (GLAR&EC)—Alternate Wednesdays, 7.30pm. Great Lumley Community Centre. Sec G8HPW.
Hartlepool (HRH)—Mondays, 7.30pm. Methodist Church Hall, Frange Road. Sec G3NWU.
Middlesborough (Post Office ARC)—All amateurs welcome, but first contact sec G8CDP.
Middlesbrough (Teesside Repeater Group)—Last Tuesday in each month, 7.30pm. 196 Marton Road, Middlesbrough, Cleveland. All amateurs and swls invited but first contact sec G8MBK.
Morpeth (Northumbria ARC)—Thursdays, 7.30pm. Old Telephone Exchange, Ellington. Sec Peter Barker, G8BBZ, tel Morpeth 519929.
Newcastle upon Tyne (T&WRG)—Now no formal meetings. Sec G8XDF.
Prudhoe (TARC)—7pm. Active all bands. CW instruction each night. Falcon Hotel, Prudhoe, Co Durham. Sec G4IZW, tel 0632 678828, evenings.
Redcar (East Cleveland ARC)—Fridays, 7.30pm. RAE classes held. Advice to newcomers given. RAFA Club, Newcomen Terrace, Redcar. Pro G4KIR.
Sunderland (SRAS)—The Brewery Buildings, Westbourne Road. Sec Arthur Everard, G8PCD.
Tyneside (TARS)—Mondays, 7.30pm. Community Centre, Vine Street, Wallsend. Sec James Dingwall, G4ILW, tel 872661.

REGION 19—RR R. J. Broadbent, G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQ. Tel 01-989 6741.

Area representatives in Region 19

W. G. Dyer	G3GEH	Acton
L. D. E. Light	G3KDL	Wembley
P. J. Marcham	G3YXZ	Watford
B. H. J. Pickford	G4DUS	Rickmansworth
J. H. Sleight	G3OJI	Ware
T. J. Tugwell	G8KMV	Stevenage

Barking (B&DARS)—Mondays, Tuesdays, Thursdays, 7pm. Westbury Recreational Centre, Ripple Road, Barking. Monday is RAE class night, Tuesday is morse code practice, Wednesday is constructional and operational night and Thursday a general get-together. Contact sec Alan Sammonds, tel 01-594 2471.
Cheshunt (C&DARC)—3 January (To be announced), 10 January (Construction), 17 January (Grand auction. Bring along all your surplus gear and go home with somebody else's), 8.15pm. The Church Room, Church Lane, Wormley, nr Cheshunt, Herts. Details from Roger Frisby, G4OAA, tel 09924 64795.
Chingford (Silverthorn ARC)—7.30pm. Friday Hill House, Simmonds Lane, Chingford E4. Sec G4AJA, tel 01-529 2282.
Chiswick (ABCARC)—15 January (AGM), 7.30pm. Committee Room, Chiswick Town Hall, High Road, London W4. All present and past members are welcome to this AGM. Sec W. G. Dyer, G3GEH, tel 01-992 3778.
Ealing (E&DARC)—This club has now moved back into its old hq, now redecorated after the fire. Tuesdays, 8pm. Northfields Community Centre, 71a Northcote Road, Ealing W13. Details from G3THQ, tel 01-450 8259.
Edgware (E&DRS)—1 January (144MHz straight key evening), 12 January (AGM), 20 January (Informal). the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. Sec Howard Drury, G4HMD, tel 01-952 6462.
Grafton (GARS)—8pm. Five Bells Pub, East End Road, East Finchley, London N5. Sec Jim Chambers, G4IBK, tel 01-346 5841.
Harrow (RSH)—8pm. Harrow Arts Centre, High Road, Harrow Weald. The club has 100 per cent RSGB membership (I think). Details from Chris Friel, G4AUF, tel 01-868 5002.
Havering (H&DARC)—Wednesdays, 8pm. Fairkytes Art Centre, Billet Lane, Hornchurch, Essex. Details from A. Negus, G8DQJ, tel Upminster 24059.
Ilford (IGRSGB)—Thursdays, 7.30pm. 50 Mortlake Road, Ilford, Essex. Sec G. Skeat, tel 01-590 3193. Chairman is J. Hooper, G3PCA, tel 01-478 3741. All are welcome to attend this venue but please telephone first if you are a new member.
Ilford (Gould Advance RC)—Wednesdays. Service Dept, 2-8 Roebuck Road, Ilford, Essex. Club callsign, G4CAE. No other details. Sec R. Howard, G4JOK.
London (BBC Ariel RG)—Membership is restricted to members of the BBC Club and their families. For details of this club, membership and the monthly nets please contact K. H. J. Rainbow, G8LRE, sec, ARG, tel 01-580 4468, ext 4891 (Room 110 HWH).
London (Central POHQARS)—This group have started a 3·5MHz net which is open to all BT employees and other Post Office and PTT employees in other countries. Listen out on Wednesdays, 2000h, local time in UK on 3,750kHz. Net control, G3BYW. Details from J. A. Clarke, G3TIS.
London (City University ARS)—Thursdays. The club has recently restarted its operations and meets at the City University somewhere not specified in the letter. Contact Robert Benyon, G4KSK, Flat 4, Bullen House, Collingwood Street, London E1, tel 01-253 4399.
London (Civil Service ARS)—First and third Mondays in each month, 9 January (Video and slide show. A small charge is to be made at this

show), 23 January ("Lightning protection", by G3LYN). CSARS hold meetings mainly during the lunch hour at The Civil Service Rec Centre, Monck Street, Millbank SW1. Details from G. Costin, G4GFU, tel 01-632 6444, day time.

London (New Scotland Yard ARS)—This society is not open to the public, but the club station is active from time to time using G4NSY and G6NSY. Further details from sec, NSY ARS, Room 99, New Scotland Yard, Broadway, London SW1 0BG.

Southgate (SARC)—8pm. St Thomas's Church Hall, Prince George Avenue, London N14. Pro John Fitch, G8EWG.

Stevenage (S&DARS)—First and third Tuesdays in each month, 8pm. T S Andromeda, Fairlands Valley Park, Shephall View, Stevenage, Herts. Morse classes, 7.15pm. Pro Trevor Tugwell, G8KMV, sec, G4BGP, tel Baldock 893736.

St Albans (Verulum ARC)—RAFA HQ, New Kent Road, St Albans. Sec Ed Bailey, G4KLQ, tel Redborne 3291.

South West Herts UHF Group—Information from sec T. Groves, G4KUJ. Current situation on uhf repeaters is: GB3SWH is operational; GB3HR may be moving from the site; GB3BH is under construction.

Wanstead (ELGRSGB)—Third Sunday in each month, 3pm. Wanstead House Community Centre, The Green, Wanstead, London E11. Details from Julian, 01-550 7013.

UK FM Group—For information on this group and future policy please contact Pat Spenceley, G8LZA, by letter, or J. Parkins, G8KVP.

REGION 20—RR B. L. Goddard, G4FRG, 2 Greenfield Park, Portishead, Bristol BS20 8NQ. Tel 0272 848140.

Area representatives in Region 20

R. W. Marshall	G4ERP	Cheltenham
E. A. Perkins	G3MA	Gloucester
K. A. Saunders	G8SFM	Leighterton
J. Thorn	G3PQE	Weston-super-Mare

Bath (B&D ARC)—Alternate Wednesdays, 7.45pm. Englishcombe Inn, Englishcombe Lane, Bath. Club now has the callsign G4TMH and operates on hf and vhf. Details of the forthcoming meetings can be obtained from Trevor Whitehead, tel Bath 319150, or sec Mike Mason, tel Bath 31104.

Bath (Downside School ARS)—Details of the school's radio activity can be obtained from the Physics Department, Downside School, Stratton-on-the-Fosse, Bath, Avon.

Bristol (BARC)—Tuesdays, 7.30pm. YMCA, Park Road, Kingswood. Computer night every fourth Tuesday. Details from Trevor Cockram, G8GFZ, or Alan Williams, G3ZKI, tel 0272 553020.

Bristol (BRSGBG)—30 January (AGM), 7.30pm. Small Lecture Theatre, Queens Building, Bristol University. Details from Chris Short, G8GLQ, tel 0272 621253.

Bristol (First Crockern Scouts Short Wave Group)—Details of the group (licensed amateurs and short wave listeners are welcome to the shack by arrangement), from Pete Knowles, 30 Church Path Road, Pill, Bristol BS20 0EE, tel Bristol 8814248.

Bristol (HTVRC)—Details can be obtained from Robin Thompson, G3TKF, tel Keynsham 3965.

Bristol (North Bristol ARC)—Fridays, 7 to 9pm. SHE, 7 Braemar Crescent, Northville, Bristol. Details from Ted Bidmead, G4EUV.

Bristol (South Bristol ARC)—Welcome to another new club. 3 January ("Early radio", by G2BAR), 10 January (Demonstration and lecture "CW operating", by Mark, G4OPQ), 17 January (144MHz night), 24 January ("Home Brew equipment", by Mark, G4KUQ), 31 January (432MHz night), Wednesdays, 7.30pm. Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. Details from Len Baker, G4RZY, tel 0272 834282.

Bristol (UoBARS)—Details of the society's activities etc can be obtained from Mark Posen, G6DYY, c/o Students Union, Bristol University, Queens Road, Clifton, Bristol BS8 1LN.

Bristol (432MHz Repeater Group)—For enquiries regarding the 432MHz repeater GB3BS, and GB3AA, the 1·3GHz repeater situated at Alveston, near Bristol, contact the sec Steve Bailey, G4MCQ, or Terry Rowe, G8NNU, tel 0272 559398.

Cheltenham (BYLARA)—YLs and xyls. Details can be obtained regarding membership c/o Little Croft, Shurdington Road, Cheltenham. (Ladies—how about some copy for this column? *RR20).*

Cheltenham (CARA)—6 January ("Getting going on 1,296MHz", by G4ERP), 20 January (Natter night), 7.30pm. Stanton Room, Charlton Kings Library, Cheltenham. Details from Gill Harmsworth, G6COH, tel Cheltenham 525162.

Cheltenham (Government Communications ARC)—Details from sec, c/o Government Communications Headquarters, Benhall, Cheltenham.

Cheltenham (Smiths Industries RS)—12, 26 January. The venue for these meetings may change from the Club House, Newlands, Bishops Cleeve, so it would be best to check with Roger Hawkins, G8UJG, c/o Sports & Social Club Office, Smiths Industries ADS Co, Evesham Road, Bishops Cleeve, Cheltenham GL52 4SP.

Gloucester (GARS)—4 January (Slide evening), 11 January (Natter night), 18 and 25 January (Ordinary club meeting), 7.30pm. St Barnabus Hall, Stroud Road, Gloucester. Details from Tony Martin, G4HBV, 12 Podsmead Close, Podsmead, Gloucester GL1 5TS.

Mendip Repeater Group—GB3WR, 144MHz repeater, GB3UB and GB3US 432MHz repeaters, and GB3UT, 1·3GHz tv repeater. Details of the repeaters, subs, and applications for membership can be obtained from Steve Gardner, G8GMZ, tel Midsomer Norton 413902.

Portishead (Gordano ARG)—23 January (RSGB film, details later on GB2RS), 7.30pm. Ship Hotel, Down Road, Portishead. Details from Robin Coles, G8ROC, tel 0272 691685.

Sedgemoor (S&DARS)—Welcome to this new club. 16 January, 8pm. Bridgwater Arts Centre, Castle Street, Bridgwater. Details from ATC Roskilly, G3ZRJ.

Shirehampton (SARC)—Fridays, 7.30pm. Twyford House, High Street, Shirehampton, Bristol. The homebrew contest date has not yet been finalized, and will be given over GB2RS. Details from Ron Ford, G4GTD.

Taunton (T&RDC)—Fridays, 7.30pm. The County Hall, Taunton (opposite the Crescent car park). Details from sec Graham Swetman, G8TJF.

Thornbury (T&DARC)—First Wednesday in each month, 7.30pm. White Horse Inn, Groves End (A38). Details from Alan Jones, G8AZT.

Wells (EMI Sports & Social Club RC)—Cedar House, Chamberlain Street, Wells, Somerset BA5 2PJ. (Regret no further details—*RR20).* Details from sec, at the above address.

Weston-super-Mare (RAFARS)—This is the headquarters station of the RAFARS, and details of membership etc can be obtained from the Admin Secretary, RAFARS, RAF Locking, Weston-super-Mare, Bristol BS24 7AA.

Weston-super-Mare (WsMRS)—Second Monday in each month, 7.30pm. the Rugby Club (off Drove Road), Weston-super-Mare. Details from G3BLO or G3PQE, tel 0934 22712.

Yeovil (Y&DARC)—5 January ("My conclusions on chordal hop", by G3MYM), 12 January ("Your amateur radio career", by G3MYM), 19 January ("From semaphore to satellite", by G3GC), 26 January (Natter night), 7.30pm. Recreation Centre, Chilton Grove, Yeovil. Details from Eric Godfrey, G3GC, Dorset Reach, 60 Chilton Grove, Yeovil, Somerset BA21 4AW, tel 0935 75533.

Members' Ads

CONDITIONS OF ACCEPTANCE

These subsidized 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 *Rad Com* to the advertiser: this will automatically provide proof of membership and should not be more than two months old. No acknowledgement of receipt will be sent, and advertisements not clearly worded or punctuated, or which do not comply with the conditions of acceptance, will be returned. No correspondence concerning this service will be entered into.

Trade or business advertisements, even from members, will not be accepted for "Members' Ads" but 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.

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.

The current rate is £1 for 40 words or less: advertisements containing more than 40 words will cost an additional £1 for every additional 40 or less words. Each advertisement must be accompanied by the correct remittance, either as a cheque or postal order made payable to Radio Society of Great Britain.

Closing dates in 1984 for issues in brackets are **10 January** (March); **14 February** (April); **9 March** (May); **6 April** (Jun); **4 May** (July); **5 June** (August); **3 July** (September); **13 August** (October); **11 September** (November); **16 October** (December); **13 November** (January 1985).

Post to: MEMBERS' ADS, RSGB, 88 BROOMFIELD ROAD, CHELMSFORD, ESSEX CM1 1SS
Do not post to RSGB HQ or Advertising officer.

FOR SALE

Microwave Modules 28/432MHz transverter, £65. Microwave Modules 2m 25W linear, £25. Marconi vhf/uhf a.m./fm sig gen, £85. 11m Shogun, £25. Bearcat 30-512MHz rx, switched a.m./fm, £125. 0-30MHz rx, bfo, suit beginner, £25. D. Ash, G6HLF NOT QTHR. Tel 0538 382117.

KW108 monitor scope, £70. Bencher keying lever, £25. Brand new, buyers to collect. G4KQG. Tel 0602 257396.

SX200, boxed, manual, mint cond, comp with scan antenna, £190. MM 2m receive preamp, new, unused, £10. GW4KDD, QTHR. Tel Blackwood 224782.

C78, nicads, charger, etc, £199. OS2 scope, Heathkit, £30. 7ERP teleprinter, £15. 6S6 tape reader, £10. Heathkit vhf swr/pwr meter, £10. Jaybeam C5 2m colinear, new, £35. FRG7, £99. G4SYK. QTHR. Tel 0992 468052, after 6pm, before 9.30pm.

Crystals: 150 in amateur bands, 75p to £1.25 according to type, incl postage. Send sae for list. G3ZWL, QTHR.

Icom IC202S, good cond, portable, ssb/cw, £100 ono. G4PEK, 1 Nelson Terrace, Westward Ho! Devon.

Xtals HC25U, 10·245MHz i.f. converter xtals, tested, as new, £1.50 each or five for £5. Aston, G6HXB, 11 Salisbury Road, Southall, Middx.

Tandy DMP200 printer, four months old, £399 new, accept around £280. FDK ATC720 handheld airband rx, incl case, BNC adaptor, £100. Albol SB3M 3MHz scope, cover, £75. All compl, in as new cond. G6IBC, QTHR. Tel John, 01-790 8163.

Magnus 1000E solidstate linear, power supply, 500W, perfect, £675. Datong FL3, £82. Perfect Yaesu 980, as new, £875. GD3KGC, agent G3PRS, tel Cuffley 4110.

FT7B, display, £350. FT790R, £295. FT480R, £265. Almco 25W 2m linear, £30. Yaesu lp filter, £15. Pocketphones RB13, modified, drop-in charger/amp, £45. All as new, boxed. Westminster, six xtalled channels, preamp, £65. D. Ash, G6HLK NOT QTHR. Tel 0538 382117 (Staffordshire).

FRG7 rx, 500kHz-30MHz, no mods, vgc, full wkg order, £110 ono. G4JOC, QTHR. Tel Stalbridge (Dorset) (0963) 62082.

Yaesu FRDX400 rx, as new, £100. 70cm converter, tv camera, spare tube, 2m monitor rx, lots of junk, shack clearance. Ian Bush. Tel West Wickham, 01-777 5072.

Microwave Modules M2001 rtty to tv converter, as new, £125. Tel Marlow 2726, evenings.

Hygain TH6 beam, exc cond, Sommerkamp 788 dx, all mode, 26,000-3,000kHz, fantastic! Three-band beam antenna 10/15/20, Collins KMW380, like new, save pounds. Tel Derby 557705.

Pye Pocketfones 70, PF2UB, 405-440MHz, 0·5W, 3ch, 25·5kHz channel spacing, incl carrying case, spare loudspeaker, mic, collect or postage extra by agreement, £50. RS49315. Tel 0279 56017.

FRDX400 rx, 160-10m, citizens band 2m and 4m converters, four filters, fm unit, xtal marker, £100. Creed 444, 128h use, 45 baud, best offer. Preference to Raynet members. Hundreds of old valves. G3IDW, QTHR. Tel Swindon 822055.

Sommerkamp TS788DX coffee warmer, 26-30MHz multimode, spkr, mic, 40W output, 13·8V dc, £125. Sommerkamp FT101ZDFM cw filter, dc converter, £500. Tel 0242 510750.

Standard C58 1W multimode, bargain for a portable operator, new QTH forces reduction, see October ad, incl case, charger, nicads, all normally extras, save yourself around 10 per cent, £235. G8YBF NOT QTHR. Contact first Rochdale 58229.

Need more space in shack! Datong UC1 up-converter, £70. UK101 6502 based computer, 8k memory, wemon, Centronics printer interface, cased, fan, £80. Prefer buyer collects computer. G8EZE, QTHR. Tel Witney (0993) 4890, evenings.

Hustler mobile antenna, five resonators, qd mount, £40. Hatfield rf bridge LE300A, £20. 3WP1 tube, £3. DG75 tube, unused, £10. G3IRM, QTHR. Tel 0284 4318.

FRG7 communications rx, mint cond, packing antenna, £155. KW Vespa Mk2, £75 ono. Army 31 set working, R209 Mk2, offers. *Wanted*: KW2000. G4PNN (nr Oxford). Tel Mark, Kidlington 3420, after 6pm.

Spare valves, KW Atlanta incl four pa, two 7360, Class D wavemeter. *Wanted:* Trap vertical. Circuit Eagle rx 60. G3KMH, QTHR.

BBC 32k super morse programs, all usual features, 500 real words in store, 100 plain language, 3min tests, prepare really fast! £4.50. PCB for rtty interface based on G4GOC circuit, £2.25. Brandon, G4UXD, 1 Woodlands Road, Chester CH4 8LB.

Radio Communications: backdated one decade, 1973-83, any reasonable offer. Buyer collects. Tel Tim, Brentwood (Essex) (0277) 227847.

Compact disc player CDP101 (Sony), mint cond, less than 10h use, three discs (Love over Gold, Four Seasons, Nimbus sampler), only £450 ono. Must sell to buy micro! G4IAC, QTHR. Tel 06755 2745, evenings, or 05645 78218, work.

QTH, four bedroom, detached, fgch, entrance hall, cloaks, wc, breakfast kitchen, lounge/diner, autumn bathroom, one mile from M1 junction 26, exc vhf site 400ft asl. Brown, G8CXV, 2 Tilstock Court, Watnall, Notts. Tel 0602 384956.

Alternator, Markon 240/115V 3·9K rpm 50Hz, 2·17/4·3A cont, self regulating/exciting, unused, £140 ono. Jackson. Tel Lowick (Cumbria) 669.

Datong D70 morse tutor, £35 ono. Daiwa auto atu CNA1001, £100 ono. Trio R600 rx, £200 ono. Microdot rtty unit, £350 ono. *Wanted:* FL2100Z, heavy duty rotator, Diwa CN620A or CN2002. G4VCU. Tel 020888 738.

TR7730 2m fm tx/rx, vgc, 5W, 25W, 5kHz/25kHz steps, five memory channels, one channel for split freq working, l.e.d. display, toneburst, memory, scan, mic, with up-down scanning, mounting bracket, orig packing, £189. G4AXO, QTHR. Tel Winchester 60807.

Standard C70 70cm fm portable rig, £140. 1-9W pa for 70cm with preamp (*RE&W*), £30. Tektronix oscilloscope type, £90. G6LVO, QTHR. Tel Geoff, 04626 76422.

432MHz linear amp, Microwave Modules MML432/50, £60. Generator, single cylinder diesel powered, 6·25kVA, 240V, £295. Daiwa RM940 infra-red mobile mic system, £30. 2m Yagi 10Y/2m, 50Ω, new, boxed, £20. G6DMS, QTHR. Tel 0371 84 250 (Essex).

Drake TR4CW/r.t. 500kHz cw filter, 300W input, AC4 psu, 34NB noise blanker, RV4C remote vfo, spkr, used little, mint, boxed, total cost new £790, sell £450. Prefer buyer collects. G4LW, QTHR. Tel Trowbridge 3166.

Muirhead K400D fm facsimile tx, comp with K346 xtal control motor amplifier, mint cond. Tel Morris, Bolton 52384.

FT101ZD, WARC mic, fan, cond as new, snip at £400. G3IJ, QTHR. Tel Aldershot 310132, evenings.

Tower, 30ft aluminium, tiltover, in six 5ft sections, £100. Bell & Howell 1in vtr model 861, in gwo, £100. *Wanted:* Olivetti A6 computer expert to help me with mine, software and data needed. G8GQS, QTHR. Tel Brian, Gainsborough (0427) 3940.

Yaesu FTONE gen cov tx/rx, fm fitted a.m. filter, YM38 mic, used for tests purposes on tx. Owner has no interest in hf operation, £1,000. G6MRZ. Tel 0782 619658.

G2DAF rx, Imhof cabinet, 898 dial, digital readout display, mech filter, works well, only replaced by Racal rx, £55 ono. Comdel csp speech processor, as mentioned in *Tech Topics*, £20 plus pp. *Wanted:* QY4400 valve bases. G3YCP, QTHR Somerset.

Printer: Centronics 101 high speed 165 cps, heavy duty matrix printer, Centronic and CBM interfaces available, £100. Keyboard, cased, good quality, 76 keys decoded, ideal for use with ZX81 or other micros, rtty etc, £5. G4PEY. Tel Horsham (0403) 69835.

Trio TS515 tx/rx, 80-10m, PS515 psu/spkr, 180W input, manual, £175 (gone QRP). Elec keyer EK121, £11. G3YNA, QTHR. Tel Hastings (0424) 753145.

R4C, extras, vgc, £315. Datong FL3, £100. YC355D dfm, £85. Varta nicad pocketphone rx, £2. Various 8MHz xtals. G8ESK, QTHR. Tel 0274 45611.

Century 21 tx/rx, £130. Icom 240, £120. Accessories available. G4OSD, QTHR. Tel 0723 863221.

FRG7, mint, super set, £135. FLDX400 tx, 80-10m, 250W input, good cond, £125. Both with handbooks. BC221, inc power supply, £5. Small old brass morse key, £16. Many other items. G8BIH. Tel Alton (Hants) (0420) 82739.

Icom IC701, 7018PS, SM2 mic, handbook, all leads, £499. Buyer inspects and collects. Recent professional overhaul. G3MCA. Tel Orpington (Kent) (0689) 56497.

IC251E, mint, orig packing, SM5 base mic, £400. IC2E, £100. CT501 wobbulator/scope, ideal to align your RA17/117, £75. Homebrew linear, 80-15m, 4xPL509, £70. G2DAF Mk 1 rx, vgc, £70. Ant, w/mount, bracket, £12. G3WDN, QTHR. Tel Great Yarmouth 667597, evenings.

Surplus to requirements: MML144/100P 100W 144MHz linear power amplifier, beautiful piece of equipment for any station, hear those dx stations, truly good preamp, power out, specification sheets included, £85. G6HJF, QTHR. Tel 0772 792935, evenings.

Yaesu FRG7 communications rx, used very little, exc cond, £110. Tel Mark Page, Great Missenden 2752, after 7pm.

Datong D70 morse tutor, £45 ono. G8GNB. Tel 0329 239702.

Collins 51J, Hallicrafters HT37, manuals, Shure mic, Heathkit swr bridge, spare valves, £150 the lot, ono. *Wanted:* good morse key, and bug or keyer. SP102 or 901 spkr. G5ABW, QTHR. Tel 07677 371.

Eight-bit servo-controlled reel-to-reel electronic tape reader by Tally, 19in rack mounting, reels, reel rack, paper tape, splicer, hand punch, hand winder, comp with manual giving interface details, offers. G4CNH, QTHR.

FDK Multi 700EX, 2m tx/rx, 25W, 18 months old, bargain, £135. Realistic DX200 communications rx, 0·15-30MHz, exceptional mw dx, new price was £199, bargain, £79. Microwave Modules 2m preamp MMA144, £15. All as new. G6ASA. Tel Oxford (0865) 863333.

DX33 beam due to change of QTH, only two years old, £105 ono. Buyer collects. G3GC NOT QTHR. Tel Yeovil (0935) 75533.

Trio 520 tx/rx, 80-10m, matching vfo, spkr, vgc, mic, manual, £300. G3RK, QTHR. Tel 0502 78 619 (Suffolk).

Atlas 210X, deluxe ac console, Shure 444, mint cond, £350. Atlas 206 digital vfo, rare item, as new, £115. Drake R4C rx, extra ssb filter, exc, £245. Consider exchange late tx/rx, cash either way. G4ERU, QTHR. Tel Bournemouth (0202) 510400.

Philips VCR1500, tapes, slight ripple on record otherwise ok, comp service manual, £35. Linsley-Hood WW casette recorder, Hart kit, exc cond, £50. Transformer, mains ip 0-6-14V, 500VA cont, £10. 500VA isolation, It, £10. Prefer collection. G3VMK, QTHR. Tel 0602 635170.

AR88D, comp with 22ft four-berth cabin cruiser, 50hp e/s ob, full inventory, trailer, dinghy, all in exc cond, lochside mooring, free whisky, £2,950. BRS33269. Haggle on 0436 3492.

Transverter FTV 2m 107R, new, unused, cables for use with FT102, £70. Tel Hill, 061-366 0927, evenings and weekends, or 061-480 4550, work.

Kenpro KR600 rotator, as new, £85. Yaesu 101ZD fm, 902 atu fitted in lockable mahogany cabinet, inbuilt spkr, comp with manuals, Yaesu headphones, a.m. board, fan, spare valves, etc, £550. Scan-air 2m handheld scanning rx, 8ch, with plug-in xtals, nicads, £25. *Wanted:* good 2m multimode. G1CKP. Tel Ron, Meriden (0676) 23028.

Racal RA17L gen cov rx, 1·5-30MHz, case, operating, maintenance instructions, exc cond, reason for sale space required, £150 inclusive. Can deliver within 50 miles. G4SJJ NOT QTHR. Tel Burnham-on-Sea (Somerset) 785238, evenings.

SX200N base, mobile, multiband keyboard, programmable scanning rx, 26-88, 108-180, 380-514MHz, a.m./fm, operational manual, technical data, mint cond, mains power unit, £240 or exchange FRG7700. G4DBA, QTHR. Tel Carlisle (0228) 24027/46847.

Drake TR4 tx/rx, 80-10m, mic, vgc, £230. G3RK, QTHR. Tel 0502 78 619 (Suffolk).

Nascom 2, 32k ram, in Kenilworth case, 9in monitor, zeap, nas-dis, D-bug, teletype asr, can be used as printer or second keyboard for Nascom, £100 of programs including chess and chess rom, full documentation, all for £375. GI6BEG, QTHR. Tel Carrickfergus 66383.

1,000MHz scope, Hewlett Packard HP185B, HP187B plug-in, comp with all adaptors, HP1400A delay line, manuals, £150. *Wanted:* Tektronix plug-in type M. Manuals for purchase or hire for type 82 and M. G4DWC NOT QTHR. Tel 0532 828994.

FT7 Yaesu tx/rx, vgc, all 10m xtals, manual, orig packing, HF3 preamp/linear, 200W p.e.p. for above tx/rx, swr/power meter matching tx/rx, rack for all units, £320 ono. G4BZE, QTHR. Tel 0392 81425.

Trio TR9000 2m multimode, all accessories, BO9 system base, mobile safety mic, 8XY beam ant, rotator, control unit, mast, low loss cable, ant switch, all in vgc, £340. Tel Lymm (Cheshire) 6170.

Realistic DX302 communications rx, 10kHz-30MHz, £180. Grundig four-track tape recorder, £40. 100W audio amplifier, twin deck unit, loudspeaker, £80. *Wanted:* tx/rx with scan/memory, incl gen cov rx. RS84745, PO Box 8, Southern Evening Echo, Hythe, Southampton, Hampshire.

2m linear amp, 3W in, 30W out, £25. Lightweight antenna rotator, up to 50kg, £25. 13-el 2m beam, £15. G6TYP NOT QTHR. Tel Kings Langley 65823.

Vintage record player Regentone, 1950s suitcase type, three-speed, good cond, wkg, £10. G6FBR, QTHR. Tel Ron, Winchester (0962) 66764.

Labax laboratory microscope, four-turret magnification to 400x, fine focus, brand new, in makers packing, £70. G6WBI, QTHR. Tel 0634 63517.

Hygain 18AVT/WB, unused, still in orig carton, £60. Buyer to arrange collection. G3FBP, QTHR. Tel 0924 403667.

FT901DE built-in psu, Curtis keyer, mint cond, comp with FC901 atu, FF501 low pass filter, £525. G4FMH. Tel Bristol 697687.

Yaesu FT290R still under guarantee, incl case, nicads, charger, Slim Jim, mobile mag mount, coaxial, £189. G6KIX. Tel Rugby 79112.

Yaesu FT200, FP200 ac psu/spkr, vgc, later black-fronted series, all 10m xtals, mic, handbook, £225. Securicor delivery possible. G8GHH, QTHR. Tel Chris, Thanet 32586.

Power supply, ex-computer, 7-22V variable voltage, approx 20A, very large, very heavy, would cost £250 to make, £35. RS52155. Tel John, 01-857 8096.

Yaesu FT207R 2m handheld, 144-148MHz adapter for 2S9 rubber duckie ant, used successfully on visit to Canada and USA, NC9B charger, 117V, PA2 dc 12V adaptor, manual, nicad battery, all vgc, £110. G4DXC, QTHR. Tel 0274 563289, anytime.

Yaesu FT480R, all mode, 2m, £280. Trio TR9500, all mode, 70cm, £320. Yaesu FT208R 2m handheld, spkr, mic, charger, spare battery, £140. G4VID. Tel Kettering 516547, after 6pm.

Variac, Lyons 100RM/2B 2kVA 2x.0-270V, 9A, nett weight 31lb, input volts 230, 270, or 115, as new, £40 plus post. Electric motor, 0·25hp ac, 240V, £10. G3DWS, QTHR. Tel 021-475 6267.

Discone antennas, 80-470MHz, unused, in orig packing, £6 each to anyone who collects. Tel Poole (0202) 682844.

Trio TS120V, matching PS20 power supply, operating manual, orig boxes, immac, £285 or part exchange for cw rig. Bug key, speed adjustable, one or two paddles, £15. Tel Stevenage 62829.

Icom IC240 fm mobile, plug-in six-digit display, multi function 80ch scanner unit, must be seen, mobile mount, data incl, £150. Matching plug-in speech processor, £15. G8SSI NOT QTHR. Tel 01-689 8389.

Free box with my FDK Multi U11 uhf fm xtal 23ch tx/rx, £100. Katsumi MK1024 electronic keyer, four memories, ideal contests/professional, £75. All vgc. G4ENK. Tel Paul, 051-546 4464.

FT225RD 2m multimode, mint cond, no mods, £495. Trio TR7800 2m mobile tx/rx, unused, £195. Yaesu FV901DM external vfo, £190. G3PTX, QTHR. Tel 061-368 2544, work.

Marconi CR300 rx, 15kHz-25MHz variable pass-band, power supply, circuit diagram, £45. Tel Chertsey 64796.

Yaesu FRG7 communications rx, no mods, as

new, used little, orig packing, £125. Tel Cirencester 66207.

2m 50W fm base station, R0-7, S20-23, £125. Jaybeam 2m four-el quad, as new, £20. Jaybeam matching harness for two 2m antennas, £5. Pye PF70, 70cm handheld tx/rx, RB2, RB6, SU8, charger/handbook, £60. Pye 4 by 70cm dipole, 6dBd vertical omni, £20. Chimney mast brackets: double lashing, £5; single heavy duty, £5. G3MEH NOT QTHR. Tel 01-388 1288 ext 3505 daytime. Tring (044282) 6651, evenings/weekends.

Trio 2400 2m synthesized handheld, base stand ST1, manuals, £135. G6MGC. Tel Ware (0920) 2713.

Racal RA1217 rx, 30 1MHz bands, all filters, 8kHz, 3kHz, 1·2kHz, 500Hz, 200Hz, good cond, rack mounting, £375 ono. G3YCP, QTHR North Somerset nr M5.

TS130S Trio, all WARC bands incl mobile mount, £435. G4BAV. Tel Ipswich 41190.

KW Viceroy tx, psu, handbook, circuits, new 6146s, set new boxed valves, good clean wkg order, £65. SR9 marine rx, some xtals, as new, £30. G4JFU, QTHR. Tel Fowey 3245.

Yaesu FR50B 80-10m aux 10MHz, 100kHz calibrator, mech filter, rf attenuator, good cond, handbook, £75 ono. Prefer buyer collect or carriage extra. *Wanted:* Kokusai 455 10K filter with data and matching xtals if possible. GW8UH, QTHR. Tel Cardiff (0222) 485062.

TET hf triband 10/15/20m three-el beam, boom 4m, elements 6m, six months old, £100. Purchaser collects. G4RWQ NOT QTHR. Tel Brian, Penkridge 4963.

Morse keys: Marconi 365, £15. Type D, £7. Lightweight type, £5. 250pF and 250pF Z-Match capacitor, £10. Variac 1A, £10. Transformers: 1,000V 250mA, £10. 890-710-0-710-890V 120mA, £10. 4V 11A four times, £10. 450-250-0-250-450V 150mA, 5V 3A, 6·3V 3A twice, 6·3V 4A, £10. Two antenna two-pole co relays, 12V coil, £3 each. *Wanted:* xtals 12·5, 19·5, 26·5, 27·5MHz. Post extra. G3SIH, QTHR. Tel Melksham (0225) 703443.

TR2200GX 2m fm portable, xtalled R0-7, S20-3, charger, £80. VIC20 3K computer, £70. *Ham Radio Today* and G4HXZ 3 by C60 morse tapes, £5. Tel 0203 468379.

Workshop manual for Kenwood TS130SV, VFO120, AT130, £5. SX200N scanning rx. Ambit ssb kit, £250. Discone antenna, new, £20. Woodpecker Blanker AEA WB1A, £45. SMD100 stereo table mic, £15. Philips ultrasonic burglar alarm, £10. Carriage extra. G3AAG. Tel Liss 2143.

ATV2, £90. JVC GS1000EK camera, £75. ICB1050. £17.50. MMC 432/144S, £20. 70cm, 6ch tx/rx, W&D, £50. G3YBK, QTHR. Tel 0392 78710.

AR88LF rx, good cond, unmodified, spare set of valves, £50 ono. Prefer buyer inspects and collects. G3WPS. Tel 0532 854401.

Grand attic clearance: relays including coaxial types, cavities, filters (ssb lowpass, bandpass), attenuators fixed and variable, af to 12GHz, Jackfield, oven, leads with BNC connectors, valve bases for 4CX series, QY4400, S125B, ceramic coil formers, prewound coils, pa tank size, ht transformers incl spares for Pye T55AM, misc subassemblies from uhf equipment, valves 4CX250B, 5763, EF50, E88CC, 22 other types, klystrons, crts 3WP1, 89D, 3AZP31, rtty parts, tuning forks, Teletype 28 tape reader, Creed 92 tape reader, Creed 54 handbooks, S-dfc and Microdec. Lots of other items. All at give away prices. G3VJI. Tel John, 0539 23327.

Yaesu FT290R, Mutek front end, nicads, as new, £220. PS30 20A psu, £65. Tel Derby 551945.

FT225RD, Mutek front end board, in exc cond, offers. Peter Crosland, Red Lion Cottage, Holt Heath, Worcester. Tel 0905 020041, home, or 021-454 8585, business.

Versatower, 30ft, good cond, £120. G3VQC, QTHR. Tel 0905 820374.

QRP tx/rx, TenTec PM3A, 5W, 7-14MHz, exchange Datong filter or sell, £40. G3JWY, QTHR. Tel 0422 73804.

FT707, FC707, FP707, a.m./fm, cw/ssb, mobile or base, will split. G4NNG, QTHR (Beds). Tel 02302 3137.

TS510, PS510 hf tx, 80-10m, external speech processor, audio notch filter, 10m preamp, attenuator, YM38 desk mic, used daily, bargain, £175 ono. 10m mobile tx, 12W out, external processor, guttermount antenna, £45 ono. 2-el beam, 10-15-20, homemade, very sturdy, 20ft mast, heavy duty wall brackets, guy wires etc, £35. AR40 rotator, one year old, £45. 30ft light alloy mast, 6ft sections, £10. Frequency counter, £12. Cushcraft ATV5, five-band vert antenna, £30 ono. Beermat rx, £8. Antenna switch, 3-in 1-out, £3. Reason for sale—now hf mobile. G4RCU. Tel John, Rugby (0788) 815335.

Trio 2400, spare nicads, spkr-mic, charger, leather case, £150. G6XLR NOT QTHR. Tel Tewkesbury (0684) 293851.

HW100 ssb tx/rx, 80-10m, SB600 HP23A psu, spkr, handbook, Shure 401A mic, £125 ono or consider exchange for 2m or 70cm linear. Ian Burns, G6OOZ. Tel Meopham (0474) 814809.

Lack of space forces sales of manuals and valves, Marconi hp, NEMS-Clark, Collins, ECCO, vlf R1283, Creed CV243, 249, 1653, many more. SAE or ring for complete list. G6EII, QTHR. Tel Allan, 0925 572332.

Datong FL2 filter unit, £65. Teleradio 146 audio generator, 10Hz-100kHz battery driven, £40. Hodec psu, 12V 3A, 5A surge, £10. Over 2000 sheets computer listing paper, 8·5 by 11 tractor feed, £7. All plus postage. G3RDG, QTHR. Tel 01-455 8831.

Hygain 10m trap assemblies, 878749, 57010, brand new, unused pair, no reasonable offer refused. G4CHP, QTHR. Tel 0508 470365.

Yaesu FT7, 10 to 80, hf, ssb, cw, tx/rx. 10W mic, mobile bracket, cables, manual, circuits, Yaesu PS4 power supply, ready to go, £240. G3CDC, 14 The Cornfield, Langham, Holt, Norfolk. Tel Binham 415.

Microwave Modules MMT432/144R transverter, £95. Postage extra or collect. G4GGV, QTHR. Tel Maidenhead 20651.

20m tx/rx, Heath HW32, HP13 12V psu, homebrew ac supply, £85. AVO sig gen, £15. Dawe ac voltmeter, microvolts to volts, £10. G3KWK, QTHR. Tel 0527 41502.

Desk mic, high impedance, stand, £8. Approx 90ft UR67 coaxial, £10. Teleprinter rolls, mostly two-ply, £1 each. Teleprinter ribbons, black, 75p each. All items plus postage. G3RDG, QTHR. Tel 01-455 8831.

Yaesu FT680R, 50-54MHz 6m all mode tx/rx. *Wanted:* AT120, SP120, TL120. GI3ZSC, QTHR. Tel 08494 72378.

Centronics 779 printer, tractor feed, 40-page illustrated manual, £185. *Wanted:* VFO4B for KW2000 series. GI4GNZ, QTHR. Tel 0266-880740, evenings or weekends.

Sony ICF2001, a.m., ssb, cw, vhf, fm synthesized gen cov rx, perfect cond, incl mains psu, only £80. Sony CV1200ACE bw video recorder, gwo, incl tapes, ideal for atv, only £50 ono. G4SXH. Tel Laurence, Cheltenham 36461, evenings.

TR2300 charger, nicads, handbook, reverse repeater mod, £90. BC221 handbook, int/psu, £10. AVO CT378B sig gen, 2-250MHz, £10. SEM atu, 10-80m, Ezitune, as new, £20. Heathkit scope, calibrator, manual, £10. AR88 HW100 manuals, £1 each. Collect or can deliver north London area. G3YRW, QTHR.

Icom 740, ac psu, fm board, hand and desk mics, as new, only used few hours, £700. *Wanted:* Collins 312B5, Heath HP23. G3ONU, QTHR. Tel Garston (09273) 76344.

Kenwood TS130SE, 200W p.e.p. mobile, all WARC bands, three months old, comp with service manual, MC35 mic, £450 ono. G4UNM. Tel Sandown (0983) 402273 (IoW).

NASA 130-140MHz satellite receiving system, used as main comms link on Saturn Five rockets, consists of diversity rx, demodulator, sdu synthesizer, all wkg, with spares, solidstate, cost $200,000, ring for further info. G6EII, QTHR. Tel Allan, 0925 572332.

Yaesu FT227RB 2m fm tx/rx, £100. G8UMA, QTHR. Tel Frensham 3607.

SSM Europa 2m transverter, good cond, new coaxial relay fitted, spare pa tube, instruction manual, 40W op, £39. W2AU balun, 1:1, unused, 30ft copper wire, £15. AVO 8 Mk5, latest model, £65. G4OXD. Tel Terry, 0462 35248, after 6pm.

1983 *USA* and *DX Callbooks*, £8.50 each plus postage. 6KD6 FTDX401 pa valves, matched pair, Japanese, unused, £12. Three used but ok, £2.50 each. Centurion DX2 case for WPO Antennalab, £3. G3IZJ, QTHR. Tel 0252 548561.

FT101ZD, fm fan, narrow cw filter, 1·5 years old, used little, reason for sale, home computing, no time for radio, manual, mic, box included, cond as new, £500 ono. G4FBZ, QTHR. Tel Telford (0952) 613824.

IC2E, modified to cover 144-148MHz, 18 months old, used little, spare battery pack, charger, orig packing etc, £135. Tel Potters Bar (0707) 58496.

HQ1 hf minibeam, exc results obtained, must now sell to pay for a big 'un, £70. Buyer collects. Tel Stamford 52504.

Icom 701, comp with IC701PS, psu/spkr, SM2 mic, £450. Trio dual impedance MC50 mic, £20. G3LBG NOT QTHR. Tel Torquay 313318.

Yaesu FT290R, original, no mods, case, nicads, £185. MM linear, 30W, 1/3W in, perfect wkg order, £40. TET 8-el Quagi, 2m, £28. Western rotator, £20. Adonis mobile mic, £15. Tokyo hf atu HC200, WARC, £40. 5/7A 12V psu, £10. G4SDK. Tel Pete, 021-300 5026, evenings.

Test equipment, Solartron oscilloscope, CD1400, dual beam, 25MHz, manual, £75. PSU, 300V 600mA rack type, £10. Wayne Kerr bridge type B221, Q221 adapter, *RL & C Manual*, £75. Muirhead rf bridge type D297A, £10. All buyers collect. G3KWK, QTHR. Tel 0527 41502.

KW202 rx, matching spkr, £120. 204 tx, Shure mic, £130. 107 antenna tuner, £75. 108 monitor scope, £60, or together £350. All used little. G4CNB, QTHR. Tel 0621-782388.

Rotator: SU4000, as new, £75. G4MH mini beam, comp, £50. AR88, gwo, £60. Buyer collects. G4GDL, QTHR. Tel Leeds 671591.

EC10 rx, battery, mains packs, £50 ono. G3IGY. Tel Leeds 862508.

Belcom Liner 2, 144MHz ssb tx/rx, preamp fitted, no sproggies—tested! £70. G6MEN. Tel 0704 74792.

French AME KL/GRR rx, ex-NATO 100kHz-35MHz in eight ranges, twin conversion bfo xtal cal, bandwidth 1, 2, 4kHz, BYG valves, 230V, 20 by 16 by 15in, £45 ono. G6DYX, QTHR. Tel Abingdon 28281, after 5pm.

Yaesu FRG7 digital communications rx, mint cond, antenna packing, £150. KW Vespa Mk2, £75 ono. Sell as comp hf station incl leads. *Wanted:* KW2000 or like. G4PNN. Tel Mark, Kidlington (nr Oxford) 3420, after 6pm.

Assorted coaxial cable, comms, morse key, *Rad Coms*, buyer collects. G8MEN, QTHR. Tel Peter, 01-733 8878.

Yaesu FTDX401 hf tx/rx, handbook, mic, in good cond, has new pa valves, £200 ono. Buyer must collect. G4NTB, QTHR. Tel Graham, Weybridge 51918.

Yaesu FT101E hf tx/rx, exc cond, 600Hz cw filter, spare pa valves, FV101B, remote vfo, mint, all leads, £400 ono. Pye Westminster, 70cm, five channels, £65. Pye Cambridge, 2m fm, three channels, preamp, £20. Tel 021-747 4570, evenings.

FT101E, spare pa valves, exc cond, £390. FRG7000, exc cond, £200. G4GIQ, QTHR. Tel Northwich 45584.

100W 24ch Standard aircraft hf tx/rx, STR18B/2 (RAF ARI 5874), 2·8-18·1MHz, cw/mcw/rt. Comprises: tx T4188, psu 4192, control 4243, rcu 4189, J-box 4191, rx R4187, atu 7180, manual, less some cables, good cond, £120. Taylor, G3UCT. Tel York 29777.

227Rs, £100. MM144/28 transverter, £69. Datong ASP/A, £60. Lunar linear 80W, preamp, switched, £70. 200/2kW hf swr/power meter HM102, £25. Surplus requirements. G4KRZ. Tel Austin, 0722 29737.

Sommerkamp FT277ZD Mk3 fm, all new bands, fitted dc-dc converter, fan, as new, only used for receive, reluctant sale following move of QTH, offers considered around £425. G6LJP. Tel Peterborough (0733) 77564.

Change of circumstances forces sale of hf station: IC720A, used little, gen cov rx and tx, 18 months old, orig packing, £795. SMC 13·8V psu, 25A continuous, 35A surge, fully protected, 15 months old, £85, or both for £850. SEM Tranzmatch, 160-10m, £60. 13·8V/16A homebrew psu, £30. Superb Admiralty morse key, one owner since new, exc cond, orig packing, £85. Can deliver within 40 miles Dartford. Simon Langlois, GJ4ODX, Merchant Navy College, Greenhithe, Kent DA9 9NY. All replies answered.

Sale or exchange comp atv station, ie Wood & Douglas 3W tx/rx, 30W linear, Camara MBM 88-el antenna. *Wanted:* hf multiband tx/rx or tx or offers. G4VEL (ex-G6HML), QTHR. Tel John, Thetford (0842) 4415, after 6pm.

Wood & Douglas 144SY25 synthesizer incl thumbwheel switches and die-cast boxes, 90 per cent comp, £30. Pair pocketphones fitted RB14, spare tx, wkg rx, less batteries, £10. *Wanted:* vhf/uhf linear and hv psu parts. GM8MNG, QTHR. Tel Chris, 0620 3833.

SX200N scanning rx, 26-512MHz, mains psu, £180. SF1 pocketphone, working any 70cm channel, £35. ITT M5 mobile, less ls, working any 70cm channel, £45. PF2UB, 3ch, wkg 433·2MHz, £60. All with workshop data. G8JNJ NOT QTHR. Tel 04465 4479.

WS No19, comp station: 12V psu, variometer, vehicle mounting, antenna, waterproof cover, junction boxes, etc, £65. Cine camera: Beaulieu 4008ZM 2 super 8, case, accessories, £325. Eumig projector, £25. G4RBR. Tel Chris, 01-398 8172, home, 01-979 1798, work.

Icom IC24G, 2m fm, fully synthesized, 10W,

supersedes the IC240, £100 ono. G4PBF, QTHR. Tel Peter, Tonbridge 351108, evenings only.

Bargain prices for new rigs: Icom IC720A, power supply, cw filter, in orig packing, £675; TS430s, £525; Icom IC751, power supply, cw filter, £825. GW4ACO, QTHR. Tel 0492 515240 evenings.

FT290R, nicads, charger, swr meter, wavemeter, all about a year old, Channel Master 9502B rotator, Jaybeam 4-el quad, feeder, both about five months old, £300 ono. G6OQX. Tel Les, St Albans 73620.

FT200, FP200, DC200, good cond, £240. FT207R, charger stand NC2, charger NC9C, YM24A mic, all new, hardly used, £155. Global AT1000 swl atu, £15. *Wanted:* SP100 (matching spkr for Trio R1000). G4ERO, QTHR. Tel Bournemouth (0202) 518012.

FT101 Mk2, Yaesu YC601 dfm readout, manual, spare valves, all vgc, £240 together. Transformers: Gardner 6V 43A, £5; 400V 600mA, £4; Partridge 475-0-475V 355mA, intermediate taps, total 20A 6·3V. Buyer inspect and collect. G2CLP, QTHR. Tel 0234 68152.

TR7730 25W fm mobile, £165. TR8400 10W 70cm fm mobile, £180. both cw mounts, mic, boxes. G3TUX, QTHR. Tel Chris, 0428 3229, or 0428 54141, business.

Oric 48k programs on cassette: morse decoder, tutor, practice sending and receiving, variable speed, six functions, £4.50. Database, ideal for station log, features mc code search routine for instant retrieval, nine functions, £5.50. Both menu driven, professionally written. G6IDQ, QTHR.

Yaesu FT208R 2m handheld, 2·5W, good cond, NC8, Base Master, quick charger, spare nicad, whip, spkr, mic, mobile mounting bracket, £190 comp or swop 2m or 70cm mobile tx/rx, cash adjustment either way. G1BNE. Tel Luton 33885.

Yaesu FTDX401 tx/rx, 80-10m input, 560W p.e.p., ssb, 430W cw, £200, or exchange for QRP or test gear to equivalent value. G3FRM, QTHR. Tel 0207 506280.

"El Grande" mains transformer giving 40V dc or less at 75A on secondary, 8mF, 650V dc capacitors, offers. G4INX. Tel Chester 678679.

Dentron hf linear GLA1000, 1,200W p.e.p. input, vgc, comp with manual, £250 ono. G4AUX, QTHR. Tel 092575 2661, after 7pm.

FT221R, full set fixed channel xtals for repeaters, service manual, £300. MFJ 722 ssb/cw audio filter, notch, £35. Tech TE65 vtvm, £16. Lionel J36 bug key, collectors item, offers? G3PEK, QTHR. Tel 0244 300897.

RX FRG7700, Amtech 300 atu, Sentinel X 2m converter, all boxed, as new, £250. Buyer collects or pays for carriage. Tel Richard, Portsmouth (0705) 814368, after 6 January.

HW101, exc cond, ac psu, 400Hz cw filter, spare valves, handbook, £130. HP13B 12V psu, £30. G4EHI, QTHR. Tel Elham (Kent) (030384) 629.

New ham selling swl equipment: R600 rx, £190. Bearcat scanner plus discone, £100. V2000 video tapes, £1 per hour. Tel 0842 861495.

Yaesu FT101E, 160-10m, incl Holdings fm tx and rx unit, £300. MMT144/28 transverter, used little, £90. Maplin matinee organ, built and tested, only £350. All above in exc cond, BBC micro forces sale. G8XUA. Tel Leeds (0532) 673251.

KW202 rx, Q-mult, £110. KW Vespa Mk2, cw/ssb tx, £70. Xtal mic, spare valves, £165 the pair ono. Buyer inspects and collects. G2CMH, QTHR. Tel Brighton (0273) 559752.

Icom 240, £120. Softy 1 development computer, £60. Nascom 2, partially built, incl 161C ram board, psu, handbook, £100. Pye 2823/6Z monitor, spare valves, circuit diagram, needs attention, £20. Europa vhf transverter, £35. G3NFL, QTHR. Tel 023371 2209.

Tono 9000E, £490. FT290R, nicads, helical, £200. MM 30W linear, £55. BBC programs: Morse tutor/keyboard send and receive, £4.50; RTTY, £5; Electron, Oric morse tutor, £4; QTH locator, bearing, distance, £4. G8KMV, QTHR. Tel 0438 354689, evenings.

FT101ZD, early, fan, noise cancelling mic, FV101Z, both mint, FL2100B, unused, SP101, Trio LF30 low pass 75Ω filter, realistic offers please. G4HKL, QTHR.

R820 rx, SP820 spkr, absolutely mint, £300. IC2E handheld, few months old, £100. Mutek front end for IC251E, £30. FDK Multi 750E, 2m multimode, £195. Daiwa CN540 crossed needle swr meter, unused, £20. G6TUA. Tel Rushden 313150, evenings.

KW E-Zee Match, KW swr meter, £35. Buyer collects or carriage extra. G3GVV. Tel Tonbridge 353360.

Trio TS780 2m/70cm all mode duobander, SP70 spkr, ML60 deluxe mic, desk type, 70cm colinear vertical, as new, boxed, used little, just over one year old, the lot, £700. G6CTE, QTHR. Tel Don, 0482 801565.

Omega CIFPU unit, brand new, assembled, £55 ono. CZ175 motor cycle, £150, or swap w.h.y? GW3COI, QTHR.

Morse tuition program tapes for Commodore 64, VIC20, Dragon, Spectrum, ZX81-16k (specify, ask about others), comp with full operating and learning instructions, checks and scores your copy, characters introduced in stages for easy, fast learning from complete beginner to GPO test standard and beyond, sends any amount at any speed and stage, random character groups for learning and a typed-in text for plain language practice, the best program to get you that A licence, £6 each. GW3RRI, QTHR. Tel 0286 881886.

Yaesu FT707, 11 months old, mint cond, orig packing, incl mic, owner needs cash, £380 ono. G6XHD. Tel Peter, Cobham (Surrey) (09326) 4507.

IC700 hf tx/rx, Inoue (original Icom), comp with psu, mic, in good cond, £175 ono. buyer inspects and collects. G4MNC, Merchant Navy College Amateur Radio Club. Tel treasurer, G4RWT, 089283-2590, evenings and weekends.

KW202 rx, spkr, manual, spare valves, new cond, £140. Icom ICB1050 10m fm, £30. Airmec 210A deviation meter, manual, £45. SR9 145MHz rx, 11 xtals fitted, £40. G4AQZ, QTHR. Tel Clacton 861632, after 6pm.

Enterprise sailing dinghy, ply construction, comp with sails, road trailer, presently stored in Southampton, £300 or consider swap for FT290R or w.h.y. Tel Leighton Buzzard (0525) 381377.

Codar T28 rx, 160/80m, bfo, 12V dc, £30. RQ10X Q-multiplier, mains powered, £15. PR30 preselector (requires psu), £10. Both items suitable for valve rx. G6DTR, QTHR. Tel Southend (0702) 230300.

TS700G, mint, no mods, orig packing, £325 ono. G3OMT, QTHR. Tel 05432 24882.

Trio 2200G, helical ant, nicads, charger, £59. Liner 2, rx preamp, £54. HRO, psu, spkr, 50kHz-30MHz, bandspread coils, incl 21MHz, miniature valve front end, £49. MFJ cw filter, £10. G3OGP, QTHR. Tel Rudgwick (040-372) 2275.

Yaesu FT1, all options fitted, immac, only used twice on tx, 5h on rx, hence reason for sale, £1,100. Watts. Tel 01-387 9452, daytime.

Trio 2400, leather case, spare battery, spkr/mic, mains, dc-dc chargers, £160. Standard C78, soft case, mobile mount, 10W power amplifier, nicads, charger, £220. Both with orig packing, manuals. G8EGL, QTHR. Tel 0226 81855.

Trio R820 notch, vbt, i.f. shift, bc bands, digital, four filter positions, matches and transceives with TS820, used little, as new, boxed, orig price £680, sale £440. Prefer buyer collects. G4LW, QTHR. Tel Trowbridge 3166.

Collectors' items: Philips ac trf rx model 2514; Amphon AR19 wooden horn speaker; S. G. Brown headphones. All about 1925, gwo, orig cables, plugs, open to offers for these and other pieces. G2CLP, QTHR. Tel 0234 68152.

TS130S, narrow ssb/cw filters, PS30 psu, AT130 atu, £660. FT480R, matching psu, £350. FT101 Mk2 fan, cw filter, £250. G3ZOX. Tel Cirencester (0285) 66997.

Beermat 14MHz dc rx, comp with 10-turn dial etc, uncased, £20. KM4000 memory keyer, uncased, £30. Robertson. Tel 0908 668800.

Brand new Yaesu FT902DM tx/rx, FV901DM, synthesized scanning external vfo, FC902 antenna coupler, SP901 spkr, dummy load, antenna switch, all unused, Yaesu FT207R handheld, NC2 charger, YM24A spkr mic, £1,200 comp ovno. Tel 0395 277313.

FT101ZDFM, cw matching spkr, mic, perfect cond, only used three times on transmit, £525 ono. G6DQT. Tel Stroud (Glos) 3775, after 5pm.

Yaesu FT480R 2m multimode, boxed, Yaesu external spkr, 5⅛/8 mobile mag mount, gp 144W model Oscar colinear, £275 ono. G6LBV. Tel 0270 214458.

Jaybeam 1,296MHz corner reflector, unused, new, £25. KW107 Supermatch, 12 months old, vgc, £105. FT708R, accessories, £200. G8ESK, QTHR. Tel 0274-45611.

Icom 260E 2m tx/rx, ssb, usb, lsb, cw, three memories, scanning, reverse repeater shift, unmarked, all mobile fittings, mic, boxed, manual, £200. G6BGY, QTHR. Tel John, Clevedon 871039.

Datong D70 morse tutor, as new cond, boxed, £38. *Wanted:* radial kit for HF5 vertical. G4MSH, QTHR. Tel Horsham 65410.

HF5 five-band trap vertical, radial kit, purchased July, £65 ono. Nascom 1 computer, smart case, psu, £80. G4TZT. Tel Padgate (Warrington area) 812290.

Yaesu FRG7700M, vhf converter, FRV7700D, mint, used very little, gen reason for sale, £300 ono. Tel 01-878 2100.

Creed 444 teleprinter, leads, gwo, £30. G8HQS, QTHR. Tel 021-706 8752, after 6pm.

Icom IC730, PS15 psu rig, fitted with cw and ssb filters, fm and transverter control boards, mint cond, £460. G4FLY, QTHR. Tel 0734 594495, after 6pm.

IC2E, new July 1982, used little, battery charger, external spkr/mic, £99. G6KNY. Tel Basingstoke 770421.

Icom IC240, unmodified, used little, unmarked, £99. Buyer collects or carriage extra. G3GVV. Tel Tonbridge 353360.

IC2A handheld, 2m fm, American equivalent of IC2E, no toneburst, 110V charger, helical, £120. KP202 handheld, 2m fm, xtalled S16, S20, S22, S32, R6-7, charger, leather case, helical, £60. G8IJC, QTHR. Tel Chris, Boston 68590.

MMT 432/144R 70cm transverter, only used three times, as new, £160. TET 2m Yagi 10XY, 14·6dB, as new, £50. R. G. Roberts, 6 Seaburn Drive, Houghton-le-Spring, Tyne & Wear. Tel 0783 843563.

IC2E fm handheld, comp with remote hand spkr mic, BC30 base charger, all orig accessories, soft leatherette case, all absolutely as new, used only occasionally, £150. Price includes delivery. G4NUO. Tel Redcar (0642) 483464.

TR2400 2m handheld with accessories, £125. Buyer collects. G4OEX, QTHR. tel Warrington 65569.

BX1 three section tower, ground post, electric winch motor needs attention, offers. Datong rf speech clipper, £35. Hustler mobile whip, £30. W32000 commercial 40/80m trap dipole, £20. G3VOF. Tel Ingrebourne 73366.

Icom IC720A tx/rx, PS20A cw filter, memory supply, £695. Tono 550 morse and rtty decoder, keyer, £195. Icom 1050 10m fm tx/rx, £25. Yaesu F290R tx/rx, nicads, case, £170. Three Extel printers, Baudot 50/75 bauds, £55. ASCII 110/300 bauds, £65. Baudot 50 bauds, £45. ASCII terminal, 80 col, 24 line, many baud rates, RS232 or current loop, ideal Amtor AMT1, £75. Icom IC2E, £100. G3NCR NOT QTHR. Tel 01-567 8771, after 6pm.

Instruction manuals for following: FT200/250 tx/rx; Trio KA2000A stereo amplifier; BCC tx/rx; Wilcox-Gay master osc, xtal osc; KW Viceroy ssb tx Mk2, switching, large Mk3 circuit; Trio TR2200G; all £2. Postage extra. G3MBL, QTHR. Tel 01-445 4321 (N London).

Datong morse tutor D70, perfect, boxed, £35. I will pay postage. G4VCT. Tel 0524 410700.

Portable IC2E, spare nicad, extension mic, charger, as new, used little, gone QRT, £150 ono. G6CKS. Tel Knutsford (Cheshire) 4949.

T1154N tx, vgc, £75. 2-866 juns, £10. *Wanted:* manual/circuit of Hallicrafters SR400 Cyclone manual. HT37 tx. G3GBB. Tel 0284 66496.

Transmitters, mobile fm, 2m, 30W, HC1400, £130. Base multimode 10W Trio 2m TS700, mains battery, £180. Transformers, stabilised 240V out, 15W, £3. 220V out, 250W, £9. Pocket 2m scanner rx, car adaptor, £35. G8CVR, QTHR. Tel Aldridge 52706.

TS430S, all options, three filters, fm board, mic, gen cov tx/rx, under warranty, worth £845, will accept £600. AT230 all band atu, £75. BNOS 12/25A power supply, £80. Yaesu hf 5-band mobile antenna, gutter mount, used once, £50. Daiwa CN520 meter, £20. Standard C78 70cm portable, CPB78 matching 10W pa, nicads, charger, case, various antennas, slide mount, £160. MML 432/50, 50W 70cm linear, preamp, £60. Heathkit electronic iambic keyer, £20. Datong D70 morse tutor, £30. Sinclair Spectrum, 48k, printer, £75. All the above is mint and boxed. G4UDT, QTHR. Tel 01-200 1839.

Heathkit SB200 linear, two 572Bs, exc cond, manual, spare unused 572B, £225. Will deliver for cost of petrol, otherwise carriage extra. G3RDG, QTHR. Tel 01-455 8831.

Grundig Satellit 2000, all bands to 30MHz, bfo, mains units, case, £60 ono. Books, some pre-war, valve types, all kinds. SAE for your wants. AR77E, working ok, £25 ono. Tel Maidstone (0622) 61327.

FTDX401 tx/rx, good cond, £220. AOR 240 handheld, £95. YO100 scope, hardly used, ideal for monitoring all modes, £120. G4ETN, QTHR. Tel Brian, 0278 451357.

Racal RA17M, in cabinet, Eddystone 770R, 19-165MHz, Yaesu 6m tx/rx, Icom 551 tx/rx, 100W MM6 amp, KW, TenTec, Omni series C, ac/dc, all perfect. Ellis, G5KW, 29 Stanbrook Road, Northfleet, Kent DA11 0JW. Tel 0474 22191.

Going mobile? Bedford ambulance, four new tyres, tax, MoT, low mileage, very good mechanical cond, fridge, cooker, ac/dc generator, spare

heavy duty battery, roof-rack, other extras and equipment if reqd. G5KW, 29 Stanbrook Road, Northfleet, Kent DA11 0JW. Tel Gravesend 22191.

Icom IC202, ssb, xtals 144-144·6, £85 ono. ZX81 printer, new, £25. IC5 course, basic electronics, never used, 12 books, £30 ono. 35mm auto/manual compact camera, Ricoh, incl case, inst, £18. All above exc cond. G6IYD. Tel Ashford (0233) 22506, evenings.

Rad Coms 1951-61, complete, £25. Volumes 6, 15, 16, 17 and 1980, 1981, 1982. *Wanted:* Pre-1935 *T&R Bulletins*. G4HUE, QTHR. Tel Andy, 01-554 0399.

Hewlett Packard sig gen, 606A, 50kHz, 72MHz, 0·1-3V output, £75. Wayne Kerr bridge source S161B, £25. both handbooks. G3UWD, QTHR. Tel 0778 422498.

Western DX5V 5-band vertical ant, 10-80m, £40. Buyer pays carriage. G4GLC, QTHR. Tel 0509 212583.

HF beam, very nearly mint cond, TET HB33SP 3-el, 20/15/10m, £150. G3SXW. Tel 01-398 2700, evenings.

FT401B hf tx/rx (also 1·8MHz and 10MHz), FV401 remote vfo, speech processor, desk mic, many spare valves incl pas, £295 ono. G4GNK, QTHR. Tel Abingdon (0235) 29042.

KW2000 spares, circuit for dc psu, circuit for ac psu, large 2000 circuit, £2.50 lot. Xtal 12077·5 (21-21·200), £2. Three-gang 261pF preselector, £4. Valves, enquire. Mobile power cables for Drake TR3/TR4, £5. G3MBL, QTHR. Tel 01-445 4321 (N London).

WANTED

For disabled housebound person, funds limited, Viceroy 3 psu and mic or any parts. PSU urgent for testing. RAIBC member. C. T. Curtis, 554 Middle Park Avenue, Eltham, London SE9. Tel 01-859 1191.

Attempting my own "real" radio collection. Good price paid for mint 19 sets, 38 sets, 1154, 1155, BC348, anything of this era accepted. W.H.Y? G3ZYC, QTHR.

For FT7 power pack, FL110. 180m adaptor or instructions to build. G4PDN, ex-G8YLF, QTHR.

UHF swr meter for freq 900-950MHz or circuit diagram and information to build. Tel Bill, 01-852 9909.

For the Wireless Museum: Old QSL cards, morse-keys, valves, components, shelving, pre-1950 radio books, magazines, catalogues, service-sheets, manuals, 'twenties Gamages catalogue; desperately wanted - knobs! Collection arranged. Details please to hon curator, G3KPO, QTHR. Tel 0983 62513.

Trio DG5 digital frequency counter for TS520S. G6JFJ, QTHR. Tel 0482 853276.

FL2000B linear. G4SUJ, Idlewild, Stourbridge, West Midlands DY7 6RR.

Eddystone 706 series TRF coils, base, and stand. G3LLZ, QTHR. Tel Dennis, 0793 38069.

Manuals for Tektronix 564 oscilloscope; vertical unit 3S1, sampling unit 3T77A, Venner freq counter type 1000F Mk1, loan buy or photocopy. G4OBH, QTHR. Tel 0727 52003.

Manuals for Ithaca Intersystems DPS1 micro system, mountain hardware real-time clock, Shugart SA800 or Remex 20 disk subsystem. Hardware manual for Hazeltine 2000 vdu. G1BUE. Tel St Albans 32759, evenings and weekends.

Frequency display unit, Eddystone 1535 or similar by Watkins Johnson, CEI, Racal, Hartmans, must be off-setable by 21·4MHz. Wideband vhf/uhf antenna multicoupler, or rf amplifier by same manufacturers. Must have low noise figure. HP 410C vavle voltmeter. Above items required in any condition. G6EII, QTHR. Tel Allan, 0925 572332.

18AVT/WB vertical 10-80m antenna, in good cond please. Pete Wells, 15 Apple Tree Grove, Ferndown, Dorset BH22 9LA.

Frequency scale disc for AR88LF, not logging scale. G4BEE NOT QTHR. c/o 12 Queensway, Brinscall, Chorley PR6 8QQ. Tel 0254 831211, after 6pm.

Manual circuit diagram, modifications, for Belcom Liner 2,144MHz ssb tx/rx, to purchase, copy, etc. No reasonable price refused. G6UGU, 12 ingram Crescent, Dunscroft, Doncaster. Tel 0302 841530, evenings.

International marketer requires cheap QRP tx/rx, stowable in aircraft cabin. *For sale*: Luggage. Largish Hawley Goodall frame tent, three pups, ideal for contests, £120 package; would swop for 2m ssb/cw rig of equiv value. Brod Purdy, G4RBP. Tel St Albans 37921.

Old call books, all years. G4RYX (G8TAK, QTHR).

Old airguns, any type, age, cond (pay most for very old, rare, and well kept!). Garrard audio click filter. Chris Reader, G6VAJ, QTHR. Tel Brighton (0273) 550509.

Copy of *Sun, earth and radio* by Ratcliffe, published by World University Library. Post and fair price paid. G2ABC, QTHR. Tel Truro 78393.

Hallicrafters S27 rx, must be cheap. Unit requiring attention may suit. Tel 01-546 4994.

T1396 TR9, any restorable cond, best price. Interested any Second world war airborne, RAF, or others. W.H.Y.? Any atu, Collins 47281, 47282. D. W. Parsonage, 52 Bramble Lane, Mansfield, Nottingham.

TenTec Century 21, must be in first class cond. G4FMH. Tel Bristol 697687.

Copy of *Code Breakers* by Kahn. Circuit etc. RX/TX NZ type WS No ZC1. Buy/borrow repay cash/kind. 2V battery four-pin screen grid value SG215 or equiv for my 1928 rx. G3EUR, QTHR. Tel 0708 852371.

HRO bandspread coils, would exchange ex-Govt 33ft glass fibre reinforced vertical antenna in approx 4ft screw together sections, comp with basemount or a pair of 7MHz 1kW dipole traps or buy. G4FEQ, QTHR. Tel Castleford (0977) 552862.

Midget MX rx, any *Practical Wireless* or similar kit rx. G6FBR, QTHR. Tel Winchester (0962) 66764.

Source for supply of copper-clad Pertinax (or similar) or fine copper mesh for plane reflectors for uhf antennas, 55cm square or larger. G6UWG. Tel 01-254 3944, evenings.

4CX250B bases, must be new, SK610, SK600, SK620A, SK630 types. New 4CX250B tubes. Cash waiting. GJ4ICD, QTHR. Tel 0534 77067, 9am-6pm.

G4RGB CQ: ETM2(B) Samson electronic keyer or Katsumi EK121. Will pay around £10 plus carriage. *For sale:* FT101E, vgc, serviced by SMC, mic, mains, 12V dc leads, handbook, service manual, £350. tel Answerphone anytime, Medway (Kent) (0634) 30822.

Required to put battery rx into commission: UX USA valves type: IA4, IA6 or IC6, IB5/25S, IF4, IF6. Octal equivalents may help! G4IMT, QTHR. Tel Bath 891254.

Frequency scale and function switch for R210 rx. Circuit diagram for Devry cro. HF rx in exchange for Sinclair ZX81 with 16k ram, preferably solidstate. Tel Mr Christian, Frodsham (Cheshire) 33723.

Handbooks, cct diags for Heathkit IT28 and Philips GM4114 rc bridges. Can copy originals. Gladly repay phone, post costs. RS5858, 77 Andover Road, Winchester, Hants. Tel 0962 56064.

Manuals required, or pay costs for copying. Tektronix oscilloscope 545B. Hewlett Packard oscilloscope, 130BR Tektronix module type 1A1. Signal generators, Marconi TF144G, and TF1066B/1. Racal DVM9070. Gregory, 75 Station Road South, Belton, Norfolk.

Early radio books (1920s-30s), components, valves etc from this period. QSL cards, logbooks, morse keys. Enthusiastic collector, cash waiting! Norman Field, G4LQF, 14 Regent Road, Harborne, Birmingham 17. Tel 021-426 3663.

BC348 owners: I need that DM28 dynamotor you removed when you converted the set to mains working, £5 paid plus carriage. *For sale:* three triode valves of 1920s vintage, comp with quaint boxes plus components, same era, £10. G3JDK. Tel Wickersley 541606.

Computer, Commodore 64 terminal unit, AMT1. Software. together or as separates. G4NYE, QTHR. Tel 0984 23762, evenings or weekends.

Cubic Astro 103. Will inspect before purchase within reasonable distance. GM4SID. Tel 0224-24774.

VIC20 computer information, advice, programs etc, for tx/rx amateur radio applications, 32k memory available. G6LIA, 44 Quilp Drive, Chelmsford, Essex CM1 4YA.

Elements for Bird Thruline 43, vhf, uhf. 4-500Z valves and bases. GM8BDX, QTHR. Tel 0361-82425.

HF linear, hb or commercial, wkg or not, but must be reasonably compact. G3WLG, QTHR. Tel G3TCO, (Bristol) (0272) 681068.

Cabinet for Racal RA17 rx. Orig psu for No19 set. Racal MA250 or MA350. Circuit diagram for Pye Lynx camera. 350pF wide-spaced variable capacitor. G3YFG, QTHR. Tel 0254-823769.

A14 spares. HF156 spares and canvas case. PRC361 spares and canvas case. LS frame for A41. Units B48, B47, C42, C45, C12, C11, C13, A43, A42, B70. G8MQT. Tel Terry, 07073 27233.

FT901DM maintenance service manual, borrow, buy or exchange for FT101ZD manual. YD148 mic, SP901P spkr for above rig. G6MOH, QTHR. Tel 090-66 2979.

Heathkit HW101 or KW2000E, power supply, good cond, no mods. G4GJP, QTHR. Tel Wirksworth 3934, evenings or weekends.

Pair of original high power (blue) Wight tapes in unused or pristine condition. MFJ atu model 989 or 984. G3PEK, QTHR. Tel 0244 300897.

Optimist seeks Marconi morse key, Yaesu FC901 or FC902 atu. Good 5-band vertical trap dipole, can collect within 100 miles. Tel Barrie, Herne Bay (02273) 3511, evenings or weekends.

Info how Collins KWM2A can be got going on top band. EI1DA, QTHR.

HF tx/rx or separates, under £200. G8LKF, QTHR. Tel 0782 330613.

Tape spools, 5in diameter for old type recorder. new tape. Parker, 133 Station Road, Cropston, Leicester LE7 7HH.

Good cond or repairable old fashioned magic eye valve type L and C. Test bridge such as AVO or similar with manual. Will collect. Offers to EI1DA, QTHR.

Good cond old fashioned valve signal generator with manual, tidy size, no doghouse, 100kHz to 30MHz or nearest with adjust. Micro and millivolt output, af mod. Arrange collection. Offers to EI1DA, QTHR.

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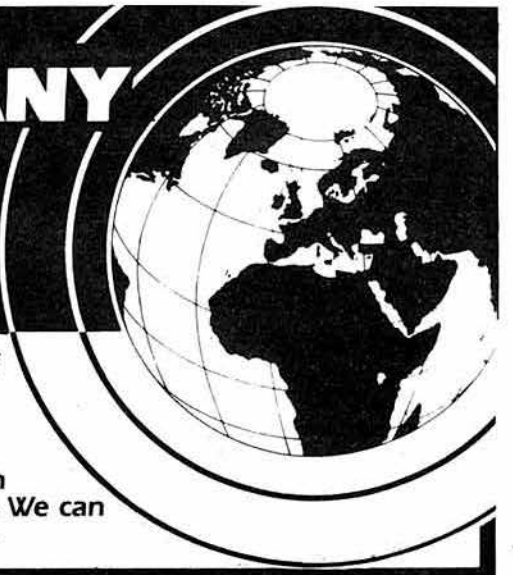

Once again we are pleased to bring to your notice details of new equipment available now, or available soon - also continuing our policy of bulk purchases for best prices we are able to offer many popular lines at superb prices.

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New case design with semi alloy construction.
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20 Memories, AM/FM,
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THE LATEST COMPACT GEN-COVERAGE RECEIVER FROM SONY
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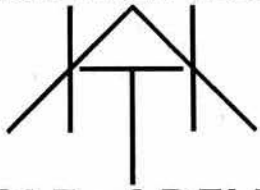
HATELY ANTENNA TECHNOLOGY

GM3HAT  GM3HAT/A

DIPOLE of DELIGHT

(Patents Pending UK and other countries)

FACTS & FIGURES

To those who missed seeing last month's advertisement we remind readers that the Dipole of Delight is:

(i) Multi-band (ii) No-tune (iii) Quiet (iv) Efficient (v) Coax-fed by 50 ohm

and that two three-band versions are being produced and are available from stock.

DD 7/14/21 is suitable for up to 800 W pk and will operate without an antenna tuner over the 7 to 7·1, 14 to 14·35, 21 to 21·45 MHz amateur bands with SWR figures less than 1·5 to 1. It is 21 metres long (about 69 ft) though it may be shortened by a small amount by bends or short folds.

DD 10/18/24 is for the new WARC bands, covering these with no antenna tuner and even lower SWR values. It is 15 metres long (about 50 ft).

PRICES

In the UK both versions are priced at £56·46 including postage and VAT. It is assumed that the purchaser has 5mm 50 ohm coax. There is an integral SO 239 socket.

For DX stations, price is £56 including AIR MAIL postage. Cheque may be written in ANY CURRENCY equivalent at date of signing to exchange rate to £56 Sterling. We will deal with the conversion to £ Sterling.

FUTURE DEVELOPMENTS

If the above versions are of no interest, please note that we are planning to produce other variants. The next type planned will be a DD 14/21/28 which will be only 10·6 metres long (about 35 ft), and which could be hung with very little visual impact in a small garden, or as an inverted V over a house roof. Watch further advertisements for the announcement on this and other types.

ANTENNA TECHNOLOGY

For prospective purchasers who do not yet have the advantage of seeing the DD-users Instruction Sheet some remarks on the measurement of very low SWR values may be of interest.

In general the SWR value $S = (1+k)/(1-k)$

Where k is the voltage reflection coefficient of the load

For example if $S = 1{\cdot}2$ then $k = 0{\cdot}1$ approximately.

But reflected power P_R is proportional to k^2

So in the example $P_R = 0{\cdot}01\ P_T$. Where P_T is power transmitted.

Now in the reflectometer SWR meter (and also in the toroidal transformer type), the sensitivity rises in proportion to frequency. Thus if the transmitter is giving out a small amount of harmonic power and this cannot be radiated from the antenna (and it cannot be from the DD) it will be totaly reflected. The fifth harmonic would then indicate on the reflectometer in a manner five times enhanced,

i.e. $k = 0{\cdot}1$ could be caused by $k_{5th} = 0{\cdot}02$

i.e. $P_{R5th} = (0{\cdot}02)^2 P_T$

$= 0{\cdot}0004\ P_T$ OR $P_{R5th} = -34$ dB relative to P_T

Not many amateur transmitters will deliver as small a fraction of harmonic power as this when driven to full output; most will improve markedly when driven less hard. So to make the most meaningful measurements of SWR it is best to set the reflectometer to medium sensitivity and drive the transmitter up to just enough power to fill the FOR POWER scale.

Many directional wattmeters are also not much good for very low SWR antenna measurements as they have rather insensitive frequency-levelled detectors and require large forward power to give convincing reverse power readings. And then it is nearly all harmonic power that shows up.

It is salutory to try one's own transmitter at lower than normal power, or to try different transmitters into a known very low SWR antenna like a Dipole of Delight. Pundits may say that one is merely coming lower down on a diode curve. The above comparison between different transmitters will verify that this is not the explanation, when they are at the same power levels.

GUARANTEE

Of course we offer a no quibble money back guarantee for anyone not delighted with his or her Dipole of Delight.

ORDER FROM

HATELY ANTENNA TECHNOLOGY, 1 Kenfield Place, ABERDEEN AB1 7UW, Scotland, UK.

Proprietor: Maurice C. Hately, BSc(Eng), MSc, MIEE, Chartered Electrical Engineer.

Antennas are MADE IN SCOTLAND (GM3HAT)

AJH ELECTRONICS (G8AQN)

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Terms of business cash/cheque with order. Education orders accepted on 30 days basis. Full money back guarantee, prices include VAT. Please add 60p for postage. Callers by appointment only.

30 WATT 2 METRE LINEAR AMPLIFIER KIT—Designed for the TF290R or any transceiver up to 3½ watts output. 2½ watts in will give 25 watts output. Suitable for FM or SSB. Rx pre-amp is switched in when required; this gives up to 20db gain or can be made variable by adding a potentiometer. Kit consists of ready drilled PCB and all components but less case and heat sink. All assembly instructions included. ONLY **£29·50**, suitable die cast box and heat sink **£6·00** (if ordered with kit, **£5·50**).

80 WATT 2 METRE LINEAR AMPLIFIER ready built, requires 2½-3½ watts drive for full output. Designed for the FT290R, size 112 × 80 × 210mm. Power required 13·8V DC @ 14 amps (no receive pre-amp) **£98·00.**

HF BAND DIPOLES made by famous radiotelephone manufacturer, consists of 1-1 balun in waterproofed die cast box, 230ft 7/029 aerial wire, 15 metres 50ohm UR67 down lead, 60ft halyard and pulley and insulators. As new and unused. Can be cut for any frequency from 2 to 30MHz. BARGAIN AT ONLY **£26·00.**

432MHz POWER AMPLIFIER UNITS as used in Pye UHF Westminster radiotelephones. This is believed to be the latest designed PA for this radio which uses a BLX68 in the output stage giving a minimum of 7 watts out. Requires 250 m/w drive @ 145MHz for full output. Ready tuned for 432MHz band. With circuit as new and unused ONLY **£16·00.**

VHF FM RADIO TUNERS 88-108MHz (could be modified for 2 metres) dual gate mosfet RF stage plus mixer and separate oscillator, 7 gang tuning capacitor, 4 tuned circuits @ VHF plus 3 gangs of 365pf for an AM tuner section. As new and unused BARGAIN ONLY **£4·00.**

JOHNSON VALVE BASES Cat No 124-0110-001 for the 4CX250B type valves. Bases only (sorry no chimneys). New and boxed ONLY **£15·00.**

AERIAL CHANGE-OVER RELAYS as used in VHF Pye Westminsters etc, made by Magnetic Devices type 354. OK up to 50 watts @ 200MHz. 12 volt coil, new, unused ONLY **£1·00** each or box of **two for £1·75p.**

CRYSTAL FILTERS

10·7 MHz Cathodeon type BP4113 ±15KHz @ 3db, imp 2k ohm unused	**£5·00**
10·7MHz Cathodeon type BP4133 SSB LSB only imp 200ohm, unused	**£5·00**
10·7MHz ITT type 024BC ±7½kHz @ 3db imp. 910ohm OK FM 32 metres	**£6·00**
10·7MHz HY-Q type QF10728 for SSB u/lsb no carrier xtals	**£12·00**
23·455MHz Cathodeon type BP4143 ±14kHz imp 1k ohm min type	**£4·00**

many more, send for list.

PTFE feedthrough insulators **25 for £1·00**
Solder-in feedthrough capacitors 1000pf 500vw **50 per 10**
Bolt-in feedthrough capacitors 1000pf 500vw **40p** each
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RF POWER TRANSISTORS—
2N3866 1 watt @ 400MHz 10db 28v **75p**
PT4236A 1 watt @ 175MHz 9db gain 12v **75p**
BLY55 4 watt @ 175MHz 7db 12v **£4·00**
BLY87A 10 watt @ 175MHz 9db gain 12v **£6·00**
PT4236B 11 watt @ 88MHz 10db 12v **£4·00**
PT4236C 35 watt @ 88MHz 6db gain 12v **£5·50**
PT4555 25 watt @ 145MHz 7db gain 12v **£6·00**
PT8711 40 watt @ 145MHz 7db gain 12v **£10·00**
PT4577 no info except FT1200MHz, 15v, collector current ¼amp **£1·50**

FETS/MOSFETS—3SK88 **90p**, 3SK87 **£1·00**, 3SK60 **75p**, 3SK51 **70p**, 3SK45 **65p**, BFR84 **50p**, TIS88A **40p**, BF256 **35p**, 2N4381 (P chan) **45p.**

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Gooday to you all,

Why the map? Well, our lucky friends in Bonnie Scotland now have a friendly local Ham Store at
ARROW ELECTRONICS (SCOTLAND)
51 Hyndland Street, Glasgow.
Tel: 041 339 6445
Where Bill McJimpsie G6NHJ will be happy to serve you with a good selection from our product range and Bill has full stocks of all our discount offers.

If you speak Welsh or English it's all the same at
ARROW ELECTRONICS (WALES)
14 Carreg-y-gad, Llanfair-p-g. Anglesey
Tel: 0248 714657
where John Lewis GW8UZL will be pleased to discuss that new rig.

In view of various nasty advertising by members of the trade who should know better we wish to state our position.
1. Arrow are one of the UK's largest Amateur Radio Retailers and buy from many sources – we are proud of our good name and take every step to keep it.
2. Arrow are authorised or franchised dealers for the great majority of our products.
3. No branch of Arrow will refuse to service equipment because "you didn't buy it from us", or "because it's Kenwood" or "because it's a Grey import" or any such reason.
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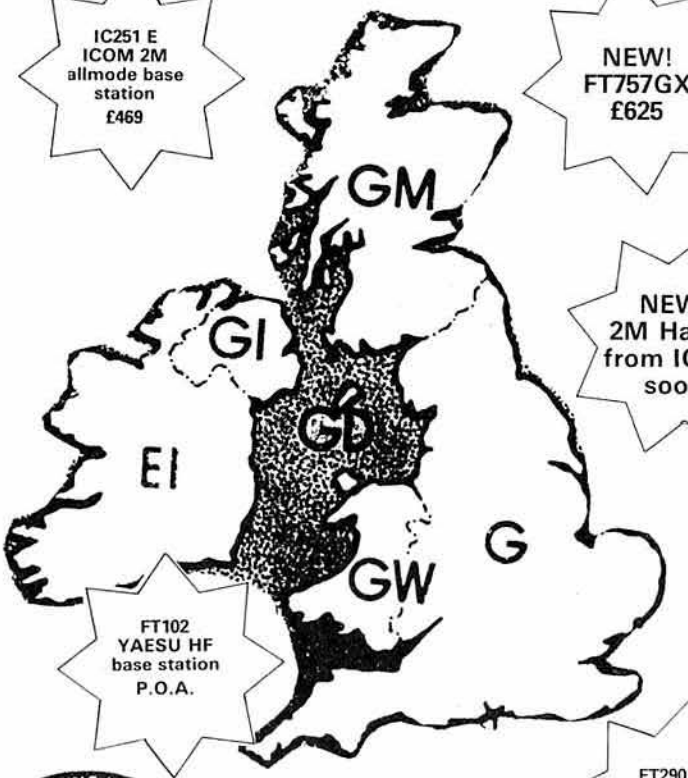
73 de G3LST and Staff.

IC251 E ICOM 2M allmode base station £469

NEW! FT757GX £625



NEW! 2M Handy from ICOM soon

FT102 YAESU HF base station P.O.A.

FT290 R YAESU 2M allmode portable £249

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WELZ	Direct import price savers!
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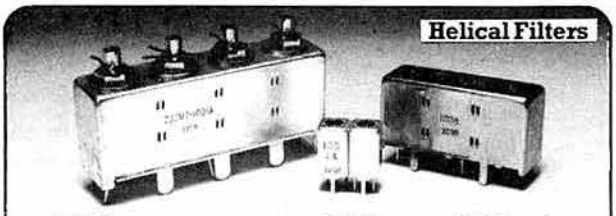


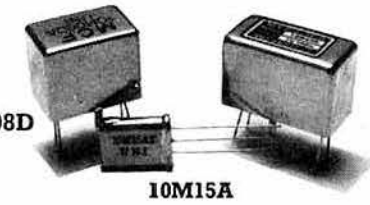
HRQ 7HW CBT

Selected from the Ranges 130-170MHz 400-500MHz

Type Number	Centre	3dB BW	Stock No.	Price	Type
252MT1001A	435MHz	18MHz	17-10011	1.85	7HW
232MT1001A	435MHz	10MHz	17-10010	7.90	HRQ
272MT1008	145MHz	1.2MHz	17-10083	3.15	CBT

* All above 50Ω in/out impedance

Crystal Filters



10M22D

10M08D

10M15A

Type	10.7MHz	Stock No.	Price
10M15A	2 Pole 15KHz BW	29-10152	0.99
10M22D	8 Pole 2.4KHz BW	20-10028	17.20
10M08D	8 Pole 7.5KHz BW	20-10088	15.50

Plenty more types in the catalogue + ceramic blocks etc.

Coax Relays + Schotky Mixers

CX520D SBL1 CX120P

Type	Ratings		Stock No.	Price
CX120P	150W at 500MHz	PC Mounting	46-90120	11.96
CX520D	300W at 16Hz	N Connectors	46-90520	26.98
SBL1	+7dBm	Double Bal. Mixer	12-00003	4.68

RF Semiconductors FET's/MosFets

Type	Stock No.	Price
J176	59-02176	0.65
2SK55	59-01055	0.32
2SK168	59-01168	0.37
3SK45	60-04045	0.49
3SK51	60-04051	0.54
3SK60	60-04060	0.58
3SK81	60-04081	1.32
3SK88	60-04088	0.99
40823	60-03823	0.65
3SK112	60-04112	4.60
BF960	60-06960	0.99
BF981	60-06981	1.20
J310	59-02310	0.80

RF Power

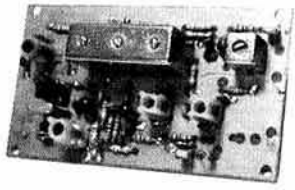
Type	Stock No.	Price
MRF237	58-14237	3.20
MRF238	58-14238	16.50
MRF245	58-14245	40.00
MRF475	58-14475	4.60
PT8811	58-18811	9.50
2SC1945	58-01945	2.60
2SC1971	58-01971	2.49
2SC2053	58-02053	0.63
2SC2097	58-02071	14.75
TP2320	58-12320	10.24
VN66AF	60-02066	0.95
ZTX3866	58-03866	0.45
2N3866	58-13866	1.20

PROJECT PACKS

MkII 2m Convertor

2m to 10m Converter with 3 chamber Helical filter

40-14401 £14.60



Auto Modulation Meter

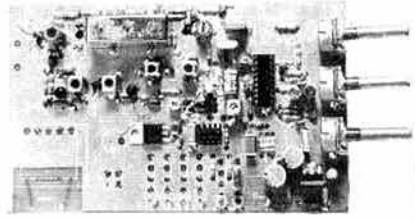
This unit will scan 20-175MHz, automatically lock into a NBFM signal and read the deviation.

40-20175 £34.06

2m Monitor (UOSAT etc)

Complete 2m/UOSAT VHF NBFM receiver system. With mains PSU and high spec ceramic filter.

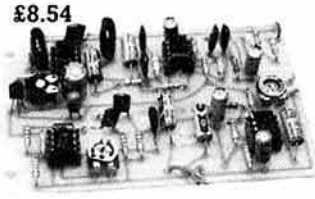
40-14006 £33.84



CW Filter

41-00205 £8.54

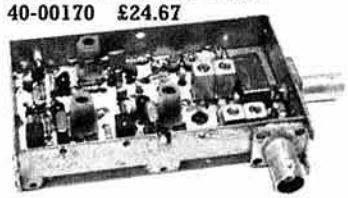
Two stage band pass filter and phase-locked loop to regenerate CW from noisy signals



UHF converter

70cm to 2m and 70cm to UHF TV Band

40-00170 £24.67



2mPreamp

18dB gain, noise figure less than 1.5dB, impedance 50Ω

40-14400 £3.35

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PROJECT	CODE	ASSEMBLED	KIT
70cms EQUIPMENT			
Transceiver Kits and Accessories			
FM Transmitter (0.5W)	70FM05T4	38.10	24.95
FM Receiver	70FM05R5	68.25	48.25
Synthesiser (2 pcb's)	70SY25B	84.95	60.25
Synthesiser Transmit Amp	A-X3U-06F	27.60	17.40
Synthesiser Modulator	MOD 1	8.10	4.75
Bandpass Filter	BPF 433	6.10	3.25
PIN RF Switch	PSI 433	9.10	7.75
Converter (2M or 10M i.f.)	70RX2/2	27.10	20.10
FM Package 2 (Synthesised)	70PAC2	163.00	128.00
TV Products			
Receive Converter (Ch 36)	TVUP2	26.95	19.60
Pattern Generator	TVPG1	39.95	32.53
TV Modulator	TVM1	8.10	5.30
3W Transmitter (boxed)	ATV-1	87.00	—
3W Transceiver (boxed)	ATV-2	119.00	—
Power Amplifiers (FM/CW Use)			
50mW to 500mW	70FM1	14.65	8.85
500mW to 3W	70FM3	19.65	13.25
500mW to 10W	70FM10	30.70	22.10
3W to 10W	70FM3/10	19.75	14.20
10W to 45W	70FM45	58.75	45.20
Combined Power Amp/Pre-Amp	70PA/FM10	48.70	34.65
Linears			
500mW to 3W	70LIN3/LT	25.75	18.60
3W to 10W (Compat. ATV1/2)	70LIN3/10E	39.10	28.95
Pre-Amplifiers			
Bipolar Miniature (13dB gain)	70PA2	7.90	5.95
MOSFET Miniature (14dB gain)	70PA3	8.25	6.80
RF Switched (30W Max)	70PA2/S	21.10	14.75
2M EQUIPMENT			
Transceiver Kits and Accessories			
FM Transmitter (1.5W)	144FM2T	36.40	22.25
FM Receiver	144FM2R	64.35	45.76
Synthesiser (2 pcb's)	144SY25B	78.25	59.95
Synth Multi/Amp (1.5W o/p)	SY2T	26.85	19.40
Bandpass Filter	BPF 144	6.10	3.25
PIN RF Switch	PSI 144	9.10	7.75
Synthesised FM Package (1.5W)	144PAC	138.00	105.00
Power Amplifiers/Linears			
1.5W to 10W FM (No Changeover)	144FM10A	18.95	13.95
1.5W to 10W FM (Auto-Changeover)	144FM10B	33.35	25.95
1.5W to 10W SSB/FM (Auto c/o)	144LIN10B	35.60	26.95
2.5W to 25W SSB/FM (Auto c/o)	144LIN25B	40.25	29.95
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Low Noise, Improved Performance	144PA4	10.95	7.95
Low Noise, RF Switched	144PA4/S	18.95	14.40
SYNTHESISER ACCESSORIES			
Display Decoder/Driver	DISP1/2	22.60	16.10
GENERAL ACCESSORIES			
Toneburst	TB2	6.20	3.85
Piptone	PT3	6.90	3.95
Kaytone	PTK3	8.20	5.95
Relayed Kaytone	PTK4R	9.95	7.75
Regulator	REG1	6.80	4.25
Solid State Supply Switch	SSR1	5.80	3.60
Microphone Pre-Amplifier	MPA2	5.95	3.45
Reflectometer	SWR1	6.35	5.35
CW Filter	CWF1	6.40	4.75
TVI Filter (Boxed)	HPF1	5.95	—
MICROWAVE PROJECTS			
Microwave Drive Source	MD05T	29.50	20.40
Bandpass Filter	BPF 384	5.10	3.25
4M EQUIPMENT			
FM Transmitter (1.5W)	4FM2T	34.75	21.20
FM Receiver	4FM2R	61.65	43.15
Pre-Amplifier	4PA4	10.95	7.95
Pre-Amplifier, RF Switched	4PA4/S	18.95	14.40
6M EQUIPMENT			
Converter (2M)	6RX2	27.60	19.95

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

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Plate Ceramic Capacitors 50V working for vertical mounting
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·33 & ·47 **8p**. ·68 (63V) **11p**. 1·0 **15p**. 1·5 **20p**. 2·2 **22p**

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·47/50 **5p**	10/50 **5p**	47/16 **6p**	100/25 **7p**	220/25 **8p**	470/40 **16p**
1·0/50 **5p**	22/16 **6p**	47/25 **6p**	100/50 **8p**	220/50 **10p**	1000/15 **15p**
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0·47/35 **14p**	4·7/25 **15p**	22/6 **20p**	33/10 **30p**	100/3	**35p**
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100/1A 1N4002 **4p** 1000/1A 1N4007 **7p** 60/1·5a S1M1 **5p** 100/1A Bridge **25p**
400/1A 1N4004 **5p** 1250/1A BY127 **10p** 30/45mA OA90 **6p** 30/150mA AAY32 **8p**
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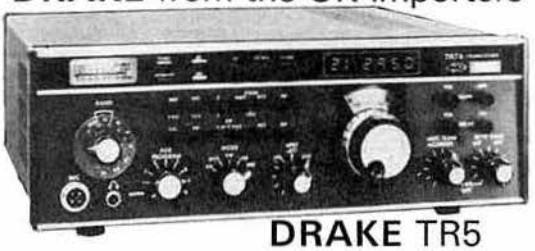

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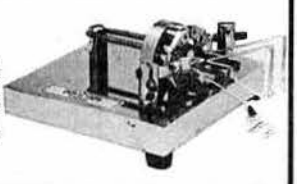

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2N5591	25w	4.4dB	13.6	175MHz	£10.25
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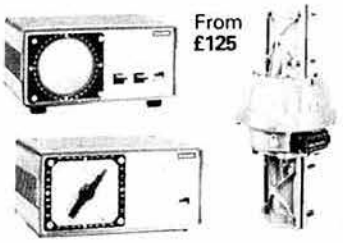

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ORDER FROM

RSGB Publications (Sales), Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW

(Raynet supplies should be obtained from Mrs J. Balestrini, Merrivale, Willow Walk, Culverstone, Gravesend, Kent)

RAD COM OPERATING GUIDE 1984

(Supplement to *Radio Communication* January 1984)

General rules for vhf/uhf/shf contests 1984

The rules governing all RSGB vhf/uhf/shf contests to be held in 1984 will be selected from the following general rules, which will be referred to by number. Please read the rules carefully before the event. Supplementary rules will be added for the more complex events such as VHF NFD.

Cover and summary sheets and up to 10 log sheets are available from the contest adjudicator. If you are entering a contest it is only necessary to tick the bottom of the cover sheet (Form 427) and enclose a large sae. All stationery is A4 size (30 by 21cm); envelopes which hold flat sheets will carry far more than those which require sheets to be folded. Note that a 12·5p or 16p stamp is only sufficient for 8-10 sheets. Larger quantities of log sheets may be obtained from RSGB Publications (Sales) quoting reference LSVHF. Queries on vhf contests should be made to John Quarmby, G3XDY, QTHR, tel Ipswich 717830.

Please note that many rules have been amended since 1983, so please read them all carefully.

1. Date and time: See individual contest rules.

2. Entries

(a) All entries must be sent to the contest adjudicator and must be postmarked not later than 15 days after the end of the contest or last cumulative activity period.

(b) All entries must be accompanied by a correctly completed current RSGB vhf/uhf contest cover sheet (Form 427) for each band used. In multiband events entrants must also complete a multiband summary sheet (Form 4422).

(c) All entries become the property of the RSGB and cannot be returned.

3. Operators: All operators must be RSGB members.

4. Sections

(a) All classes of stations with no separate sections.
(b) Fixed stations only.
(c) Portable stations only.
(d) There will be two sections:
Section S – Single-operator
Section M – Multi-operator
(e) There will be two sections:
Section F – Fixed stations
Section O – All other stations
(f) Sections as per IARU rules.

In fixed station sections, the station must be located at the main address as shown on the licence.

Single-operator stations are those operated by one operator who received no assistance with operating or log keeping during the contest.

5. Locations

In multiband events all stations forming one entry must operate from one site, defined as a circle of 1km radius.

All equipment for portable stations must be installed on site during the 24h preceding the contest or during the contest itself.

(a) Entrants may not change the location of their stations during the contest.

(b) Entrants may change the location of their stations once during the contest. In the event of a repeat contact with a station, the higher score should be claimed, and the other contact clearly marked as a duplicate.

6. Modes

(a) Contacts may be made on all permitted modes.

(b) Entrants may transmit only A1A (cw) or F1A (fsk) and contact only other stations transmitting these modes.

7. Scoring

No points will be lost if a non-competing station being contacted by an entrant is unable to supply a QTH, QTH locator, or serial number, but the receiving operator must obtain enough information to be able to calculate the claimed distance score.

Contacts with stations whose callsigns appear on the cover sheet will not count for points.

(a) Contacts made between stations separated by the distances shown in the table will score as indicated. Distances falling on borders between scoring rings score low, eg 50km scores 1 point.

Km	Points	Km	Points
0-50	1	150-200	7
50-100	3	200-250	9
100-150	5	250-300	11

and pro rata

Note: All radial rings are 50km wide, and all possible scores are odd numbers.

(b) Contacts will be scored at one point per kilometre.

8. Final tabulation of multiband contests

(a) All bands will be listed separately. There will be no overall table.

(b) The final tabulation showing the overall results will be formed by taking the sum of the points gained on each band, which will first be calculated by dividing each station's score by that of the band leader and multiplying by 1,000.

$$\textit{i.e.}\ \text{Points for each band} = \frac{\text{Score achieved from Rule 7}}{\text{Band leader's score from Rule 7}} \times 1{,}000$$

(c) The final tabulation and multipliers will be in accordance with IARU rules.

9. Awards

There will be an award to the highest scoring station in each section. An award will also be made to the runner-up in each section in which there are 10 or more entries. In events tabulated under Rule 8(b) a certificate will be awarded to the highest scoring station on each band that has not qualified for either the overall winner or runner-up award.

10. Crossband contacts

(a) Crossband contacts do not count for points.

(b) Half-points can be claimed by both stations for a crossband contact if two-way communication cannot be established on the same band.

11. Repeat contacts

(a) Only one scoring contact may be made with a given station on each band in use during the contest, ie any callsign regardless of suffix or prefix may only be worked for points once. Any non-scoring contacts must be clearly marked in the log.

(b) One contact may be made with a given station (as defined in 11a) during each activity period. Only the highest scoring three activity periods will count towards the final score. However, all available logs should be sent to the adjudicator for the purpose of checking. Serial numbers increment from 001 for each activity period.

12. Log keeping

The logs for contest entries must be made out on current RSGB vhf/uhf log sheets, or if computer listings are to be submitted, these must be cut to A4 size, RSGB log format, and be line spaced to contain 25 contacts per sheet.

Logs must be tabulated as follows:

(a) *i)* Date/time (gmt)
ii) Callsign of station worked
iii) My report on his/her signal and serial number
iv) His/her report on my signal and serial number
v) QTH locator received
vi) QTH received
vii) Points claimed

The contest exchange must consist of both callsigns, RS or RST report followed by serial number, both QTH locator and QTH. The QTH must be given as a point identifiable on an Ordance Survey route-planning map (scale 1:62,500) or as a distance and direction not greater than 25km from such a point. In multiband events the QTH must be given in a different form on each band.

(b) As 12(a) but less part *vi* (QTH received). The QTH need not be given as part of the contest exchange, but contestants should note Rule 14.

13. Serial numbers start from 001 and advance by one for each contact.

14. A station must operate within the terms of his/her normal licence (this excludes high power permits).

15. A station may not engage in more than one contact concurrently.

16. The equipment comprising the station may be used under one callsign only for contest purposes on each band. This does not preclude the use of shared equipment for talkback purposes.

17. Stations using telephony in the recognized cw sub-bands 70·025-70·150MHz, 144·000-144·150MHz, 432·000-432·150MHz, and 1,296·000-1,296·150MHz, or transmitting on beacon frequencies, are liable to disqualification. Entrants should observe the provisions of the IARU/RSGB band plans.

18. Stations which persistently radiate poor quality signals, or otherwise contravene the code of practice for vhf/uhf contest operation (see below), are liable for disqualification or loss of points.

19. Special event callsigns may not be used by contest stations.

20. Contacts made via a repeater, man-made satellite, or moonbounce will not count for points.

21. Proof of contact may be required.

22. Entrants must permit inspection of their station by members of the VHF Contests Committee, or its representatives, and give site access information if requested to do so.

23. Failure to comply with the rules given for a particular contest may result in loss of points or disqualification.

24. The ruling of the Council of the RSGB shall be final in all cases of dispute.

General rules for listeners vhf/uhf contests 1984

1. The following general rules for vhf/uhf contests published above will apply: 1, 2, 3, 4a, 5a, 7a, 9, 11a, 20, 21, 23, 24.

2. Listeners contests are open to all non-licensed members of the RSGB. Only the entrant may operate the receiving station.

3. Logs must show in columns: **a)** date/time (gmt); **b)** callsign of station heard; **c)** my report on his/her signals; **d)** report and serial number sent by station heard; **e)** callsign of station being worked; **f)** QTH locator given by station heard; **g)** QTH given by station heard (if appropriate); **h)** points claimed.

On 144MHz the callsign in column **(e)** may only occur once in every 10 contacts logged. CQ and test calls do not count for points and should not be logged. If both sides of a QSO can be heard, both can be claimed for points.

The Hansen Trophy will be awarded to the entrant with the highest aggregate score in all the swl contests between 3 March and 16 September 1984.

(General rules continued on page IV)

UK 144MHz band plan

144.000		
CW only	144.000 to 144.015	*Moonbounce*
	144.050	*CW calling frequency*
	144.100	*MS cw reference frequency*
144.150		
SSB and cw only	144.250	*Used for GB2RS (SSB) and slow morse transmissions*
	144.260 ±	*Used by Raynet*
	144.300	*SSB calling frequency*
	144.400	*MS ssb reference frequency*
144.500		
All modes non-channelized	144.500	*SSTV calling frequency*
	144.600	*RTTY calling frequency*
	144.600 ±	*RTTY working (fsk)*
	144.675	*Data transmission calling frequency*
	144.700	*FAX calling frequency*
	144.750	*ATV calling and talkback*
	144.775	*Raynet*
	144.800	*Raynet*
	144.825	*Raynet*
144.845		
Beacons	(144.850	*Raynet)* †
144.990		
FM repeater inputs	145.000 R0	
	145.025 R1	
	145.050 R2	
	145.075 R3	
	145.100 R4	
	145.125 R5	
	145.150 R6	
	145.175 R7	
145.200		
FM simplex channels	145.200 S8	*Raynet*
	145.225 S9	*Used by Raynet*
	145.250 S10	*Used for slow morse tone modulated transmissions*
	145.275 S11	
	145.300 S12	*RTTY-afsk*
	145.325 S13	
	145.350 S14	
	145.375 S15	
	145.400 S16	
	145.425 S17	
	145.450 S18	
	145.475 S19	
	145.500 S20	*FM calling channel*
	145.525 S21	*Used for GB2RS (FM) broadcast*
	145.550 S22	*Used for rally/ exhibition talk-in*
	145.575 S23	
145.600		
FM repeater outputs	145.600 R0	
	145.625 R1	
	145.650 R2	
	145.675 R3	
	145.700 R4	
	145.725 R5	
	145.750 R6	
	145.775 R7	
145.800		
Satellite service		
146.000		

UK 430-440MHz band plan

430.000		
	NB: 431-432MHz not available within 100Km of Charing Cross, London.	
432.000		
CW only	432.000 to 432.015	*Moonbounce*
	432.050	*CW calling frequency*
432.150		
SSB and cw only	432.200	*UK ssb calling frequency*
	432.300	*IARU ssb calling frequency*
432.500		
All modes non-channelized	432.600	*RTTY calling frequency*
	432.600 ±	*RTTY working (fsk)*
	432.675	*Data transmission calling frequency*
	432.700	*FAX calling frequency*
432.800		
Beacons		
433.000		
FM repeater outputs in UK only	433.000 RB0	
	433.025 RB1	
	433.050 RB2	
	433.075 RB3	
	433.100 RB4	
	433.125 RB5	
	433.150 RB6	
	433.175 RB7	
	433.200 RB8/SU8	*Used by Raynet*
	433.225 RB9	
	433.250 RB10	
	433.275 RB11	
	433.300 RB12/SU12	*RTTY repeater and rtty afsk working*
	433.325 RB13	
	433.350 RB14	
	433.375 RB15	
433.400		
FM simplex channels	433.400 SU16	
	433.425 SU17	
	433.450 SU18	
	433.475 SU19	
	433.500 SU20	*FM calling channel*
434.600		
FM repeater inputs in UK only	434.600 RB0	
	434.625 RB1	
	434.650 RB2	
	434.675 RB3	
	434.700 RB4	
	434.725 RB5	
	434.750 RB6	
	434.775 RB7	
	434.800 RB8	
	434.825 RB9	
	434.850 RB10	
	434.875 RB11	
	434.900 RB12	*RTTY repeater-afsk*
	434.925 RB13	
	434.950 RB14	
	434.975 RB15	
435.000		
	434 – 440	*ATV – frequencies chosen so as to avoid interference to other band users and in particular, the amateur satellite service*
	435 – 438	*Amateur satellite service*
440.000		

Notes on UK 144 MHz and 430 MHz band plans

MS operation can take place up to 26kHz higher than the reference frequency (see RSGB Amateur Radio Operating Manual page 80).

The beacon and satellite service must be kept free of normal communication transmissions to prevent interference with these services. († - 144.850MHz in use by Raynet until further notice, subject to 25W erp max. and vertical polarization).

The use of the fm mode within the ssb/cw section and cw or ssb in the fm-only sector is not recommended.

Repeater stations are primarily intended as an aid for mobile working and they are not intended to be used for dx communication. Fm stations wishing to work dx should use the all-mode section, taking care to avoid frequencies allocated for specific purposes.

IARU Region 1 HF Band Plan

Band (MHz)		Type of emission
3.50 – 3.60		cw (2)
3.60	+ 20kHz	rtty (1)
3.60 – 3.80		cw and phone (2, 3)
7.00 – 7.04		cw
7.04	+ 5kHz	rtty (1)
7.04 – 7.10		cw and phone
10.100 – 10.150		cw
10.145	+ 5kHz	rtty (1)
14.00 – 14.10		cw
14.09	+ 10kHz	rtty (1)
14.10 – 14.35		cw and phone
18.068 – 18.110		cw
18.105	+ 5kHz	rtty (1)
18.110 – 18.168		cw and phone
21.00 – 21.15		cw
21.10	+ 20kHz	rtty (1)
21.15 – 21.45		cw and phone
24.890 – 24.930		cw
24.925	+ 5kHz	rtty (1)
24.930 – 24.990		cw and phone
28.00 – 28.20		cw
28.10	+ 50kHz	rtty (1)
28.20 – 29.70		cw and phone

Notes

(1) For rtty, recommended section of operation shared with cw.

(2) 3,500-3,510 and 3,790-3,800kHz reserved for intercontinental working.

(3) 3,635-3,650kHz is used by USSR stations for intercontinental working.

(4) For sstv recommended operation frequencies are: 3,735, 7,040, 14,230, 21,340, 28,680kHz, all ± 5kHz.

(5) For beacons, 28.2-28.3MHz is recommended.

(6) For the downlink of amateur satellites, 29.4-29.55MHz is recommended.

(7) The transmitter power on the 10MHz band should not exceed 250W mean output power. (N.B. UK max. Carrier power is 20 dBW).

(8) No contests should be organized on the 10MHz band.

(9) Credit for awards or diplomas should be accepted for contacts made on the 10MHz band.

(10) SSB may be used on the 10MHz band during emergencies involving the immediate safety of life and property, and only by stations actually involved in the handling of emergency traffic.

UK 70MHz band plan

70.025		
Beacons only		
70.075		
CW only		
70.150		
SSB and cw only	70.200	*SSB calling frequency*
70.260		
All modes	70.260	*National mobile and calling frequency*
	70.300	*RTTY calling frequency*
	70.350 to 70.400	*Raynet*
70.400		
FM simplex only	70.450	*FM calling frequency*
70.500		

Code of practice for vhf/uhf contest operation

1. Obtain permission from the landowner or agent before using the site, and check that this permission includes right of access. Portable stations should observe the Country Code.

2. Take all possible steps to ensure that a site is not going to be used by some other group or club. Check with the local club and last year's results table to see if any group used the site last year (QTH locator). If it is going to be used by another group, come to an amicable agreement before the event. Groups are advised to select possible alternative sites.

3. All transmitters generate unwanted signals; it is the level of these signals that matters. In operation from a good site, levels of spurious radiation which may be acceptable from a home station may well be found to be excessive by nearby stations (25 miles or more away).

4. Similarly, all receivers are prone to have spurious responses or to generate spurious signals in the presence of one or more strong signals, even if the incoming signals are of good quality. Such spurious responses may mislead an operator into believing that the incoming signal is at fault, when in fact the fault lies in his own receiver.

5. If at all possible, critically test both receiver and transmitter for these undesirable characteristics, preferably by air test with a near neighbour before the contest. In the case of transmitters, aim to keep all in-amateur band spurious radiations, including noise modulation, to a level of −90dB relative to the wanted signal. Similarly, every effort should be made to ensure that the receiver has an adequate dynamic range.

6. Above all, be gentlemanly at all times. Be helpful and inform stations apparently radiating unwanted signals at troublesome levels—having first checked your own receiver! Try the effect of turning the antenna or inserting attenuators in the feedline; if the level of the spurious signal changes relative to the wanted signal then non-linear effects are occurring in the receiver. Some recent synthesized equipment has excessive local oscillator phase noise, which will manifest itself as apparent splatter on strong signals, even if there is no overloading of the receiver front end. Preamplifiers should always be switched out to avoid overload problems when checking transmissions. If you receive a complaint, perform tests to check for receiver overload, and try reducing drive levels and switching out linear amplifiers to determine a cure. Monitor your own signal "off air" if possible. Remember that many "linears" may not be linear at high power levels under field conditions with poorly regulated power supplies. The effects of overdriving will be more severe if speech processing is used, so pay particular attention to drive level adjustment.

If asked to close down by a Government official or the site owner, do so at once without objectionable behaviour.

General rules for RSGB hf contests 1984

The general rules for RSGB hf contests are given below and are to be read in conjunction with the specific rules for each particular contest. International contest rules will contain the relevant sections of the general rules for the benefit of overseas entrants.

1. Entrants must operate in accordance with the terms of their licences.

2. Only one contact on each band may be claimed with a specific station, whether fixed, portable, mobile or alternative address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Proof of contact may be required.

3. Unless otherwise stated, only single-operator entries will be accepted. A single operator station is one manned by an individual operator who receives no assistance whatsoever during the contest period.

4. When multi-operator entries are specifically allowed, such entries will be accepted only if:

(a) The declaration is signed by one operator, who will be regarded as the entrant, and

(b) The operator's callsign is given for each contact.

5. Operators of stations located within the British Isles, ie within the call areas G, GD, GI, GJ, GM, GU and GW, must be fully paid-up members of the RSGB.

6. A contact consists of an exchange and an acknowledgement of an RS report on telephony or of an RST report on telegraphy, and a three-figure serial number commencing with 001 and increasing by one for each successive contact throughout the contest period, irrespective of the band or mode in use. Serial numbers, when sent, must be recorded from non-competing stations.

7. Entries must be clearly written or typed on one side only of RSGB hf contest log sheets (Form HFC1) or international A4 size paper using blue or black ink. *Separate log sheets must be used for each band.* Logs must be kept and entries submitted in gmt. Computer derived logs will be accepted provided that they follow the same format as standard hf log sheets, with 40 entries on an A4 size page split into groups of 10 and having the same column spacings and headings as HFC1.

8. Each entry must include a cover/summary sheet (eg Form HFC2) incorporating a signed declaration.

9. Entries must be addressed to the adjudicator, whose address will appear in the specific rules for each contest, with the name of the contest marked in the top left hand corner. All entries must be postmarked not later than 15 days following the contest. If acknowledgement of receipt is required, British Isles entrants should include a stamped addressed postcard which will be returned to the sender. Overseas entries will not normally be acknowledged.

10. All entries become the property of the RSGB. In the event of any dispute, the ruling of the Council of the RSGB shall be final.

11. For scoring purposes, aeronautical mobile and maritime mobile stations will count only as the minimum score of the particular contest and not for any bonus or multiplier. Entries from GB stations, aeronautical mobile and maritime mobile stations will not be accepted.

12. Awards are made at the discretion of the Council of the RSGB and may consist of trophies, plaques or certificates.

13. Certificates of merit are normally sent to the three leading stations in each section of a contest.

14. Entrants may be disqualified for failure to observe the general rules or the specific rules.

15. Points are deducted for errors in the logs. Duplicate contacts must be recorded without claim for points. Any such unmarked contacts for which points have been claimed will be penalized by the deduction of 10 times the points claimed for that contact.

16. Small quantities of RSGB hf contest log sheets (Form HFC1) and cover/summary sheets (Form HFC2) may be obtained from RSGB HQ on receipt of a large stamped addressed envelope. Larger quantities may be purchased.

General rules for RSGB hf receiving contests 1984

1. To claim points, a station may be logged once only on each band whether fixed, portable, mobile, or alternative address.

2. A receiving station log must show in columns: date/time (gmt), callsign of station heard, report and serial number sent by station heard, callsign of station being worked, bonus points, total points. The band in use must be shown at the top of each log sheet.

3. A cover/summary sheet (eg Form HFC2) must be submitted with the logs. The signed declaration must include the words "I certify that I do not hold a Class A transmitting licence".

4. The following rules from the transmitting general rules also apply to receiving contests: 3, 5, 7, 9, 11, 12, 13, 14, 15 and 16.

Code letters for use in RSGB contests

County/Region	Letters
Alderney	ALD
Antrim	ATM
Armagh	ARM
Avon	AVN
Bedfordshire	BFD
Berkshire	BRK
Borders	BDS
Buckingshamshire	BKS
Cambridgeshire	CBE
Central	CTR
Cheshire	CHS
Cleveland	CVE
Clwyd	CWD
Cornwall	CNL
Cumbria	CBA
Derbyshire	DYS
Devon	DVN
Dorset	DOR
Down	DWN
Dumfries & Galloway	DGL
Durham	DHM
Dyfed	DFD
Essex	ESX
Fermagh	FMH
Fife	FFE
Mid Glamorgan	GNM
South Glamorgan	GNS
West Glamorgan	GNW
Gloucestershire	GLR
Grampian	GRN
Guernsey	GUR
Gwent	GWT
Gwynedd	GDD
Hampshire	HPH
Hereford & Worcester	HWR
Hertfordshire	HFD
Highlands	HLD
Humberside	HBS
Isle of Man	IOM
Isles of Scilly	IOS
Isle of Wight	IOW
Jersey	JER
Kent	KNT
Lancashire	LNH
Leicestershire	LEC
Lincolnshire	LCN
Greater London	LDN
Londonderry	LDR
Lothian	LTH
Greater Manchester	MCH
Merseyside	MSY
Norfolk	NOR
Northamptonshire	NHM
Northumberland	NLD
Nottinghamshire	NOT
Orkney	OKE
Oxfordshire	OFE
Powys	PWS
Salop	SLP
Sark	SRK
Shetland	SLD
Somerset	SOM
Staffordshire	SFD
Strathclyde	SCD
Suffolk	SFK
Surrey	SRY
East Sussex	SXE
West Sussex	SXW
Tayside	TYS
Tyne & Wear	TWR
Tyrone	TYR
Warwickshire	WKS
Western Isles	WIL
West Midlands	WMD
Wiltshire	WLT
North Yorkshire	YSN
South Yorkshire	YSS
West Yorkshire	YSW

RADIO COMMUNICATION

Index to Volume 59 - January to December 1983

Issue	Pages	Issue	Pages	Issue	Pages	Issue	Pages
January	1-92	April	285-380	July	561-664	October	849-944
February	93-188	May	381-472	August	665-752	November	945-1040
March	189-284	June	473-560	September	753-848	December	1041-1128

Authors

Clubs

Conferences, conventions, courses, exhibitions and lectures

Contests, df (*Rules in italic*)

New equipment/products

Non-technical articles

Regular features

Reviews, equipment

Reviews, publications

RSGB affairs

Satellites

Technical articles

"Technical topics" items

B.N.O.S.
ELECTRONICS

British Designed & Manufactured

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Take a look at the world's most advanced range of 2 metre Linear Amplifiers

Over 40 years of design experience has gone into what is fast becoming acclaimed as the biggest break-through in linear technology. Performance and reliability have been designed in, which gives us the confidence to offer a free 5-year warranty. Why not take a closer look at our products and see where value for money really counts.

The LPM144 Range

This sophisticated, but simple to use, range of amplifiers have performance characteristics and extra features previously not available in the UK. The pre-amplifier uses the highly regarded BF981 MOSFET, and an LED bargraph power meter is provided, to highlight only two of the amazing number of features.

The L144 Range

To complement the LPM range, we have introduced the L series linear-only versions for the amateur who may already be equipped with a good pre-amplifier and power meter. The excellent linear performance is maintained and both RF Vox and hard-wired changeover are standard.

- *Linear all mode operation*
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- *Trouble-free RF switching at low drive levels*
- *Straight-through mode when switched off*
- *Unique over-drive protection circuit*
- *Mobile mount on all 100 Watt models*

LPM144-1-100	**£172.50**
LPM144-3-100	**£172.50**
LPM144-10-100	**£149.50**
LPM144-25-160	**£189.50**
LPM144-3-180	**£215.50**
LPM144-10-180	**£212.50**

LINEAR PART NUMBERING SYSTEM

LINEAR / PREAMP / RF METER — LPM144-3-100 — OUTPUT POWER / INPUT POWER / FREQUENCY (BAND)

L144-1-100	**£138.00**
L144-3-100	**£138.00**
L144-10-100	**£115.00**
L144-25-160	**£155.00**
L144-3-180	**£181.00**
L144-10-180	**£178.00**

BNOS 'A' Series Power Supplies

12/6A £48.30
- 13·8V, 6A continuous output
- 7A maximum output current
- 10A current meter
- 10A output terminals
- LED shut down indicator
- Fully protected

12/25A £125.45
- 13·8V, 25A continuous output
- 30A maximum output current
- Large 30A current meter
- 30A output terminals
- LED shut down indicator
- Fully protected

12/12A £86.40
- 13·8V, 12A continuous output
- 15A maximum output current
- Large 20A current meter
- 15A output terminals
- LED shut down indicator
- Fully protected

12/40A £225.40
- 13·8V, 40A continuous output
- 50A maximum output current
- Large 50A current meter
- Large output meter
- LED shut down indicator
- LED out of regulation indicator
- Output sensing terminals
- Fully protected

Our Guarantee *Our aim is to provide you with high quality products at realistic prices, to give you the best value for your money.*

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FT77

YAESU MUSEN

Utilizing a new CAD/CAM method now presents . . .

THE FT77

A milestone in simplicity, economy and reliability in HF radio.

The FT77 is an all solid state no tune transceiver for SSB and CW operation on ALL amateur bands between 3·5 and 30MHz. FM operation is possible with the optional FM unit. Nominal power output for SSB and CW is 100 watts (85 watts on 10 metres, 50 watts on FM).

Employing all the latest engineering and manufacturing techniques the FT77 is intended to offer the essential modern operating features in the most economical, reliable and compact HF transceiver available today.

Reliability and quality control have been increased to a degree beyond that previously attainable in amateur equipment, while production costs have been reduced considerably, due to the new CAD/CAM (computer aided design/computer aided manufacturing) system. Computer-designed circuit board layouts ensure the high level of reliability in the smallest possible space, while automatic (robot) parts insertion and soldering vastly improve quality control and reduce costs.

The front panel layout and operation are actually simpler than some VHF FM transceivers, while the simple circuit design leaves fewer parts that could cause problems. Nevertheless, all of the essential modern operating features for HF SSB and CW are included, along with extras such as dual selectable noise blanker pulse widths (designed to blank the woodpecker or common impulse noise), full SWR metering and capabilities for an optional internal channel crystal*, narrow CW filter*, and FM unit*.

The extremely compact size and simple control layout make the FT77 ideal for mobile operation, or as the heart of a complete base station with the optional FP700 AC Power Supply, FV700DM Digital Scanning VFO and Memory System, FTV700 V/UHF Transvertor and the FC700 Antenna Tuner.

The low price of the FT77 coupled with the expansion capabilities presented by these accessories, make this transceiver the perfect choice for those new to amateur HF communication, or as a practical second rig for old timers.

Ask your authorised Yaesu dealer for a full colour leaflet or better still call in to him and try one out today!

GENERAL

FREQUENCY COVERAGE
Rx/Tx: 10-80M (*All* 8 bands)

FREQUENCY RESOLUTION
100Hz (Digital Readout)

FREQUENCY STABILITY
Better than 100Hz/½ Hr A.W.U.
Better than 300Hz during ½ Hr W.U.

MODES OF OPERATION
J3E (USB/LSB), A1A (CW), G3E* FM (Tx & Rx)

POWER REQUIREMENTS
13·5VDC; 1A Rx, 20A Tx

DIMENSIONS (EX/INC Projections)
250/340D × 245/248W × 100/115H, mm 6Kg (13·3lb) Nett

RECEIVER

SENSITIVITY
J3E/A1A (SSB/CWW) @ 10dB S + N/N; 0·3μV (2·4KHz)
A1A (CWN)* @ 10dB S + N/N; 0·15μV (600Hz)
G3E (FM)* @ 12dB SINAD; 0·7μV (12KHz)

CIRCUIT TYPE
J3E/A1A (SSB/CW); Single Conversion (8987·5KHz)
G3E (FM) ; Double Conversion (8981·5 & 455KHz)

SELECTIVITY (all @ −6dB & −60dB)
J3E/A1A (SSB/CWW); 2·4-5KHz, 2.08:1 SF
A1A (CWN) ; 0·6-1·3KHz, 2.17:1 SF
G3E (FM) ;12-24KHz, 2.00:1 SF

SPURIOUS REJECTIONS
Better than; −70dB image, −50dB IF

AUDIO
4W-16 Ohms, 3W in 4 ohms (@ 10% THD)

TRANSMITTER

POWER OUTPUT
J3E/A1A (SSB/CW); 100W PEP (80-12m)
; 85W PEP (10m)
G3E (FM) ; 50 WATTS

AUDIO RESPONSE
350-2700Hz (@ −6dB)

SPURIOUS SUPRESSIONS
Carrier; Better than −40dB
General; Better than −40dB
Sideband; Better than −50dB (W/R 1KHz)

MICROPHONE IMPEDANCE
600 Ohms Nominal

OUTPUT IMPEDANCE
50 Ohms Nominal, Unbalanced

ACCESSORIES

FC700	*Antenna; tuner, load, SWR etc*
FP700	*Power Supply (mains to 12VDC)*
FV700DM	*Synthesized external VFO/memory*
MMB16	*Mobile bracket (accepts FT & FV & /or FC)*
MR7	*Rack Unit*
FTV700	*VHF/UHF monoband transvertor frame*
•TV	*6m, 4m, 2m, 70cms module*

INTERNAL OPTIONS

D3000233	*FM Board (TX & RX)*
D3000234	*Crystal Marker (25KHz)*
XF8·9KC	*Crystal Filter (600Hz)*

ADDITIONAL ACCESSORIES

The FT77 (FT775) is electrically compatible with the FT707 accessories eg. FC707, FP707, FV707DM, FTV707 etc.

MICROPHONES

MD1B8	*Desk, 'Lift Out', c/w scanning*
YM38	*Desk, 'Swan neck' c/w scanning*
YM34	*Desk 'Swan neck'*
MH1B8	*Hand, 'Tone switch' c/w scanning*
YM35	*Hand, 'Standard' c/w scanning*
YM36	*Hand, 'Noise cancel'*
YM37	*Hand, 'Economy'*

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